

“A Wonderful Movie!”: The Appropriation of Entertainment Ultrasound Technology in The Netherlands

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ABSTRACT

It is now almost impossible to imagine a pregnancy in The Netherlands without one or two fetal ultrasounds. In contrast to the biomedical view of seeing ultrasound technology as a transparent window into the womb, much scholarly research in the social sciences highlights that the technology is not neutral, but has different meanings and applications depending on the context. Feminist anthropologists have mostly criticized ultrasound technology for invading the intimate experience of pregnancy and making women “invisible.” This article focuses on so-called “entertainment” ultrasounds to explore how pregnant women in The Netherlands use ultrasound technology for new, unintended purposes. Using semi-structured interviews and discourse analysis of websites of commercial ultrasound clinics, I demonstrate that many pregnant women in The Netherlands consider the ultrasound scan a positive and valuable experience that they can consciously use to feel less insecure and to relax during their pregnancy. It is argued that, in looking so closely at the structural power relations that limit women’s agency, feminist anthropologists often downplay the possible leeway that expectant mothers have. These women are not forced into doing “entertainment” ultrasound scans but are active agents appropriating the technology.

Keywords: entertainment ultrasound; fetal ultrasound; feminist anthropology; the Netherlands

The one where seeing sound waves makes parents cry

When Rachel first saw her baby, she cried. To tell the truth, Rachel did not *actually* see her baby. She saw sound waves produced by her fetus, made visible by sonographic technology. And to be even more precise, Rachel did not even understand that that was what she saw on the screen. While crying, she exclaimed: “I don’t see it! I lied, I didn’t want her to think I was a terrible mother! I can’t even see my own baby.” Stammering, Ross, the father of the baby, started explaining: “You see this, this tiny thing, that looks like a peanut? Sweetie, that is it.” Rachel’s expression changed immediately. It seemed like she was suddenly looking at a cute baby animal movie. Lovingly, she took Ross’s hand and spoke the words: “Wow, I cannot believe that is our baby” (*Friends* 2001).

This famous episode of the American television show *Friends* is certainly not the only time that fetal ultrasound plays an important role in popular culture. In the Dutch soap opera *Goede Tijden, Slechte Tijden* (2013) one of the characters, Nina, is going to bed early, because as her boyfriend tells her, she has “an important photoshoot tomorrow.” Her mother-in-law weighs in: “It is the first time that you see your child. You have to share that with each other.” The first moments in the hospital are awkward, because the father of the baby and Nina’s boyfriend, who hate each other, are both there. But that changes immediately when they see the fetus on the screen; Nina exclaims: “It is really a small human!”

Although these examples are “just” scenes of television shows, they demonstrate the role that fetal ultrasounds play in experiences of pregnancy. While the sonogram was introduced

to improve the physical health of pregnant women and their babies, the practice is now also used by pregnant women for other purposes. This is evidenced by the rise of what is popularly referred to as “the entertainment ultrasound,” or “*pretech*” in Dutch, where women are shown images of the fetus in a non-medical setting, often in 3D imagery. The goal of doing an ultrasound is no longer (just) to see the medical condition of the baby or fetus (these terms were used interchangeably by my interviewees). As such, my research explores how pregnant women in The Netherlands appropriate the technology of the fetal ultrasound for new, unintended purposes. The concept of “unintended purposes” includes non-traditional uses of ultrasounds that are beyond the scope of their original design and use by scientists and designers who introduced them to the medical community (Van Dijck 2005), on which I will elaborate later in this article. I chose to specifically focus on women because the mother (and not her partner) is made a “patient” in the ultrasound process. I was also intrigued by popular ideas about motherhood and the “natural” and special connection that exists between a mother and her child.

I am certainly not the first anthropologist to look into fetal ultrasounds. Many researchers have been critical of this relatively new technology “invading” the experience of pregnancy. Multiple feminist anthropologists have, for example, critiqued the way that the ultrasound erases the female body to make the fetus visible (Kroløkke 2009, 130). In my analysis I focus more on the leeway that certain pregnant women in The Netherlands have; they are not “lured” into “entertainment” ultrasounds; they see them as valuable experiences. I will explore the ways in which expectant women act as active co-creators of the fetal ultrasound, shaping the technology and ascribing meaning to it while using it.

In this article, I first examine theories that are important for understanding the changing uses of the sonogram. I pay particular attention to the Science and Technology Studies (STS) concept of “appropriation of technology,” by giving not only examples of ultrasound in other countries, but also of another technology: the car. I then briefly discuss the concepts of “co-production” and “embodied knowledge.” Finally,

I critically look at the specific case of ultrasound in the Netherlands. Particular emphasis is upon how non-medical uses were attributed to the practice of ultrasound, such as the theory of ultrasound bonding. I then come to my argument, by demonstrating how ultrasound technology influenced the pregnancy experience of Dutch women. Part of my argument will be that the introduction of selective reproductive technologies (SRTs) has made pregnancy more insecure, especially because women have less confidence in their embodied knowledge (Browner and Press 1996). However, I also argue that some women have the possibility to appropriate the technology to “solve” this problem and take this opportunity to incorporate ultrasound in their embodied pregnancy experiences. In the end, I position myself within the debates of many feminist anthropologists: are women indeed victims of ultrasound technology?

