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19 Interactional Reciprocity in Human-Dog Interaction

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Abstract

This chapter explores the potential existence of interactional reciprocity in human-dog interactions by analyzing experimental data on situations where dog owners fail to produce reciprocally modified actions for two minutes. We found that their dogs soon realized the strangeness of the situation. While they pursued missing feedback with touch, gaze and vocalizations, they also addressed other humans and requested their attention. Therefore, the dogs oriented to the lack of reciprocity and attempted to repair it. We demonstrate that interactional reciprocity in human-dog interactions can be breached, thus proving its existence. Moreover, we show that it also returned when the experiment ended. The findings are compared with mother-infant experiments where evidence of interactional reciprocity has also been found.

Index: conversation analysis, dogs, experiment, Finnish, high-pitch vocalizations, intersubjectivity, interspecies interaction, reciprocity

Running head: Interactional reciprocity

1 Introduction

This chapter investigates the possibility that dogs and humans share similar reciprocal processes. Research suggests that the dog was the first domesticated animal (Larson et al. 2012) and has thus existed in human societies longer than any other animal. Nonetheless, while sayings such as "a dog is a man's best friend" imply that the human-dog relationship is very special, it is unclear whether dogs have begun to establish what is known as *interactional reciprocity* with humans. The notion usually refers to conditions where a human mother and her normally developed infant coordinate and produce their own actions based on the feedback they receive from one other. Moreover, what infants learn of the processes of interactional reciprocity from their mother is the basis for their social behavior in later life (Tronick et al. 1978; Tomasello 1995). Recent studies have hinted that similar reciprocal processes may, in fact, occur in human-dog interaction (e.g., Topál & Gácsi 2012). For instance, it has been proposed that owners promote their dogs' confidence to play with strangers (Prato-Previde & Valsecchi 2014: 172), that dogs could establish emotional loops with humans via mutual gaze and touch to promote affiliation (Nagasawa et al. 2015), and that dogs and blind persons could coordinate their joint action of walking together (Naderi et al. 2001). Revealing the significance of interactional reciprocity in human-dog interaction could help us understand how interspecies interactions are organized in general.

Consequently, we conducted this study to investigate how reciprocal processes in human-dog dyads could be demonstrated by videotaped materials analyzed with conversation analysis (Sidnell & Stivers ed. 2013). Our analysis is supported by auditory and acoustic analyses (Szczepek Reed 2006; 2011; Walker 2013) in order to capture the dogs' vocalizations (e.g., whining). Conversation analysis is built on the principle of social interaction as a local achievement constituted in an orderly, reciprocal manner by those members present on a particular occasion (Stivers & Sidnell 2013: 2). However, are dogs also capable of reciprocating, for instance, via their vocalizations? In a foreword to David Goode's book *Playing with my dog Katie. An Ethnomethodological Study of Dog-Human Interaction*, Lynch suggests the moment-to-moment unfolding of play in human-dog interaction can be analyzed in detailed ways: "To speak of *actions* or *inter-actions* in this context is already to grant that the nonhuman 'other' of the encounter is an agent rather than a mechanism that can only react on cue" (2007: xiv, original emphases). Following Lynch, we focus on processes of reciprocity in human-dog interaction and investigate dogs as *members* who produce their part of those processes. Thus, we attempt to avoid abstract, extra situational explanations (Lindwall, Lymer & Ivarsson 2016) and, rather, focus on the concrete details of the data.

For these reasons, we briefly introduce two experiments originally designed to investigate the human mother-infant relationship, which we have used here to study human-dog interaction: the Still-Face Paradigm and the Strange Situation Paradigm. Next, we outline the setting and the methods used, after which our research questions are introduced. The analysis is then presented in two sections. Finally, we summarize the analysis and present our conclusions.

1.1 The Still-Face Paradigm

The studies of Murray & Trevarthen (1985), Daniel N. Stern (1971), and Edward Tronick et al. (1978) have created a rich research framework for investigating reciprocal processes between human mothers and infants. The Still-Face Paradigm (SFP) is an experiment for investigating interactional reciprocity (e.g., Tronick et al. 1978) that is conducted in a laboratory where a mother sits in front of her infant. In the experiment, the participants are first invited to play together, after which the mother is asked not to respond to the infant's actions for three minutes. A normally developed infant facing an unresponsive mother is reported to appear uncomfortable, serious, wary, and helpless. After the Still-Face phase, however, the participants resume their normal interaction patterns. These phases are videotaped and subsequently analyzed according to the methods employed by this research tradition.

A review and meta-analysis of 85 empirical studies on the SFP (Mesman et al. 2009) has demonstrated the robustness of the paradigm, with the Still-Face effect being found regardless of most experimental variations (e.g., the infant's gender, the length of episodes, the order of episodes). As a result of their parent's inattentiveness, infants gaze less at their mothers and display less positive affects and more negative affects. Furthermore, the Still-Face effect has been shown to influence the following reunion phase. There too, infants display less positive affects and more negative affects than prior to the experiment.

Streeck (2013) has proposed that participation in social relationships is based on *implicit knowledge*. If this is the case, the SFP thus proves that infants have access to such knowledge of how their caregivers usually behave (see also Lyons-Ruth et al. 1998). We hypothesized that dogs participating in the SFP (and in our experiment reminiscent of the SFP) would recognize the strangeness of the situation and orient to their owners in a distinct way. This, in turn, would hint at dogs possessing implicit knowledge of their owner's ordinary behavior.

1.2 The Strange Situation Paradigm

The Strange Situation Paradigm (SSP) is an experiment for studying attachment in mother-infant interaction. This experiment has its roots in John Bowlby's psychoanalytical studies, which were influenced by ethology (e.g., Bowlby 1958); hence, the notion of attachment is defined by Ainsworth & Bell (1970: 50) as "an affectional tie that one person or animal forms between himself and another specific one—a tie that binds them together in space and endures over time." Mother-infant attachment ties are tested in the Strange Situation by inviting the mother and child to a laboratory, where the experiment is conducted in eight phases. First, the infant and their mother spend some time together in the laboratory. Then, they are joined by a stranger. Next, the mother and, shortly afterwards, the stranger leave the lab. The infant is then left alone for three minutes. After that period of time, the stranger returns to the room. Finally, after another three minutes have elapsed, the mother returns and the test is complete.

Based on the findings from the SSPs, Ainsworth identified three attachment styles (e.g., Ainsworth & Bell 1970): secure, ambivalent-insecure, and avoidant-insecure. For the purposes of this study, the secure attachment style is most relevant. In this attachment style, the mother acts as *a secure base* for the infant's exploration in the lab. The infant misses the mother when she is outside of the lab (no secure base available) and greets her when she returns. However, separation from the mother is distressing. Nonetheless, once the infant is comforted by the mother, the child continues to explore and play. Although the SSP and SFP are known to cause minor discomfort for their participants, the paradigms are not considered to provoke long-term distress (Mesman et al. 2009: 32).

Overall, the SSP has received more attention than the SFP from researchers investigating human-dog interaction. Prior dog studies on the SSP have suggested that dog owners could act as secure bases for their dogs (Topál & Gácsi 2012; Horn et al. 2013). In these experiments, dog owners' presence has been found to promote exploratory behavior in their dogs and a willingness to play with strangers (Prato-Previde & Valsecchi 2014: 172). However, different dog breeds and attachment styles should be taken into account, as they might influence the outcomes of the SSP (Rehn et al. 2013). Moreover, it has been suggested that the moments after separation should be studied in detail, as they are crucial when considering dyadic attachment (Prato-Previde & Valsecchi 2014: 183).

