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A linguistic-pragmatic analysis of cat-induced deixis in cat-human interactions



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ABSTRACT

The present paper contributes to the emerging field of embodied interaction. It reports on research into deictic interactions between a human and a non-human, specifically a cat, interlocutor, applying a pragmatic framework developed for human–human communicative interactions. We analyse video recordings of interactions where a cat is a deictic agent pointing the human interlocutor either to the door or the food bowl. We show that these interactions show triadic pointing, hence, focusing joint attention on a common object as a proxy for the event i.e., providing food in the bowl and opening the door. We show that the cat also checks whether the human understands her intentions and that she confirms the human's interpretation. We do not restrict ourselves to vocal communication – as is often done in human language studies –, but we examine how in cat-human communication the cat and human bodies are used to express deixis. Thus, we conceptualize deixis as an embodied interpersonal i.e., interspecies phenomenon. We show that the cat interlocutor uses her body, e.g. eyes/body/tail/ears, as well as her voice, meowing/purring, within this complex deictic interaction.

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1. Pragmatics of human-animal communication

This paper addresses the interaction between so-called domestic cats¹ and their humans² in the shared home setting. More specifically, we investigate the deictic cues induced by cats in interspecies interactions and argue that these cues objectively lend themselves to a linguistic-pragmatic analysis of deixis originally developed for human–human interaction (Stukenbrock, 2020).

In the field of pragmatics, definitions are always in motion, continuously evolving extensions and delimitations. One subfield recently admitted to the margins of the field is the pragmatics of animal communication. Tradition admits communication skills and pragmatic acts specifically to humans only, and interspecies communication is often relegated to

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¹ Felis catus.

² Homo sapiens.

overinterpretation by humans anthropomorphizing, i.e., ascribing human traits to nonhuman animals. However, anthropomorphizing could also be analyzed as “a situated direct perception of human properties by someone who is engaged in a given situation and sensitive to what the animal is doing to them” (Servais, 2018:2). De Waal (1999:261) argues in a similar vein that anthropomorphism should be used “not to find some quality in an animal that is precisely equivalent to our own inner lives. Instead, the fact that we are animals is exploited to develop testable ideas”.

We take this view on anthropomorphism as a hypothesis on nonhuman animal behavior together with the idea that language is an inherently mutual activity (see Clark, 1996). Scott-Philips (2010:17) defines this as follows: “Linguistic symbols are by their very nature collaborative: they are coordination devices that are useful only in so far as one’s interlocutor is prepared to recognize their significance.” That this also applies to interaction of nonhuman animals within their own species or between nonhuman animals and humans has already been shown in the literature. Mondada (2018), for example, analyzed a short interaction between two baboons, showing their interaction is mutually organized. Mondémé (2021) also argues that human–animal interaction exhibits systematic features. Simonen and Lohi (2021:424) show that dogs have implicit knowledge of their owners on the basis of which dogs “have access to the principal ways in which human interaction is organized”. Harjunpää (2022) demonstrates the human use of prosodic and lexical resources in talking to companion animals as an interactional practice, resulting in a supposed reciprocal vocal action. Thus, although pragmatics is classically defined as “the ability to use language to convey a specific communicative meaning in a given context” (Parola et al., 2021:7), including animal-induced, human-directed communication in this definition of pragmatics would extend it to “the ability to use language and other expressive means (like gestures, body movements, facial expressions, and paralinguistic cues) to convey a communicative meaning in a given context” (cf. Bosco et al., 2018:1).

These definitions make cat-human interaction particularly well suited to an investigation into linguistic-pragmatic fundamentals of interspecies communication (Mondémé, 2018, 2021). First, it reveals that other sensory means than visual ones, such as smelling (illustrated in the analysis of excerpt 2 below, see also Koyasu et al., 2020; Turner, 2021), may be crucial in defining pragmatics. Second, cats share their lives with humans in the same home, often spending more time with humans than with conspecifics. Domestic cats – depending of course on their experiences – behave friendly towards humans and accept them as housemates throughout their lives, welcoming their food and touch, and engaging in shared activities.³ When socialized with humans, cats acquire “a general mental representation for the emotions” of their human, as well as cat partners, in the same home setting (Turner, 2021:3). Turner’s (2021) study also reveals that in the home setting, a symmetry exists in cat-human interactions depending on their relationship, that is, if the human invests in interactive behavior with the cat, this increases the cat’s communicative interactional efforts with the human; a more disengaged human tends to decrease the cat’s communicative efforts. Thus, this linguistic study converges with recent studies in ethology displaying that animals have their own preferences and make their own choices (Reesink, 2021; see also DeMello, 2012); which in no way excludes the premise that successful cat-human communications also depend on prolonged attentiveness of a human interlocutor.

This paper investigates the expression of deictic reference by cats asking for the attention of the human via sound, eye-gaze, and gestures, as well as the expression of spatial reference pointing to a certain object in a shared space (Bühler, 1990:111; Diessel, 2006).⁴ Our linguistic study is unique, firstly because it incorporates insights from human linguistics, veterinary studies, behavioral psychology, and biology, and secondly, and most importantly, because it observes what the cat indicates as relevant in the unfolding sequential interaction with human(s). In an investigation into the full range of communication strategies, we stay open to all possible communicative elements, requiring close analysis of the entire body of all interaction partners.