Gathering data

To examine the above-mentioned research question I used two forms of qualitative methods. First, I did seven semi-structured interviews that lasted between thirty minutes and an hour and a quarter, six of which were with Dutch women who chose to do one or multiple entertainment ultrasounds during their pregnancies. Their ages varied between twenty-five and thirty-four and they had all been pregnant within the last three years at the time I interviewed them. For the purposes of my research and to protect their identity, all of my informants were given pseudonyms. I used my first interview as a pilot to obtain insights into how to structure the questions. However, most of the time, I let my interviewees take the lead and talk about the topics that they thought were interesting. To complement the data from these six interviews, I also did one interview with a 55-year-old sonographer who has her own commercial ultrasound clinic, which means that the clinic is geared toward non-medical uses, not covered by health insurance, and often referred to as “entertainment” ultrasound clinic. With permission from the interviewees, I recorded all the interviews and transcribed them afterward.

The interviews were carried out between October 2020 and June 2021, which means that for a big part of the research period The Netherlands was in lockdown due to COVID-19. Therefore, all the interviews were done through video calls, either on Zoom or WhatsApp, depending on the preference of the interviewee. The benefit of this was that it was often easy for my interviewees to find the time for an interview. One of them was even driving home from work during part of the interview. However, because I had never done an online interview before, I did encounter some difficulties. Next to background noises and a sometimes inconsistent internet connection, the interviewees were sometimes distracted by children or other family members that I could not see. These distractions during the interviews sometimes influenced the interview flow. Another problem, that I only noticed while doing the first interview, was that it can be quite difficult to read body language when you can only see someone’s face. Sally Seitz (2016, 232) argues: “This makes it even more vital to listen to the tone of the participant’s voice and be very conscious of their facial expressions.” During the interviews, I recognized how difficult this can be, especially when the internet connection is poor. I was also more conscious of my own facial expression than when doing a face-to-face interview. I could constantly see my face on the screen and noticed that it sometimes distracted me: am I looking okay? Do I show enough emotion in my face? Seitz (2016) also argues that a video interview can cause a loss of intimacy when talking about sensitive topics. I think that I was lucky that my interviewees liked to discuss this topic. For all of them, the ultrasound was a happy memory to look back at.

This seemingly insignificant observation about the feelings my interviewees had concerning their ultrasound scans is not as innocent as it looks; it hints at the women’s positionality within Dutch society. Part of the reason that they did not face many structural barriers in accessing health care and did not experience much fear in medical settings, is that my interviewees were almost exclusively white, middle-class, able-bodied, cisgender, straight women. In this research, I use the experiences of this relatively powerful group of

women to dive deeper into the often-heard statement of feminist researchers that women and their embodied experiences are made invisible in maternity care, for example by ultrasound technology. Having said that, there is of course an important body of work within feminist anthropology that focuses on how structural inequalities, particularly racism, seep into – and are maintained by – the medical system and medical technologies (e.g. Colen 1995; Bridges 2011). My research shows that, although my interviewees did not experience the structural barriers often encountered by less privileged groups of women, there were still boundaries left to encounter and strategies needed to overcome them; this article sheds light on the ways even these relatively powerful women were struggling to navigate through their pregnancies and the medical processes related to it.

Next to the semi-structured interviews, I also did a discourse analysis of four websites of Dutch commercial ultrasound clinics (*Joehoedaarbinnen*, *BabyView*, *Dokter Papa*, and *FunBaby*) and one of a Dutch company for rental ultrasound devices (*Babywatcher*). I mostly focused on the reviews written on the websites but also paid attention to the ways entertainment ultrasounds are sold to expectant couples. Now that I have discussed the methodology used in this article, I will turn to some important theoretical concepts.

Society shaping technology

Doing an ultrasound scan can feel miraculous. On the website of *Babywatcher*, a site for an ultrasound device for home use, I watched a vlog of a woman moving the scanner across her belly. While pointing at the screen, she explained to the child sitting next to her: “Look! That is the baby.” It seemed like the woman’s belly was suddenly invisible, and the inside was shown on the screen of her laptop. Looking at it that way, one may think that the scan provides pregnant women with an objective view of their fetuses. And, according to anthropologists Lisa Mitchell and Eugenia Georges, this is the exact discourse that is presented by medical professionals about ultrasound technology:

For physicians and sonographers, ultrasound represents a necessary,

passive, and neutral technology, capable of providing, as one obstetrical text describes it, “a window of unsurpassed clarity into the gravid uterus” (Mitchell and Georges 1997, 373).