Both the SSP and SFP are reminiscent of a set of breaching experiments conducted by Harold Garfinkel (1967) that considered the sense-making procedures shared by humans. In these experiments, usually conducted with one experimenter and one participant who is unaware of the experiment, the participant's everyday understanding was momentarily breached. This was achieved, for instance, by the experimenter asking for clarification on a self-evident matter raised by the participant (e.g., "What do you mean by a flat tire?"). As a result, the participants often scratched their heads and became hostile toward the experimenter. Other experimental setups were also employed, including the use of games (Heritage 1984).

2 The Setting and Methods

The data for our study were drawn from a short 5-minute behavioral test organized for dogs in an indoor arena in Finland during 2010–2011. The participating dog owners signed and returned informed consent forms, and videotaped interactions from 15 owner-dog dyads were then analyzed with conversation analytic methods.

The purpose of the behavioral test was to investigate the validity of a questionnaire developed for behavioral phenotyping of fearful behavior by studying correlations between the questionnaire and behavioral test results (Tiira & Lohi 2014). The questionnaire surveyed dog owners' thoughts on their dogs' emotions and reactions in various encounters (e.g., meeting a stranger or an unfamiliar dog). Of the 1832 dog-owners who answered the questionnaire, 54 were invited to participate in the test with their dog(s).

In short, the test consisted of three phases: (1) a human stranger approached and attempted to pet the dog, who was waiting alongside its owner; (2) the dog was freed for a 2-minute exploration while the owner was instructed to ignore the dog (and the stranger waited at the other side of the arena), and (3) a novel, strange, human-like moving object entered the arena. The details of the test scoring are presented in Tiira & Lohi (2014). For instance, Phase 2 was scored by measuring the distance of the dogs' exploration in the indoor arena. Tiira & Lohi (2014) found disparities between the test scores for Phase 2 and the dog-owners' questionnaire answers on their dogs' behavior in a new situation or environment. The authors suggest that the 2-minute exploration activity was affected by the owner-dog relationship: well-trained dogs almost immediately stared at their owners instead of exploring.

The present study expands previous understanding of the way dogs engaged with their owners during Phase 2. Through a detailed analysis of videotaped materials, we show several methodical practices used by the dogs to pursue feedback not only from their owners, but also from others present in the indoor arena. Moreover, we introduce new information on the dogs' vocalizations during the test.

Although we initially investigated 15 dyads, we ultimately chose to focus on just two human-dog relationships. The dogs we analyzed were a Nova Scotia Duck Tolling Retriever and a Saluki. The former breed, like other Tollers, are characterized by the production of a high-pitch vocalization known as *the Toller scream*, which is elicited when the dog is excited. Similarly, Salukis are also known to emit high-pitch sounds. Details of the breeds can be obtained from various online resources. Nonetheless, the specific ways in which the two breeds' high-pitch vocalizations are deployed in human-dog interaction are as yet unknown.

However, a study investigating the frustration whines of several other breeds (Caucasian Shepherd, Collie, Dachshund, Giant Schnauzer, Mongrel and Pekingese) found that dogs attempting to attract their owners' attention are able to produce low and high pitch vocalizations when facing an unsolvable problem (Volodina, Volodin & Filatova 2006). Their audio data were collected in home environments where the dog-owners organized various frustration-invoking situations related to the dogs' requests for food, a walk, or opening a door (Volodina et al. 2006: 260).

In the present study, the dogs' vocalizations and other multimodal activities are analyzed with conversation analytic methods (Sidnell & Stivers ed. 2013) supported by auditory and acoustic analyses (Szczepek Reed 2006; 2011; Walker 2013; Selting 2010; Ogden 2010). In these analyses, we measure high pitch and the span of pitch in the dogs' voice range. Pitch represents the rate of dogs' vocal fold vibration (e.g., Riede & Fitch 1999); in turn, their voice range is determined by the length of their vocal folds (Szczepek Reed 2011: 79). For instance, whines may occur in a low-pitch range (400–1400 Hz) and/or a high-pitch range (3100–11000 Hz) (Volodina et al. 2006: 260). We also investigate pitch movements and, in particular, pitch accents, such as rising pitch and falling pitch (Szczepek Reed 2011: 32). Intonation contours represent overall pitch movements in a given extract; shorter segments of an intonation contour are referred to as intonation phrases (Szczepek Reed 2011: 43–53). Intonation phrases, in turn, have boundaries, which are marked with silences and changes in pitch (Szczepek Reed 2011: 53). All these auditory and acoustic features, initially introduced for investigating human speech, are detectable in dogs' vocalizations (Taylor et al. 2014). The dogs' vocalizations and other embodied actions are transcribed following conventions established by Mondada (2018a, especially Extract 5) and developed further according to the requirements of the data.

3 Research Questions

As previously mentioned, this chapter explores the possible existence of interactional reciprocity in human-dog interactions. More specifically, we aim to answer the following research questions inspired by prior studies:

- How do dogs pursue missing feedback from their owners and others during a 2-minute exploration?
- How do the dyads coordinate their reunion after the 2-minute exploration?

If the dogs do pursue feedback, it would suggest they have registered the strange situation and possess the means to solve it. Moreover, those moments right after separation are considered critical in the literature in terms of the affective tie. If we agree that interactional reciprocity exists in interspecies interactions, a third question thus arises:

- How are interspecies dyads able to restore their interactional reciprocity?

4 Analysis

For the analysis presented in this study, 15 dyads were initially investigated. From these, we identified seven dogs that emitted audible vocalizations for their owners during the 2-minute exploration. As noted above, we selected two of these dogs for detailed analysis: a Nova Scotia Duck Tolling Retriever and a Saluki. We attempt to answer the research questions by analyzing their interactions.

4.1 The Nova Scotia Duck Tolling Retriever and the passive owner

First, we investigate the Nova Scotia Duck Tolling Retriever's attempts to elicit feedback from its owner. We begin by demonstrating how the dog applies physical pressure to *awaken* its owner, but without any response. Then we examine how the dog apprehends the lack of interactional reciprocity. Without clearly knowing what to do, the dog produces vocalizations that can be interpreted as indications of tension and concern. Finally, we consider their interactions after the 2-minute exploration, where the dog orients to the owner and engages in play and the dyad's interactional reciprocity seems restored after the experimental breach.

We begin as the Toller explores the corner of the arena where the video camera and crew are situated. The dog then returns to the starting point, where its owner is located. In this section, we analyze the dog's feet, gaze, and high-pitch vocalizations. The extract (1) demonstrates that the dog's practices for eliciting a response consist not only of *gazing at the owner* (Tiira & Lohi 2014) but also of *gazing at the other adults*, *touching the owner*, *and producing variable vocalizations*. At the beginning of the extract, the dog is running toward the owner and is soon close enough to touch her with its left front foot (LFF) (line 1).

Extract 1

```
01      +  (23.5)    +    (0.1)    +    (0.3)     +
  DOG >>+run forward+ LFF touch +put LFF down+
  DOG >>+look ahead-->
  DOG             +snout touch+
  fig             +#fig.1     +
```

In the extract above, the dog approaches the owner from the other side of the arena (line 1). It runs forward for 23.5 seconds, reaches the owner, and touches her with its snout and left front paw (Figure 1). From the video, we can observe that the dog's tail is wagging; it is currently on the dog's left in Figure 1.[1]

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[1] The rotating video-camera during the dog's rapid movement caused the picture to blur.