This paper is organized as follows. Section 2 provides our background discussing the literature on deixis as an embodied phenomenon as well as relevant literature on deixis in nonhuman animals including cats. Section 3 provides the methodology we employed to investigate deixis in cat-human interactions. We give a qualitative analysis of two interactions between a cat and a human in Section 4 and show how the deictic interaction proceeds. Section 5 concludes the paper.

2. Theoretical background: deixis

2.1. Embodied deixis

Deixis is a fundamental and arguably universal property of pragmatics, language, and communication: every utterance is interpreted relative to a deictic center, grounded in time and space by the body from which the utterance emerges (Bühler, 1990; Diessel and Coventry, 2020).⁵ Deixis has been argued to predate all other language; both in acquisition (cf. e.g., Liszkowski, 2012) and in language evolution (cf. e.g., Kirtchuk, 2004). Although these claims too are subject to debate (cf.

³ When cats are exposed to frequent interactions with humans during their socialization phase as kittens (between 2 and 7.5 weeks), they typically become social towards them.

⁴ Cf. also Lyons (1995: 303): “The term [] ‘deixis’ [...] originate[s] in the notion of gestural reference: that is, in the identification of the referent by means of some bodily gesture on the part of the speaker.”

⁵ Cf. also Lyons (1995: 303): “The terms ‘deixis’ [...] originate[s] in the notion of gestural reference: that is, in the identification of the referent by means of some bodily gesture on the part of the speaker.”

Stukenbrock, 2020), deixis presents itself as a natural and necessary first area of linguistic-pragmatic investigation into interspecies communication (see also Krause et al., 2018).

Deixis can be established via language (e.g., demonstratives like *this*, *that*) and/or embodied cues, most significantly, pointing (Diessel, 2006; Levinson, 2004). Although the embodiedness of deixis including pointing is acknowledged by a variety of scholars (Bühler, 1990; Levinson, 2004), the exact bodily implementations and potential cut-off point between pointing and non-pointing gestures have been debated. Levinson and Holler (2014:3) for instance argue that declarative pointing is “human-specific in form and function”, typically involving an index finger; other research demonstrates the employment of several other body parts in pointing (cf. also “Kendon’s continuum of pointing gestures”; e.g., Kendon, 2004). Fricke (2014) provides an extensive literature overview of (human) body parts used in deictic spatial reference, including the lips and the nose (cf. Auer and Stukenbrock, 2022 and references there). Importantly, Fricke (2014:1804), following Bühler (1990:100–101), argues that pointing either with spoken language or with the body is the same communicatively and linguistically.

A more recent debate investigates and discusses the role of eye-gaze as a vehicle for referential pointing, i.e., eye-gaze as a pointing gesture. In early acquisition of human language, eye-gaze as attention getting is considered an aspect of communication crucial to later language development (e.g., Clark, 1978; Cates et al., 2012 and references cited therein). Rather than seeing pointing and eye-gaze as two separate phenomena that sometimes occur simultaneously, Diessel and Coventry (2020) suggest instead that pointing and gaze can in fact be reduced to the same phenomenon, observing that, in a range of human languages, pointing or eye-gaze is obligatory as an accompanying deictic cue for certain demonstratives to act as a successful deictic sign. Moreover, it is a widely accepted insight within the field of sign language that eye-gaze, sometimes in combination with hand pointing, is used e.g., to anchor personal deixis and to establish the referential framework (Garcia and Sallandre, 2020; Sandler, 2018).

In the literature on pointing, imperative pointing, involving reaching for an object to get it, is distinguished from declarative pointing. The latter is a communicative act involving two participants and an object where the sender aims to draw attention to the object and, when successful, ultimately reaching joint attention with the addressee on that object (Brinck, 2004, Diessel, 2006; Stukenbrock, 2020:3). Imperative pointing is “performed in order to make the addressee do something for the subject” (Brinck, 2004:430). Put differently, in the words of Brinck (2004:441) “In a communicative act, the sender conceives of the addressee as somebody with whom she can exchange information by mutual interaction, not – as in acts of imperative pointing – as a means to reach a given end”. We will come back to this difference between imperative and declarative pointing below in our analyses.