Mitchell and Georges based their conclusion on research in Canada and Greece at the end of the twentieth century. However, the same discourse can be recognized in The Netherlands in 2021; for example, during an interview, Viviënne (55), the owner of a Dutch entertainment ultrasound-clinic, compared doing an ultrasound to “taking a look inside.”

The ultrasound is, however, not as passive and neutral as it seems. As sociologist Julie Roberts (2012) argues, the technology does not provide a transparent window to the inside of the uterus. Rather, the meaning of the images is shaped by the cultural context and interactions within which the technology is used. In her anthropological article about ultrasound in Tanzania, Babette Müller-Rockstroh (2012) not only states that the sonogram has very different meanings within the country, but also that there are extensive differences between countries. In the United States, an ultrasound is a way to get to “know” the baby, while in Brazil the technology is used to improve family bonds (Müller-Rockstroh 2012). In contrast, in Japan the diagnostic meaning of the ultrasound is almost completely left out of the discourse (Ivry 2006, 452); instead, the focus is completely on the “cuteness” of the baby. In this article, I will complement this earlier literature, by looking at the case of the Netherlands to show that, in this context, pregnant women use ultrasounds in an attempt to pragmatically counterbalance the medicalized discourse on pregnancy and to feel less insecure about the pregnancy.

To understand the different meanings of ultrasound technology I follow earlier work in the field of STS in stating that technology is predominantly shaped by the people that use it (e.g. Bijker, Hughes and Pinch 2012). Technology is not a fixed and stable entity, but acquires meaning through interactions within a cultural context. This re-making or shaping of technology by its users can be described as the appropriation of technology. Müller-Rockstroh (2012) explains that users shape technology in two ways: first, they are imagined as potential

future users by the designers, and, second, they shape the technology by using it, for example by giving meaning to the equipment. In analyzing the appropriation of the sonogram by pregnant women in the Netherlands I will focus on the latter: the way expectant mothers change the meaning of ultrasound technology by interacting with it in various ways.

While a non-conventional comparison, the history of the car and how its meaning has changed over time, is a good example of how technologies and their meanings get reinscribed with time and usage. When the first cars were seen driving around the American countryside at the beginning of the twentieth century, the farmers called the vehicle the “devil wagon” (Kline and Pinch 1996). However, they soon found “less dangerous” ways to use the technology: instead of using the technology as a means of transportation, they used it as a general source of power, especially for agricultural machinery. Ronald Kline and Trevor Pinch (1996, 775), both STS scholars, state: “Although manufacturers may have ascribed a particular meaning to the artifact they were not able to control how the artifact was used once it got into the hands of the users.” The farmers were active participants in the social construction of the car. They were not passive users but changed the meaning of the automobile by using it in different ways than intended by the designers.

Thus, although the focus is often on the ways technology influences society, I will in this article also look at the other side of the coin: society shaping technology. To describe these two sides of the same coin anthropologist Kim Tallbear (2013) uses the concept of “co-production,” a concept that was developed by STS-scholar Sheila Jasanoff about two decades earlier. Tallbear describes co-production as distinct from “...discrete categories where one determines the other in a linear model of cause and effect...” (Tallbear 2013, 11). Instead, ““science” and “society” are mutually constitutive – meaning one loops back in to reinforce, shape, or disrupt the actions of the other...” (Tallbear 2013, 11). Society and technology are thus constantly interacting with each other, impossible to be seen as separate, and resembling an eternal loop. Using this

concept of co-production, I argue that ultrasound technology not only influences experiences of pregnancy, but that pregnant women in turn also shape what ultrasound technology *is*; the two processes are interconnected. The application of this concept will make clear that, while pregnancy experiences are indeed influenced by this new technology, expectant mothers also have a chance to transform the technology.

When discussing the reassuring function of the ultrasound, I also adopt the concept of “embodied knowledge.” Anthropologists Carole Browner and Nancy Press (1996, 142) describe this kind of knowledge as: “subjective knowledge derived from a woman’s perceptions of her body and its natural processes as these change throughout a pregnancy’s course.” It can be contrasted with authoritative knowledge, which can be defined as “rules that carry more weight than others” (Browner & Press 1996, 142). Browner and Press argue that American women consider information that is based on technology authoritative knowledge. I argue that this is also the case for Dutch women. However, women, irrespective of whether American or Dutch, appropriate the technology and “make it their own.” I now first turn to a broad overview of the medical history of the ultrasound.