Fig. 1

Touching the owner fails to elicit any feedback. The dog realizes this and lowers its left front foot (line 1). Then, the dog takes a sequence of steps backward while maintaining gaze with its owner's face (lines 2-3).

```
02      +    (0.3)    +   (0.2)     +   (0.2)     +
  DOG   +LFF step back+RBF step back+RFF step back+
  DOG   +LBF step back+             +LBF step back+
  DOG ->+look up at the owner-->

03      +    (0.2)     +   (0.2)     + (2.2) +
  DOG   +RFF step back +LFF step back+
  DOG                  +RBF step back+
  DOG ->+look up at the owner-->
  fig                                +#fig.2 +
```

Those steps bring the dog to a distance where the owner’s face is fully visible. For the next 2.2 seconds, the dog stands still and gazes at its owner (line 3). Shown in Figure 2, the dog’s tail has stopped moving but is not completely limp either, which might imply that the dog is currently more suspicious than, for instance, distressed: the dog has apprehended the strange situation. Again, the practice of gazing at the owner from this particular position fails to produce a response.

Fig. 2

```
04      +    (0.2)    +    (0.3)    +    (0.4)    +
  DOG   +LBF step back--------------+LFF step back+
  DOG                 +RFF step back+RBF step back+
  DOG ->+look at owner-->

05      +   (0.1)     +   (0.1)     +  (0.2)  +
  DOG   +LBF step back--------------+
```

```
  DOG                 +RFF step back----------+
```

```
06      + (5.0) +    (0.1)    +    (0.2)    +
  DOG   + stand +RBF step back--------------+
  DOG                         +LFF step back+
  DOG ->+look at owner-->
```

The dog takes several steps backward while maintaining its gaze (lines 4–5). This movement brings the dog to a new location from which to pursue feedback. It stands still for five seconds and gazes at the owner, after which it takes two more steps backward (line 6) and begins to sit down (line 7).

```
07      +   (0.2)    + (0.16) +   (0.6)    +
  DOG   +sit down-------------+ sit-->
  DOG ->+look at owner-->
  DOG   +vocalization+        +vocalization+
  fig   + #fig.3 (L) +        + #fig.3 (R) +
```

While sitting down, the dog stares at its owner and produces a vocalization. The intonation contour shown in Figure 3 has two intonation phrases that are divided by 160 milliseconds of silence (line 7). The first phrase begins at 13980 Hz and ends at 13550 Hz (Figure 3: left-hand side), thus the pitch is higher than the level previously suggested for dogs' high voice register (i.e., 3100–11000 Hz). Next, the second phrase is a longer vocalization, interpreted as whining. Here, the pitch fluctuates between around 700 Hz and 1100 Hz (Figure 3: right-hand side), thus belonging to a lower voice register (Volodina et al. 2006).

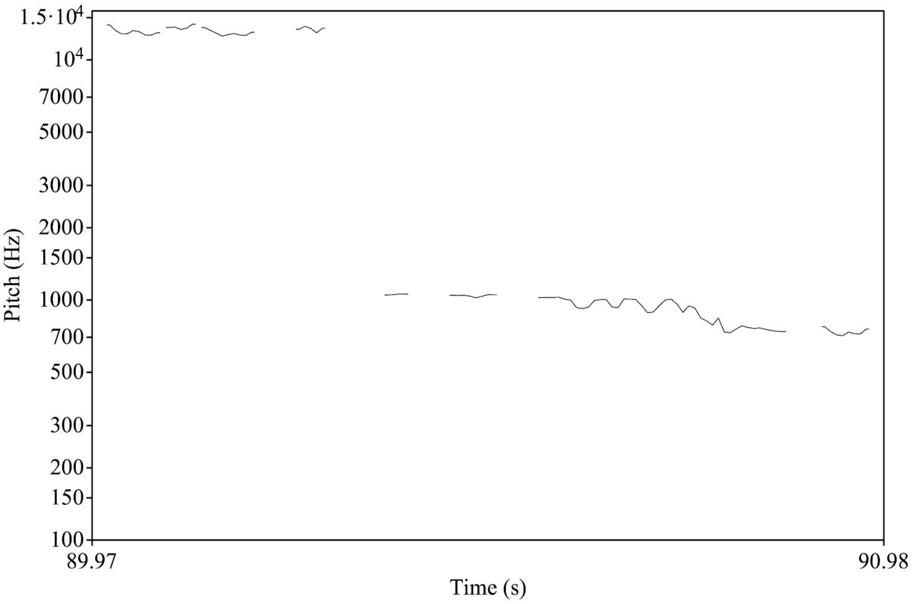

Fig. 3

By contrast, as previously mentioned, the pitch of the first intonation phrase is approximately 13000 to 14000 Hz. The theoretical maximum for human hearing is around 22000 Hz (Heffner & Heffner 2008). However, the maximum pitch of human conversation is around 800 Hz (Szczepek Reed 2011: 182-183). This Toller, it seems, is able to communicate with its owner with a combination of very high-pitch vocalizations and lower-pitch vocalizations. It has been suggested that dogs change their voice register in this way in an attempt to attract their owner's attention (Volodina et al.

2006). *Changing the voice register* is, therefore, yet another dog practice. In line with the findings of Volodina et al. (2006), the dog waits for its owner's feedback for 4.6 seconds (lines 8-9, Figure 4).

```
08      + (4.0)  +
  DOG ->+ sit-->
  DOG ->+ look at owner-->
  fig   + #fig.4 +
```

Fig. 4

In sum, this section addressed the question of dogs attempting to receive feedback from their owners. In the extract, the dog pursued feedback with several modalities of action (Stivers & Rossano 2010). The dog ran to a close distance and touched its owner, first with its snout and then with its left front paw. Then, moving slightly away, the dog strove once more to elicit feedback by attempting to establish a mutual gaze with its owner.

Subsequently, the dog moved further away, stood still, and finally sat down and produced two vocalizations while watching the owner. It thus seems that the dog was able to calibrate the distance between itself and its owner in order to pursue feedback. However, was the dog able to calibrate the frequencies of its dual-pitch vocalization so that the owner could hear them? To answer this question more investigation is required, but while prior studies have suggested that ultrasonic communication (>22000 Hz) is used in interspecies communication (Sales & Pye 1974: 1), the Toller's very high-pitch was not ultrasonic: the dog's pitch range rises to 14000 Hz, with 12000–14000 Hz considered the upper limit of middle-aged adults' hearing. Consequently, some older adult recipients would be unable to hear the dog's dual-pitch communication as the dog intends it. Another interesting empirical question is dogs' capacity to recognize and orient to failures to completely hear their vocalizations. Do they calibrate the frequencies of their vocalizations according to the recipient? In other words, do they orient to recipient design (Sacks, Schegloff & Jefferson 1974)?

4.1.1 The dog sets a new project

In the previous section, the dog found no means to resume interaction with its passive owner. Even sitting in front of her, staring at her, and producing a dual-pitched vocalization failed to produce results. In the next section, after noticing this impasse, the dog's project seems to change. This section investigates what happens then. While we continue to analyze the dog’s feet, gaze and vocalizations, in addition, we pay attention to the dog’s tail, which is now included in our transcripts.

```
09      +    (0.3)    +   (0.1)    +
  Dog ->+lean forward +RFF step-->
  Dog ->+look at owner-->
  Dog                 +vocalization+
  Dog                 +tail swing-->
  fig                 +  #fig.5 (L)+
```

In line 9, the dog’s head and upper body bend slightly forward; then the dog rises and takes a step forward toward the owner. Simultaneously, the dog produces an intonation phrase in a low voice register with an extremely stable intonation contour between 1294 Hz and 1340 Hz (Figure 5: left-hand side).

