Action request episodes in trauma team interactions in Japan and the UK - A multimodal analysis of joint actions in medical simulation

Abstract

Grounding is a fundamental human practice for cooperation and collaboration in a joint activity, when more than two people interact. Emergency care is one such interactive situation, and whether a trauma team can efficiently establish and increment their common ground at an appropriate timing during the complex and fluid activity of emergency medical treatment is key to maximise collective competence to best perform as a trauma team. This article investigates recurrent patterns in the grounding process between the trauma team leader and the members, comparing the practices between Japan and the UK, using an eye-tracking device. The embodied practice of grounding was multimodally described, applying both quantitative multimodal corpus analytic and qualitative interactional linguistic approaches. The analysis has shown that five grounding episodes reoccurred, most of which were more ego-centric and one of them *ba*-centric interactions, drawing on intersubjectivity and the theory of *ba* in Western and Eastern philosophy respectively. (150 words)

Keywords: multimodal analysis, emergency care simulation, common ground, request, eye-tracking

Introduction

A trauma team leader's requesting practice is of crucial importance to successful team interactions in emergency care settings as a proliferation of research on a leading doctor's requesting in a surgical team indicates (Bezemer, Murtagh, Cope, Gunther, & Kneebone, 2011; Ivarsson & Åberg, 2020; Mondada, 2014), playing a key role in the orchestration of care provision and enhancing collective competence of the team (cf.

Lingard, 2012; Sarangi, 2016). This study reports on a multimodal analysis of trauma team leaders' requesting behaviour observed in the context of emergency care simulation in Japan and the UK. The focus is specifically on grounding for joint activities (Clark, 1996; Clark & Brennan, 1991; Keysar, Barr, & Horton, 1998) and request sequences (Drew & Couper-Kuhlen, 2014; Mondada, 2014; Rossi, 2014), in which the team leader and members recognise an error or misunderstanding in their communication and orientation of activities.

In Japan and the UK, two emergency care simulation sessions were examined, one involving a senior doctor (SD) and the other a junior (JD). In each case, the team leader's requesting behaviours were examined and compared both quantitatively and qualitatively, applying multimodal corpus analytic (Adolphs & Carter, 2013; Knight, 2011; Author, 2013) and interactional linguistic approaches (Couper- Kuhlen & Selting, 2001, 2018; Enfield, 2013). Here, we focus on team leaders' verbal and non-verbal practices in requesting, examining what was being said and also the direction of the team leaders' gaze, captured through the means of eye-tracking technology. Embodied practices in the activity of the team leader's action request and the recipient's response in both sites were compared, and the results are discussed by drawing on the concept of *intersubjectivity* in the West (Duranti, 2010; Husserl, 1931 [2002]; Schutz, 1967) and the *ba* theory in the East (Hanks et al., 2019; Shimizu, 2003, 2020).

The next section first looks at the concept of *common ground* and review previous studies of requesting in everyday and healthcare contexts, which is followed by analysis and discussion sections.

Grounding

Emergency care interaction is a multiparty *joint action*, which involves several healthcare professionals (HCPs). In the context, HCPs act jointly with "coordination of

both content, what the participants intend to do, and processes, the physical and mental systems they recruit in carrying out those intentions" (Clark, 1996, p.59). Through the process of *grounding*, interactants form a *common ground* (Clark & Carlson, 1981; Stalnaker, 1978 [1999]), which is interactants' awareness of "certain information they each have", and can be *communal* or *personal* (Clark, 1996, pp.120-121). Clark and his colleagues explored common ground in understanding a demonstrative reference, proposing that the listeners' judgement was made based on their assumption of shared perceptual salience with the speaker (Clark, Schreuder, & Buttrick, 1983). Two phases in grounding were then identified: *presenting phase*, which is a speaker's "initial presentation of the content", and *accepting phase*, which is a speaker's and listener's "mutual acceptance of that content" (Clark & Schaefer, 1987, p. 21). These were termed as *contributions* to conversations (also see Clark & Brennan, 1991). The model was developed and there are four levels in the cognitive process of grounding in Clark (1996): Speaker's proposing joint project and Addressee's considering, Speaker's signalling the proposal and Addressee's recognising, Speaker's presenting the signal and Addressee's identifying, and Speaker's executing the action and Addressee's attending (ibid., p.152). Distinctions were also made between *shared common ground* (CG-shared) and *reflexive common ground* (CG-reflexive): the former is mutual belief, knowledge, assumption and awareness of a presented content between the interactants, and the latter their belief and knowledge that they believe the information (ibid., pp. 94-95). Keysar et al. (1998) conducted an experimental study on grounding processes and proved that "adults routinely process language egocentrically" (p.46) as children do, but they monitor and adjust their plan to establish a common ground. Kecskes and Zhang (2009) updated Clark's two types of common ground, labelling with the new names: *core common ground*, which is "the relatively static, generalised, common knowledge

that belongs to a certain speech community", and *emergent common ground*, which is "the relatively dynamic, particularised, *private* knowledge created in the course of communication" and found in intercultural encounters (Kecskes & Zhang, 2009, p. 347, original emphasis).

Grounding is an embodied practice that involves both verbal and non-verbal behaviors, e.g., gaze and posture. Holler and Bavelas (2017) conducted a systemic review on gestures in grounding, identifying repetitive gestures, pointing and interactional gestures contribute to constituting a new common ground or re-activating a previously shared common ground. Clark (2012) calls a pair which consists of verbal and non-verbal pair parts a *projective pair*, to distinguish it from an *adjacency pair* in conversation analysis, which features a pair of verbal utterances. Before moving on to the research data and method, existing research of grounding in request sequences is reviewed in the next section.

Multimodally embedded request

As seen in a detailed review in Drew and Couper-Kuhlen (2014), request is a fundamental social practice for cooperation and collaboration. Through an analysis of a multimodal corpus of informal interaction among family and friends in the UK, for instance, Kendrick and Drew (2016) further developed the discussion by introducing the notion of *recruitment* of Others' assistance in multimodally embodied interactions. This involves "both the linguistic and embodied semiotic resources through which Others are recruited to help resolve difficulties" (ibid., p.15). To develop the concept of recruitment, Zinken and Rossi (2016) added that Others' engagement can be characterised as *contribution* to a shared course of action rather than *assistance* when Others' commitment has been already established. In such situation, they also highlight

that “recruitment sequences can be progressed nonverbally based on established commitments and activity roles” (ibid., p.26). In Rossi’s (2014) conversation analysis of informal interactions among family members and friends in Italy, non-verbal requests were often observed in a joint activity in progress where the interactants share a goal, and to make those requests observable to recipients, some manual actions were accompanied with verbal requests or without them, e.g., pointing to the object (ibid., p.311).

Gaze behaviours also contributes to turn and action formation in human interactions (Rossano, 2013). Physicians and patients exploit various multimodal semiotic resources including gaze in medical consultations, such as different registers embodied with distinctive gaze behaviours and voice quality to shift from a consultation frame to an examination frame (Tannen & Wallat, 1983), and gaze and body orientation for mutual involvement (Heath, 1984). In an operation theatre in the UK, a surgeon’s embodied practice of requesting action to his colleague nurses was captured. The surgeon adjusts their utterances, body and gaze orientation, depending on a recipient’s medical knowledge and skill sets (Bezemer et al., 2011). More recently, Ivarsson and Åberg (2020) classified request sequences in surgeon - anaesthetic nurse interactions in an operation theatre in a Swedish hospital to suggest strategies to avoid and repair the ambiguity of requests, providing an image of the interactants’ body orientation and the arrangement of a multiple number of medical equipment around them. In emergency settings, the trauma leaders’ requesting practice was explored in relation to discourse frames (Bateson, 1972 [2000]; Goffman, 1974) and gaze behaviours (Author, 2019; Author, 2021), such as gaze address and *joint attention* (Kidwell & Zimmerman, 2007; Tomasello, 1999). The practice of grounding in request could be socio-culturally embodied in a local context and influenced by underlying cultural orientations. The

following section explores notions of common ground further through looking at two theoretical concepts, *intersubjectivity* and *ba* respectively, which are employed in the discussion at a later stage.