2.2. Deixis in nonhuman animals, including cats

Krause et al. (2018:328) note that “declarative pointing and its apparent developmental precursors (exhibition of self, showing of objects) have been reported in great apes (...)”. They thus claim that nonhuman animals may use declarative pointing like humans do. In their literature review on animal pointing, Krause et al. (2018:330) define pointing as “a quantifiable behavioral response [of an animal, authors] to communicate the location of an object to a human experimenter”. They summarize the results of 25 experimental studies involving object-choice tasks investigating nonhuman animal pointing production between 1987 and 2016.⁶ Individuals of various species appear to reveal pointing production (cats are not included in the tests): chimpanzees, bonobos, gorillas, orangutans (Hominoidea), rhesus macaques, Tonkean macaques, Japanese monkeys, guenons, red-capped mangabeys, olive baboons (Cercopithecoidea), capuchins, squirrel monkeys (Platyrrhini), dogs, wolves (Canidae), horses (Equidae), dolphins (Delphinidae), and Australian magpies (Artamidae). These species use different body parts and movements in referential pointing. Horses, for example, show head and neck extension towards an out-of-reach object (Krause et al., 2018). Observational studies reveal that raven address their pair-partners by “pick[ing] up a non-food item (for example, moss, small stones, or twigs), hold[ing] it up in the beak and moving the head up-and/or downwards repeatedly” (Pika and Bugnyar, 2011:2–3). According to Pika and Bugnyar (2011), this showing and offering non-edible items to a recipient of the other sex “directs the attention of conspecifics outside entities triadically and referentially”, and may “function as declarative gestures (used to share attention or to comment on things)”. Crucially, ravens rely heavily on social bonding, and communication between pair-partners (Pika and Bugnyar, 2011).

Let’s now turn to domestic cats. Turner (2021) and Pongrácz et al. (2019) show that domestic cats read and follow human gaze for referential information. Koyasu et al. (2020) concludes, from a rather extensive literature review, that cats can follow humans’ pointing and gaze direction and they can also look alternately at the owner and an object when confronted with a strange object (e.g., Miklósi et al., 2005). Although this does not in itself verify the cat’s ability to establish deictic reference, the ability of cats to follow human gaze, and to use their own gaze to communicate to humans, is a prerequisite to cats potentially exploiting their own gaze to express deixis with a human of their household. Moreover, it clearly demonstrates the readiness of cats to see humans as agentive partners necessary for successful interspecies interaction. This conclusion is

⁶ Those studies were included in which 50% or more nonhuman animal subjects were reported to have demonstrated each of the three capacities, that is, pointing production, human pointing comprehension, and attentional sensitivity.

underpinned by other documented means of attention getting displayed by domestic cats towards humans of their household, for instance, vocalizations.⁷ Based on a corpus of 535 domestic cat vocalizations, derived from over a total of 36 h of recording in the home setting of 12 adult cats, [Nicastro \(2004\)](#) shows how cats seek the attention of their cohabiting humans by meowing accompanied by a range of bodily cues depending on and discriminating between specific contexts. He distinguishes two different contexts that clearly contain gaze alternation, which might be interpreted as referential pointing by the cats between the human and an object. Firstly, in the so-called food-related context, the cats look alternately from the human to the food with eyes open, ears up and tail up, and secondly, in the context where the cat vocalizes to solicit assistance in removing a barrier such as a window or door in their home setting to get to another space. In such situations, the cats also orient themselves towards the obstacle with tail up and eyes open, looking alternately from the human in the household to the obstacle. In other studies, human informants report a range of postures and behaviors that they understand as means by which their cat companions attract and manipulate human attention, for instance, cats may raise their tails upright when greeting the human, flank-rub their legs, modify meows and purrs, and use direct eye-gaze ([Humphrey et al., 2020](#); [Turner, 2021](#)). These means are intentional acts that communicate the cat's message to which addressees respond ([Meijer, 2019:124](#)) and react ([Sievers et al., 2017](#)). Thus, we recognize these means as domestic cat agency to initiate signal production to “co-create meaning in relation to members of their own and other species” ([Meijer, 2019:39](#)).

The literature reviewed above makes clear that deixis is attained in spoken and signed languages via various strategies, involving words (e.g., demonstratives), bodily movements (pointing with fingers, lips, other body parts), and eye-gaze. Since deixis is embodied, nonhuman animal communicators may use yet different strategies fitting their bodies. Ravens use their beaks, horses their neck, and cats may use tail movement, ears, paws, nose, eyes, whiskers, they may perform spatial reference by means of moving in a direction, and they may use looking alternately from the human to the object (food and/or window/door) ([Nicastro, 2004](#)). Traditionally, strands of various research ideologically centered around the question of human exceptionalism when investigating language/grammar (no body involved) versus (embodied) communication ([Goldstein and Hall, 2021](#)). However, we agree with [Bucholtz and Hall \(2016:178\)](#) that “[t]he production of contextualized meaning arises from bodily engagement with the world” and emphasize that research into embodied communication goes beyond the human.

2.3. The aim of this paper

The aim of the present paper is to examine a selected set of interspecies communication acts between cats and humans where the feline interlocutor is the agent inducing the potential deictic cues. In our study, we investigate whether the sequential steps observable in cat-human interaction mirror those attested in human–human communication, and whether [Stukenbrock's \(2020\)](#) model offers a suitable format to observe and describe the precise deictic resources characterizing (successful) cat-human interactions. One of the questions we aim to answer is whether the deictic interaction can be construed as imperative (I want that), declarative (I want to share information with you) or something in between (see Section 2.1 above). We will investigate the embodied deictic cues the cat uses in her interaction with human interlocutors and describe and analyze the sequential organization of these interactions.