Looking back

When the ultrasound technique was invented, the designers were not thinking about visualizing fetuses. At the start of the twentieth century, the technology was used to track submerged icebergs by using sound (Van Dijck 2005, 102). Later, it was also used in the First World War to search for hostile submarines. After some experiments with ultrasound in the medical world, the technology was only first used in obstetrics in the 1950s, when medical scientist Ian Donald coincidentally discovered that the technology could be used to visualize fetuses at an early stage of pregnancy (Van Dijck 2005, 102). In 1958, for example, echography was first used to determine the gestational age of a fetus (Harris et al. 2004). By 1962, the first ultrasound machines came to the wider market, but at that moment the technology was still only used when doctors

suspected problems (Draper 2002). Slowly, the sonogram gained ground and in the 1980s, the ultrasound scan turned into a routinized procedure in most countries in the global North, including the Netherlands.

Currently, most pregnant women in the Netherlands receive two ultrasound scans in the hospital: one at around ten weeks of pregnancy to measure the gestational age, and one at twenty weeks to examine the development and anatomy of the fetus. These two scans are covered by state-mandated health insurance and are strongly recommended by medical professionals. As part of a scientific study, a new scan was added to these insurance-covered ultrasound scans in September 2021: pregnant women can now also choose to do a supplemental scan at thirteen weeks of pregnancy. More scans are only done at the hospital when there are complications or health risks. Still, for the Netherlands, a country in which homebirths are relatively usual (Van den Berg 2020), this medicalization of pregnancy is quite unique (Van Dijck 2005). Professor of media and culture José van Dijck (2005, 110) argues: “In a generally low-tech and de-medicalized trajectory of pregnancy and childbirth, the clinical ultrasound seems an anomaly.”

When the sonogram was initially introduced in hospitals (especially in British and American contexts) to check the health of fetuses, scientists not only started to investigate changes in fetal and maternal health, but also theorized about the emotional consequences of the ultrasound. One of the first people to explore this was obstetrician Stuart Campbell. In 1982 he stated that pregnant women had more positive feelings about the fetus after doing an ultrasound scan (Campbell et al. 1982). However, anthropologist Janelle Taylor (2008, 89) argues that this is not what Campbell actually “measured” with his survey: “What this study really documents, then, is simply that when the person conducting an ultrasound examination provides more information and feedback, pregnant women experience it as a more positive event.” In reality, Campbell did not ask the women about their feelings towards the fetus, but about their feelings towards the scan. Still, the assumption that “ultrasound

technology accelerates and improves upon the natural process by which pregnant women enter into specifically maternal relationships to the fetus” (Taylor 2008, 77) is now widely accepted in medical and psychological research, and seldom questioned in scientific research, although it was never “proven.”

According to Taylor (2008), this assumption, called “the theory of ultrasound bonding,” has had a big influence on popular ideas about “bonding.” First, earlier theories about bonding focused on the period *after* birth. The theory of ultrasound bonding indicates that women can also enhance bonding with their babies *before* birth. Next to that, the practice of bonding also changed due to ultrasound technology. Where bonding was first seen as something that had to involve touch, eye contact, and smell, it was now also expected to happen when a woman could only *see* her baby (Roberts 2012, 81), something that can be recognized in the fragments from television shows that I described in the introduction. Thus, the introduction of the ultrasound in the medical world not only changed practices, but also ideas about the basis of the relationship between mother and child. The importance of this theory will come back in the part of the article to which I now turn: how ultrasound has changed the experience of pregnancy.

Uncritical faith in human optics

When Mitchell and Georges (1997, 386) investigated the meaning of ultrasound technology in Greece, they interviewed an older obstetrician. He observed:

There are few things my hands can't find that the ultrasound can. My hands are my eyes... but patients think it's more modern to use a machine. They themselves wouldn't trust just a manual exam. The doctor needs to show that he's modern too. That is, some will do an exam with a machine just because a woman will trust him more if he does.

The same discrepancy between the trust in manual and machine examinations appeared in my interview with Christa, a Dutch 29-year-old woman who became a mom in August 2018. Christa had some complications during her

pregnancy, which made her feel insecure. However, when she wanted to do an ultrasound scan, she could not do that at the hospital. Following the advice of the doctor, she decided to go to a commercial ultrasound clinic. I wondered out loud why she felt like she *needed* that scan. Would it also have been enough if she had just heard the baby's heartbeat and if the doctor had told her that he was confident that the fetus was alright? It took Christa some time to come up with an answer. She never thought about this; it just felt like the right thing to do. In the end, she said: "When it is visual, it satisfies more." She clarified: it would not have been enough if the doctor had just *told* her that her baby was alright, she needed to *see* it – even though she also explained that she did not understand what she saw.

This example from my interview with Christa is an example of the growing authority of the visual over other sensory experiences, which could also be distinguished in most of the other interviews. When I discussed the need for reassurance with Elise (28), who was still on maternity leave when I interviewed her in April 2021, she stated: "I think that it was really necessary to see it. I had the feeling: a check-up in which we only hear the heartbeat isn't enough. I really have to see it. Is everything alright?" In this part of the article, I will explain why my respondents' need for reassurance can no longer be satisfied without the help of an ultrasound machine.