Intersubjectivity and the *ba* theory

In the western philosophical tradition, phenomenology (Husserl, 1931 [2002]; Schutz, 1967) has influenced society and various academic disciplines such as sociology, anthropology, and linguistic philosophy. *Intersubjectivity* is the central thought of Husserlian phenomenology, which is described as: "more than mutual or shared understanding" and "the source of objectivity" (Duranti, 2010, pp. 4-13). Intersubjectivity is thus a process of separating Self from Others by objectifying Others to establish common ground with them. Intersubjectivity denotes "intersubjective understanding" in interactions in conversation analysis (Heritage, 2007, p. 6; Mori & Hayashi, 2006), but in this study, we use the term intersubjectivity as a philosophical concept and grounding as a local practice to achieve a common ground with others *in situ*. In the *ba* theory in Japan, which was first conceptualised by the Japanese philosopher Nishida Kitaro[1](Nishida, 1926[2019]) and is rooted in Zen/Chinese Buddhism and Shinto, on the other hand, this egocentric process of intersubjectivity would be regarded as *secondary ba*, where interaction process occurs. In contrast, *primary ba* attributes to "impermanence and ultimately non-separation" between Self and Others/context, which is a status "prior to the subject-object distinction" (Hanks et al., 2019, p. 64; Shimizu, 2003). The literal meaning of the Japanese word *ba* is equivalent to 'place' or 'space' in English, but in the *ba* theory, *ba* is both spatial and

[1] The name is written in the order of the Japanese system, where surname comes before first name.

interactional, which involves “participation frameworks, norms governing behaviour, one’s own sense of belonging, and the singularity of any particular interaction” (ibid.). Subjectivity is also treated differently in phenomenological thoughts and the *ba* theory:

> The phenomenological focus on the first person point of view is contrary to both primary *ba* and *ba* theory, because it starts from the premise that the subject is given, whereas primary *ba* is devoid of individuation, and *ba* theory generates the subject from the joining of primary and secondary *ba*.
> (Hanks et al., 2019, p.66)

The *ba* theory is thus an ontology of mutual dependence, which has been advocated by scholars in emancipatory pragmatics, which is a new approach to analysing embodied interactions in various cultures from non-classic/non-Western linguistic and pragmatic views (Hanks, 2014; Hanks, Ide, & Katagiri, 2009).

The current study explores how a trauma team leader establishes common ground for the joint activity of medical treatment with their team members in requesting in emergency care simulation in Japan and the UK, capturing their eye gaze with an eye-tracking device. The results will be discussed from the different philosophical thoughts on interactions among humans and contexts in the East and the West.

Research data and methods

In the context of each site, Japan and the UK, two emergency care simulation sessions were recorded and examined, one involving a senior doctor and the other a junior as the team leaders.

Session A: recorded in the UK with a senior doctor as a leader (UK_SD), abdominal bleed

Session B: recorded in the UK with a junior doctor as a leader (UK_JD), abdominal bleed

Session C: recorded in Japan with a senior doctor as a leader (JP_SD), brain haemorrhage

Session D: recorded in Japan with a junior doctor as a leader (JP_JD), traffic injury

Two recordings of emergency care simulation with the same trauma scenario were recorded at a large teaching hospital in the UK, as part of regular simulation training (see Figure 8 in Appendix 1 for the setting). Each comprised of a team leader wearing eye-tracking glasses (the first session, Session A, with a senior doctor as a leader [SD] and the second, Session B, with a junior doctor [JD]), two foundation doctors (FD1 and FD2), two emergency department (ED) nurses (a senior nurse [SN] and junior nurse [JN]), one ED assistant (EDA), and one anaesthetist, who joined the team in the middle of the scenario. The same team members participated in both sessions with a different team leader. Several recording devices were set up in the room: three video cameras and a pair of eye-tracking glasses (SMI ETG2)[2], which the leaders wore. In both sessions,

[2] SMI Eye-tracking glasses (SMI ETG2) and Tobii Pro Glasses 2 (Tobii Pro 2) were used to record eye movements, sampling binocularly at 60Hz in SMI ETG2 and 50 Hz in Tobii Pro 2. Eye movements were overlain, by the SMI hardware (SMI ETG2) and iMotions (Tobii Pro 2), onto the scene that was captured with a forward-facing camera embedded in the glasses sampling at 60fps in SMI ETG2 and 25fps in Tobii Pro 2. A one-point calibration

the scenario was a trauma case with a simulated patient (60 years old, male), who suffers from a falling wardrobe. After the patient comes in, a paramedic conducts a handover with the team leader, who then directs the members of the team in taking tests, providing care and preparing the patient for a scan.

Similarly, the two recordings from the Japanese data sets took place in the resuscitation area at a university hospital as part of regular simulation training (see Figure 9 in Appendix 1 for the setting). Both teams were comprised of a team leader (L) with eye-tracking glasses (Tobii Pro 2)[2], another two doctors (D1 and D2), a foundation doctor (FD) in Session C and two FDs in Session D (FD1 and FD2), two nurses (N1 and N2), two X-ray technicians (X1 and X2), and a simulated patient in Session C and a manikin in Session D (both assumed as male, 60 years old). The scenario of Session C was a brain haemorrhage and Session D was a traffic injury. The patient is taken into a hybrid resuscitation room with a built-in CT scanner. The teams insert an intravenous (IV) line and an arterial line, intubate the patient, and do X-rays/CT-scans before leaving for the intensive care unit.

In each case, the team leader's requesting behaviours, especially their requests for immediate actions (immediate requests), were examined and compared, applying a multimodal corpus analytic and interactional linguistic approaches. The leaders' eye-tracking data and utterances were stored and annotated using applications iMotions (2018) and ELAN (2001-2015). The leader's gaze fixations were annotated manually on ELAN using the imported streaming from iMotions with the gaze markers, which are indicated as the circles in the figures. Interest areas relating to specific team members

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was conducted before each session with a threshold of <1° visual accuracy (SMI, 2017; Tobii, 2018).

(e.g., a foundation doctor) and an object (e.g., a monitor) were manually identified and fixations were attributed to these interest areas if, at the relevant period in the video, the fixation overlaid the team member or the object. The other members' eye gazes were annotated by observing the video images of the scene data. Gail Jefferson's transcription conventions were adapted to the transcripts[3, 4].

Results

The leaders' first and second position requests

Five patterns of request-action episodes were observed in the way the leaders made requests in both sites. The term *episode* is used here, which is a similar concept to a paragraph in a story in narrative analysis (van Dijk, 1982), to capture a larger unit of multimodally embedded sequence in interactions. In some cases, the recipient member gazes at the leader before the leader makes a first position request (Episode 1, Anticipated request). We shall call the recipient's gaze behaviour *anticipation gaze.* In other cases, the leader makes requests to confirm a task the recipient is already attending to (Episode 2, Request for confirmation). The leader also assigns a different task from the one the recipient is engaged in by making a request (Episode 3, Request

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[3] The number in brackets indicates a time gap in tenths of a second, and a dot enclosed in a bracket indicates a pause in the talk of less than two-tenths of a second. Square brackets between adjacent lines of concurrent speech indicate the onset and end of a spate of overlapping talk, and a double bracket indicates non-verbal activity (Hutchby & Wooffitt, 1998, pp. x-xi). All the name used in the transcripts are pseudonyms.

[4] For the Japanese data sets, English translations appear in bold below the original transcripts in Japanese in italic with abbreviations of literal glosses adapted from Suzuki (1995) (see Appendix 2 for the abbreviations).

for orientation). In terms of the leaders' making second position requests, the leaders are verbally prompted by team members (Episode 4, Recipient's verbal request initiation). In this case, a team member recognised a required task that had not yet been completed in the interaction and highlighted it to the leader. The leaders' second position requests could also be prompted by members' non-verbal behaviours (Episode5, Recipient's non-verbal cue for request). The leaders gazed at a member and noticed s/he was doing or trying to do something that should not be done, and then made a second position request to reorient the activity. A recipient member's gaze at the leader in Episode 1 could be a non-verbal cue for request (Heath, 1984), but in this study, we distinguish the cases where the recipient gazes at the leader and waits the leader's making a request (Episode 1, Anticipated request) and the instances where the recipient have commenced an activity, which induces the leader's making a request to reorient the activity (Episode 5, Recipient's non-verbal cue for request).

Table 1 shows that most of the leaders (UK_SD, UK_JD and JP_SD) made immediate requests for members' action about 40 times in the session except JP_JD, who made requests more than twice than the others. Both the SD and the JD in each site self-initiated requests (first position request, FPR) more frequently than made requests after being prompted by other members (second position requests, SPR).