3. Methodology

3.1. Data collection

[Mondémé \(2018: iii\)](#) points out that observed data about interspecies interactions are “rather challenging to obtain, precisely because they arise spontaneously in domestic, private, and ordinary interactions”. This, of course, holds for interhuman interactions as well, but the added challenge of acquiring data on interspecies interaction is that non-human individuals can generally not be asked to display or withhold from certain behaviour, to remain within the camera's sightlines, and so on. Performing research in an experimental setting could overcome this challenge, but this would go at the cost of ecological validity while we want to study interspecies behaviour as it occurs naturally. Therefore, to address the research question as to what sequence of deictic cues characterizes cat induced interaction, we collected video-audio recordings of situated ordinary interactions between cats and humans sharing the same household.

Twenty-one videos totaling 18 min and 41 s were collected. Four of these were selected and qualitatively analyzed through interpretive video analysis,⁸ focusing on “the meanings of actions to the actors involved” in social interactions ([Knoblauch et al., 2014:436](#)). The format of this article only allows us to present the transcriptions and detailed analysis of two of them: interactions between the cat Salma and the human members of her household (KME, the fourth author; and H, her husband, respectively). These two videos were carefully chosen firstly because of their representativity since they incorporate the relevant features of the interactions for all twenty-one videos thus far collected. Secondly, these two interactions were

⁷ It seems relevant that cats use vocalizations and signals towards their human interlocutors that they never use towards members of their own species; Cf. e.g., the meowsic project at Lund university. <https://meowsic.se/publ.html>.

⁸ See <https://public.yoda.uu.nl/i-lab/UU01/1L7E20.html> (created May, 6 2022). Two videos were filmed by RvZ (the fifth author) and include cat Lieve and RvZ's father. The other two were filmed by KME (fourth author) (see Section 4 for more information). All videos were filmed using handheld smartphones.

recorded before this research project existed (August 30, 2020/March 16, 2021). We hence know that the recordings were not made for scientific purposes and the interaction recorded is therefore not modified through *reactivity* (Knoblauch et al., 2014), where the activity of the human making the video-recordings is affected because of the scientific goals, e.g., making the video-recording the priority and/or pretending not to understand the cat's intentions. Thirdly, the technical quality of these videos allows for clear visibility of the interaction unfolding. Fourthly, these recordings show Salma taking the initiative to establish the deictic space successfully in a very short time span; allowing us to include both the transcription and the analysis of two interactions within the word limits of this paper. Finally, as the analysis of the interactions unfolded, KME was able to volunteer all relevant information about whether and how this activity was typical for Salma in an interaction of this kind, due to her sharing the same household with Salma. This gives us a good fundament to understand the meanings of the actions of Salma and the human actors involved (Knoblauch and Tuma, 2011). The necessary objective distance to the given interactions was ensured through the transcriptions and analysis of these two videos being performed by the first, second, third and fifth independently, but not by the fourth author (KME).

3.2. Data analysis, methods and procedures

The four videos were analyzed using VideoNote. The analysis consisted of several steps. Firstly, the temporal sequence of events was transcribed, including the gestures and activities performed (Knoblauch et al., 2014). A combination of Systematic Text Condensation (STC) (Malterud, 2012) and the naturalistic inquiry method (Beuving and de Vries, 2014) was used to code and summarize the data. The transcripts were unitized, where the units contain information relevant to the research topic (Beuving and de Vries, 2014; Brinkmann and Kvale, 2015; Malterud, 2012). Specifically, actions corresponding to the different steps involved in establishing deixis, as indicated by Stukenbrock (2020), were identified in the transcripts. The interpretation of the data has been done as objectively as possible, only referring to aspects of the interaction that could be seen in the videos. Video frame grabs were also used to illustrate visible conduct such as eye gazing (Hepburn and Bolden, 2013).

3.3. The feline actor

Salma has lived on a farm in a rural area in Norway since she was a kitten. She lives in a house with two adults receiving frequent visits from a grandchild, and is a very explorative, attentive, and communicative cat. In the two recordings we can observe the following: In the first recording, Salma is ten months old, guiding the human KME to the location where her food in a bowl is located, thus where she is typically fed (the utility room). The second recording is made when Salma is four months old. At that time, she had not been allowed outside the house except for short trips when kept on a leash. The balcony, where she wants to go, is a confined space, but still allows her to go outside without a leash.

4. Analysis

We put forth a linguistic-pragmatic analysis originally developed for human–human communicative interaction incorporating eye-gaze as a means of pointing, specifically Stukenbrock (2020). She developed a model of the interactional organization of deictic reference resting on the partitioning of such interactions into precise and characteristic sequential expressions constituting the “temporal order of the course of action” (Knoblauch et al., 2014:440) of deixis that “emerge[s], change[s] and disappear[s] continuously and fluidly as the interaction itself changes” (Goodwin, 1986:35). In particular, she argues that deixis consists of several consecutive steps, discussed in more detail in the analysis section below, summarized as follows: (i) the sender seeks the attention of the addressee, (ii) the sender establishes the deictic space (for instance by inviting the addressee to come closer, hence, eliciting a reaction), (iii) the sender points (via eye-gaze, pointing, spoken/signed language) to the target. If the sender and the addressee reach joint attention on the target, the deictic communication is successful and ends, otherwise the communication is repeated in another attempt. During these steps, the sender confirms and verifies, via e.g., spoken language or eye-gaze, that the addressee is paying attention and correctly interpreting the communication.