Pregnancy has always been a liminal state filled with insecurity (Rapp 1999, 105). The pregnant woman is temporarily in a middle stage: not a nonparent anymore, but also not a parent yet. There is a certain level of universality in pregnancy-related anxiety, which is also at times thought to be unavoidable by expectant mothers (Rapp 1999). But the obstetrical ultrasound, together with other SRTs, has amplified this insecurity. Anthropologists Tine M. Gammeltoft and Ayo Wahlberg (2014, 207) explain: "At the same time that they render the child-to-be "real," sonographic images also remind women that this pregnancy may come to an abrupt and unfortunate end." This contradictory observation is confirmed by Rayna Rapp's anthropological study on amniocentesis. She

argues that the women she interviewed all worried more about the health status of their fetuses because of the test (Rapp 1999, 118). The possibility of having a child with a disability is increasingly present in the minds of the women because the technology confronts them with it. Joëlle (31) could even tell me the exact moment that she started to get nervous about possible complications during her pregnancy; when she was pregnant with her first child in 2019 she told a nurse in the hospital that she would be on holiday in Australia when she was supposed to have her 20-week ultrasound scan. Personally, she did not worry about it; she could do the scan one or two weeks later. But after being confronted with all of the possible complications by the nurse, she started to worry more and get nervous.

With this knowledge about possible disabilities and complications also comes responsibility: now more than ever, pregnancy is about choice. In this context of what Charlotte Faircloth and Zeynep B. Gürtin (2018) describe as "anxious reproduction", women can choose to do tests, to have abortions, or to not smoke during pregnancy, for example. But having a choice also means that one can make the "wrong" one. Harris et al. (2004, 30-31) describe the increasing responsibility for fetal health that is attributed to women. Bluntly said: if a woman does not accept the advice of medical professionals, it is projected as her fault if there are any complications during the pregnancy. One of these responsible choices is the ultrasound scan. The theory of ultrasound bonding also plays an important role in this practice. Every woman is now susceptible to the "universal risk of failure to bond" (Roberts 2012, 88). If the mother does not bond with the child and did not do an ultrasound, who is then to blame but the mother herself?

Pregnant women must find a way to handle this intensified anxiety. In the next part of the article, I argue that Dutch women are less likely to use their embodied knowledge to reach this goal, instead relying on visual, technological knowledge. Roberts (2012, 8) states that "subjective knowledge of the body is no longer to be trusted and visual knowledge from imaging technology takes precedence." This is reflected in the earlier described examples

from my interviews. Knowledge is no longer trusted when it cannot be seen. This development already began during the nineteenth century with the rise of the positivist tradition. As Roberts (2012, 6) aptly says: "Faith in God was replaced by uncritical faith in human optics." Much of modern scientific belief and approach now depends on the power of observation. The sonogram thus originated in a strong tradition of privileging visual knowledge (Draper 2002, 777). As Van Dijck (2005, 106) summarizes: "Feeling and listening are still important sensorial perceptions, but ever since ultrasound has entered the prenatal trajectory, sight has arguably become the privileged sense perception."

This is not only the case for physicians and obstetricians but especially for the patients themselves. For example, Christa stated: "I feel like I would miss the ultrasound at 20 weeks if I would not have that one because then I would be thinking: is he *really* healthy?" She needed the visualization to get the confirmation that her baby was healthy and she privileged this medicalized knowledge over her embodied experience. The same can be seen in a review by Amber on the previously discussed website, *Babywatcher*: "It was mostly nice to see the heart beating, that gives reassurance that everything is well in there, especially if you haven't been to the obstetrician for a while." Just like Christa, Amber does not feel like her embodied knowledge is enough to be confident about the health of the baby. The embodied knowledge of the woman, which used to be the most important source of knowledge for making choices during pregnancy (Browner and Press 1996, 141), has since the rise of the ultrasound been overshadowed by the authoritative knowledge of the visual image on the screen. This is summarized by Isabel (34), mother of three children: "Even though you feel good, you don't know if everything is alright in there."

On top of the strong tradition of visual knowledge, this privileging of authoritative knowledge is strengthened by the influence of ultrasound technology on the realization of pregnancy. Before the introduction of the sonogram, the pregnancy often started to feel "real" when women experienced bodily quickening: the first time pregnant women feel

the movements of their babies. Now, fetal movement is often seen on a screen before the mother can feel anything (Mitchell and Georges 1997, 378). The moment when the pregnancy first feels "real" has become what Charlotte Kroløkke (2009, 129) calls a "technogenic experience." Next to that, the process of bonding is also accelerated. Roberts (2012, 82) states: "Bonding is no longer a long process of weeks or months but something to be achieved (or at least accelerated) in the course of a short appointment." Bonding thus happens even before the "natural" bonding process begins for the expectant mother. The experience of pregnancy is being hijacked by technology before the "natural" process has even had a chance to start.

