The embodied organization of a real-time fetus: The visible and the invisible in prenatal ultrasound examinations

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Abstract

Through an analysis of videotaped interactions between healthcare professionals and pregnant women during ultrasound prenatal examinations in Japan, I explore some aspects of sequence organization in which an ultrasound real-time fetus is organized. The ultrasound demonstration of the fetal condition is an intrinsically interactional and distributed achievement. The ultrasound fetus is constructed as a real-time object in a particular technological environment; in this environment, the participants' orientations to spatially separated operational fields, that is, the monitor screen and the woman's abdomen, are exhibited and integrated in the actual course of interaction. In conclusion, the fundamental relation between organizational lived work in a technological environment and the observable features of technology will be suggested.

Keywords

action sequence, distributed reference, interaction, real-time fetus, ultrasound examinations

The aim of this article is to elucidate the embodied organization of objects. This topic includes how objects are organized through the spatial and temporal arrangement of bodies (bodily movements, bodily postures and so on) and talk in the actual course of activities in which participants jointly engage. The phenomenological programme claims that the world in which we encounter various objects is not an aggregate of pre-constituted entities, but rather a structure of differentially textured experiences (see, for example, Husserl (2002) for his concept of the world as 'horizon'). The objective character of the objects we encounter in the world is achieved and oriented-to in the midst of our lives.

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This article analyses interaction during ultrasound prenatal examinations in order to demonstrate empirically how the objective character of an object is achieved in and through the actual course of interaction (see Garfinkel (1967) for this type of research policy; see also Hindmarsh and Heath (2000b) for an exemplary study).

Prenatal ultrasound examinations[1] focus on a very real object: a fetus. An ultrasound scanner projects an image of an interior structure on a monitor screen, through a calculation of the time difference between the sending and receiving of ultrasound waveforms from a transducer. A healthcare professional, an obstetrician or midwife, holds the transducer against a pregnant woman's abdomen in order to capture images of interior structures (see Cunningham et al., 2001: 390, for example). The participants orient to several operational fields, two of which are particularly relevant to the prenatal examination: the ultrasound monitor and the pregnant woman's abdomen beneath the transducer. The monitor projects an image of the uterine interior and the fetus contained within the woman's abdomen. Consequently, one practical problem for participants is how to relate the visual image on the screen to the current conditions in the abdomen. I will elaborate on this shortly.

Ultrasound examinations aim to reveal the immediate condition of the uterine interior and the fetus. Such examinations not only require that the pregnant woman must be connected to the technology, but also that the healthcare professional must keep holding the transducer against the woman's abdomen throughout the examination (Taylor, 2008). The technology is thus deeply involved with the development and coordination of moment-to-moment interaction during the examination.

How is a 'real-time fetus' (Rapp, 1997, 1999) organized in this socio-technological environment? The analytical task is to show how the 'natural accountability' (Garfinkel, 2002; Garfinkel and Wieder, 1992) of a fetus as a real-time entity is organized through the spatial and temporal arrangement of bodies and talk. Prenatal ultrasound examinations provide the occasion for a kind of 'natural' experiment for rethinking the relationship between objects, technology, bodies, action and cognition. They do so in two respects. First, while modes of orientation (visual, tactile, and so on) usually appear to converge on a single operational field in which an object of interest is found, in prenatal ultrasound examinations the operational fields are spatially distributed between abdomen and monitor. Second, the object (the fetus) is not directly visible, unlike the 'workplace objects' that Hindmarsh and Heath (2000b) describe. Nevertheless, to participants it is a very real thing. Prenatal ultrasound examinations are thus a 'perspicuous site' (Garfinkel, 2002) in which the *interactionally achieved* character of a real-time, real-worldly object is particularly salient.[2]

In what follows, I first present a general description of prenatal ultrasound examinations and demonstrate how the two operational fields are combined in the course of interaction. I then elucidate the 'sequence organization' (Schegloff, 2007) that is implemented in prenatal ultrasound examinations. 'Sequence organization' has more specific scope than 'sequential organization'. It is 'the organization of courses of action enacted through turns-at-talk – coherent, orderly, meaningful successions or "sequences" of actions or "moves"' (Schegloff, 2007: 2). The most important device for sequence organization is 'sequence types', such as 'question – answer', 'greeting – greeting',

'request – acceptance/rejection', and so on, which are each typified as a sequence of actions.[3] The core sequence in prenatal ultrasound examinations can be referred to as a 'differentiation sequence', in which the grey shades on the monitor screen are structured so that the location of a fetal body part or the woman's interior is discriminated from its surroundings. We will see that these core sequences are embedded in larger sequences, in which the fetus is interactionally constituted as a real-time object. I will aim to elucidate the procedures for the interactional constitution of the real-time fetus through a systematic description of practices for sequence organization in prenatal ultrasound examinations.[4]

Bodies connected to an ultrasound scanner

In this article, I analyse audio-visual recordings of interactions between healthcare professionals and pregnant women in regular prenatal checkups. The data to be analysed in this article were collected in Japan from 2001 to 2008. We videotaped 32 prenatal ultrasound examinations in various healthcare institutions with women at various stages of pregnancy. The settings included general hospitals, obstetric clinics and 'midwife houses'. Japanese obstetricians are sometimes criticized for overusing ultrasound. Indeed, one pregnant woman who participated in our research received an ultrasound examination every time she visited her clinic. I suspect that this is not exceptional in Japan. However, the purpose of this article is not to criticize the technophilic attitudes of Japanese healthcare professionals, but to investigate the distinctive organization of prenatal ultrasound examinations, and to elucidate the practices that participants employ.

The official purpose of prenatal ultrasound examinations is to examine the fetus and its uterine 'environment' for abnormalities. However, healthcare professionals such as obstetricians or midwives also demonstrate the *normality* of the uterine and fetal development to pregnant women, rather than performing examinations in silence.[5]

How healthcare professionals orient to demonstrations of the normality of the uterine and fetal development can be illustrated with the following segment, which was excerpted from the beginning of an ultrasound prenatal examination at an obstetric hospital. First, the doctor (an obstetrician) explains the general procedure of the examination (lines 01–02):[6]

```
(1) [SZ: 1: 02: 39 - 03: 09]
01 DOC:    .shhhh ma' boku tachi choo onpa de   miru  toki  mazu
                    well   we        ultrasound with see   when first
02         <atama no ichi>   kara  mi te iku  n'desu kedo.   kono
             head  of position from  see   go     JD though    this
           'When we perform an ultrasound examination, we first examine
           the position of the head. This'
03 PWM:  h a ⌐i
           yes
           'Yes.'
```

04 DOC: └*maruku mie te n' no ga at̲a̲ma:* °*'e* ┌*su° ne̲:̲:*
                round   look   thing P   head   JD   P
           'round-looking thing is the head.' [Continued from line 02]
05 PWM: └*h̲a̲i:*
                                                       yes
                                                       'Yes.'

06   *(1.4)*
07 DOC: *at̲a̲ma wa choodo:̲: (.) ok̲a̲a san no sh̲i̲ta no   hoo   ni ima:*
           head   P   exactly   mother P   lower P   direction P now
08   *i̲chi shi te   masu kara: k* ┌*ore mo m̲a̲a ii   tokoro desu yo ne̲:̲:*
           positioned   PL because   this   also well good place   JD   P P
           'The head is positioned exactly in the mother's lower direction, so this
           is a good position.'
09 PWM: └*h̲a̲i:*
                                       yes
                                       'Yes.'
10 DOC: *momdai n̲a̲i to   omo* ┌*u n' de:. .s̲h̲hhh ((sniff))*
           problem no P   think   P JD
           'There is no problem, I think.'
11 PWM: └*ha:::i.*
                                 yes
                                 'Yes.'