In the analyses below, we equate the camera viewpoint with the approximate human gaze direction (see e.g., Knoblauch et al., 2014). This is especially relevant for the analysis of the first video, where the cat Salma interacts with human K (author KME), who is filming. Thus, in this case, to analyze the interactions between the two agents, the camera follows the gaze direction of the human eye. This is confirmed by the shadow of human K, which is visible in video 1 and indicates where she is standing.

4.1. Excerpt 1: Salma-human interaction; food bowl in the adjoined utility room (in KME's house, March 16, 2021)⁹

The transcript conventions (see the appendix) that were used when making the transcripts are based on the conventions presented by Hepburn and Bolden (2013). In the transcripts, each line describes a separate action of either the cat or a human. A time indication is given directly after the line number, so that the action can easily be looked up in the video. The time indications also make clear that there are some prolonged actions, such as crossing a room towards a door, which take

⁹ In the interest of space, we have excluded some parts of the transcription of Excerpt 1 & 2. This paper only includes those parts of the transcription that shows Salma's deictic agency. The entire transcripts can be found in the online repository (see <https://public.yoda.uu.nl/i-lab/UU01/1L7E20.html>).

multiple seconds. Such prolonged actions sometimes involve multiples stages, e.g., ‘walking towards a door’ involves ‘starting to walk’, ‘moving closer’, and ‘rubbing the door post’. In such cases, we have put the prolonged action as well as its subactions on separate lines. In these and other cases, actions occur at the same time, e.g., when the cat and the human do something simultaneously or if the cat walks and turns her ears at the same time. Simultaneity can be deduced from the time coding and is also visualized by means of square bracketing and indentation, as well as color coding (only available in the online version of this paper) of the opening and closing brackets that belong to one continuous action. Visual representations, i.e., video frame grabs are included to illustrate certain actions.

CONTEXT: Cat Salma is sitting on a carpet at the start of the video and eventually walks towards the adjoining utility room, where her food bowl is located. The human (KME) (female) is filming her with her smartphone and is not in the frame. The video lasts a total of 21 s. The time frame is indicated in seconds. The transcript conventions can be found in the appendix.

1. 00 Cat: ((sitting on a carpet, [gazing at Human]))
2. 00-01 Cat: [((moves closer to Human)), meows]
3. 02-04 Cat: [((starts [walking towards Human]))]
4. 03 Cat: [[meows]
5. 03-04 Human: [[([moves closer to Cat]))]
6. 04 Cat: [[[meows]]]
7. 04-06 Cat: [[[((starts walking again))]]]
8. 06 Cat: [([looks down))] ^gazing in direction of Human^
9. 06-07 Cat: [meows]
10. 07 Cat: ((gazes up at Human))
11. 07-08 Human: ((moves closer to Cat))
12. 08-11 Cat: [((starts walking towards the door))]
13. 08 Cat: [((turns her head away towards the door)) ^gazing in the direction of a door opening^
14. 09 Human: [((follows Cat))]
15. 09 Cat: [((ears oriented backwards towards Human))]
16. 09-11 Cat: [((rubs herself against the doorpost, # arching her back))]



Fig. 1. Salma arching her back (line 16).

- 19. 11-12 Cat: ((points left ear towards food bowl, right ear towards Human))
- 20. 12-13 Cat: ((stands still, gazing back in the direction of Human))
- 23. 13-14 Cat: ((continues walking towards the food bowl))



Fig. 2. Salma rubbing against the door post (line 25).

- 25. 14-16 Cat: #((rubs her side against another doorpost)) (behind which her food bowl is)
- 26. 16-18 Cat: ((turns back around to gaze at Human))
- 28. 18-19 Cat: ((sits down and [gazes up at Human])) (presumably Human's face)
- 29. 19 Cat: [((slightly blinks))]



Fig. 3. Salma pointing with her ear to the food bowl located in the utility room (line 30).

- 30. 19 Cat: #([turns her right ear towards the room])) (where her food bowl is)



Fig. 4. Salma blinks (line 31).

31. 20-21 Cat: # [meows, ((turning her head in the direction of the room and blinking))]
 32. 21 Cat: (([gazes into the room])) (where her food bowl is)]
 33. 21 Cat: [[((points her right ear towards the food bowl))]]

4.2. Analysis of excerpt 1: deictic spatial reference towards food bowl in utility room

According to [Stukenbrock \(2020\)](#), a deictic interaction starts when a focused interaction is established. The sender must first make sure the addressee is attentive to the interaction. In the video, Cat Salma gazes, meows, and walks towards Human K (gazing (1)¹⁰ (8) (10), meowing (2) (4) (6) (9), approaching (2) (3) (7) (11)). K responds by moving towards Salma in (5) and (11), thus showing that she is indeed attentive and cooperative.

When this focused interaction is established, the next step is to identify the deictic space (i.e., the “domain of pointing” in Stukenbrock’s terminology). The final domain of pointing is the utility room containing the food bowl. Since Salma and K are not in that room when the interaction starts, Salma seems to lure K towards this space. Salma gazes towards K and then turns away from her and walks towards the door post of the utility room containing the food bowl (in (12), (13), [Fig. 5](#)). K responds to this by following Salma (in (14)).