At this point, pregnant women may seem helpless victims of this new technology. Their embodied experience is devalued, and their experiences of pregnancy are anxious, because they question their bodies. However, that conclusion would be too shortsighted. The women in my research changed the meaning of the ultrasound. They appropriated the technology to make their pregnancy experiences more pleasant. I will turn to this part of the article now.

"It was a wonderful movie"

While interviewing Christa (29), I soon found out that her pregnancy was not the easiest one. In the first weeks of her pregnancy, she suffered from blood loss, and later in her pregnancy, she experienced extreme gallbladder pain, sometimes lasting for more than three consecutive days. For Christa, this made the already insecure period of pregnancy even more anxious. She felt the need to be reassured every so often and found the solution for this in the sonogram. She did her first *pretecho* shortly after the blood loss. When I asked Christa why she did this "entertainment" ultrasound, she answered:

Well, the first one was of course because of the blood loss, so that was really for me to know that everything was alright. Because at that moment you do not feel anything yet and you just experience the blood loss and you think... you don't know what is going on on the inside, you

know what I mean? So that was really nice to know for sure: okay, he is still moving and the heart is still beating, that kind of stuff.

For Christa, the ultrasound was a coping mechanism to handle the insecurity that she experienced during the pregnancy. Whether the technicians performing this *pretecho* had any medical education, did not matter to Christa. Seeing the baby was enough to reassure her. She even told me that she already felt okay after seeing the screen for half a minute. Most important, despite the serious medical reasons for which Christa went to the ultrasound clinic, she only described the ultrasound in cheerful expressions, for example: *leuk* [fun] 24x, *fijn* [nice] 6x, *bizar* [bizarre] 6x, *blij* [happy] 2x and *speciaal* [special] 2x. It seems like Christa transformed an oftentimes stressful procedure into an exciting experience.

Christa is not the only woman who had such fond memories of the ultrasound. After reading some reviews on the website of the Amsterdam-based commercial ultrasound clinic *Dokter Papa*, one may almost forget that the sonogram is originally meant to detect abnormalities. The Dutch actress Nicolette van Dam for example wrote: "Incredible... what an experience to see our little wonder in 3D. To share this with each other before your baby is born is so special." Famous television presenter Lieke van Lexmond had the same kind of experience: "It was a wonderful movie with our little baby in the lead! Getting to know your baby together with your loved ones, certainly recommended!!!!".

These examples demonstrate the changed meaning of the ultrasound. In the previous part of this article, I explained that ultrasound scans can be a cause of insecurity and worry. However, the women in my research transformed this technology into a positive experience. Instead of making their anxiety worse, the sonogram is now used to relieve stress. Some women even consciously chose to do a commercial ultrasound to feel less insecure. Cynthia for example wrote on the website of *Babywatcher*: "We could watch if everything was alright with our girl when we felt insecure. That got me through an insecure period. Because of this, I could still enjoy [my

pregnancy] without having to go to the hospital every time." Elise (28) and Joëlle (31) expressed a similar motivation when I interviewed them. Both women decided to do a commercial ultrasound scan because they felt that the period without an ultrasound at the end of the pregnancy was too long and they started to feel insecure.

Not all the women I interviewed felt this need to use an entertainment ultrasound for reassurance, mostly because not all of them had the same level of insecurity about their pregnancies. However, all emphasized the importance of the absence of stress during these non-medical ultrasounds, particularly in contrast to the check-ups in the hospital. Emma, a 25-year-old woman who was 34 weeks pregnant when I interviewed her, pointed out that for her the *pretecho* was mostly about a moment of fun:

[The pregnancy] is just going so fast and you are dragged into this medical wringer of ultrasounds and making sure not to eat this and not to drink that. ... [And when going to the entertainment ultrasound] you don't have any stress of course. It's really just for fun and not to rule out any complications.

Striking in this excerpt is Emma's use of the Dutch expression "*medische molen*," which can literally be translated to "medical mill" (although "medical wringer" seems more appropriate) and is used to negatively describe a seemingly never-ending cycle of a large number of hospital visits and medical treatments. The expression seems to reflect the earlier mentioned "generally low-tech and de-medicalized trajectory of pregnancy and childbirth" (Van Dijck 2005, 110) that is distinctive of the Dutch context.

The same negative sentiment about the medicalization of pregnancy was expressed by Isabel (34), who stated that, "there are already a lot of things that you need to do at the obstetricians. And of course, you are glad to have these check-ups, but they are also quite stressful... And it was just nice to have something fun in between." Even Viviënne (55), the owner of a Dutch entertainment ultrasound -clinic, made a distinction between medical

ultrasounds and “fun ultrasounds.” She argues that a lot of women come to her clinic to consciously create a moment to enjoy their pregnancy “in a relaxed way with a lot of time and attention.”