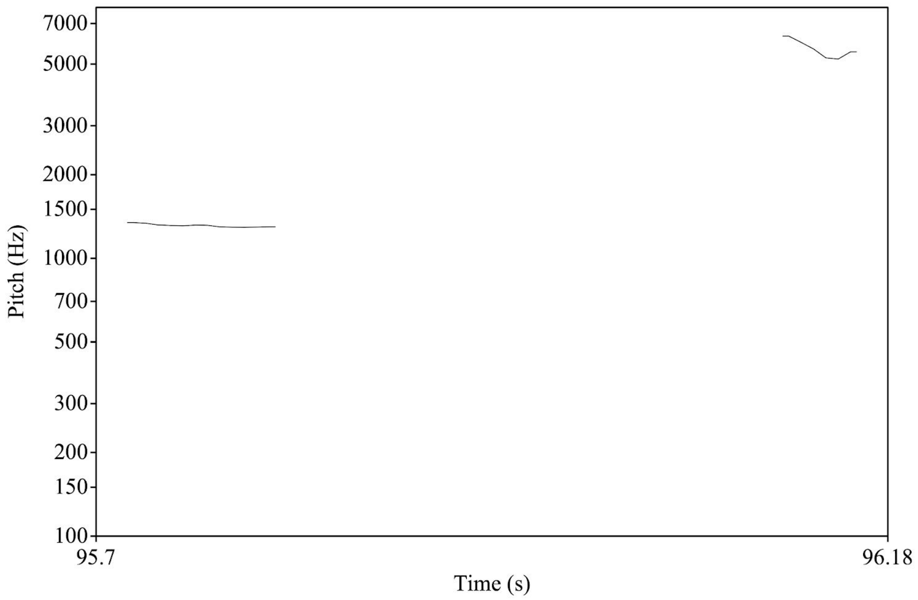

Fig. 5

While the dog takes the step, it begins to wag its tail. The dog continues to approach its owner in line 10.

```
10      +  (0.2)  +(0.08)+  (0.04)    +(0.18)+
  DOG ->+RFF step +      +            +
  DOG   +look at owner’s LH-->
  DOG                    +vocalization+
  DOG ->+tail swing-->
  fig                    +  #fig.5 (R)+
```

The dog delivers a high but extremely short vocalization, depicted on the right of Figure 5. This intonation phrase is delivered 280 milliseconds after the previous phrase. We suggest that this vocalization, which is deployed between 5257–5985 Hz, represents the dog's high voice register. Thus, the dog has deployed vocalizations from three registers while gazing at the owner.

After that, the dog orients more clearly to its owner's left hand, which is at her side. The dog approaches the owner with six steps, but the owner looks into the distance and pays no attention to her dog. The dog's approach leads, as shown in Figure 6, to its front feet being parallel; it is now very close to its owner, almost as close as in Figure 1. Furthermore, it is wagging its tail.

Fig. 6

This section investigated the dog's new project, which was preceded by a session of sitting and watching its owner for 4.6 seconds. Here, the dog approached the owner with its tail wagging (Figure 6). Its tail was also wagging the first time it approached its owner (Figure 1). Moreover, its vocalizations were gaze-selected, thus arguably directed at the owner. In addition, they were also shorter in duration when compared to the cases shown in the previous section. Since the dog's new project again failed to produce any expected outcome, the dog terminated its efforts to receive feedback exclusively from its owner.

4.1.2 The dog requests help from the owner and others

In this section, we continue to investigate the dog's attempts to obtain feedback from its owner and also from others. Therefore, we focus on the dog's vocalizations and use of gaze. Following the events in line 10, the dog sits down and remains seated for 1.5 seconds. Then, the dog looks to the left, rises, and moves behind the owner, with its tail wagging, perhaps indicating that a way out of the strange situation has eventually been found. The dog then spends eight seconds standing and gazing at the owner and then at the video camera crew. In Figure 7, the dog is watching its owner, with its snout pointing at 10 o'clock.

Fig. 7

Considering the dog's location in the corner of the arena, it seems likely that it can observe all the humans present. It then leans against the wall, located on its left (not visible in Figure 7); perhaps tactile sensitivity is bringing the dog comfort. The dog's tail is no longer moving, indicating, once more, a change in the level of activation. The strange situation is not over yet.

The dog gazes at the owner's upper body and simultaneously sits down and produces a whine. This whining, shown in Figure 8, is a dual-pitch vocalization with four intonation phrases. The first phrase is delivered in a high voice register (Figure 8: on the left). The pitch then drops to a low voice register during the second phrase. The third intonation phrase also maintains the pitch in a low voice register. Finally, the fourth phrase is produced after approximately 230 milliseconds of silence, and it lasts for approximately 1200 ms.

The dog's gaze selection leaves no doubt that the selected recipient of the dual-pitch vocalization is the owner. However, the acoustic properties of the intonation contour are different from those in the previous examples; this vocalization is audible as an initial peak and then a long whine that fluctuates at the end of the phrase.

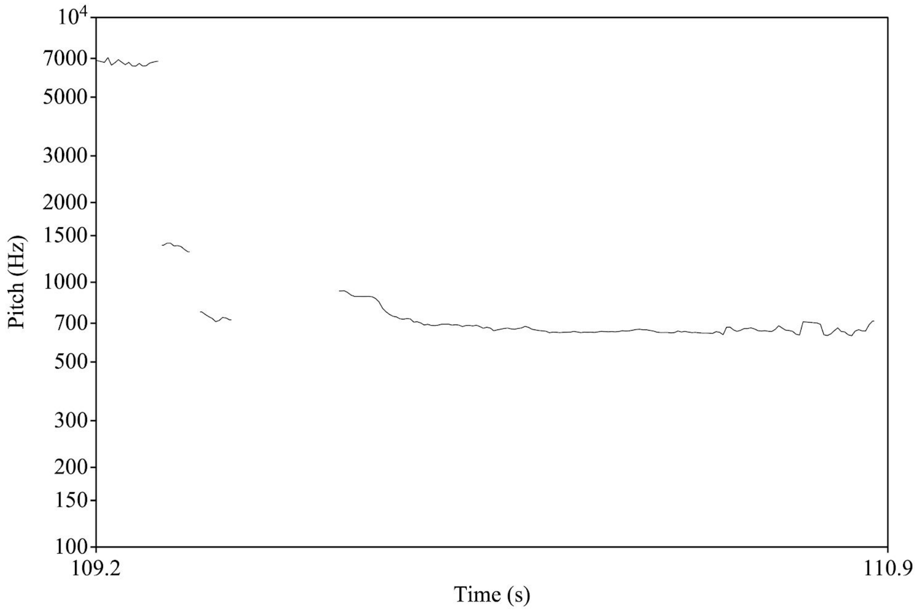

Fig. 8

Subsequently, the dog sits still for 26 seconds and gazes alternately at the owner's upper body, the target of the owner's gaze—as if looking for cues to solve the strange situation—and the camera crew. During that time, the dog emits three vocalization sequences. The first sequence occurs five seconds after the intonation contour shown in Figure 8 is delivered, when the dog is watching the owner. Four more seconds elapse before the dog's head turns toward the camera, and then the dog elicits the second vocalization. Here, we focus on that second sequence and leave the investigation of the first and third sequence to future studies.

The dog's gaze selection preceding the second vocalization implies this sequence is intended for the other humans in the indoor arena. The dog's snout is directed at the camera (Figure 9).