Fig. 5. Salma setting the deictic space by moving and gazing towards the door opening (line 12, 13).

¹⁰ In the analyses of the transcripts, numbers between brackets refer to line numbers, e.g. (1) is line 1.

Subsequently, the Sender must monitor the communicative success with the Addressee. Salma checks K's response by gazing ((20), (26), (28)) or pointing her ears towards K, possibly to respectively see and hear if K follows, (15).

When the deictic space is reached, the Sender points to the referent. In our case study, Salma's referent is the food bowl, or rather the food that should go into the food bowl. We interpret Salma's activity, namely the turning of her ears in (19), (30, Fig. 3) and (33) along with alternating her gaze between K in (31, Fig. 4) and the food bowl in (32), as pointing towards the food bowl. The idea that gaze alternation between an object and the addressee can be seen as pointing (especially in animals that do not have hands) has already been argued in the literature (see e.g., Diessel and Coventry, 2020 for humans; Heberlein et al., 2016 for dogs and wolves; Leavens and Hopkins, 1998 for chimpanzees). Furthermore, Pongrácz et al. (2019) show that cats understand gaze of (familiar) humans as referential signs. The use of one of the ears as a pointing gesture in interspecies interaction between (other) cats and humans has not been observed before and should be examined further in future research. Fig. 6 below illustrates how Salma turns her right ear towards the food bowl in the utility room while gazing towards K.



Fig. 6. Salma turning her right ear towards the food bowl in the adjoining utility room (line 30).

That Salma is turning one of her ears towards the food becomes clear when this ear position is compared with a more 'neutral' ear position which is upwards and fronted (Fig. 7).

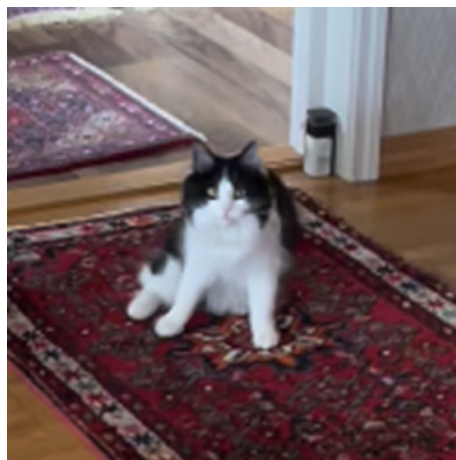


Fig. 7. Salma with ears in more 'neutral' (non-pointing) position (line 1).

Salma turns her right ear towards the food bowl in the adjoining utility room, but keeps her left ear directed towards K (Fig. 6, line 33). We like to suggest that the tip or the end of the right ear points to the food bowl, while the tip of the left ear simultaneously monitors K's behavior. It must be noted that there is no human or other sound coming from the direction of the food bowl that might trigger the position of Salma's right ear, or at least not a sound that has been captured on the video recording. Of course, it could be the case that Salma hears something that is not detectable to human ears or a video camera. Moreover, Salma turning her right ear towards the food bowl could be a sign of her observing the space, or experiencing some kind of emotion towards it, rather than pointing at it. Our reason for interpreting this as a pointing gesture is the fact that the ear movement is embedded in a larger deictic interaction and combined with other deictic cues, such as eye gaze and moving her body towards the food bowl. However, to substantiate our interpretation, more deictic interactions by cats should be studied and compared.¹¹

During a deictic interaction, the Sender checks whether the Addressee is still participating in the interaction. Although we cannot see in this video whether K is gazing at the location Salma indicates, we do see that Salma provides cues that K is on the right track. She does this by rubbing against the door post, (16, Fig. 1) and (25, Fig. 2), puffing up her back, purring and blinking (29). Investigating 21 cats from 14 different households, Humphrey et al. (2020) found that cats more readily reproduced "the slow blink" (an expression of positive emotion) in response to a human with whom they share a household as compared to an experimenter producing the same trigger stimulus, revealing that cats and humans mutually fine-tune their communication as individual adaption in their interaction. Although K is not in the video's frame (however, K's shadow is visible in the video, showing her position with respect to Salma), making it difficult to see which part of K Salma is gazing at when gazing in her direction, the transcription shows that K reacts. Hence, K moves closer to Salma (in (5) and (11)) and follows Salma (14) showing that the drawing attention and recruitment strategies by Salma were successful.

4.3. Excerpt 2: Salma-human interaction; the door handle to go outside (in KME's house, August 30, 2020)

CONTEXT: Cat Salma is sitting on a stool in front of the window door of the balcony. KME is filming her, but does not appear in the transcript as she does not take part in the interaction. The human in the interaction is H, KME's husband, who is sitting on the left side of the camera, off camera. Salma is continuously purring. Human K and H are both not in frame, which makes it difficult to see which part of them Salma is gazing at when she is gazing in their direction. At one point, Human H's hand comes into the frame, as he opens the door for Salma in order to for her to go outside. The video lasts a total of 52 s. The timeframe is indicated in seconds.