Table 1 The four patterns of the leaders' request sequences[5]

	UK_SD		UK_JD		JP_SD		JP_JD	
Operation Time (MM:SS)	18:44		18:40		16:55		19:49	
Speaking Time (MM:SS)	02:44		03:22		01:40		02:35	
Word Count	1888		2090		2433		2088	
No of Immediate Request	35		38		40		86	
Episode 1 Anticipated request (FPR)	22	62.9%	20	52.6%	2	5.0%	1	1.2%
Episode 2 Request for confirmation (FPR)	0	0.0%	0	0.0%	6	15.0%	27	31.4%
Episode 3 Request for orientation (FPR)	7	20.0%	5	13.2%	19	47.5%	32	37.2%
Episode 4 Recipient's verbal request initiation (SPR)	5	14.3%	11	28.9%	11	27.5%	24	27.9%
Episode 5 Recipient's non-verbal cue for request (SPR)	1	2.9%	2	5.3%	2	5.0%	2	2.3%

The percentage of second position requests is higher in UK_JD and the two Japanese data sets compared with that of UK_SD. The pattern in Episode 1 was observed more often in the British leaders' making requests (62.9% in Session A (UK_SD), 52.6% in Session B (UK_JD)) than the Japanese leaders (5.0% in Session C (JP_SD), 1.2% in Session D (JP_JD)), while, Episode 2 seems to be attributed more to the Japanese leaders' requesting patterns (15.0% in Session C (JP_SD), 31.4% in Session D (JP_JD), no occurrences in the UK data). The detail of these leaders' requesting practices in their interactional context are qualitatively described in the following sections.

Episode 1: Anticipated request

Extract 1 is an instance of an anticipated request by the UK_JD in Session B. In the interaction immediately prior to this extract, the leader is listening to the foundation

[5] The word count for the Japanese leaders (JP_SD and JP_JD) indicates the number of characters, which include all the three letters in Japanese, i.e., *hiragana*, *katakana* and *kanji*. FPR means first position request and SPR second position request.

doctor's (FD1) primary survey. Listening to FD1's report of the patient's saturation level in line 2, which is 94 when the normal range is 97 to 100, the leader first looks at it on the monitor by himself in line 5 (Figure 1-1), then gazes at N2 in line 7 (Figure 1-3) and asks her to put an oxygen mask on the patient in line 8, verbalising the proposition for grounding while objectifying N2 as an Other. N2 is looking at the leader in line 6 (Figure 1-2) before the leader's request, because the members' commitment to the course of activity is already established, and N2 is also listening to FD1's survey reporting. N2 responds to the leader's request with a headnod, walking towards a cabinet to get an oxygen mask.

(1) Episode 1 (Anticipated request) in Session B (UK_JD) [at 02:15]

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1    L:     ((gazes at the patient.))
2   F1:     the satu[ration is 94] now.
3    L:             [((gazes at the monitor.))]
4    L:     (0.2)((gazes at the patient.))
5    L:     (.)((gazes at the monitor. #fig.1-1))
6   N2:     (0.2)((gazes at L. #fig. 1-2))
7    L:     (.)((gazes at N2. #fig. 1-3))
8 ->L:     can you put the [oxygen on?] Thank [you].
9    L:                     [((gazes at the monitor.))]
10   L:                                      [((L
                                        gazes at the
                                           patient.))]
6   N2:      [((headnods.))]
7   N2:     ((walks towards a cabinet.))
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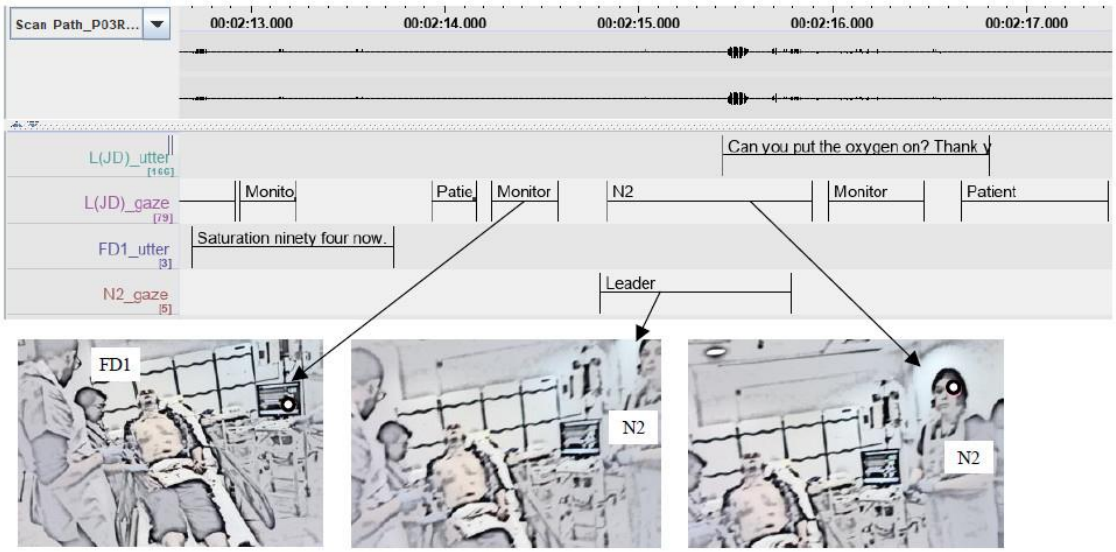
Figure 1 Episode 1 (anticipated request) in Session B (UK_JD)



1-1 (Line 5) 1-2 (Line 6) 1-3 (Line 7)

In contrast to the UK data, only few cases of Episode 1 (two instances in Session C with JP_SD and one in Session D with JP_JD) were observed in the Japanese simulation data. Extract 2 is an instance of Episode 1 (anticipated request) in the Japan data (Session C with JP_SD). JP_SD has just finished a call to the emergency intensive care unit to secure a bed for the patient while X-ray technicians are preparing for the CT scan. Seeing they are almost ready for the CT scan, the leader comes to the door, pretending to close the door for the CT scan, uttering “Okay we assume we closed the door” in line 1. He knows the door should be closed when taking a CT scan in an actual operation, but he leaves it open since there are many observers at the simulation. The leader’s utterance informs the ordinary practice, which is processed differently due to the simulation setting, to the members and observers. A foundation doctor (FD1) is standing near the door, looking at the leader in line 3 (Figure 2-1). The leader looks at FD1 and says, “Okay Foundation Doctor after we finish CT scan” in line 8, standing by FD1. FD1 looks back to the leader, which leads to their mutual gaze (lines 9- 10, Figure 2-2), and responds verbally, “Yes”, in line 12.

(2) Episode 1 (Anticipated request) in Session C (JP_SD) [at 07:15]

1 L: [*hai ja* [*tobira wa*] [*shimeta*]]

Okay then door TP close-PAST

[*toiu koto ni nari masu.*]

say NOM ADV become COP.POL.

okay then we assume we closed the door.

2 L: [((L comes to the

door where FD1 is

Standing.))]

3 FD1: [((gazes at L and headnods.

#fig. 2-1))]

4 L: [((gazes at

the door.

#fig. 2-1))]

5 L: [((gazes at the ECG.))]

6 L: ((gazes at SD and X-ray technician.))

7 FD1: ((gazes at the patient.))

8 ->L: *ja kennshuui no sen*[*sei sore ga*][*owatta-ra*],

then Foundation Doctor it S finish-PAST-COND

then Foundation Doctor after we finish it,

9 FD1: [((gazes at L

and headnods.

#fig.2-2))]

10 L: [((gazes at FD1.

#fig.2-2))]

11 L: [((gazes at
ECG.))]

12 FD1: [*hai.*]
Yes
yes.

13 L: [((gazes and
points at
ECG.))]

14->L: [[*shindenzu toka*] [*ato ha (.)*
ECG something like and TOP
you are going to do ECG and (.)
are dane nyokate toka
That COP.FP urinary catheter something like
wo ireru] *tsumori de.*
DO insert you will COP
that one- insert a urinary catheter.