Fig. 9

While looking at the other humans, the dog elicits an intonation contour with four intonation phrases (Figure 10). The first phrase occurs in a very high voice register: the pitch ascends from 13152 Hz to 14534 Hz, which is the highest frequency found in this study. The second intonation phrase occurs after 500 milliseconds of silence and shifts the pitch to a high voice register. Then a silence of 110 milliseconds occurs, which ends when the third intonation phrase begins. Now the pitch drops to a low voice register, after which silence ensues for 540 milliseconds. The final phrase returns the pitch to a high register.

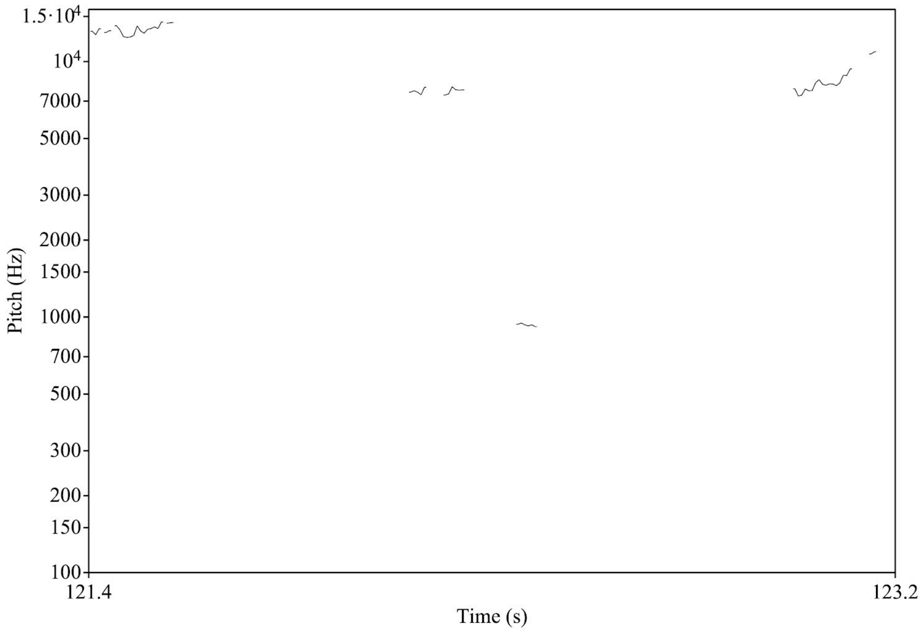

Fig. 10

Thus far, we have established a new voice register for dog vocalizations. According to Volodina et al. (2006), dogs have a low-pitch range (400–1400 Hz) and a high-pitch range (3100–11000 Hz). Nonetheless, Figures 3 and 10 suggest the Nova Scotia Duck Tolling Retriever possesses the capacity to use a very high pitch register (13000–14500 Hz) in interspecies communication.

While the sounds the dog projects at its owner (Figures 3, 5 and 8) are dual-pitch vocalizations used to elicit the owner's attention (Volodina et al. 2006), the sound used to attract the attention of the other humans (Figure 10) is a tri-pitch vocalization. Moreover, the vocalizations intended for the owner contain a flat or falling pitch (Figures 3, 5 and 8), and they are audible as whining. The vocalization for the other humans contains two intonation phrases with a rising pitch accent (Figure 10). If the dog's whining conveys tension and concern for the recipients, the intonation phrases signal urgency or even an emergency.

In the preceding sections, we have seen how the dog attempted to obtain feedback from the owner and other humans. The dog pursued feedback with the practices of touching its owner, gazing at her, gazing at the other adults and producing variable vocalizations for the recipient(s) selected by gaze. However, the highest-pitch, estimated to reach 14500 Hz, was produced when the dog was gazing at the other humans. Moreover, this involved a tri-pitch vocalization containing pitch movements in three registers: very high, high, and low.

Tail-wagging, in turn, began when the dog approached its owner: both initially (Figure 1) and later on during the dog's new project (Figure 6). In both cases, the dog's approach ended with it standing close to its owner, after which the tail-wagging soon stopped (for example, Figure 2). As is clear by now, in this section, the dog failed to establish interactional reciprocity with its owner (or even with the crew).

4.1.3 Once contact is restored, the dog engages in play

This section investigates how the reunion is coordinated after the separation. It is important to note that the owner did not physically leave the indoor arena, in contrast to the SSP; rather, according to the rationale of the SFP, she simply failed to reciprocate: not only her face but also her entire body remained still.

As demonstrated in the previous sections, the dog owner distanced herself from the dog’s immediate presence and reduced her active participation in interactional reciprocity (i.e., remained aloof). Thus left to its own devices, the dog then produced expressions that implied the existence of an affective tie. In this section, by contrast, the owner is no longer still, and the dog’s affective expressions indicate something that we might call playfulness. Prior studies have suggested that the moments after separation are critical for any dyad’s affective tie (e.g., Prato-Previde & Valsecchi 2014).

Here, we analyze the dog’s feet, gaze and tail, but not its vocalizations, since the dog is silent, as is its owner (OWN). The test leader (LRD) is holding a timer (TMR), and soon she instructs the human-dog dyad to move on to the next part of the experiment.

```
11      +(0.3)+(0.3)+(0.3)+(0.3)+(0.3)+(0.3)+
  DOG ->+look at the camera-->
  OWN                                 +turn head-->
  OWN                                 +bend R knee-->
```

```
  OWN                                +rotate body-->
  TMR   +ring +                +ring +
  LRD               +hyvä.+
                     good.
```

The owner hears the alarm but does not move until the test leader says "*hyvä*" ('good') and the timer rings again. Then, the owner begins to turn her head and upper body toward the video camera. In addition, the owner pushes her right knee forward (R). The dog is looking at the camera throughout line 11.

```
12      +    (0.6)      +    (0.2)    +
  DOG   +look at owner--+look at owner's face-->
  DOG   +stand up-------+RFF step     +
  OWN   +RF to the right+
  OWN ->+---------------+rotate body toward dog-->
  LRD   +sit sä voit    +=ota kiinni +
         then you can     =catch
```

The dog notices the movement in the owner's knee (in line 11) and becomes interested in that development. When the owner moves her right foot (RF), the dog stands up, then begins to gaze at its owner's face and takes one step forward. The test leader provides instructions to the owner, "*sit sä voit=ota* *kiinni*" ('then you can=catch'), and the owner begins to rotate her upper body toward the dog. This indicates the owner follows the instruction.

```
13      +  (0.2)   +   (0.3)   +
  DOG ->+look at owner's face-->
  DOG   +LFF step  +RFF step   +
  OWN   +look at dog-->
  OWN              +LF close RF+
  LRD   +          +  ota se   +
                      take it
  fig   + #fig.11  + #fig.12   +
```

The owner looks at the dog, who is approaching and already gazing at her (Figure 11). The owner shifts her left foot (LF) close to her right foot, as if making space for the dog (Figure 12). By moving her left foot, the owner invites the dog to come closer, and the dog accepts the invitation by complying. This *invitation-acceptance* adjacency pair (Stivers 2013: 192–193) is conducted by the interspecies participants in embodied ways. Furthermore, by skillfully coordinating their movements, they maintain mutual gaze. These linked efforts could be seen as indicating intersubjectivity between the owner and the dog (Heritage 1984: 256), but, to substantiate that claim, further evidence is needed. Therefore, for the purposes of this study, we suggest they are restoring the dyad's interactional reciprocity. In addition, the test leader continues with her upcoming instruction (line 13).