2. 23 Cat: ((moves her head closer to the door handle))
4. 24 Cat: ((moves her right front paw towards the door))
5. 24-25 Cat: ((leans a bit on the door))
6. 25 Cat: ((moves closer to the door))



Fig. 8. Salma stands up on her back legs touching window door below door handle (line 7).

¹¹ We are aware that our interpretation of ear movements as pointing may not convince all readers. In response, we would like to point out that even if they would not be a pointing gesture, Salma's ear movements are still remarkable. After all, the videos show that cats can turn their ears in different directions and to different locations that all hold relevance in the deictic space of the interaction. Regardless of the cat's communicative intentions, or our interpretation of them, Salma's ear movements constitute empirical proof of cats' ability to use their ears as an interactional tool.

- 7. 25-27 Cat: #([stands up on her back legs])) (leaning with her right front paw on the door)
- 8. 26 Cat: [((lifts her left front paw towards the door))
- 9. 26-27 Cat: [((stretches out her left front paw))]
- 11.27 Cat: ((turns her head to the left (towards Human K) whilst moving to sit down))
- 12.27-28 Cat: (([gazing at Human], going to sit down))
- 13.28 Cat: # [meows]



Fig. 9. Meowing while gazing at Human (line 13).



Fig. 10. Salma moves her right front paw while gazing at Human (line 18).

18. 30 Cat: #((moves her right front paw in Human's direction, gazing in Human's direction))
24. 33 Cat: ((extends her right front paw in Human's direction,
[gazing at Human]))
26. 34 Cat: [([[extends her right front paw again]])]
27. 34 Human: [((moves his hand into the frame))]



Fig. 11. Salma gazes at Human and extends her right front paw towards Human (line 28).

28. 34 Cat: #([[gazes at Human's hand], while extending her right front paw towards it))
29. 35 Cat: [((touches the hand with her right front paw))
31. 35-36 Cat: [([[smells and licks Human's fingers]])]



Fig. 12. Touching Human's hand and turning her ear towards the door (line 32).

32. 35-36 Cat: # [[((turns her left ear back (in the direction of the door)))]]



Fig. 13. Salma looks at the door handle while Human's hand is moving towards it (line 40).

- 40.40 Cat: #((([gazes up at the door handle, ears positioned towards the handle]))
 (where Human's hand has moved to))
- 43.41-42 Human: [((opens the door))]
- 45.42-43 Cat: [((moves her left front paw forward, turning more towards the door))]
- 46.44 Cat: ((moves her left front paw to turn more towards the door, whilst gazing up))
 ^either gazing at the door handle or outside^
- 47.47 Cat: ((gazes down)) ^gazes to the outside^

4.4. Analysis of excerpt 2: the door handle of the balcony window door

As already discussed above, in a deictic interaction, there must be a focused interaction between the participants, in this case humans H and K and cat Salma. The moment the recording starts, there is already a focused interaction: human K is focusing on Salma, as we can tell from the fact that she is filming her. We cannot see what human H is doing at this point, but the fact that focused interaction is established is confirmed by the fact that Salma is purring, indicating her success in gaining the addressee's attention. Later in the video, it can be confirmed that human H is in fact part of the focused interaction as well, when he moves his hand towards Salma (27) and opens the door with the door handle (43). These actions signal to Salma that human H is attentive and cooperative.

The next step is to identify the deictic space or domain of pointing. Salma wants to go outside for which the door must be opened by pushing the door handle down. Salma directs attention towards this door (handle) by moving her head in (2), her front paw in (4), and her whole body in (5),(6) towards the door and finally standing up against the door in (7), (8) and stretching out her front paw towards the door handle in (9). During this time, she eye-gazes at the door. We already discussed above that gazing is a form of pointing (see Section 4.2). In this interaction we also take the extension of the head in (2) and reaching with her front paw (4) and the rest of her body in (5),(6) as a form of pointing. We already discussed that the extension of head and neck in horses has been analyzed as pointing (see Krause et al., 2018). Although more research is necessary, we assume here that Salma is using this embodied option as well to point.

H and K do not respond to her at this point in the interaction by opening the door (see Fig. 8). This unresponsiveness initiates a new cycle of deictic interaction: Salma turns towards K, in (11), and starts gazing at H in (12) and meowing in (13) (see Fig. 9). At this point, Salma also appears to change her attention, which was first the door, towards H's body, possibly even H's hand, which is needed to open the door. She does this by moving her (righthand) front paw towards him twice in (24) and (26), see Fig. 10. Again, we interpret this moving of the paw as an instance of pointing in combination with eye-gaze and bodily position. Further data should be studied to substantiate this hypothesis. When H reaches out his hand (27), Salma touches his hand (28), see Fig. 11, and starts sniffing/licking his fingers (31). This might be a way of Salma to indicate that H has understood her correctly. Salma then changes the domain of attention again towards the door by turning her left ear back in the direction of the door (32), see Fig. 12. This might again be construed tentatively as a form of pointing, just like the ear position towards the food bowl in section 4.2. H then opens the door (43) and shows that he not only identifies the target of Salma's pointing (the door handle), but also deduces her intention to go outside – otherwise, he would have just had to touch the door handle but leave the door closed. Therefore, this can be seen as constructing the referent (i.e., the balcony) in Stukenbrock's terms. Meanwhile, Salma keeps checking H's hand movements and gazing towards the door, thus going into Stukenbrock's phase of Monitoring the addressee's gaze (40) (Fig. 13). Once H has opened the door (43), Salma signals the recruitment's success of the deictic interaction by extending her left front paw towards the door (45), gazing outside (46) (47), and walking out.