15 FD1: [((FD1 looks at ECG.))]

16 L: [((L looks at
Patient.
#fig.2-3))]

17 L: ((L points at Patient. #fig.2-3))

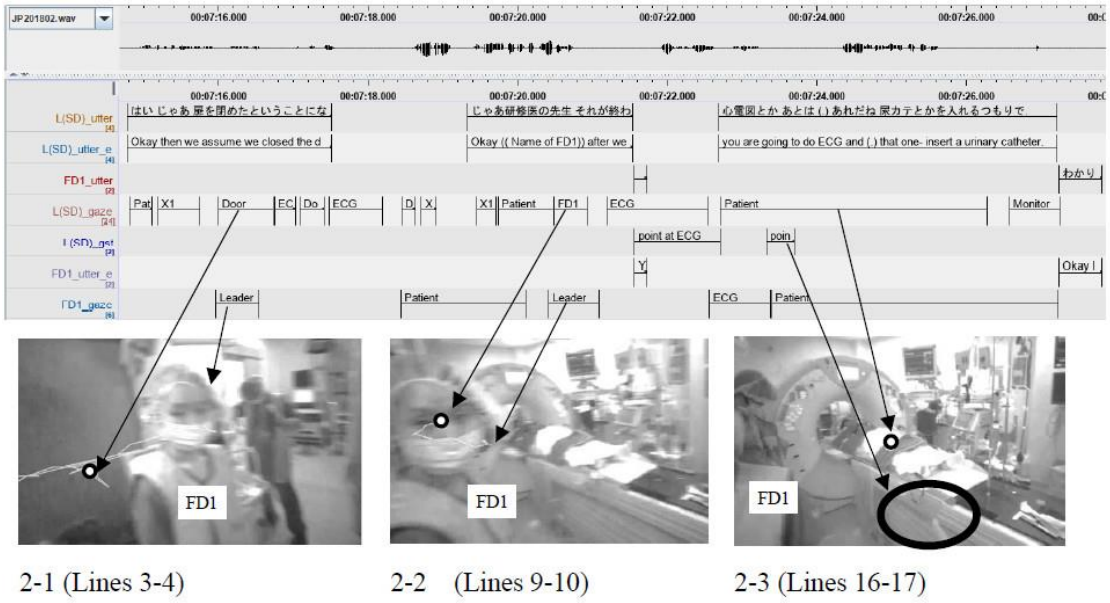
18 FD1: [((FD1 looks at
Patient.))]

19 FD1: *wakari mashita.*
understand COP.POL.PAST

okay I will.

((FD1 starts to prepare for taking an ECG.))

Figure 2 Episode 1 (Anticipated request) in Session C (JP_SD)Session C



2-1 (Lines 3-4) 2-2 (Lines 9-10) 2-3 (Lines 16-17)

Coordinating his gaze and pointing gestures towards the electrocardiograph (line 13, ECG) and the patient (line 17, Figure 2-3), the leader assigns the tasks to FD1, saying “you are going to do the ECG and (.) that one- the urinary catheter” in line 14. The leader also gazes at the equipment (the ECG) to be use for the treatment before he initiates the request verbally (line 5). FD1 looks at the leader while listening, and verbally responds again (line 19), starting the preparation for taking an ECG. Thus in Episode 1, the recipient looks at the leader before the leader actually verbalised the requests.

Episode 2: Request for confirmation

More instances of Episode 2 (request for confirmation), where the leader makes a request when members are already involved in the task the leader asks, were observed

in the Japanese data than the UK data (no instances in both the UK data. Six instances (15.0%) in Session C in JP_SD and 27 cases (31.4%) in Session D with JP_JD). Extract 3 is an instance of Episode 2 in Session D with JP_JD. Soon after the arrival, the patient is transferred to the bed in the resuscitation room, and Doctor 1 (D1) and Foundation Doctor 2 (FD2) start to take off an immobiliser from the patient's head. The leader, who is standing on the right side of the bed, looks at FD2 from her back (line 2, Figure 3-1), watching D1 and FD2's removing the immobiliser and saying, "Take it off".

(3) Episode 2 (Request for confirmation) in Session D (JP_JD) [Session D at 00:41]

1 D1&FD2: ((D1 and FD2 are taking the immobiliser
Off from the patient's head.))
2 L: ((gazes at FD2. #fig.3-1))
3 L: *anpakke:ji* [*shite.*]
Remove do-IMP
take it off.
4 L: [((gazes at D1. #fig.3-2))]
5 ->L: *ja sato sensei ((Name of D1))*
then Dr Sato
then Dr Sato ((Name of D1))
ue kara hyouka shite itte kudasai.
top from evaluation do-CONV please
please do the primary survey.
6 ((Few lines are omitted.))
7 D1: *ja C kara hyoka shimasu.*
Then C from evaluation do-POL

okay I will start checking with C.

8 ((Few lines are omitted.))

9 D1: *wakari masu ka.*

Understand COP.POL Q

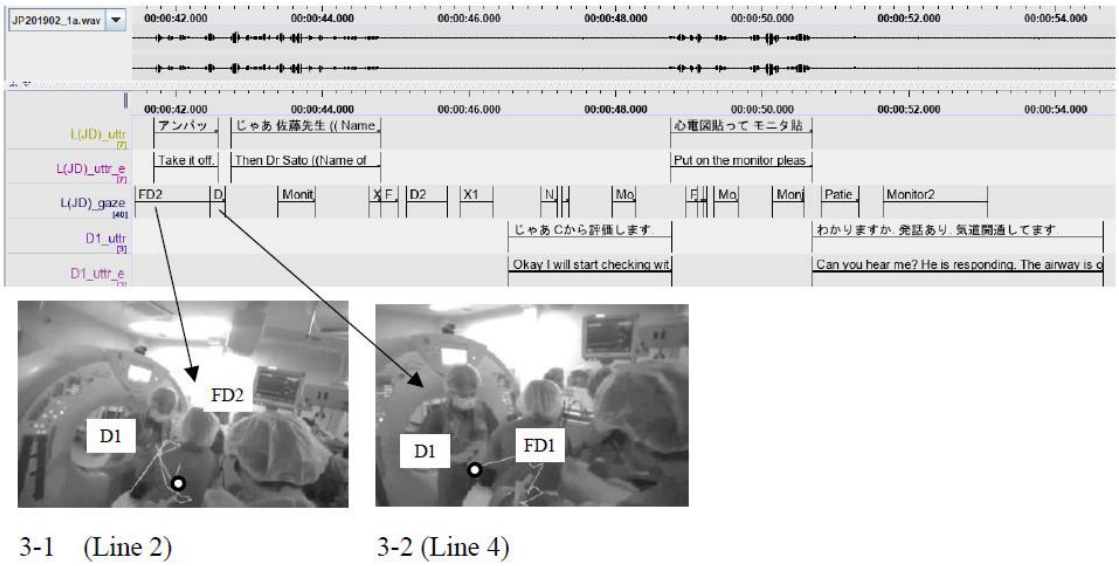
can you hear me?

10 *hatsuwa ari. kido kaituu shite masu.*

speak COP airway open do-COV COP.POL

he is responding. the airway is open.

Figure 3 Episode 2 (Request for confirmation) in Session D (JP_JD)Session D



3-1 (Line 2) 3-2 (Line 4)

When they finished removing the immobiliser, the leader quickly looks at D1 and asks D1 to start the primary survey (lines 4-5, Figure 3-2). D1 is already attending the patient at that moment and responds to the leader, saying “Okay I will start checking with C” in line 7. In Episode 2, the common ground has already been established before the leader’s presenting proposition with the request. D1 and the leader are both immersed in the situation and slightly foregrounded with the request, reinforcing the common ground

in a reflexive manner. In line 9, D1 then starts talking to the patient, “Can you hear me?”, for the primary survey, and reporting “He is responding. The airway is open” (Line 10).