The doctor (DOC) shows the pregnant woman (PWM) the location of the fetal head on
the monitor screen at lines 02 and 04 ('This round-looking thing is the head'). One
should note that when the doctor utters a demonstrative expression *kono* [*this*] at the
beginning of the utterance, he points to a particular location on the monitor screen with
his left index finger, while looking at the monitor. (The doctor's index finger approaches
the monitor screen at the sound *do* of '*desu kedo*' in line 02, and remains there until the
prolonged sound *ne* at the end of line 04 ('*ne:̲:*'); see Fig. 1).[7] One should also note that
the bodies of the doctor and pregnant woman and the monitor screen are positioned so
that both participants can see both the screen and each other looking at the screen
(see Fig. 1). Indeed, the doctor's pointing finger is positioned at the intersection of both
participants' lines of sight in a way that they can see each other see that very position of
the finger. Thus, the doctor does not merely examine the ultrasound image of the fetal
head by himself, but rather shows it to the pregnant woman.

   Interestingly, the doctor further shows the pregnant woman the location of the fetal
head on her abdomen at lines 07–08 ('The head is positioned exactly in the mother's
lower direction'). When he produces the expression '*shi̲ta no hoo ni* [in the lower direction]',
with his left hand he touches a particular location on the pregnant woman's abdomen
where the transducer is placed (Fig. 2). There are several points to be made here.

   First, we now clearly see that there are two operational fields toward which the par-
ticipants are oriented during the ultrasound examination. The doctor, while talking about
a single object (the fetal head), references two distinct places: the monitor screen and the
pregnant woman's abdomen. Furthermore, these distinct operational fields are subject to
distinct modes of orientation: vision and touch.

Figure 1. The doctor points to the monitor screen in line 04 of Extract 1 (°'e ⌐su° ne::).

Figure 2. The doctor touches the woman's abdomen in 07 of Extract 1 (*shi̲ta*)

Second, vision and touch are related to each other through: (1) the sequential juxtaposition of the doctor's successive references to the monitor screen and the pregnant woman's abdomen; (2) his use of the same referential expression – the word *atama* [*head*]; (3) both participants' unbroken gaze at the monitor screen, even when the doctor

references the woman's abdomen (see Fig. 2); and (4) the doctor's use of the same hand to reference the monitor screen and the woman's abdomen.

Third, the image of the fetal head on the screen thus is now constructed as something more than a mere image on the screen; it becomes precisely the image of the fetal head that now lies within the woman's abdomen.

Fourth, the doctor's entire demonstration in lines 02, 04 and 07–08 attempts to show the pregnant woman the normality of the fetal presentation (that is, the orientation of fetal parts inside the woman). The doctor cannot demonstrate the fact that the fetal presentation is normal (that is, cephalic) only by showing an image of its head on a screen, or by referencing a particular location on the woman's abdomen – he can only *claim* it rather than demonstrate it. Instead, he does so by relating the image on the screen to the particular abdominal location. Indeed, he provides an explicit evaluation of the position of the fetal head in line 08 ('this is a good position') and concludes that there is no problem in line 10.

We now see that an ultrasound examination is performed in a multi-modal environment, in which spatially distanced loci for distinct modes of orientation need to be coordinated.[8] The accomplishment of this demonstration poses a practical problem for the participants. Extract 1 is a clear case in which this problem is addressed by the participants. In what follows, I will show that this organizational problem is omnipresent in ultrasound environments, with the participants' distributed orientations, and will describe how this problem is systematically addressed by the participants.

Sequence organization of ultrasound prenatal examinations: Core sequences

Invitation to differentiation

When healthcare professionals reference an image on the screen, they frequently use the 'This is X / Here is X / This location is X' format (a deictic expression *plus* the name of a fetal part), and they bodily point to a particular location on the monitor screen, as the doctor did in lines 02 and 04 of Extract 1. Below, I elucidate the action type that this conduct instantiates, before describing the sequence type in which it is a crucial part.

The following segment is excerpted from the same interaction as Extract 1. The doctor has shown the woman the location of the fetal face on the screen and now moves to the location of its heart:

```
(2) [SZ: 1: 04: 11-20]
01 DOC:  → e' chotto   modori  masu  to >kore< ga <shinzoo  °desu°>
            well a-little  return   PL    and  this   P    heart     JD-PL
02        → yo  ne:::  <d ┌e onaka   ga <atte:> (.) .shhh ((sniff))
            P    P         and  stomach P    exist
            'If ((we)) return ((to the detail of the image)), this is the heart, you see. And
            the stomach is ((there)), and'
03 PWM:                      └h'i
                             yes
                             'Yes.'
```

```
04 DOC:    >s'kara< bookoo ne:   aka cha ⌐n no oshikko ga    koo
            then     bladder P    baby      P   pee    P   this-way
05 PWM:                                  └hai:
                                           yes
                                          'Yes.'
06 DOC:    °deki te'ru    tokoro:::°
            is-produced   place
           'then, the bladder, you see, the part where the baby's pee is,
           you know, produced.' [Lines 04 & 06]
07         (3.2)
08 DOC:    e#e#::::: kore oshiri   kara mi ta:  ni hon no ashi: desu
            uhm     this buttocks from see   two P   leg  JD
09         yo  ne ⌐: futo momo no hone.
            P   P       thigh   P  bone
           'Uhm these are the two legs, seen from the buttocks' side.
           The bones of the thighs.'
10 PWM:          └hai
                   yes
                  'Yes.'
11         (1.2)
```

When the doctor mentions the fetal heart in lines 01–02 ('this is the heart, you see'), he uses the deictic expression *kore* [*this*] and points to a particular location on the screen with his left index finger, while mentioning the referent (the heart). I understand this entire set of practices by the doctor to constitute an invitation to the pregnant woman to differentiate the location of the fetal part from its surroundings on the screen.

Two points about the doctor's conduct can be noted. The first has to do with the precise timing of the pointing gesture (see Hindmarsh and Heath, 2000a). The doctor started to move his hand towards the screen prior to his utterance in line 01. His index finger arrives in front of the screen when he produces the sound *ma* of '*modori masu* [return]', and he holds it there until he mentions the heart. Precisely when he utters the sound *shi* of '*shinzoo* [heart]', he touches a particular location on the screen. Obviously, the deictic expression *kore* brings into visual focus the item that he is publicly orienting to with his hand movement on the screen. However, his pointing gesture is precisely coordinated with naming of the fetal part rather than uttering the deictic expression.[9] Indeed, the doctor produces another instance of the same type of action when he mentions the fetal bladder in line 04 ('the bladder, you see') while pointing to the screen, this time without using any deictic expression. His left index finger reaches the screen at the precise moment that he utters the sound *ko* of '*bookoo* [bladder]'.

Second, it may seem that the particle *ne* at the end of each utterance is crucial for performing an action type we can call 'invitation to differentiation', because *ne* appears to mark a request for confirmation that presumes the recipient's recognition of what to confirm (see Kamio, 1997). However, this is not the case, as we can see with another instance of the same action type during an ultrasound examination at a general hospital. Neither a deictic expression nor the particle *ne* accompanies it:

(3) [TE I: US: 01: 34–39]
```
01 DOC:      .hh sate: .h ko'k   kara   koo       kite:
                 then    here   from   like-this come
             'Then, coming from here like this'
02           (0.8)
03 DOC: →    .h bookoo.
                bladder
             'Bladder.'
04           (0.4)
05 PWM:      hai
             yes
             'Yes.'
06 DOC:      .hh >bookoo  ga arutte   koto  wa  mae  ni mo   itta<  yoo ↓ni:
                 bladder  P  exist the-fact P  before P also said   as  P
             'The fact that there is a bladder means, as ((I)) said before'
```

In line 01, with his left hand the doctor moves the transducer upwards along the pregnant woman's abdomen: the deictic expression '*ko'k* [here]' appears to refer to a particular location on the woman's abdomen and '*koo* [like this]' to the direction of the movement of the transducer. He starts to move his right index finger towards the screen during the 0.8-second long pause in line 02, and the finger reaches it when he produces the sound *ko* of '*bookoo* [bladder]'. The doctor's one-word utterance ('*bookoo*.' or 'bladder.') accompanied by the pointing gesture but no deictic expression is another instance of the same action type: an invitation to differentiate the location of a fetal part from its surroundings.