By using ultrasound technology as a strategy to reduce anxiety or create a moment of relaxation and fun, pregnant women appropriate the technology into something uplifting. In this new context, the technology changes from an SRT that could result in a positive diagnosis to a reassuring emotional event and way to obtain information about the baby. This is the other side of the coin of co-production. Earlier I explored how the introduction of ultrasound technology changed the experience of pregnancy by creating more anxiety and giving pregnant women more responsibilities. However, the interaction between technology and society is not linear: women also influence ultrasound technology. They turn it into their own important ritual until the diagnostic purpose of the SRT has become secondary; they appropriate the technology.

And again, the eternal loop of co-production continues. The introduction of the entertainment ultrasound influences society and society in turn influences technology, changing the meaning of the technology itself as it influences society again. The new meaning of the technology is now also altering practices in the medical setting. At the beginning of this article, I stated that ultrasound is not a neutral technology; it is influenced by cultural ideas. The meaning of the sonogram as a reassuring and bonding instrument, is now also reflected in practices in hospitals and clinics. My interviews seemed to indicate that medical professionals in hospitals are influenced by the new purposes of the sonogram and try to reach new goals: reassuring the pregnant women and making the scans into “wonderful” experiences. Christa (29), for example, recalled that sonographers in the hospital sometimes tried to show the fetus in 3D and print some “nice pictures,” similar to what happens during an entertainment ultrasound. Women are also encouraged to “interact” with their fetuses (Kroløkke 2009, 134). Women are, for example, asked to massage their bellies, to try to get the

fetuses to move or kick, a process that several of my interviewees described as “fun.”

In this part of the article, I have shown how women take the anxious experiences of SRTs and change them into meaningful and important rituals that help them to feel more confident about their pregnancies. A criticism of my argument so far could be that I look at ultrasound mostly as a valuable experience for women, without looking at the downsides. I now turn to this feminist critique of ultrasound and explain why I have a more uplifting view.

The invisible woman

When Theresa, a 27-year-old business owner, went to do an ultrasound scan, she told the sonographer that she had felt the fetus moving already (Georges and Mitchell 1997, 379). It was a happy memory that she wanted to share with her doctor. However, the sonographer soon burst her bubble. Theresa explains:

We could see it moving and I told [the sonographer] I had felt it when I was taking the Metro. She said that wasn't it, that I couldn't feel it until a few more weeks. I thought for sure it was the baby moving, but I guess not (Georges and Mitchell 1997, 379).

The way in which Theresa's embodied knowledge is rejected and substituted for authoritative medical knowledge during her hospital visit, is an important reason why a lot of feminist anthropologists, including Georges and Mitchell (1997), are so critical of the ultrasound. Some researchers have even talked about a “technomedical takeover” (Harris et al. 2004) in which the process of pregnancy is removed from the hands of women and placed into the hands of the medical-scientific world. The example of Theresa fits in this body of feminist research critiquing the devaluation of embodied knowledge in maternity care: it shows how pregnant women have unsettling experiences because they lose their privilege on knowledge about the fetuses. Where previously women always had somewhat of a monopoly in the pregnancy experience, because of their first-hand bodily experience, the ultrasound made this experience more equal for men and women (Draper 2002). Some researchers even

argue that women have become invisible in the pregnancy experience (e.g. Martin 2001). Sociologist Barbara Rothman (2004, 285), for example, states that, “to make the fetus visible, the mother becomes invisible, even to herself. She turns away from her own body, away from her lived experience of the fetus, and watches it on the screen.” It even seems as if the female patient *needs* the technology, for example to bond with her baby.

While I agree that it is important to take the embodied knowledge of women seriously and look critically at the power relationships that are reflected in biomedical technologies, I think that the above-mentioned feminist critiques miss an important point. In looking so closely at the structural power relations that limit women’s agency, they downplay the possible leeway that women still have. Women are presented as being completely subjected to a technology – with a pre-determined goal, use, and effect – over which they have no influence. However, as can be seen when looking at theories from STS, technology is never a finished project and is created in interaction. To say that women are entirely subjected to ultrasound technology would be a form of technological determinism. Ultrasound technology in and of itself does not *do* anything; it is produced in constant interaction with other actors: the pregnant women using the technology, the technicians operating it, the families and friends being present, the buildings in which this all takes place, and many more. The pregnant women are not just subjects of the technology, but are actors, which means that, within the existing structures, they still have the power to make choices. This does of course not mean that every woman has the same amount of power. As mentioned before, the women in this research were highly privileged.