Episode 3: Request for orientation

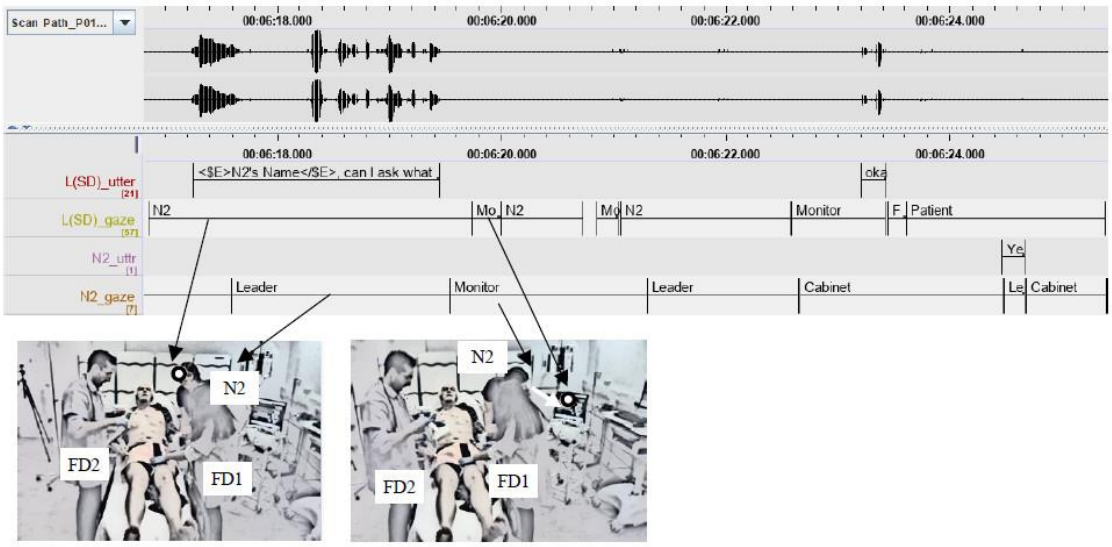
The third episode is the leader’s request for orientation, where the leader asks the recipient to do a task when the recipient is engaged in another. This was observed more frequently in the Japanese data (19 instances (47.5%) in Session C with JP_SD and 32 (37.2%) in Session D with JP_JD). The number of the instances of Episode 3 is relatively small in the UK data (7 instances (20.0%) in Session A with UK_SD and 5 (13.2%) in Session B with UK_JD), but they were still present. Extract 4 is an example of Episode 3 in Session A (UK_SD). FD1 and FD2 are putting a pelvis bandage on the patient and a nurse (N2) is helping them by holding the patient’s left arm since the patient has an open wound on his wrist. UK_SD looks at N2 (line 2), addresses her name and asks her, “can I ask what was the temperature?” (line 3). Responding to the leader’s address, N2 first looks at the leader, which leads to their mutual gaze (lines 5-6, Figure 4-2), and then looks at the monitor to see whether the temperature is displayed. Looking at N2’s gaze, the leader also looks at the monitor, which is an instance of joint attention. The temperature is not on the monitor due to the simulation environment. The leader then utters “okay” in line 10, which is followed by N2’s response, “Yeah” in line 13. The leader’s verbalised proposition is accepted by N2 after their checking the monitor where the patient’s temperature is displayed in a real situation but not in the simulated setting, leading the establishment of the common ground that they need to take the patient’s temperature with a thermometer while objectifying each other. During the process, N2 also looks at the cabinet behind her to search for the thermometer. After

this extract, N1, who is listening to the conversation, comes to the cabinet, takes out the thermometer from a drawer and brings to N2 since N2 is holding the patient's arm and not able to leave the bedside.

(4) Episode 3 (Request for orientation) in Session A (UK_SD) [at 06:17]

```
1    N2:   ((N2 is helping FD1 and FD2 to put a
           pelvis bandage on the patient.))
2     L:   ((gazes at N2. #fig.4-1))
3  ->L:    Ruth ((N2's Name))[ can I ask what was
                              the temperature?]
4  N2:                      [((gazes at L.
                                  #fig.4-1))]
5  N2:     ((gazes at the monitor. #fig.4-2))
6   L:     ((gazes at the monitor. #fig.4-2))
7   L:     ((gazes at N2.))
8          ((Few lines are omitted.))
9  N2:     ((gazes at the cabinet behind.))
10  L:     okay.
11  L:     ((gazes at FD1.))
12  L:     ((gazes at the patient.))
13  N2:    ((gazes at the leader.)) Yeah.
```

Figure 4 Episode 3 (Request for orientation) in Session A (UK_SD)



4-1 (Lines 2 and 4) 4-2 (Lines 5-6)

The recipient's anticipation gaze at the leader before a request was not observed in Episodes 2 and 3.

Episode 4: Recipient's verbal request initiation

The leaders' requests are sometimes prompted by other team members' verbal utterances, which is categorised as Episode 4 (5 instances (14.3%) in Session A with UK_SD, 11 (28.9%) in Session B with UK_JD, 11 (27.5%) in Session C with JP_SD, and 24 (27.9%) in Session D with JP_JD). Extract 5 is an instance of Episode 4 in Session D with JP_JD. The excerpt is from the moment described in Extract 3, but the focus is placed on another interaction observed at that time between JP_JD and a nurse (N1). Soon after the leader asks D1 to do the primary survey, N1 gazes at the leader, pointing at the monitor (line 7, Figure 5-1). The leader notices N1's oriented her torso towards him, gazing and pointing to the monitor, and gazes back at N1 (line 8, Figure 5-1). After the establishment of mutual gaze, N1 utters, "ECG?" (line 9), in a rising tone, which should mean "do we have to put the ECG monitor on the patient?".

(5) Episode 4 (Recipient's verbal request initiation) in Session D (JP_JD)

[Session Dat 00:41]

1 D1&FD2: ((D1 and FD2 are taking the immobilizer from the patient’s head.))

2 L: ((gazes at FD2.))

3 L: *anpakke:ji* [*shite.*]

Remove do-IMP

take it off.

4 L: [((gazes at D1.))]

5 L: *ja sato sensei ((Name of D1))*

then Dr Sato

then Dr Sato ((Name of D1))

ue kara hyouka shite itte kudasai.

top from evaluation do-CONV please

please do the primary survey.

6 ((Few lines are omitted.))

7 N1: ((gazes at L and points at the monitor. #fig.5-1))

8 L: ((gazes at N1. #fig.5-1))

9 N1: *shindenzu?*

ECG

ECG?

10 N1: ((gazes at the monitor. #fig.5-2))

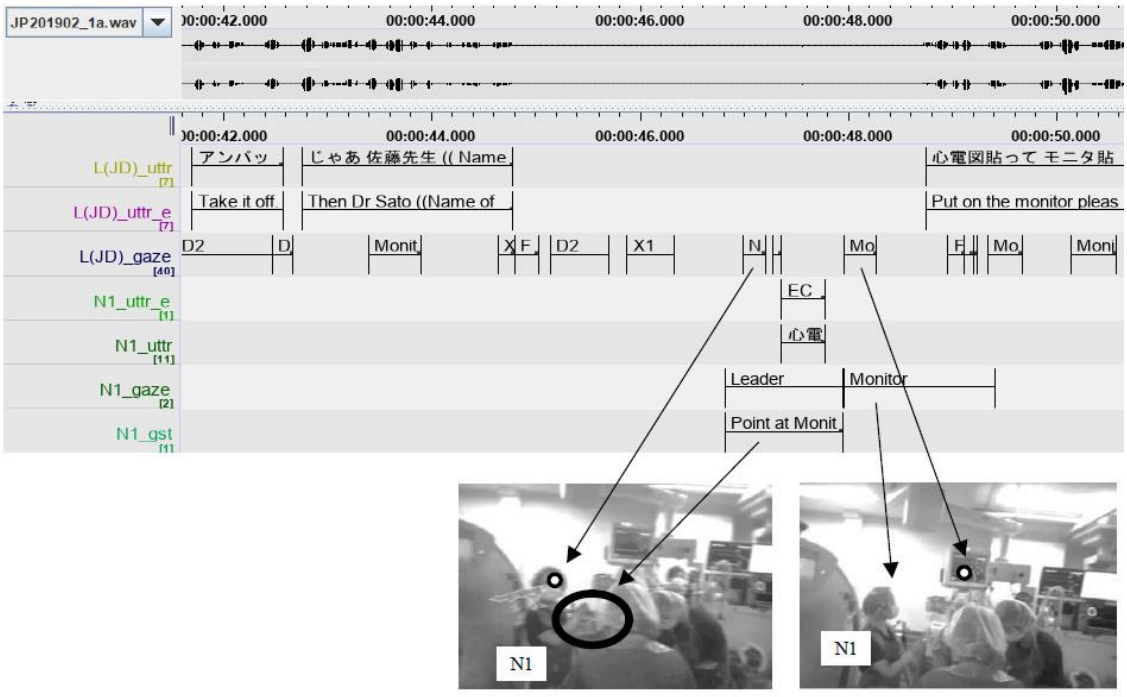
11 L: ((gazes at the monitor. #fig.5-2))

12 ->L: *shindenzu hatte monita hatte ne.*

ECG put-CONV monitor put-CONV FP

put on the monitor please.