The doctors in these instances use a generic procedure for this action type. A parallel may be seen in news articles reporting discoveries of animal fossils. The articles often feature a photo of the fossil, accompanied by a drawing, as shown in Fig. 3.[10] In such cases, the photo can be difficult to understand without the accompanying drawing – it would be a chaos of grey tones. The juxtaposition of the drawing with the original photo provides readers with instructions on how to see the image in the photo. This is accomplished through a set of three practices: (1) naming main parts with familiar descriptors; (2) highlighting the outline of the photo image with drawn lines; and (3) establishing a relation between the parts on the photo and the drawing by juxtaposing them (Lynch, 1985, 1988).

Similarly, the doctors in Extracts 2 and 3 provide the pregnant women with instructions on how to see the image on the monitor screen by the following practices: (1) naming a fetal part with a familiar descriptor; (2) highlighting the location (or the outline) of the fetal part on the screen image with a pointing gesture; and (3) establishing a relation between the location being highlighted on the screen and its descriptor by juxtaposing talk, gesture and image. Through the deployment of these practices, the doctors invite the pregnant women to differentiate the fetal parts on the monitor screen (see Goodwin, 1994, for expositions of these practices in different interactional contexts).

We can now describe an alternative way to accomplish the same action type. In line 04 of Extract 1, the doctor uses a shape descriptor ('round-looking'), along with the
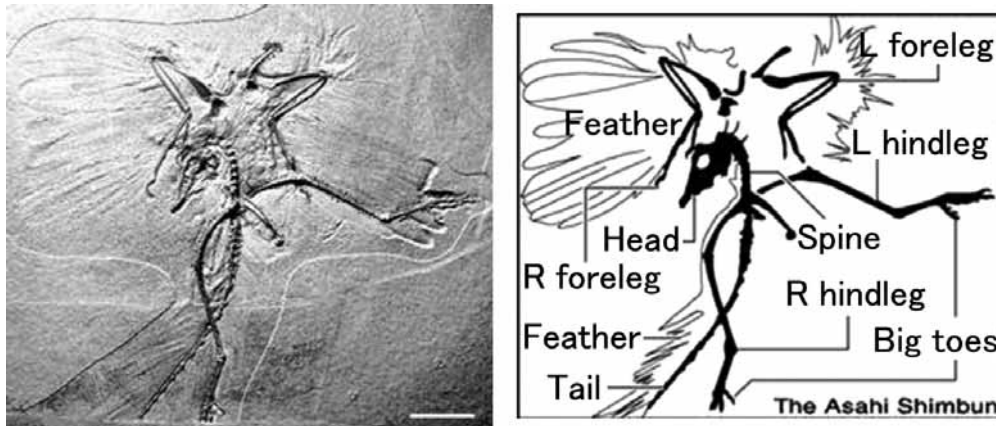
Figure 3. The juxtaposition of a photo and a drawing of the fossil of an archaeopteryx (Asahi Shimbun, 2 December 2005)

practices that I have just described (pointing and naming). Also in lines 08–09 of Extract 2, the doctor further describes how the focal object is to be viewed ('seen from the buttocks' side'). These descriptors further highlight the location of the fetal part, thus acting in a way that is functionally equivalent to a pointing gesture. In other words, such descriptors can highlight a structure on the screen without any accompanying gesture. This can be seen in the following segment. The segment is from another obstetric clinic in which midwives usually perform ultrasound examinations. In line 02, the midwife (MDW) explicitly invites recognition of the location of the fetal part she has captured on the screen:

```
(4) [IK: II: 04: 01–15]
01 MDW: →   ↑de ↓kore sebone  des' ne::::=zuu:: tto sebone   ga.
            and  this backbone JD-PL P     MIM  P backbone  P
            'And this is the backbone. Like zuu, the backbone is.'
02          (.) wakari     masu?
                recognize  JD-PL
            'Do you recognize?'
03 PWM:     hai
            yes
            'Yes.'
04 MDW:     kore sebone::
            this  backbone
            'This ((is)) the backbone.'
05          (1.2)
06 MDW:     de? kocchi gawa ni
            and  this    side P
            'And on this side'
07          (18.8)
```

At this clinic, two monitors are used. One is for the examiner (midwife) and is placed in front of her. The other is for the pregnant woman and is placed at her bedside. The pregnant woman needs to look in the opposite direction from the midwife in order to view her monitor, but the midwife can use a pointer embedded in both monitors to indicate what appears on their screens. However, in this case no pointer appears throughout the midwife's entire utterance in lines 01–02, and does not appear until the pregnant woman responds in line 03. Later, I will return to the first part of this utterance, which includes the deictic expression *kore* [*this*] without an accompanying pointing gesture (with a pointer). In the second unit of her utterance ('Like *zuu*, the backbone is'), the midwife describes how the spine appears on the screen, using a mimetic expression ('*zuu::*') indicating a long, slender shape.[11] This mimetic expression appears to be functionally equivalent to a pointing gesture in that it highlights a structure in the shadowy grey tones on the screen.[12] Following a very brief pause, the midwife solicits recognition explicitly in line 02 ('Do you recognize?'), apparently pursuing a response. The pregnant woman then claims recognition of the object in line 03 in a minimal way. That mimetic expression is the only material throughout lines 01–02 on which the midwife can rely to highlight the location of the fetal part and to solicit recognition of it.

Thus, it is intelligible that the action type 'invitation to differentiation', implemented by three above-described practices and their variants, is instantiated in various ways. Its instances are observable all over ultrasound demonstrations.

Differentiation sequence: The pregnant women's responses

The action type 'invitation to differentiation' can be viewed as part of a sequence type that I will call a 'differentiation sequence': an invitation to differentiate a structure and a claim (or display) of recognition.

Healthcare professional:	Invitation to differentiate a structure
	[Sequence-initiation]
Pregnant woman:	Claim or display of the differentiation[13]
	[Sequence-completion]

Indeed, in all previously cited segments the pregnant women have responded to these invitations by claiming recognition of the structures on the screens (line 05 of Extract 1; lines 03, 05 and 10 of Extract 2; line 5 of Extract 3; line 03 of Extract 4). These responses include only minimal affirmative tokens. However, minimal affirmative responses appear to be the *default* (unmarked) response-type in these sequences for the following reasons.

First, when a differentiation invitation does not receive even a minimal response, the absence can be 'noticeable'.[14] In the following segment, the doctor declares that he is going to examine the fetal face in line 01, and then moves on to show the pregnant woman the locations of facial parts in line 03:

(5) [TE I: US: 03: 06–26]
```
01 DOC:      .h de: saa (.) koko e ↓orite ki te    ↓↓kao o miru  to:.
                and now    here  to  come-down     face P  see    P
             'Then, now ((we)) are coming down here and examine the face.'
02           (0.4)
03 DOC :     hai .hh <odeko.  me.> hana.  kuchi.
             ok     forehead eye    nose   mouth
             'OK. The forehead.  The eyes. The nose. The mouth.'
04       →   (0.4)
05 DOC:      shoomen kara  mite 'ru    no ne:: .hh mae ni  te  ga
              front    from be-seeing  P   P       front P hand P
06           koo       ki te 'ru      kedo ⌈:
             this-way have-come  though
             '((We)) are looking from the front. The ((fetal)) hand lies
             on the face like this, though.'
07 PWM:                                      ⌊ha::i
                                              yes
                                              'Yes.'

08           (4.0)
09 DOC:      kore ga: kuchi:
             this P    mouth
             'This is the mouth.'
10           (.)
12 PWM:      hai
              yes
              'Yes.'
13 DOC:      <hana no atama:.>
              nose  P  top
             'The top of the nose.'
14           (1.2)
15 DOC:      me.
             eye
             'The eyes.'
16       →   (5.4)
17 PWM:      h a ⌈i
              yes
             'Yes.'
18 DOC:          ⌊°>kore me<   ne:_ ⌈:° .h
                   this  eye    P
                  'These are the eyes.'
19 PWM:                               ⌊hai.
                                       yes
                                       'Yes.'
```

```
20 DOC:        koo -:      te   ga chotto  jama shi te 'ru  kara
               this-way hand  P  a-little   be-hindering     because
21             mie nikui kedo       n ┌e?
               see hard   though   P
               'The ((fetal hand)) is hindering ((our)) sight like this, though.'
22 PWM:                             └hhai
                                     yes
                                     'Yes.'
```