Fig. 11

Fig. 12

```
14      +    (0.3)    +  (0.2) +
  DOG ->+look at the owner's face->>
  DOG   +LFF step-----+RFF step+
  DOG                 +RBF step+
```

```
DOG   +tail swing->>
DOG                 +lower anterior->>
OWN   +lift her LH--+touch dog with LH->>
LRD   +vaan         +takas   +
       just          back to
fig                 +#fig.13 +
```

The dog's tail is wagging again, marking the dog's third approach to the owner. The dog continues to advance, but it simultaneously lowers the front of its body while keeping its posterior elevated, thus performing an embodied action designed to indicate play, rather than conflict (See, e.g., de Waal 2019: 71). Such a movement is termed a *play bow*. The owner bends over the dog and raises her left hand (LH) before lowering it to touch the dog. However, the dog withdraws its head while looking at its owner's face, as if playfully attempting to avoid the touch (Line 14). These embodied features are visualized in Figure 13.

Fig. 13

The owner’s left hand makes a circle in a clockwise direction above the dog’s head. The dog takes one step to the left with its left feet, thereby regaining its balance after play bowing, while simultaneously looking at its owner’s face. The owner returns her left hand to just above her lap, close to her right hand, and then she begins to put the leash on her dog. The dog stands still, waiting patiently, and participates in their mutual accomplishment of fastening the leash (Figure 14).

Fig. 14

In sum, we investigated how a reunion after separation is coordinated and revealed how promptly the participants oriented each other with their bodies and gazes. The dyad skillfully demonstrated how interactional reciprocity in human-dog interaction could be re-established in an experimental setting.

4.2 The Saluki and its passive owner

In this section, we turn to the investigation of the Saluki's attempts to make sense of the strange situation. Here, attention is focused on the practices already established in the previous sections: touching the owner, gazing at the owner, gazing at the other adults and producing vocalizations. In addition, we analyze the dog's movement and describe in detail how it walks to the side of its owner.

When we arrive at this encounter (2), the Saluki has been exploring the floor near the owner. While the Toller investigated the whole indoor arena, the Saluki has remained closer to its owner. It is likely that the dog's activities, such as sniffing and tasting the air (Mondada 2018b), have continued for some time. Then, the Saluki turns toward its owner and begins to approach (line 1).

Extract 2

```
01      + (0.4)  +  (0.4) +    (0.3)    +  (0.5) +  (0.2) +
  DOG >>+RFF step+
  DOG >>+RBF step+                      +RBF step+
  DOG            +rotate upper body to L+
  DOG            +LBF step+
  DOG >>+nose near the floor-->
```

```
02     +  (0.3) + (0.5)  + (0.3)  + (0.3)  +
  DOG  +RFF step+LFF step+RBF step+RFF step+
  fig                    +#fig.15 +
```

The dog has been moving away from its passive owner, but now, in line 1, it is time to turn back and return to her. The dog’s right feet move at the same time, turning its posterior. Then, the dog’s upper body begins to rotate to the left (L). After this rotation, the dog takes four steps forward (Figure 15) and then one further step. The dog’s nose is almost touching the floor, as if it is carefully investigating the floor.

Fig. 15

```
03      + (0.3)  + (0.5)  + (0.2)  + (0.2)  +
  DOG   +LBF step+LFF step+RFF step---------+
  DOG                              +LBF step-->
  DOG            +head begins to rise up-->
```

```
04      +  (0.3) + (0.2)  + (0.3)  +
  DOG   +LFF step---------+RFF step+
  DOG ->+LBF step+RBF step---------+

05      +      (0.2)        +        (0.3)      +
  DOG   +stretch head upward-->
  DOG                       +LFF stationary step+

06      +   (0.5)   +
  DOG ->+head upward+
  fig   + #fig.16   +
```

The dog approaches the owner with a sequence of eight steps (lines 3–6). At the end of line 4, the video shows that the dog is standing straight-legged in front of its owner. Then, the dog’s head stretches upward as it watches its owner. The dog then takes a stationary step with its front left foot (line 5). Here, this embodied practice, *tapping a paw on the floor,* can be seen as a demand for attention, and signaling the fact that the dog has apprehended the strange situation. Figure 16 illustrates the situation after the step.

Fig. 16

```
07     +  (0.5)  +  (1.5)  +   (0.2)    + (0.1) +
  DOG  +gaze camera-->
  DOG                      +vocalization+
  fig  + #fig.17 +         +  #fig.18(L)+

08     +     (.)    + (0.2) +   (0.1)    + (1.9) +
  DOG  +vocalization+        +vocalization+
  fig  +  #fig.18(C)+        +  #fig.18(R)+
```

Since the owner refuses to pay attention, the dog begins to gaze at the other humans in the indoor arena (line 7, Figure 17). Thus, the practice of gazing at other humans might be a resource also for this dog.

Fig. 17

Then, after a 1.5-second silence, the dog produces a sequence of high-pitch vocalizations, shown in lines 7–8. Figure 18 indicates that the intonation contour contains three intonation phrases, with each belonging to a high pitch register. The first vocalization (line 7, Figure 18: left-hand side) features two segments and one peak. The peak is divided by a micro-pause, and in terms of overall pitch movement, the pitch is rather flat, rising slightly at the beginning and end.

The second intonation phrase is extremely short (line 8, Figure 18: center). Moreover, the phrase is v-shaped: the pitch quickly falls and then rises rapidly. The dog's voice is audible against the background noise, but it is not shown by Praat, a computer program for analyzing sound files.[2] This indicates the need to modify the pitch analysis of the program, as pitch was

---

[2] 2 https://www.fon.hum.uva.nl/praat/manual/FAQ__Pitch_analysis.html (accessed 2 December 2020)

only captured after the voicing threshold setting was changed to 0.25; ordinarily that setting is 0.45.

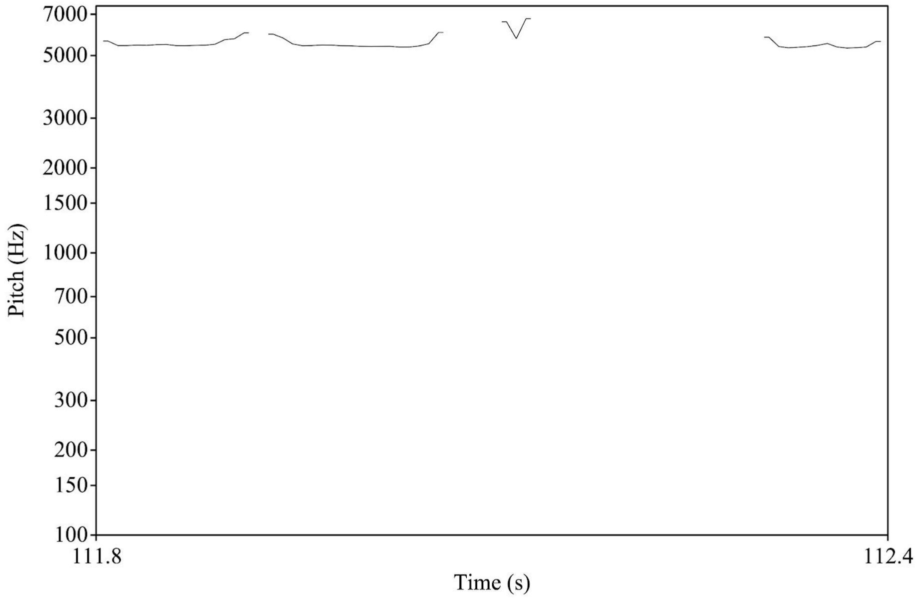

Fig. 18

The third intonation phrase (line 8, Figure 18: right-hand side) is delivered after a 200-millisecond silence. Here, the pitch movement of the third phase resembles a smaller version of the first; there is a peak in the middle of the phrase, and the pitch also rises at the borders.