Figure 5 Episode 4 (Recipient's verbal request initiation) in Session D (JP_JD)



5-1 (Lines 7-8) 5-2 (Lines 10-11)

N1 then looks at the monitor behind her, which is followed by the leader's gaze shift towards the monitor, leading to joint attention (lines 10-11, Figure 5-2). The leader then asks N1 to put the monitor on the patient in line 12. As seen in this extract, the leader's request is sometimes prompted by a member's previous utterance.

Similar cases of a leader's second position request are also found in the UK data. Extract 6 is the time when an anaesthetist (A) comes into the simulation room to give help. A greets UK_JD with mutual gaze (lines 1-4) and the leader asks who he is, which is followed by A's self-introduction of his name and expertise (lines 5-6).

(6) Episode 4 (Recipient's verbal request initiation) in Session B (UK_JD) [at 9:44]

1 A: ((A comes into the room and gazes at L.))

2 L: ((gazes at A.))

3 L: hello [what's-]

4 A: [Hi.]

5 L: [Who are you my friend?]

6 A: [I'm Tom ((Name of A))] one of the anaesthetics.

7 L: hi nice to meet you anaesthetics [Tom.

8 L: [((gazes At the patient.))]

9 L: yeah [perfect.]

10 A: [How can I help you?]

11 L: [are you] part of the trauma team?

12 L: [((gazes at A.))]

13 A: yeah.

14 L: ((gazes at the patient.))

15 L: okay erm so we got a chap he is now erm about thirty minutes post injury.

16 ((Few lines omitted. L continues to share the situation with A.))

17 A: ((points at the patient’s head. #fig.6-1))

18 A: ((gazes at L. #fig.6-1))

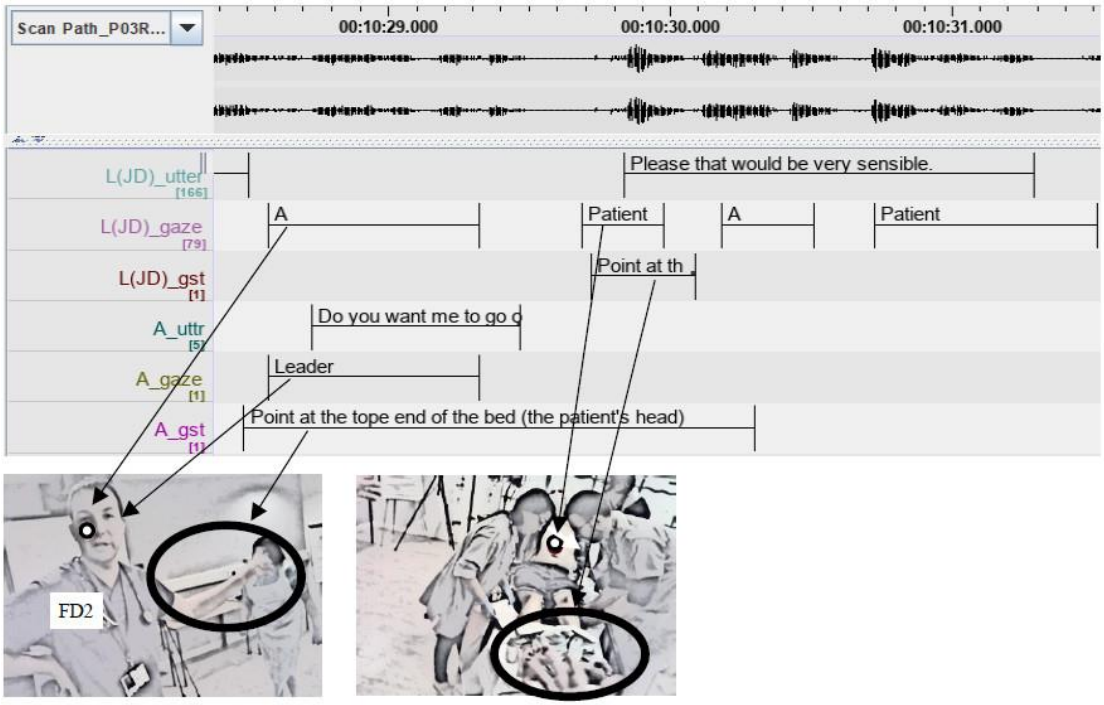
19 L: ((gazes at A. #fig.6-1))

20 ->A: do you want me to go on the top end?

21 L: ((gazes at the patient. #fig.6-2))

22 L ((points at the top end with open palm
supine. #fig.6-2))
23 ->L: please that would be very sensible.

Figure 6 Episode 4 (Recipient's verbal request initiation) in Session B (UK_JD)



6-1 (Lines 17-19) 6-2 (Lines 21-22)

The leader then starts explaining the current situation to A, shifting his gaze on the patient (lines 14-15). After the leader's explanation, A asks, "Do you want me to go on the top end?" with mutual gaze with the leader and a pointing gesture at the bed top (the patient's head) (lines 17-20, Figure 6-1). The leader also looks toward the patient and points at the bed end with an open palm supine (palm up) gesture, accepting his suggestion (lines 21-23, Figure 6-2). In Episode 3, the proposition is multimodally presented by a member recipient, which is accepted by the leader with their making a request.

Episode 5: Recipient's non-verbal cue for request

Although the number of cases is limited, the leaders also responds members' nonverbal behaviours, which is related to the phenomenon called *projective pair* (Clark, 2012). Extract 7 shows Episode 5 (Recipient's non-verbal cue for request) in Session D (JP_JD). The team are preparing for taking X-rays after intubating the patient. The leader requests to take X-rays (lines 1-5), and X1 comes beside the bed and asks the team to lift the patient up to insert the spacer (a flat rectangle plate) under the backboard (line 7). The leader looks at the patient's body, where the spacer is going to be inserted (line 9, Figure 7-1).

(7) Episode 5 (Recipient's non-verbal cue for request) in Session D (JP_JD) [at 9:01]

1	L:	*ja rentogen da.*
		then X-ray COP
		then let's take X-rays.
		[*mune* [*to*] *kotsuban*,]
		chest and pelvis
		[chest and pelvis,]
2	L:	[((gazes
		at X1.))]
3	X1:	[hai tori masu.]
		yes take COP.POL
		[Yes, I will do.]
4	L:	((gazes at D1.))
5	L:	*toroo.*
		take-VOL

let's do it.

6 L: ((gazes at the monitor.))

7 X1: *ha:i bakku*[*boodo no*]

okay backboard GEN

[*shitani supe:sa: iretai desu.*]

under spacer insert-want COP.POL

oka:y I want to insert the spacer under the backboard.

8 L: [((gazes at FD2. #fig.7-1))]

9 L: [((gazes at the patient.))]

10 ((Few lines omitted.))

11 D2: *hai,*

okay

okay,

12 L: ((gazes at the patient.))

[*ja*] [*ashi mochi masu.*]

then legs take COP.POL

then I will lift his legs up.

13 L: [[((gazes at D2.))]

14 L: [((gazes at FD2. #fig.7-2))]

15 L: *hai.*

okay

okay.

16 D1: *atama* [*mochi*] *masu.*

head take COP.POL

I will lift his head up.

17 L: [((gazes at D2.))]

18 L: ((gazes at FD2. #fig.7-3))

19 ((FD2 is about to stop pumping to help others.))

20 ->L: *ii yo Sasaki sensei ((Name of FD2)) ha*

okay FP Dr Sasaki TOP

zutto ponpingu shitete.

all the time Pumping do-IMP.STAT

it's okay Dr Sasaki((Name of FD2))

you can continue pumping.