When the doctor names each facial part in line 03, he points to a particular location on the screen. However, the pregnant woman does not claim to have discriminated the location of each facial part, though an opportunity to do so is provided at the end of the utterance in line 03. There is a small, 0.4-second gap after the doctor utters the name of the fourth facial part. Here, the absence of the pregnant woman's response is noticeable. Indeed, following the gap, the doctor further describes how the fetal face appears on the screen to facilitate the recognition. (When the doctor says '*koo* [like this]' in line 06, he covers his own face with his right hand to demonstrate the fetal posture. This gesture provides a 'structural isomorph': a mimetic gesture that highlights the current condition of the fetal face on the screen.)

Note that in lines 09 to 15, the doctor again attempts to point out three of the just named facial features on the screen. (During the 4.0-second gap in line 08, he moves the transducer very slightly on the woman's abdomen. He appears to adjust the transducer to re-obtain the shade of the fetal face.) However, again, the absence of the woman's response is noticeable in lines 14 and 16. The long 5.4-second gap in line 16 is particularly notable, as the doctor again attempts to point out the fetal eyes, this time with a grammatically more complete form in line 18 (with a deictic expression as a grammatical subject), and he further mentions the possible difficulty with seeing the fetal face (lines 20–21, with the expression '*jama shi te 'ru* [hindering]'). Throughout these lines, the doctor orients to the absence of the pregnant woman's response. The woman's conduct is also interesting in this respect. During the 5.4-second gap, the doctor again starts to bring his hand towards the monitor. This movement is visible to the pregnant woman, and, indeed, she starts to respond in line 17 when the doctor's hand has almost reached the screen. The doctor appears to attend to the woman's delayed response with his second attempt to point out the fetal eyes in line 18. He does so quickly and quietly (as the symbols '><' and '° °' indicate). Moreover, in line 19 the pregnant woman responds quickly, slightly overlapping the doctor's utterance, perhaps acknowledging her previous delay.

More interestingly, in the following segment, the pregnant woman responds to the doctor's attempt to show her the location of the fetal stomach not merely with a claim, but with a *display* that she has discriminated the location. The doctor points to a particular location of the monitor screen when he says '*i* (the stomach)' in line 05. The pregnant woman responds immediately, and mentions the colour (the blackness) of the location on the screen (line 06), which was not included in the doctor's just prior utterance. In doing so, the pregnant woman demonstrates her ability to discriminate the location of the stomach on the screen from its surroundings:

(6) [TE I: US: 01: 20–31]
```
01 DOC:      .h n:de shinzoo kara chotto      ori ↓te:
               then  heart  from a-little  come-down
             'Then, coming down a little bit from the heart,'
02           (0.6)
03 DOC:      kore i       ga  mie te    masu °ne:°.
             this stomach  P   seeable  JD-PL  P
             'This, the stomach is now visible.'
04           (.)
05 DOC:      i      ⌈ oheso no joomyaku. ⌉
         stomach      navel of vein
                 'The stomach. The vein in the navel.'
06 PWM:           ⌊sono kuroi tokoro de ⌋ su ne:.
                   that  black place  JD-PL P
                   '((It)) is that black place, isn't it?'
07 DOC:      >soo so  ⌈o soo.<
               right right    right
               'Right, right, right.'
08 PWM:               ⌊ha:::i
                       yes
                       'Yes.'
09           (0.4)
10 DOC:      datte: (0.8) °°e*-:°° kuuki  ga   hain'nai  kara:   omizu
               because               air   P   enter not because water
11           yoosui      non'de'ru   °wake° ⌈°°da.°°
         amniotic-fluid be-drinking   reason     JD
               'Because the air doesn't come in, and ((it)) drinks the water,
               amniotic fluid.'
12 PWM:                                      ⌊°ha:i°
                                             yes
                                             'Yes.'
```

We can note two points about the pregnant woman's response. First, her utterance in line 06 constitutes a request for confirmation, with the particle *ne* at its end. In other words, it initiates another sequence – a confirmation sequence – as well as responds to the doctor's initiation of the differentiation sequence. The doctor's response provides an emphatic, thrice repeated confirmation (translated as 'right, right, right'). It seems that the final epistemic authority for the differentiation of a structure on the monitor screen still belongs to the doctor.[15]

Second, following his confirmation, in lines 10–11 the doctor goes on to provide an account for the pregnant woman's observation. The word *datte* [*because*] at the beginning of the utterance adumbrates an account, which provides a reason or explanation for the dark appearance of the stomach on the screen. Though it may not be clear why the doctor provides this account, it is clear that he treats the pregnant woman's response as accountable.

In this section, I have demonstrated a sequence type recurrently observable in ultrasound demonstration: 'differentiation sequence'. Differentiation sequences appear to be organized so that both the healthcare professional and the pregnant woman can display their orientations to the former's epistemic authority. In terms of ultrasound demonstration, each differentiation sequence can be a complete sequence in its own right, in the sense that it can accomplish showing something on the screen by itself. Considering that an ultrasound scanner is a device for visualization, differentiation sequences can be viewed as 'core' sequences in ultrasound demonstration. Now I move onto an expansion of the demonstration sequence from these core sequences. Incidentally, I use the term '*demonstration* sequence' to refer to the larger sequence that includes differentiation sequences and expansions from them.

Expansion of the sequence

As we saw in Extract 1, following the differentiation sequence in lines 02–06, the doctor locates on the pregnant woman's abdomen what he just had discriminated on the screen, to demonstrate the normality of the fetal presentation. Also in Extract 4 (line 04), following the completion of a differentiation sequence, the midwife wraps up the current demonstration by again mentioning the name and the location of the fetal part. However, another type of 'expansion' occurs *before* differentiation sequences, and I elaborate upon this below.

Pre-expansion as agenda-setting for differentiation sequences

In this section I focus on a *pre*-expansion, rather than post-expansion, of the demonstration sequence.[16] Its instances are observable in the excerpts discussed earlier from the visit designated as 'TE I' (See Extract 3, line 01; Extract 5, line 01; and Extract 6, lines 01–03, above). Three things that cannot be seen in the transcripts should be noted. First, these utterances are *not* accompanied by any pointing gesture to the screen, though they contain deictic expressions, such as *koko* ('ko'k') and *koo* in Extract 3, *koko* in Extract 5, and *kore* in Extract 6. Second, after or during these utterances, the entire image on the screen changes. Third, when they contain the name of a fetal body part, the image of the fetal part appears on the screen at the moment it is named.

I characterize these utterances in terms of: (1) their relation to the differentiation sequences that follow them, and (2) what is referred to and done with the deictic expressions in them.