Following, among others, Kroløkke (2009), I argue that women are not passive spectators and victims of ultrasound technology but are active agents in shaping the instrument. They consciously develop ways to make the sonogram a positive part of pregnancy. Cynthia’s previous anecdote is an example of this: Cynthia rented an ultrasound device to decrease her anxiety. She was aware that this

purchase would help her feel more relaxed and enjoy her pregnancy more. One could almost say she was acting like a pragmatic consumer. Like Cynthia, most of my interviewees also had a clear goal in mind when choosing to do an entertainment ultrasound. Whereas Elise’s (28) motivation was, just like Cynthia’s, mostly about reassurance, Emma (25) had a different goal: “I think that my biggest motivation was to involve my partner [in the pregnancy experience] and to get him to connect more to his child.” Mother of two Celine (33) also mentioned her family; apart from being curious about the looks of the baby, for her the ultrasound was mostly about having a nice experience together with her mother and sisters. Another example was mentioned by Viviënne (55), when discussing the motivations of the women doing an ultrasound scan at her clinic. After hearing that the baby would be born with a cleft lip, an expectant mother wanted to be prepared before giving birth. Therefore, together with her partner, she came to the clinic so they could look at the baby’s face. These examples demonstrate that the pregnant women in my research consciously *chose* to do an ultrasound to reach their own goals. The ‘entertainment’ ultrasound is, for example, used to feel more comfortable, to connect with the baby and to build a family.

In a critical essay about motherhood and technology, feminist sociologist Ann Oakley asked herself whether “women and fetuses really needed scientists and high-tech medical devices to “glue” them together” (Taylor 2008, 79 paraphrasing Oakley 1993). My answer is: no, women do not *need* this technology to bond with their children. However, that does not mean that it has not become valuable to some of them. When I asked my interviewees, they all told me that they would really miss the ultrasounds if they would not be able to do one in their next pregnancies. The reviews on websites of commercial ultrasound clinics, such as *Dokter Papa*, tell the same story. The ultrasound turned from an SRT into an important emotional ritual; women are not helpless victims of the technology, but active actors using it for their own goals.

Going back to Ross and Rachel

In the previous section of this article, I stated that the pregnant women in my research consciously transform ultrasound technology to change their experiences of pregnancy for the better. The question that I tried to answer in this article was: how do pregnant women in The Netherlands appropriate the technology of the fetal ultrasound for new, unintended purposes? My use of the word “appropriate” in this question already highlights my assumption that pregnant women are active agents in the process of changing technology. Therefore, I started to answer this question by looking at the concept of “appropriation of technology.” I noted that technology is not neutral, and that ultrasound has different effects in different contexts. I articulated, for instance, the first side of the coin of co-production: the way in which ultrasound technology has influenced pregnancy experiences. I used examples from my interviews to elaborate on the growing importance of visual knowledge. The introduction of new forms of SRTs has made pregnancy more insecure than it was before. I ended this part of the article on a sour note: because of a combination of more insecurity and less trust in embodied knowledge, pregnant women now must deal with new anxieties.

Subsequently, I explained a second component of co-production in which pregnant women influence ultrasound technology. They change the meaning of the technology to reduce their anxiety and to consciously take a moment to “relax.” Ultrasound is not only used as a method of reassurance but also as a “wonderful experience” and a family maker. In contrast to feminist critiques, I state that some women *choose* to do these ultrasounds. This choice should not be considered a “surrender” to biomedical power, but a pragmatic strategy to handle the changing experiences of pregnancy. Women are not passive victims, but active agents of technological change.

Of course, this study also has limitations. First, as I discussed earlier in this article, my research population consists of, in many ways, a homogenous group of privileged, white, middle-class women. The experiences of these women provide interesting insights into the

appropriation of ultrasound technology, but they are not representative of the entirety of society. The research also shows that, despite their privileges, these women *do* encounter anxieties and difficulties during their pregnancies that they must navigate. However, it would be interesting to research how other groups of women in The Netherlands relate to ultrasound technology. Viviënne, for example, observed that women with a Hindustani background often brought their whole family with them to her clinic, while white women often only took their partners. In my research, I did not get the chance to look at these differences. Next to that, I chose not to focus on the use of the image of the fetus in abortion debates, as well as on the result of positive medical diagnosis after ultrasounds. Although interesting topics, these issues could not be discussed due to time limitations.

Theoretically, I think that this article provides an interesting view of the interactive relationship between technology and society. Medical technology is not neutral and has to be explored critically, because it *is* changing the world in which we live. When I first watched the episode “The one where Rachel tells...” of the television show *Friends* (2001), I thought it was one of the funniest of the whole show. I am not the only one. The clip in which Rachel tells Ross that she is pregnant is often mentioned as a particularly hilarious scene of the show. But it is also emotional; it is the moment that brings the most popular couple of this show back together. After writing this article, I recognize that this episode is not just funny and emotional; it reflects the new meaning of ultrasound technology that is created by women. Ultrasound is something that can connect a mother to her baby, that can tell the mother that she is a good mother, and that can bring a family together. In stating this, I do not conform to the theory of ultrasound bonding as “real,” or to the idea that ultrasound technology on its own *does* something at all. But the experiences that are created in the interaction between women and ultrasound technology are real, and it makes ultrasound indeed a wonderful, miraculous experience.

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