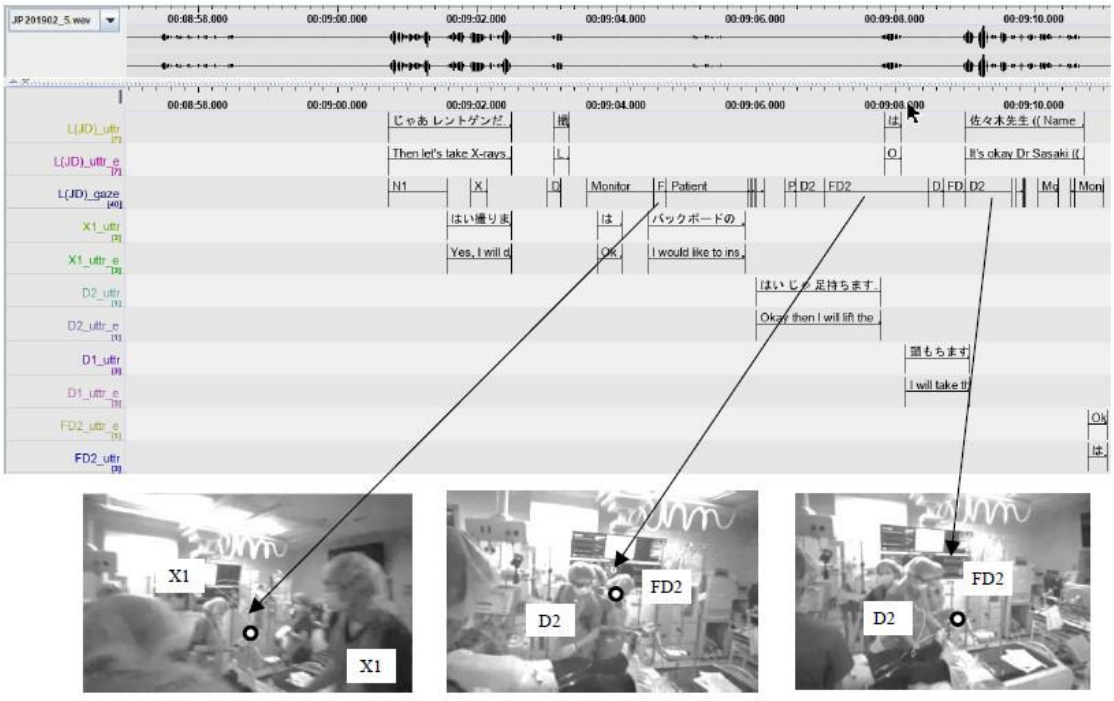
21 ((Few lines omitted.))

22 FD2: *hai.*

okay

okay.

Figure 7 Episode 5 (Recipient's non-verbal cue for request) in in Session D (JP_JD)



7-1 (Line 8) 7-2 (Line 14) 7-3 (Line 18)

Responding X1's request, D1 and D2 hold the patient's head and legs to lift him up (lines 11 and 16). Seeing the situation, FD2, who has been pumping blood, stops doing so to help the team, which is monitored by the leader (lines 8, 14 and 18, Figures 7-1, 7-2 and 7-3). The leader then asks FD2 to continue pumping in line 20, which is followed by FD2's response in line 22.

There are only a couple of cases of Episode 5 in each session, but this captures the moments where the leaders anticipate the members' actions. The recipient member signals non-verbal cues of their acceptance of the leader's proposition, which is monitored and recognised by the leader since it is not intended. The leaders then reorient the recipient's activity with requests, co-constructing a common ground for joint action, moving from the primary *ba*, where the recipient and the leader are immersed in the context, to the secondary *ba*, where they emerge as Self and Other with a verbal request and a response.

The phases of grounding in the four episodes

The leaders exploit request practices for recruitment of members' contribution by establishing a common ground for collaboratively performing medical treatments at each moment. Table 2 summarises the phases and the gaze behaviours of the leaders and the recipients in the grounding process in the five interactional Episodes identified.

Table 2 The processes of grounding in the five request-action episodes[6]

Episode 1: *Anticipated request*	Phase -1: Update about the patient's condition and medical procedures Phase 0: Recipient's anticipation gaze (signalling *p*) Phase 1: Leader's gaze/request (presenting *p*) Phase 2: Recipient's acceptance of *p*
Episode 2: *Request for confirmation*	Phase -1: Recipient's executing the task to be requested (attending *p*) Phase 0: Leader's gaze at Recipient who is already executing the task (signalling *p*) Phase 1: Leader's gaze/request (presenting *p*)
Episode 3: *Request for orientation*	Phase -1: Recipient's executing a task, which is different from the task to be requested Phase 0: Leader's seeking gaze at Recipient (signalling *p*) Phase 1: Leader's gaze/request (presenting *p*)

[6] *p* refers to a proposition of a joint action.

	Phase 2: Recipient's acceptance of *p*
Episode 4: *Recipient's verbal request initiation*	Phase 0: Recipient's seeking gaze at Leader (signalling *p*) Phase 1: Recipient's request initiation (presenting *p*) Phase 2: Leader's gaze/request (accepting *p*)
Episode 5: *Recipient's non-verbal cue for request*	Phase 0: Leader's anticipation gaze (signalling *p1*) Phase 1: Recipient's non-verbal cue (signalling *p2*) Phase 2: Leader's gaze/request (presenting *p1*) Phase 3: Recipient's acceptance of *p1*

In Episode 1 (Anticipated request), joint action is co-constructed with the recipient's anticipation gaze (signalling *p*), which leads to the mutual gaze between the leader and the recipient before the leader verbally makes a request (presenting *p*). After the mutual gaze between the leader and the nurse, the leader then makes a request, and the recipient accepts the request (accepting *p*), establishing the common ground of what activity should be done by whom at that moment based on the information shared in the preceding phase. Both the leader and the recipient signalled the proposal with gaze before the leader presented the proposal verbally.

In Episode 2 (Request for confirmation), the leaders make a request while a recipient is on a task. The leader confirms the activity the recipient is already engaged in with making a request. In this situation, the leader gazes at the recipient member who

is executing the activity (attending *p*) and verbalises a request, which both already share. It indicates the common ground is reflexive. In other words, the recipient's commitment of the course of activity is already established before the leader's verbal request (presenting *p*) in this episode. Six occurrences (15.0%) in Session C (JP_SD) and 27 (31.4%) in Session D (JP_JD) are categorised into Episode 2, whereas, no instance of Episode 2 was found in the UK data.

In Episode 3 (Request for orientation), on the other hand, the leader asks the recipient to do another task after the one the recipient is working on at the time of the leader's requesting. The leader seeks the recipient's attention with gaze (signalling *p*) and utterances (presenting *p*) in Episode 3. The request is taken up by the recipient (accepting *p*) immediately in some cases. In other cases the orientation is verbally and/or non-verbally negotiated and co-constructed between the leader and the recipient before establishing a shared common ground and executing the task as described in Extract 4, where mutual gaze between UK_SD and N2 and their joint attention to the monitor were observed in the process of grounding.

In Episode 4 (Recipient's verbal request initiation), absence of the leader's request or instruction is recognised and prompted by the recipient with seeking the leader's attention with their gaze, body orientation, gestures and utterances (signalling and presenting *p*). The leader then co-constructs a common ground with the recipient by responding and making a request (accepting *p*)[7]. In Episode 5 (Recipient's non-verbal cue for request), the leader anticipates potential misorientation by the recipient,

[7] There are few instances of the leaders' rejection to the member's suggestion of an action in the data sets in both sites, which will be discussed in a separate work because of the limited space of a manuscript.

monitoring the recipient's behaviours (signalling *p1*). Seeing the recipient is going to attend an activity (signalling *p2*) which the leader does not intend them to do, the leader verbally instructs the recipient (presenting *p1*) and reorients the activity.

Discussion

Different embodiments of grounding –intersubjectivity and ba

Although the data in the UK and Japan show many commonalities, two noticeable differences were found in the practices of grounding in the emergency interactions between the UK and Japan: (1) In the former, a recipient's anticipation gaze is observed before the leaders' request in most cases (Episode 1, Anticipated request, 62.9% in Session A (UK_SD), 52.6% in Session B (UK_JD), see Table 1 for the details), while in the latter, the leaders asks the action which the recipient is already engaged in, confirming the orientation of the activity, more frequently than the leaders in the UK (Episode 2, Request for confirmation, 15.0% in Session C (JP_SD), 31.4% in Session D (JP_JD), no occurrences in the UK data), and (2) in the UK data, the junior leader is prompted by the members to re-orient the current activity (Episode 4, Recipient's verbal request initiation) more often than the senior doctor (14.3% in Session A (UK_SD), 28.9% in Session B (UK_JD)), while in the Japan data, the members recognise and verbalise the absence of the leader's requesting a necessary action in both sessions led by the senior and junior doctors (27.5% in Session C (JP_SD), 27.9% in Session D (JP_JD)). This might reflect how the interactions are framed and embodied in the two distinctive sociocultural contexts. A discussion on the idiosyncrasies is added, employing the concepts of intersubjectivity and the *ba* theory.