In line 01 of Extract 5, the doctor declares that he is now starting to see and examine the fetal face. He then invites the pregnant woman to differentiate the locations of the facial parts (line 03). It appears that the differentiation sequence he initiates at that point is designed to contribute to recognition of the entire fetal face on the screen. If so, his earlier utterance in line 01 sets up a coherent context for differentiating the location of each facial part. This practice can be seen in the following extract from the same clinic from which Extract 4 was excerpted. A midwife, different from the one in Extract 4, performs a prenatal ultrasound examination. In line 01, she declares that the fetal face has appeared on the screen:

(7) [IK I: 02: 19–27]
```
01 MDW:     aka chan okao  ga  mie    mashita  yo::::
             baby    face  P   appear  did-PL   P
            'The baby's face has become visible.'
02          (1.0)
03 MDW:     koko ga  ne:  <omeme>  no tokoro    de: koko  ga hana des': ne:::
            here  P   P    eye-PL   P   place     and here  P nose JD    P
04          .h koko ga <odeko>.
              here  P    forehead
            'These locations are the eyes, and this location is the nose. This
            location is the forehead.'
05 PWM:     AA  AA ⌈:
            oh  oh
            'Oh.'
06 MDW:            ⌊d' kocchi ga <atama no>  tep ⌈pen no  hoo    de (.)
                    and here   P    head  P        top   P around  JD
07 PWM:                                         ⌊ha:i
                                                 yes
                                                 'Yes.'
08 MDW:     >kono<  hen  ga  <okuchi>   desu   ne: ⌈::
              this   around P   mouth-PL   JD-PL   P
            'And this side is near the top of the head, and this location is
            roughly the mouth.' [Lines 06 & 08]
09 PWM:                                        ⌊aa aha::  ⌈iru    iru:.
                                                oh  oh       there-is there-is
                                                'Oh. ((The baby)) is there.'
10 MDW:                                                   ⌊n
                                                           yeah
                                                           'Yeah.'
```

In lines 03–04, the midwife invites the pregnant woman to differentiate the facial parts on the screen, and in line 05 the pregnant woman claims the differentiation. (The midwife points to a particular location on the screen with a pointer each time she mentions a fetal facial part.) In lines 06 through 09, there are other instances of differentiation sequences.

There are two things of note. First, as was also the case in Extract 5, the midwife mentions several facial parts consecutively before the pregnant woman's claim of differentiation.[17] Second, and more importantly, the pregnant woman's response in line 09 is characteristic, in that she uses the expression *iru* [*there is*], which is only used to refer to an entire animate organism, whether animal or human. (In Japanese, the expression *aru* is used to refer to inanimate objects or animal or human body parts.) In other words, she marks recognition of the entire fetus (or baby), rather than its separate parts.

Taken together, these two points show that the differentiation sequences are embedded in a larger sequence in which the aim is to accomplish recognition of the fetal face, rather than its individual parts alone.[18] Their non-verbal conduct reinforces such sequential
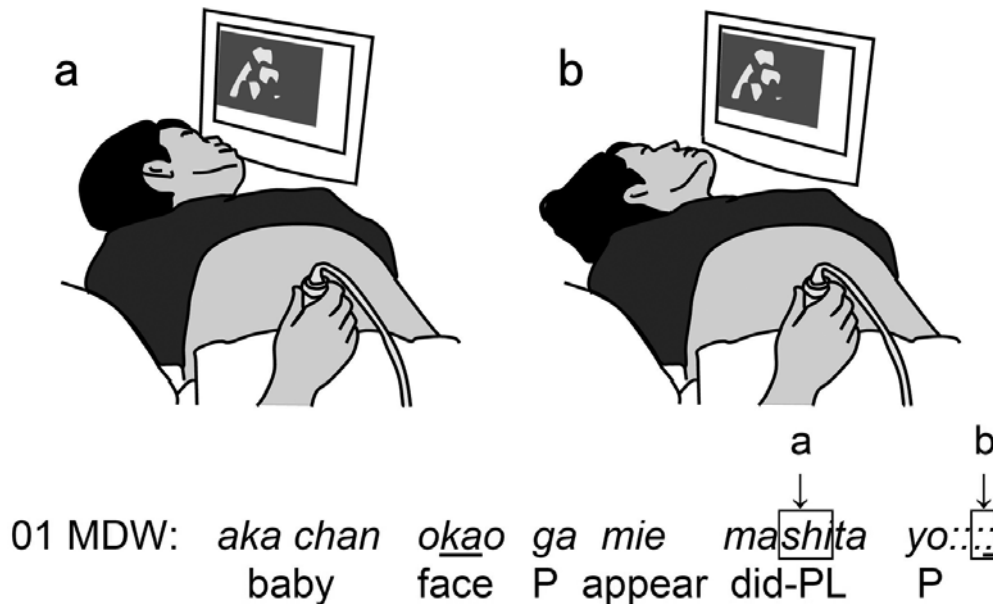
Figure 4. The pregnant woman leans back from the monitor screen in line 01 of Extract 7.

organization of recognition. The pregnant woman in Extract 7 leans back from the monitor screen, when the midwife says '*yo:::*' at the end of line 01 (Fig. 4), and starts to return her head to its original position immediately after the pointer appears on the screen during the 1.0-second pause in line 02. (Remember that the clinic uses two monitors, and the midwife points to particular locations on the screen with a pointer.) The midwife then begins to mention the fetal eyes during the pregnant woman's head movement. By leaning back, the pregnant woman exhibits her orientation to the *entire* image on the screen as well as her continued attentiveness to the screen, whereas returning her head to the original position exhibits a focus on a *specific* locale, and may inform the midwife to initiate the next move – a differentiation invitation. Thus, the midwife's first utterance in line 01 recognizably provides a feature of the entire image on the screen, which serves as the agenda for the differentiation sequences that ensue.

On the other hand, in the pre-expansions in line 01 of Extract 3 ('Then, coming from here like this'), line 01 of Extract 5 ('Then, now ((we)) are coming down here and examine the face'), and lines 01–03 of Extract 6 ('Then, coming down a little bit from the heart, (0.6) This, the stomach is now visible.'), the doctor mentions the movement of the transducer which he holds against the woman's abdomen, and, indeed, slides it on the abdomen. In this way, the pre-expansion also contributes to the assignment of the entire image on the screen to a particular location on the woman's abdomen. The work of assigning the entire image to an abdominal location appears to be central to ultrasound prenatal examinations, whether or not it is explicitly articulated in the pre-expansions. In the remainder of this section, I develop this point by discussing the reference made with deictic expressions in the pre-expansions.

Distributed reference

As I noted earlier, when the healthcare professionals use deictic expressions in pre-expansions, such as *kore* [*this*] and *koko* [*here*], they do *not* point to the monitor screen. This makes such utterances essentially different from those that initiate the differentiation sequence. In what follows, I will examine three varieties of referential practices in pre-expansions to demonstrate of what is done with these deictic expressions.

   Prior to the following segment (Extract 8), the midwife was trying to measure the size of the fetal head with ultrasound. However, the fetus had developed so well and the fetal head had gone so deep into the pelvis that the midwife could not place the transducer at the right location for obtaining an image of the entire head. The midwife's utterance in line 01, 'a little bigger', means that the ultrasound measurement may be 'bigger' than its actual size:

```
(8) [JH II: 04: 06–16]
01 MDW:     n:: chotto ooki(ku) ne:
            uh a-little  big     P
            'Uh a little bigger'
02 PWM:     °ookii°
              big
            'Bigger'
03 MDW:     .hh
04          (2.4)
05 MDW: →   kochira gawa  ga  sebone    ni  naru ne:::
             this    side  P  backbone  P   be   P
06          ↓sebone    ga (.) mie   masu yo ne: ⌈: koko   ne ⌉:
            backbone    P  visible JD-PL P   P      here   P
            'This side is the backbone. The backbone is visible, here.'
07 PWM:                                          ⌊ha::i    ⌋
                                                   yes
                                                 'Yes.'

08          (1.2)
09 MDW:     °sorede senaka de°
             and    back    and
            'That was the back, and'
10          (1.4)
11 MDW:     °>koko  ni< shinzooh gah  arimasu ne::?°
               here  P     heart   P    exist    P
            'Here is the heart.'
```