The Saluki's vocalizations (shown in Figure 18) for the other humans differ from those of the Toller shown in the previous sections, since the Saluki uses only a high voice register rather than dual-pitch or tri-pitch communication. The pitch of the intonation contour moves between 5000 and 7000 Hz. After producing these vocalizations intended for the other humans in the arena rather than for the owner, the dog stands still and quietly looks at the camera crew for 1.9 seconds (the end of line 8).

```
09      +  (0.8)  +(0.2)+   (0.2)    + (0.2) +
  DOG   +head to R+     +head slowly to L-->
  DOG                   +vocalization+
  fig                   +  #fig.19   +
  fig                   +  #fig.20(L)+
```

Next, in line 9, the dog’s head and gaze shift to the right (R) from the crew to the target of the owner’s gaze. As the crew failed to respond to the dog’s vocal actions, the dog treats the owner’s gaze direction and her posture as better resources for interpreting the owner’s intentions. These resources are, most likely, visibly available clues for the dog, which has first attempted to solve the peculiar situation by treating other humans as a social resource (Figure 17) and only after that by looking in the direction of the owner’s gaze (Figure 19).

Fig. 19

Prior studies have shown that dogs are capable of following gazes and establishing joint visual attention with humans (e.g., Itakura 2004). This is also evident in our extract when the dog looks in the same direction as its owner (i.e., the dog knows the owner is looking at something) (Tomasello 1995). As Figure 19 indicates, the dog seems to proceed to solve the strange situation by itself by focusing on the owner's gaze. Nonetheless, similar to its previous efforts, this alignment of gazes fails to help the dog comprehend the owner's intentions or the strange situation. Next, the dog rotates its head backward toward the owner.

Shortly after starting to turn its head slowly to the left (line 9), the dog initiates a sequence of high-pitch vocalizations (Figure 20). When the dog delivers the first intonation phrase (line 9, Figure 20: left), it is unlikely that its gaze has identified anything in that direction except the structures of the indoor arena (e.g., tables and walls). Concerning pitch movement, there are two peaks, but otherwise the pitch is rather flat.

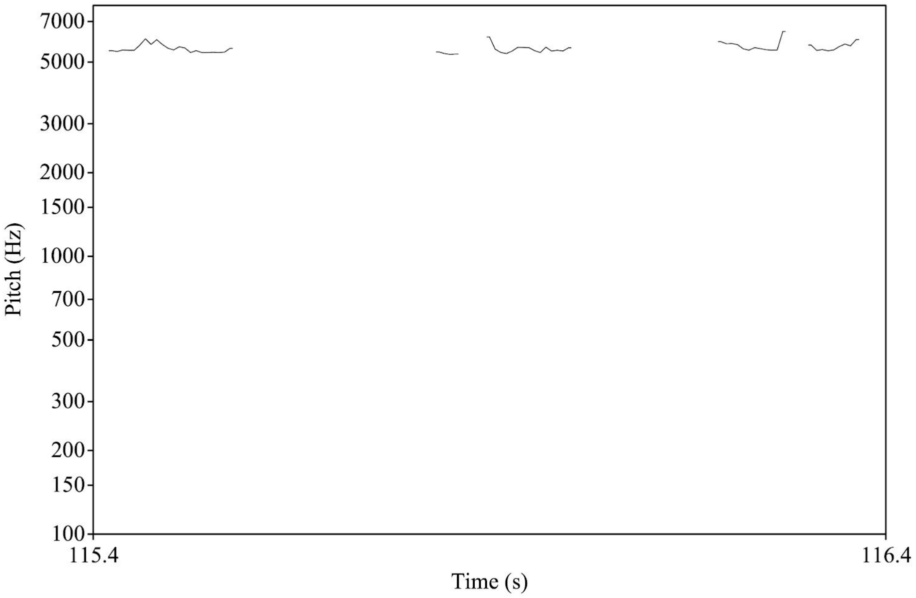

Fig. 20

The dog's head rotates slowly back toward the owner (line 10). While doing this, the dog elicits the second intonation phrase of this contour (Figure 20: center). The phrase contains two segments; if there is a peak, Praat captures only its fall (right-hand side).

```
10       +    (0.2)     + (0.2) +    (0.2)     +      (0.2)      +
  DOG ->+head slowly to left--------------+gazes the owner+
  DOG   +vocalization+       +vocalization+
  fig   +  #fig.20(C)+       + #fig.20 (R)+
```

Then, there occurs a 0.2-second silence, which ends when the dog launches the third phrase of the contour (line 10). The dog is now looking at its owner, who fixes her gaze firmly ahead. The vocalization, shown in the top right corner of Figure 20, again contains two segments. Contrary to the prior phrase, however, Praat has drawn only the rise (left-hand side) of a possible peak. Considering that the owner is the target of the dog's gaze, the third phrase is clearly intended for her.

In total, the intonation contour seen in Figure 20 contains three intonation phrases, each featuring one or two peaks and each connected to a different gaze focus. Moreover, these vocalizations from the Saluki belong to a high vocal register, at around 5000–6000 Hz.

After the third phrase of the intonation contour, the dog's head and, later on, its entire body orient to the left (line 11).

```
11      +   (0.3)    +      (0.6)        +
  DOG               +LFF stationary step+
  DOG   +head to left+reach to left      +

12      + (0.4)  + (0.3)  + (0.3)  + (0.3) +
  DOG   +RFF step+LFF step+RFF step--------+
  DOG           +RBF step---------+
  fig   +#fig.21 +
```

The dog performs a left-front-paw tap as a precursor to walking. Unlike the previous act of tapping (line 5), however, this effort can be considered a weaker demand for attention from its owner, as it is performed less rapidly (line 5: 0.3-seconds; line 11: 0.6-seconds). Then, the dog takes a step to the left with its right front foot (Figure 21). Next, the dog walks behind its owner, as occurred with the Toller. At this point, the time for the experiment unfortunately expires, and the test leader interrupts the walking dog. Consequently, we do not know how the dyad would have re-established their interactional reciprocity with mutual gazes and coordinated bodies, since they orient to the test leader. Finally, during the moments after separation, neither displays of aggression nor extensive gazing were observed from the video.

Fig. 21

In summary, this section described how the Saluki looked at the other humans in the indoor arena and produced high-pitch vocalizations for them when the owner failed to respond or behave in an expected manner. This orientation to the other humans could be seen as indicating its own agency. Nonetheless, while the other humans were potential sources of help for the dog, as they were following the rules of the experiment, they denied the dog any support in this strange situation. Then, the dog shifted to an attempt to understand the owner's point of view by gazing in the same direction, which was as futile in securing attention from the owner as the previous attempt. In this extract, the dog did not use dual-pitch or tri-pitch vocalizations to seek attention; instead, the Saluki produced sequences of single-pitch vocalizations at 5000–7000 Hz. Lastly, the dog employed the practice of tapping a paw, which is yet another way to pursue the owner's attention.

4.3 Summary of the analysis

How did the dogs pursue missing feedback from their owners and other humans during a 2-minute exploration? During the breach, the dogs used the following practices: gazing at their owner, gazing at the other humans, gazing in the same direction as their owner (i.e., attempting to establish joint attention), using single-pitch, dual-pitch and tri-pitch vocalizations, touching the owner with their paw and snout, and tapping a paw on the floor.

How did the dyads coordinate their reunion after a 2-minute exploration? In the first dyad, with the Toller, the reunion after the separation was coordinated by embodied means: the members of the dyad moved closer together and shared mutual gaze. Then the dog's tail became active, and soon the dog presented its owner with an invitation to play. By contrast, in the second dyad, with the Saluki, the test leader ends the strange situation and draws the dyad's attention toward herself. Thus, the dyad's reunion is coordinated in a triadic interaction, which is not analyzed in this chapter.