In intersubjectivity and in egocentric interactions in secondary *ba*, Self objectifies Others by recognising their distinctive assigned social and institutional roles

to interact and seek for a common ground with verbal utterances and non-verbal behaviours. In such context, their agency as a leader/requester and a member/recipient is foregrounded, and the members tend to wait till the leader's making a verbal request, monitoring the leader with gaze, before they execute the action requested. In primary *ba*, on the other hand, Self is not separated from Others/context (Hanks et al., 2019; Shimizu, 2003, 2020), and the participants including the leader are immersed in the context of the activity of medical treatment and their behaviours are defined by *ba*, which are not necessarily initiated by the leader's requesting.

The ego-centric practice of grounding is observed in Episode 1 (Anticipated request), where the recipient gazes at the leader, anticipating and waiting the leader's request. The same practice was found in the Japan data, but only in the process of grounding between the leader and the foundation doctors. Episode 3 (Request for orientation) could also be more ego-centric, where the leader instructs the next task to the recipient member. While, the leaders' use of confirmation request in Episode 2 (Request for confirmation) seems more *ba*-oriented, reassuring a shared common ground within a team. Along the same line, in Episodes 4 (Recipient's verbal request initiation) and 5 (Recipient's non-verbal cue for request), the requester, either the leader or the member, is performing as part of *ba*, getting noticed the lack of certain necessary actions or some wrong actions in the context, and moving towards the ego-centric interactions with reorienting Other's activity with voice, gaze and body movements.

Both practices of grounding were observed in the data sets of Japan and UK, but the egocentric interactions for grounding (especially, Episode 1, Anticipated request) seemed the dominant practice in the UK teams. On the contrary, the primary-*ba* oriented practice (especially, Episode 2, Request for confirmation) seemed to be more attributed to the interactions in the Japan data with evidence that there are no instances

of Episode 2 in the UK data. It would, however, be too simplistic to claim that the egocentric process characterises the interactions in the UK data and the mutual dependent practice of primary *ba* the Japanese one, and this dichotomous interpretation is suggested cautiously. There are many other factors to be considered. The Japanese data sets, for example, were recorded *in situ* in the resuscitation area with the members of the emergency care department who work together in daily basis. This differs from the UK data sets, where the ad-hoc trauma teams took part for training in a simulation room. This could also affect the team interactions and needs to be investigated further.

Conclusion

Whether a trauma team can efficiently establish and increment their common ground at an appropriate timing during the complex and fluid activity of emergency medical treatment is key to best perform as a team. This is emphaised in Lingard's (Lingard, 2012) notion of healthcare professionals' *collective competence*, which is characterised as "a constantly evolving set of multiple, interconnected behaviours enacted in time and space" (p.60). This article has investigated recurrent patterns in grounding process between the trauma team leader and the members, comparing the practices between Japan and the UK, and between the leaders with different levels of experience in each site.

Request is a central move in grounding to (re)orient the course of joint activities. These practices were embodied in the process of grounding by the leader and the members in emergency care interactions. The analysis has shown that five grounding episodes reoccurred. Two of them (Episode 1, Anticipated request, and Episode 3, Request for orientation) are more *ego*-centric interactions based on intersubjectivity (Duranti, 2010; Husserl, 1931 [2002]; Schutz, 1967), another (Episode 2, Request for confirmation) *ba*-centric interactions which are urged by *ba* as a whole (Hanks et al.,

2014; Shimizu, 2003, 2020) and the other two (Episodes 4, Recipient's verbal request initiation, and 5 Recipient's non-verbal cue for request) have both elements. The British leaders led the team in a more ego-centric manner, while, the Japanese leaders tended to submerge themselves in *ba* with the members, transcending Self and merging with Others/context. Although these findings should be treated cautiously, avoiding simplistic cultural stereotypes, and situational differences (e.g., the team composition and activities they are engaged in) and its influence on leaders' requesting practice should not be underestimated, this study illuminates how interactants frame the leader-member collaboration through leaders' requesting in distinctive linguacultural contexts, drawing on the theories of intersubjectivity and *ba*.

Further investigation with a larger and more comparative set of data is necessary to make stronger claims, but this article sheds light on the potential of multimodal corpus analytic and interactional linguistic approaches to explore task-oriented multi-party interactions, drawing on the concept of grounding, intersubjectivity and the theory of *ba* for a cross-cultural comparison. It is also hoped this study stimulates multimodal research with eye-tracking technology on healthcare interactions, which contributes to a finer understanding of emergency care team interaction and informing medical simulation training and education.

Declaration of interest statement

The authors declare no conflicts of interest associated with this manuscript.

Ethics approval

The Ethics Committees of [details omitted for anonymous peer review] approved this study. Informed consent was obtained from all the participants involved.

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Appendix 1 Settings

Figure 8 The setting of the simulation room in the UK

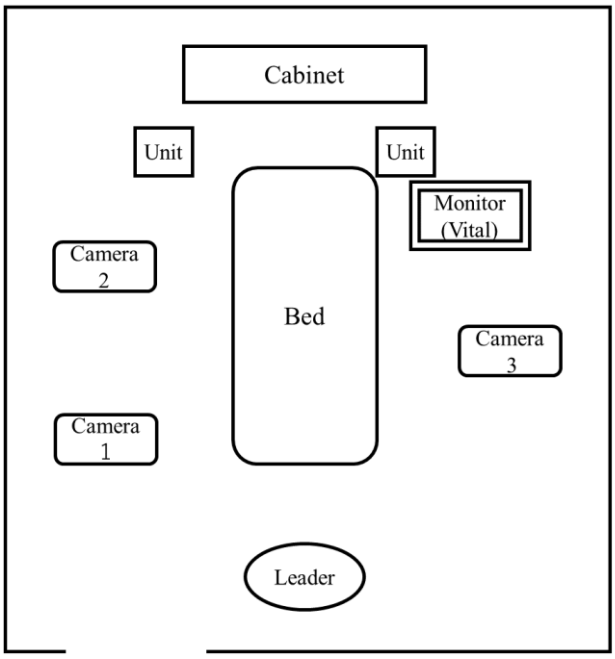
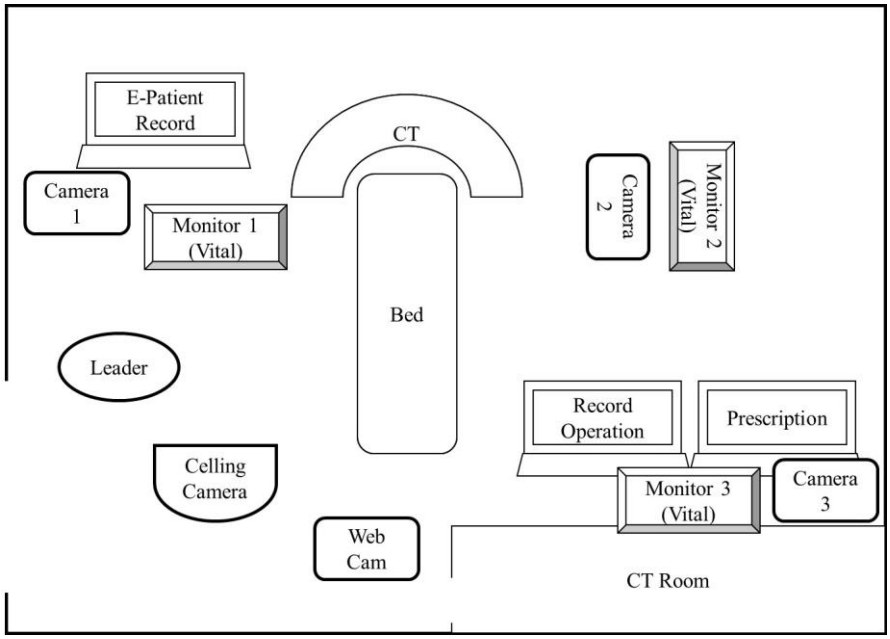


Figure 9 The setting of the resuscitation room in Japan



Appendix 2 Abbreviations

ADV	adverbial marker
COND	conditional morpheme
CONV	converb
COP	copula
DO	direct object marker
FP	final particle
GEN	genitive
IMP	imperative form
NOM	nominalizer
PAST	past morpheme
POL	polite form
Q	question marker
S	subject marker
STAT	stative morpheme
TOP	topic marker
VOL	volitional morpheme