In line 06, the midwife invites the pregnant woman to differentiate the shape of the fetal spine in the following way: when starting this utterance, the midwife does not make any pointing gesture to the monitor screen, but just before she says '*koko*', her
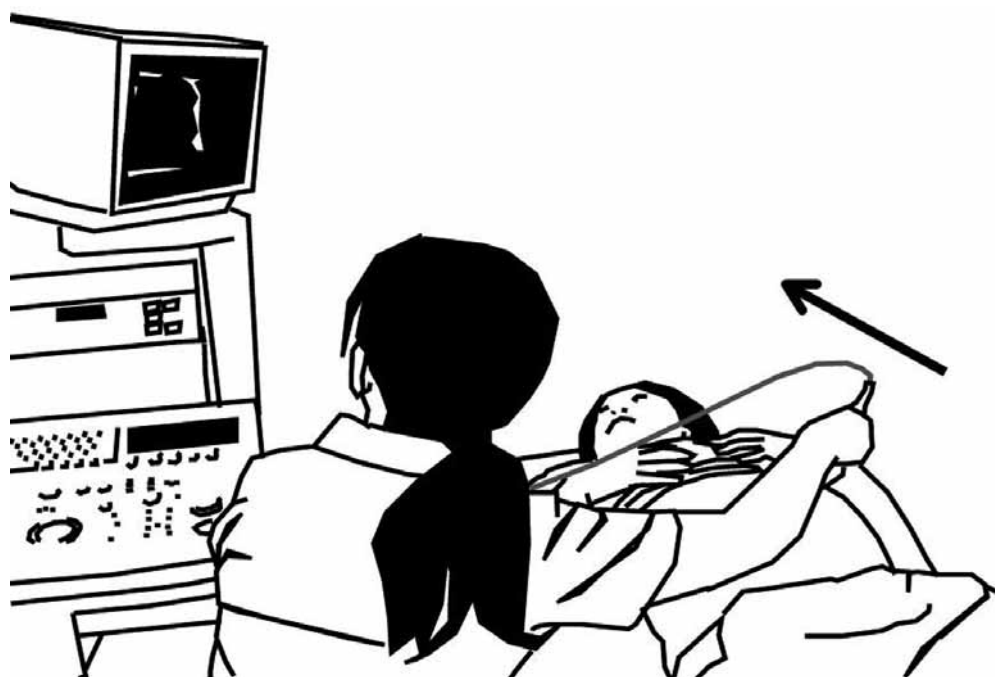
Figure 5. The midwife slides the transducer along the left side of the abdomen while saying '*kochira gawa* (this side)' in line 05 of Extract 8.

hand reaches the monitor screen. More precisely, the midwife starts to raise her left hand when she says '*ga*' ('↓*sebone ga*' in line 06), and the hand gets very close to the monitor when she says '*ne*' (of '*mie masu yo ne:*'). This movement of the midwife's hand towards the screen, together with her naming of the fetal part (the spine), initiates a differentiation sequence; and the pregnant woman's response ('*hai* [yes]' in line 07) completes the sequence.

The utterance in line 06 is preceded by an utterance unit in line 05 ('This side is the backbone.'), which contains a deictic expression (*kochira* [*this (side)*]) and the name of the fetal part. Though the midwife does not perform a pointing gesture towards the monitor screen to accompany what she says in line 05, she prominently slides the transducer in her right hand along the left side of the woman's abdomen (Fig. 5), making it obvious that '*kochira gawa* [*this side*]' is the side of the abdomen she is touching with the transducer, and not any particular location of the image on the screen. The utterance unit in line 05 not only shows what should be differentiated on the screen in the differentiation sequence to follow, but also relates it to a particular location on the woman's abdomen.

Just how a reference is made to a particular abdominal location of the fetal part to be differentiated on the screen is far from trivial. Though the midwife in Extract 8 refers to a particular abdominal location, both the midwife and the pregnant woman look at the monitor screen during the midwife's utterance in line 05 (see Fig. 5). They can locate the fetal spine on the pregnant woman's abdomen only by identifying its image on the screen. By doing so, the midwife begins to *show* that the abdominal location touched by the transducer is the location of the fetal spine. Such referential convergence between image and abdomen is achieved through distinct and simultaneous orientations to two spatially separated common operational fields.

Figure 6. The doctor slides the transducer on the abdomen while saying '*koko e* ↓ *orite ki te* (coming down here)' in line 01 of Extract 5.

Such convergence also can be found in Extracts 5, in which the deictic expression *koko* (*here*) in the pre-expanding utterance ('Then, now ((we)) are coming down *here*') appears to be used to refer to a particular abdominal location. Both the doctor and the pregnant woman, again, look at the screen during this utterance (see Fig. 6; the doctor in Extract 5 holds the transducer in his left hand and manipulates the control panel with the right hand while looking at the monitor screen). Now, it appears to be the case that the deictic expression does not merely reference a particular abdominal location or region, but rather *a particular abdominal location, the image of whose interior is being displayed on the screen*. This suggests that the deictic expression also references the entire image of the woman's interior on the screen, the corresponding abdominal location of which is being touched by the transducer. To put it differently, the deictic expression appears to reference *this* current state, both on the abdomen and on the screen, created by a movement with the transducer. In this sense, the reference can be understood to be distributed between the abdomen and the screen.

The deictic expressions in the pre-expansions in Extracts 4 and 6 ('And this is the backbone.' and 'This, the stomach is now visible.') appear to perform a similar function, though they apparently reference something on the screen, rather than an abdominal location. Each of them references more than a particular location on the screen. In Extract 4, after the midwife had measured the size of the fetal head by ultrasound, in line 01 she declares that she has captured an image of the spine, using the continuation marker *de* [*and*] to mark the entire utterance as the beginning of a 'next' sequence.[19] Though no pointing to the screen is done during this utterance, the midwife and the pregnant woman both look at the screen. The deictic expression *kore* [*this*] references the image on the screen without any of its structures being highlighted, though it may prompt the woman to look for a feature of the image that she can see as the spine. It references *a possible*

image of the spine on the screen, appearing as a product of the work of capturing an image as a 'next' item. The capturing work includes movements of the transducer on the abdomen, inspection of the image on the screen for a shape of a particular fetal part, and various adjustments on the control panel, all of which are visually or tactilely accessible to the pregnant woman. The same thing can be said of the deictic expression in line 03 of Extract 6, which is preceded by the talk about movement from the previous item ('coming down a little bit from the heart').[20]

One of the jobs done by the utterances discussed in this section is to assign the entire image currently captured on the screen to a particular abdominal location, so that, in the differentiation sequences to follow, particular patterns of light and shade on the screen become discernable as parts of the fetus right beneath the pregnant woman's abdominal skin.[21]

The interactional and distributed character of ultrasound demonstration

The intrinsically interactional achievement of ultrasound demonstration

Ultrasound demonstrations, with differentiation sequences as core sequences, are intrinsically interactional. They are only completed by the pregnant woman's appropriate response to an invitation to differentiation, which includes instructions on what and how to see. Indeed, as I have shown, if there is a brief silence following a differentiation invitation, the absence of the pregnant woman's response is noticeable and the healthcare professional often pursues the response, for example, by repeating the differentiation invitation. Thus, the ultrasound demonstration is not the healthcare professional's unilateral achievement, but rather a joint achievement with the pregnant woman.

In this way, pregnant women are provided with opportunities to control the subsequent trajectory of the current demonstration sequence, though, as we saw previously, the healthcare professional had the final epistemic authority in each demonstration for differentiating structures on the screen. Pregnant women can take the opportunity to explicitly request an elaboration on the differentiation invitation, but also withhold an immediate response to prompt such an elaboration.

We saw in Extract 6, that when the pregnant woman's response deviated from the default, unmarked type of response, the doctor provided an account for the observed feature of the current image on the screen. Furthermore, pre-expansions of demonstration sequences may also provide pregnant women with opportunities to pre-empt the healthcare professional's initiation of a differentiation sequence. In line 03 of the following segment, the pregnant woman initiates a differentiation of the structure on the screen without being solicited by the midwife:

(9) [JH II: 3: 08: 12–29]
01 MDW: °ato wa <t<u>ai</u>b<u>a</u>n   o kakunin> shi te   oita   hoo ga ii   n<u>e</u> hh°
                 now   placenta P confirm   do   put   better   P
               'Now, ((I)) had better examine the placenta.'