4.5. Imperative or declarative pointing

Taking the linguistic perspective of pragmatics, we have analyzed two interactions between Cat Salma and Humans H and K sharing the same household. We demonstrated how this interaction is structured and sequentially ordered and that it follows the deictic interactional phases that Stukenbrock (2020) describes for human–human interaction.

Now, we will address the question posed in Section 2.3 as to whether there is an imperative (“I want that”) or declarative interaction (“I want to share information with you on a certain object”). The major difference between these two instances of pointing is, as discussed above, that only the latter is considered a communicative act where one participant wants to draw attention to or interact about a certain object with the other participant, whereas the former is just a means to get something.

In both interactions, the cat initiates an interaction to get something for which human help is necessary (e.g., getting food in the bowl or pushing the door handle down to open the door to go outside). At first sight, these interactions seem to involve an imperative interaction i.e., recruiting the human to get something. Also, the fact that the interaction is based on routinized behaviors (these interactions occur frequently in a household and get ritualized) rather than imitation (learning gestures from the interlocutor) might point in this direction (see Brinck, 2004). However, the emergent interaction also shows properties that are less congruent with imperative pointing and are more indicative of declarative pointing. First, the pointing is

embedded within an elaborate communicative interaction, following the steps of deictic interaction identified by [Stukenbrock \(2020\)](#), including monitoring the addressee and positively affirming the behavior of the addressee. The pointing gesture also does not take place necessarily in the same space in which the communicative interaction starts (as in the first video with the bowl in the adjoining utility room). In addition, the feline sender has a repertoire of deictic gestures to get what she wants, which are combined, and she changes her pointing and other deictic cues too when the human does not respond appropriately to her request (for instance in the second interaction with the door). All these aspects show that the feline sender is not simply pointing to something, but actively attempts to involve the human addressee in her pointing. Therefore, we would like to argue that the pointing by the feline sender i.e., Salma in this case is not simply an activity of imperative pointing, but something that has properties of both imperative and declarative pointing.

5. Discussion and conclusion

The deictic interactions discussed in this paper result in achieving the cat's goal (getting food in the bowl in an adjoining room, getting the door to be opened by pushing down the door handle). We have applied the pragmatic framework developed by [Stukenbrock \(2020\)](#) for human–human interaction to cat-human interactions. The analysis shows that the cat's expressions follow the same sequential ordering as those which characterize human–human interaction: the deictic interaction starts when a focused interaction is established, followed by an identification of the deictic space and (bodily) pointing to the relevant object, the careful monitoring of whether the Addressee is still participating in the interaction, and finally the communicative success with the Addressee.

The innovative application of this framework allowed us not only to confirm via our dataset a range of observations from other fields like behavioral, psychological, and ethological studies pertaining to cat-human interaction (as summarized in Section 2.2), but also to demonstrate the relevance of these observations to the field of pragmatics. Moreover, using [Stukenbrock's \(2020\)](#) framework as a lens on these instances of interspecies communication allowed us to identify a set of deictic cues initiated and produced by cats, which to our knowledge have never been observed before, including arching of the back, the instrumental and deictic use of the paw, and, possibly, pointing with (one of) the ears. Even when focusing on only two typical cat-human interactions, we have hence already identified several deictic resources exploited by the cat interlocutor. In our view, this clearly displays the potential for new observations and directions in future research along these lines. Earlier studies have already verified that deixis potentially includes more bodily resources than pointing with an index finger (for instance, human lip-pointing, nodding, gaze etc.), depending in part on cultural conventions. In the present analysis, the body emerges as the crucial locus of deixis, which in turn entails that one (and perhaps the only) prerequisite to deixis is that there is a body. As is expected, the specific expression of deixis must depend on the kind of body possessed by the Sender: there are aspects of “human deixis” that cats cannot express (pointing with a finger), and vice versa (turning of ears).

Declaration of competing interest

We declare that there is no conflict of interest concerning the paper “A linguistic-pragmatic analysis of cat-induced deixis in cat-human interactions”.

Data availability

The data are available via an online repository

Appendix

Transcript conventions:

((X)) = description of events (e.g., movement, gazing)

(X) = transcriptionist comments

[= Indicates overlapping actions. An action that continues in following lines is enclosed in two square brackets [...]. Every action in the following lines that overlaps has the same indentation as the continuous action and is accompanied by an opening bracket [. When the continuous action has ended, a closing bracket] is included as well for the last overlapping action. The opening and closing brackets of the continuous action have been color coded (only available in the online version of this paper) to make the transcript easier to read.

^..^ = description of where exactly a gaze was directed towards

#Fig. 1 is indicated with a specific sign (i.e., #), showing its position in the action

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