Nevertheless, both interspecies dyads are able to restore their interactional reciprocity by orienting to each other in interaction. Moreover, as the Saluki case suggests, a third person can participate in restoring the interactional reciprocity of interspecies dyads.

5 Conclusion

This study aimed to investigate the interactional reciprocal processes of human-dog dyads using videotaped materials analyzed with conversation analysis. The following conclusions can be drawn from the findings:

- Dogs' orientation to the lack of reciprocity during a breach demonstrates that interactional reciprocity exists in human-dog interactions, which not only can be breached but can also be restored.

- Dogs understand how their owners should behave in social interaction; thus, they possess implicit, non-lexical knowledge (Streeck 2013) of their owners' ordinary behavior.
- Dogs share a collection of practices for pursuing feedback from their owners and others, and they use those practices to repair a lack of interactional reciprocity. Their practices can be termed *primordial ethnomethods*.

The data for this study were gathered from a short 5-minute behavioral test organized for dogs and their owners. The present study aimed to reveal what occurs in the 2-minute exploration phase in terms of the owner-dog relationship. The findings of a prior study suggested that a breach in this relationship would reduce the dogs' interest in exploring the indoor arena and cause them to stare at their owner more (Tiira & Lohi 2014). However, our study demonstrated that the dogs explored the arena and then subsequently stared at their owner and other humans.

For the two dogs analyzed in this chapter, the nature of the 2-min exploration phase changed as soon as they realized the strangeness of their owners' behavior and attitude. In line with the instructions, the owners refrained from maintaining interactional reciprocity and distanced themselves from their dogs. The strange situation revealed the dogs' agency, as they chose different paths to pursue feedback from the owner and help from the other humans in the arena. Nonetheless, some other dogs in the collection were less interested in their owners and concentrated more on the exploration. Thus, for them, the situation was apparently not strange at all! Perhaps, then, it requires special qualities from a dog to understand that its owner is behaving strangely, and the dogs analyzed in this study certainly possessed that capacity. We suggest that those dogs possessed implicit knowledge of how their owners should behave, and they compared that knowledge to the situation they faced during the experiment.

As mentioned earlier, the notion of interactional reciprocity originally derives from research on mother-infant interactions. In this study, we investigated the notion in the context of the Still Face Paradigm (SFP) and the Strange Situation Paradigm (SSP). Based on our findings, two observations can be made that relate to the original mother-infant findings. The first concerns the Toller's initiation of play with the owner (Goode 2007). This finding is interesting because human infants are reported to transfer negative emotions from the Still-Face phase to the reunion phase. Thus, unlike the dogs in our study, infants do not usually play with their mothers in this phase. The second observation concerns separation from the owner. In the SSP, the infant/dog is left alone when the caretaker walks into another room; thus, walking away provides a clue for the infant/dog to understand the caretaker's intentions. Here, the caretakers remained in the indoor arena and merely behaved rather passively. Thus, following the rationale of the SFP, what occurred was not a physical absence but more of an interactional separation. Future mother-infant interaction and human-dog interaction studies could consider these findings and investigate the links between the paradigms.

It has been suggested that the notion of interactional reciprocity may contribute to our understanding of intersubjectivity. According to the SFP, infants learn the basics of social interaction primarily from their caregivers, after which they are able to adapt their social practices according to the situation, for instance, to being with other infants (Dixon et al. 1981). In addition, Garfinkel (1967) found adults share certain common sense beliefs during social interaction; moreover, those beliefs can be made visible experimentally. Consider the following example, where S is recounting what occurred on her way to work.

Extract 3 (Garfinkel 1967: 42)

```
(S) I had a flat tire.
(E) What do you mean, you had a flat tire?
She appeared momentarily stunned. Then she answered in a
hostile way: "What do you mean, 'What do you mean?' A flat
tire is a flat tire. That is what I meant. Nothing special.
What a crazy question!"
```

In this dialogue, S is unaware that E is conducting an experiment, so her response to E's repair initiator indicates that E's turn was entirely unexpected. Thus, requesting clarification without a clear reason breaks the moral expectancies of ordinary conversation. Returning to our study, the dogs too were unaware of the experiment, and they found that their owners failed to behave as expected.

The dogs' implicit knowledge of their owners seems to have spurred the dogs to act again and again, as they attempted a range of different solutions to repair the ongoing breach. Our experiment underlines moral responsibility in caring relationships with dogs, as dogs recognize when their owners break the expectations of normal behavior (consider Drew 1998: footnote 8). This finding also resonates with the notion of sequential organization (e.g., Sacks et al. 1974; Schegloff 2007), as it seems clear that the dogs possessed a certain understanding of what should ordinarily happen *next* after their actions. Furthermore, as the experiment demonstrated, immediately after separation, sequences can be renewed in embodied ways (Figures 11–12).

Returning to the experiment, the dogs remained near their owners after realizing the lack of reciprocity. As the study demonstrated, the dogs deployed various initial actions but received no feedback. Since the dogs' actions failed to produce the expected responsive action (e.g., a show of attention from the owner), the dogs then changed their behavior. The Toller initiated a new project of approaching its owner, while the Saluki oriented to the other humans in the indoor arena. These, however, failed to produce the expected outcomes in a reasonable time. The Toller then decided to circle behind the owner and sat there observing its owner and the other humans.

By contrast, the Saluki continued to attempt to establish joint attention with its owner. However, after noticing that this attempt was unfruitful, the Saluki too decided to circle behind its owner. These findings, where the provider of the initial action receives no response from the recipient, might correspond to human interactions in a similar situation. Due to the experiment protocol, it is unclear whether the dogs succeeded in increasing pressure on their owners through their actions (Stivers & Rossano 2010). However, it is clear that they recognized when an action was unsuccessful and then chose another in an attempt to make progress. For instance, the Toller revised the distance from which it gazed at its owner.

During the experiment, the dogs produced high pitch sounds. However, in contrast to the study mentioned earlier in this chapter (Volodina et al. 2006), where high pitch vocalizations were produced in response to the active frustration-provoking attempts of dog owners (e.g., refusing to open a door), the owners in this study merely remained passive, in accordance with the SFP. While the Toller produced vocalizations in a very high register, the frequency was not, however, high enough to be inaudible or ultrasonic (Sales & Pye 1974).

Finally, this study, as with many studies on human-dog interaction, focused on interactions between dogs and their owners. Our empirical evidence demonstrates dogs' implicit knowledge of their owners. Based on this knowledge, dogs have access to the principal ways in which human interaction is organized; thus, they expect that the principles that work with their owner work with any human. Using this knowledge, they can tentatively enlist help from any bystander. This implicit knowledge of humans could even grant dogs the status of canine members of human societies, due to their understanding of the ways in which human morals are structured. Intriguingly, primordial ethnomethods may indeed be based on the notion of moral accountability. Thus, if some facet of human interaction fails to conform to implicit knowledge of human behavior, the dog (or human) may be entitled to receive an explanation. Thus, the bystanders in our examples would have been morally accountable for the dogs' requests for aid. Such accounts, for dogs, are most likely indexical and non-lexical. Furthermore, it seems clear that humans and dogs share the fundamentals of procedural knowledge, allowing them to achieve practical accomplishments such as fastening a leash or walking in the park. Performing such practical accomplishments in human-dog interaction conveys moral obligations not only on dogs and their owners but also on the bystanders encountered on those occasions.

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