02   *(25.2)*

03 PWM: →   *sono m<u>o</u>ko moko* ⌈*shita no* ⌈*ga* ↓*<°soo-°>*
                 that   MIM   like P   P   so
                 'That thing like *moko moko* is it-'

04 MDW: →   └*s-*   └*soo soo soo soo soo:::.*
                                      right right right right right
                                        'Right right right right right.'

05   *(1.6)*

06 MDW: *kono h<u>e</u>n   ne:<u>:</u>*
             this around P
             'Around here.'

07 PWM: *h a* ⌈<u>:</u>:::
             all-right
             'All right.'

08 MDW: └°*kore ne::*°
                 this P
                 'This.'

09   *(3.2)*

10 MDW: °*kore*° *s<u>o</u>o desu   ne:<u>:</u>*
             this   so JD-PL P
             'This is it.'

11   *(2.4)*

12 MDW: *ano::::::: (0.6) a*-fur<u>u</u>:ku natte k<u>i</u>   tari tte yuu* ↓*ka*
             well   old   become or P say IR

13   *sh<u>i</u>npai na koto   toshi te   ko'   bok<u>o</u>n bok<u>o</u>n te an<u>a</u> mitai*
             concerned thing   as   like-this MIM   P hole like

14   *ni kuroi kuudoo ga mie tari* ⌈*tok<u>a</u>: .sh*⌉*h suru: h<u>i</u>to* =
             P   black cavity P   visible or   P   do person

15 PWM: └*he<u>e</u>: : :*   ┘
                                           really
                                           'Really.'

16 MDW: = *mo <u>i</u>ru n'da ked<u>o</u>: yotee bi chikaku naru   to   ne?*
            also exist P JD though due   day close   become when P

17   *n-s<u>o</u>o yuu no wa nas<u>a</u>   soo.*
              soo like P   P   no   seem
             'Well, ((placentas)) sometimes become old, I mean a possible concern is that some people have black cavities visible like holes like *bokon bokon*, when the due day comes near. No such things seem to be there.' [Lines 12–14 & 16–17]

18 PWM: *f<u>u</u>::* ⌈↓*:n*
             uh huh
             'Uh huh.'

19 MDW: └*fu::<u>:</u>n*
               yeah
               'Yeah'

Note that the midwife's proposal to move on to the examination of the placenta (line 01) is not accompanied by any pointing gesture. In line 03, the pregnant woman demonstrates her independent ability to recognize the placenta on the screen. Precisely at the point in line 03 where she exhibits such recognition (see Jefferson, 1973), the midwife, in line 04, repeatedly and emphatically confirms in overlap, to the point that the pregnant woman cuts off her own utterance (see Stivers, 2004, for a use of 'multiple sayings'). Consequently, the sequence type that the healthcare professional would be expected to initiate is here displaced by another sequence type (a confirmation sequence) initiated by the pregnant woman. Insofar as the midwife provides the confirming response, she maintains the final authority for affirming how to see the relevant features. However, the subsequent development of interaction following this confirmation also is of interest; though the midwife could have closed down the current sequence after line 10,[22] she moves on to a detailed account of the current condition of the placenta; in particular, an account of what is *not* visible there. This complex account may have been prompted by the woman's pre-emptive utterance in line 03, in which she demonstrated her competence.

Reading ultrasound images requires a high degree of expertise (which healthcare professionals would be expected to have), but the interactional organization of ultrasound examinations provides opportunities (however constrained) for pregnant women to intervene in the current trajectory of the examination.

The intrinsically distributed achievement of ultrasound demonstration

The ultrasound demonstration of the normality of the fetal and uterine development is distributed among spatially separated operational fields: the monitor screen, the woman's abdomen and the control panel. It is also distributed among temporally separated sequences, because the images on the screen that capture fetal parts have to be produced one after another. We saw the spatially and temporally distributed accomplishment of ultrasound demonstration in Extract 1. However, in the previous section we saw that the distributed character of the demonstration was systematically embodied in its proper sequence organization.

A fetus made visible in ultrasound examinations is characterizable as an *objective and separate entity* inside the woman, whose current existence is *publicly evidenced* on the screen. However, it is only a real object as a consequence of the lived work of the examination. It is organized through the practices of moving the transducer, watching the monitor screen, manipulating the control panel, talking about the image on the screen, and so on.[23] In particular, in order to demonstrate the fetal presentation, healthcare professionals need to map the images captured on the screen onto the woman's abdomen one after another. Distributed reference in pre-expansions of demonstration sequences is crucial for this to be achieved.[24]

The *objectivity* of an ultrasound fetus is provided by the visual evidence on the screen. That evidence is mutually available to the participants and also available to anyone else who happens to be co-present. The *separateness* of an ultrasound fetus is produced through the practice of highlighting only the location of the focal fetal part, setting it apart from the rest of the image on the screen and from the rest of the woman's body, which is thus made invisible, or relegated to the background. As scholars such as Mitchell

(2001) and Taylor (2008) observe, these two features of the ultrasound fetus – the objectivity and the separateness – are products of the participants' work on the ultrasound images. What I have demonstrated is that this work is lodged in the sequential organization in interaction. In particular, the participants' interactional work integrates and coordinates their orientations to spatially separate operational fields.

The organization of an ultrasound fetus is constrained by the mechanical features of the ultrasound scanner. However, the features of the scanner are also organized through arrangements of bodies and talk, as participants orient to the scanner (in particular, the transducer on the woman's abdomen, the monitor screen and the control panel) and each other. (In another context, the scanner could serve as a weight for compressing cucumbers in bran during the process of making Japanese pickles.) Figures 1, 2, 4 and 5 show some features of bodily arrangements for ultrasound examinations. Not only do both participants in each figure look at the monitor screen, while the healthcare professional holds the transducer against the woman's abdomen; but they also have their heads or bodies 'torqued' (Schegloff, 1998). Pregnant women position their abdomens toward the healthcare professional, making them available for the transducer, but they also turn their heads towards the monitor screen. Healthcare professionals look at the monitor screen, but their lower bodies maintain a 'basic' orientation to the pregnant women's bodies (Kendon, 1990; see also Scheflen, 1973). The participants' bodies thus display simultaneous orientations (more basic or more acute and current) to different aspects of the environment, including each other's bodies. The features of the scanner that constrain the organization of the activity are thus organized through the arrangement of bodies and talk. Note that the pregnant women in Figs 1, 2 and 5 remain motionless during the segments from which the figures are clipped; the success of the demonstration in these segments largely depends on the pregnant women's maintenance of their bodily postures and orientations as well as on the healthcare professional's actions.[25]

Conclusion

As Rayna Rapp observes, '[t]he real-time fetus is a social fetus, available for public viewing and commentary at a much earlier stage than the moment of quickening, which used to mark its entry into the world beyond its mother's belly' (Rapp, 1999: 119–120). To this we can add that the real-time fetus is a locally organized interactional object. In this paper, I have explicated the interactional organization of the real-time fetus in a technological environment. No features in the participants' environment are inherent to the fetus or the technology, as they depend on the organization of the lived work of the ultrasound demonstration for producing and performing the objectivity and separateness of an ultrasound fetus. Because of this interactional organization, it remains unclear how consequential the presence of technology is for pregnant women's agency. We saw that, while the final epistemic authority is granted to healthcare professionals, pregnant women are systematically afforded opportunities to intervene in the interactional trajectory in progress.[26] Furthermore, the relevant features of technology are interactionally organized in the very process in which a real-time fetus is produced and the woman's pregnant body is (re-)structured. They are fundamentally lodged in the locally produced orderliness of interaction. The procedure that the participants employ to organize their

interaction is describable, manageable and changeable by the participants themselves, and so are all the observable and describable features of the technology and its objects.

Notes

1. Prenatal ultrasound examinations may be abdominal or vaginal. In this article, however, all instances were abdominal.
2. One is reminded of Garfinkel's 'breaching experiments' for revealing taken-for-granted orders (Garfinkel, 1967).
3. For the properties of sequence types, see Sacks et al. (1974), Schegloff (1968, 2007) and Schegloff and Sacks (1973), among others. Basic sequence types, consisting of two ordered action types, are sometimes called 'adjacency pairs'.
4. Hindmarsh and Heath (2000b) carefully analyse the *sequential* organization of the activity in which an object is interactionally constituted. The interactional constitution of an object is deeply embedded in the particulars of the current activity. I will explore a specific aspect of the formal structure of prenatal ultrasound examinations in which the real-time fetus is interactionally constituted, focusing on the procedures for the *sequence* organization with 'differentiation sequences' as the core sequences.
5. Furthermore, ultrasound examinations sometimes appear to promote emotional 'bonding' between the woman and her fetus by using emotional expressions, such as 'cute', to evaluate captured fetal images. They also do so by attributing putative motives to fetal movements, as though they 'personify' the fetus (Mitchell, 2001; Taylor, 2008). However, it also appears to be the case that some healthcare professionals carefully avoid such 'personification' throughout examinations, though they perform demonstrations for pregnant women.
6. All the extracts cited in this article are composed of three tiers: at each numbered line, there is first a romanized original Japanese transcript. Below this is a phrase-by-phrase gloss. Finally, a rough English translation is added as the third tier. In the first tier, a transcription system developed by Gail Jefferson is used (see Jefferson, 2004, for the most recent version). Several of the notational conventions are as follows: left and right broken brackets (eq [and]) bridging two lines indicate points of overlap onset and ending, respectively; a dash (-) indicates a cut-off of the preceding word or sound; colons (:) indicate stretching of the preceding sound; and numbers and a dot in parentheses indicate silence in tenths of a second and less than 0.2 second, respectively. In the phrase-by-phrase gloss, the following abbreviations are used: IR for 'interrogative', JD for 'judgmental', MIM for 'mimetic', P for 'particle' and PL for 'polite'.
7. The camera-person carried a camera when videotaping this interaction; she first stood at the pregnant woman's feet, but at the start of the ultrasound examination moved to the woman's head to capture the doctor's conduct. Because of this, unfortunately, the doctor's pointing gesture during the time period from '*kono* [this]' (line 02) through '*atama* [head]' (line 04) is occluded behind the body of the monitor, though one can infer, from the visible part of the doctor's body, that the pointing gesture is maintained throughout that time period.

8. Charles Goodwin (2000, 2003a,b, 2007) argues that the primordial site of human action and cognition is essentially multi-modal.

9. In the interest of space, I do not cite more examples, but such precise timing is not exceptional when healthcare professionals invite pregnant women to differentiate a location of a fetal part. This is consistent with Hindmarsh and Heath's (2000a: 1863) observation that deictic gestures, or pointing gestures, often come to rest on screens 'late in the articulation of the demonstrative, and not infrequently, just following its completion.'

10. Figure 3 is excerpted from a Japanese newspaper, but I have replaced Japanese words in the drawing with their English translations.

11. The mimetic expression *zuu* is rather conventionalized in Japanese. It indicates 'length' in both spatial and temporal senses.

12. Indeed, while producing the mimetic expression *zuu*, the midwife slides the transducer in her right hand along the woman's abdomen. The woman thus can have a tactile sense of the outline of the spine, which also may help her locate the spine on the screen.

13. We should be sensitive to the distinction that Sacks (1992) made between claiming and displaying (showing, exhibiting or demonstrating): 'Things like, for example, at the end of some first story a recipient says "I know just what you mean." Period. We can say that that's a *claimed* understanding as compared to having some way to produce some materials that *exhibit* an understanding' (vol. 2: 252, emphasis in original). As we will see shortly, the pregnant women's unmarked responses to differentiation invitations are no more than claiming.

14. A brief silence at the beginning of line 02 of Extract 4 can be analyzed in a way similar to the analysis to follow. The midwife's explicit solicitation of recognition in line 02 appears to have been induced by this silence, which was perceivable as the absence of a response.

15. The management and negotiation of epistemic authorities in talk-in-interaction is extensively discussed by Heritage (2002), Heritage and Raymond (2005), Peräkylä (1998), and Whalen and Zimmerman (1990), among others.

16. The pre-expansion that I explore in this section should be referred to as a pre-expansion of the *sequence*, rather than a pre-expansion of the *utterance*. As will be revealed in the course of this analysis, it constitutes a distinct action that is systematically related to the subsequent *sequences* (that is, differentiation sequences). On the other hand, it should be distinguished from 'pre-sequences' in the technical sense (Sacks, 1992; Schegloff, 1980, 2007; Terasaki, 2004), since it does not constitute a sequence by itself.

17. More precisely, after the midwife says, 'These locations are the eyes', in line 03, the pregnant woman nods slightly. However, the midwife moves to a next item (the fetal nose) before the pregnant woman begins to nod.

18. The expression *iru* cannot be used to predicate a face (it is not possible to say '*kao* [face] *ga iru*'). However, the face may be a prominent body part among other body parts, particularly in terms of the recognition of the entire organism. One should also note that it may be difficult to only recognize the nose, for example, without locating it in relation to other facial parts; in this sense, too, the discrimination of the image of a fetal facial part is expected to be embedded in the recognition of the entire face.

19. The similar marking is also seen in Extracts 3, 5 and 6.

20. The healthcare professionals and pregnant women may *directly* see on the monitor screen the results of various operations on the women's abdomens and the control panels, rather than first seeing the image on the screen and then inferring that it is the result of the operations.

See Gibson (1986), for the conception of direct perception. In this connection, readers may be reminded of Hanson's (1958) discussion on 'seeing differently'. He argues that when Galileo saw the sun, he saw a static sun *directly*; that is, Galileo did not see a plain sun and *interpret* it as static. Hanson, as is well known, further argues that seeing involves 'knowledge and theories' about what is seen. However, I demonstrate that the organization of seeing in prenatal ultrasound examinations involves various practices in interaction, rather than shared *theoretical* knowledge. See Nishizaka (2000a, b) for the interactional organization of seeing.

21. I have not examined the pre-expanding parts in Extracts 1 and 2. However, I hope the reader is now able to have some sense about them, though Extract 2 is quite complex.

22. In the interest of space, I do not go into the detail of the utterances from 06 through 10, but one note may be in order. The midwife does not make a pointing gesture to the monitor during this interval; she only holds the edge of the monitor with her left hand during the silence in line 09. The deictic expression '*kono hen* (around here)' in line 06, in particular, is hearable as referencing *the image on the screen mapped onto a particular abdominal location*. This distributed reference in lines 06 through 10 comes up here because the woman's preemptive utterance in line 03 may also have preempted an utterance that otherwise might have followed the substantial silence in line 02, and would have contained a distributed reference of this kind.

23. The image on the screen and the lived work in ultrasound prenatal examinations compose what Garfinkel calls a 'Lebenswelt pair' – an achieved unity between a formal account and the work of producing it (Garfinkel, 2002; Garfinkel and Wieder, 1992; Lynch, 1993; Livingston, 2008). In this instance, the image on the screen becomes a visual account of the work of producing it through a set of practices implemented in situ. An ultrasound fetus emerges from the work of producing and maintaining the pair.

24. See Nishizaka (2007) for referential practice in the context of palpation, where the entire fetus is present beneath the pregnant woman's abdomen, though invisible.

25. Certainly, during an ultrasound examination, the pregnant woman often changes her bodily posture; she may look at the doctor or midwife, lean towards or back from the monitor screen, and so on. All these slight changes may be consequential for the subsequent development of interaction, as I suggested in the analysis of Extract 7.

26. Charis Thompson suggests that women's agency and technological constraints ('objectification' of the woman') can be mutually constitutive in infertility clinics (Cussins, 1996; Thompson, 2005).

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