

1 **Technologies of Time: Women’s Practices of Trying to Conceive with Ovulation Biosensing**

2 **(Word Count 7902)**

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4 **Abstract (185 words)**

5 Ovulation biosensors are devices worn on or used with the body, which can help women detect
6 ovulation. The manufacturers of such devices claim that if women know when they ovulate, couples
7 can arrange heterosexual intercourse during this time, and thus increase their chances of conceiving.
8 Within the contemporary UK context, in which becoming pregnant is presented in the popular media,
9 and in medical discourses, as more difficult for women in their 30s and 40s, manufacturers’ claims are
10 attractive for those trying to conceive. Yet few sociological studies have examined women’s practices
11 of ovulation biosensing. Drawing on women’s accounts of tracking ovulation, this paper explores how
12 such practices fit into their trajectories of trying to conceive. It examines why ovulation biosensing
13 seemingly becomes helpful, relevant or important during this time. Ovulation biosensors, it argues,
14 alter the landscape of trying to become pregnant by introducing new stages and materialities which
15 seemingly place women closer to conception. Women engage in ovulation biosensing, not only to help
16 them become pregnant, but also as a way to manage the complexities of fertility and the uncertainties
17 of becoming pregnant in contemporary society.

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19 **Keywords**

20 Ovulation, ovulation biosensors, reproductive technologies, fertilities, self-tracking, conception

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22 **Data Availability Statement**

23 Research Data are not shared.

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25

26 **Introduction**

1 In the United Kingdom, if women want to become pregnant, ovulation emerges as a bodily process
2 they need to know about. Discussions among women on online fertility forums are a starting point for
3 making sense of this: 'Is it best to have sex just at the time of ovulation or lots around that time?' posts
4 a forum member asking for advice from other women also trying to conceive. 'Did I ovulate on cycle
5 day 17?' asks another, and 'Are ovulation tests worth it?' posts a third. There are a number of devices
6 currently available on the market which claim to help women do this, including hormone testing strips,
7 digital ovulation monitors, ovulation microscopes and basal body thermometers.

8 In the UK, ovulation tracking was first recorded by doctors in the 1930s as a way to observe the effects
9 of infertility drugs on women's ovulation. It was later promoted in the 1960s as a form of birth control
10 through the Billings Method (Billings & Westmore, 1980), and was taught to specific groups of women
11 around the world. This method involved identifying and recording changes in the texture of cervical
12 mucous during the menstrual cycle through self-examination. However, for many women, ovulation
13 was a silent, deeply buried event. This began to change in the late 1970s with the development of new
14 reproductive technologies such as in vitro fertilisation (IVF) which identified ovulation as a 'key
15 process' in becoming pregnant, and one that could be monitored and controlled. As the topics of
16 infertility and IVF became more prevalent in the media, discussions on ovulation began to permeate
17 specialist and lay debates on fertility.

18 In 1989, the first over-the-counter ovulation monitoring kit was brought onto the UK market by
19 Unipath, a commercial unit of Unilever, one of Europe's largest consumer businesses, known in Britain
20 for household brands such as Persil detergents, Flora margarine, and Birds Eye Fish Fingers (Jones and
21 Kraft, 2004). The ovulation testing kit named 'Clear Plan One Step', was used to detect the luteinising
22 hormone surge in urine, a process first observed in 1959 (Chen and Wallach, 1994), and which became
23 key in the success of IVF. However, the use of such devices remained novel for some years and it was
24 not until the early 2000s that more ovulation tracking devices began to appear in the UK and were
25 purchased by women trying to conceive.

1 Ovulation biosensors sit alongside a number of other devices currently on the UK market that allow
2 users to collect data about their bodies, including tracking glucose in the blood, body weight, breathing
3 or heart rates, sleep patterns and blood pressure. Such tracking devices may be linked to websites or
4 online applications ('apps'), accessed through smartphones, tablets and computers. There is to date
5 a small but growing body of research on the topic of self-tracking (Lupton, 2013a; Mol, 2000; Nafus,
6 2016; Lynch & Farrington, 2018; Roberts et al., 2019) and the design of wearable sensors (Viseu and
7 Suchman, 2010). A small number of studies have examined reproductive apps that involve the user
8 inputting data about the menstrual cycle into a mobile device (see Lupton, 2014b; Gambier-Ross et
9 al., 2018; Hamper, 2020). However, there are few studies on women's practices of ovulation
10 biosensing which, in contrast to apps, involve the measuring or detecting of fluids or temperatures
11 and is often practised by women alone at home using special equipment.

12 Mamo (2007) is one exception to this, writing briefly about ovulation tracking in her study of lesbian
13 women's reproductive practices, adding that 'the technical process of predicting ovulation often goes
14 unnoticed in popular depictions of getting pregnant, yet it is a particularly important step in assisted
15 conception and an increasingly important technique when using frozen sperm' (2007:139).
16 Manufacturers of ovulation biosensing devices often centre their publicity campaigns around women
17 trying to conceive within heterosexual relationships. Their devices, they claim, enable women to
18 detect ovulation and the fertile days, from which they can time heterosexual sexual intercourse and
19 thereby increase their chances of conceiving (author of this paper, 2016). However, this paper argues
20 that there is more to ovulation biosensing than knowing about ovulation and when to engage in
21 reproductive heterosex. It considers how, when women use such devices, they are not only trying to
22 become pregnant, but also trying to manage and negotiate the complexities of fertility, and the
23 uncertainties of becoming pregnant, in contemporary times.

24 **Mediating Reproductive Technologies**

1 Feminist scholarship has long demonstrated the multiple ways in which technologies mediate
2 reproductive bodies, producing and displacing different kinds of bodily knowledge. The home
3 pregnancy test is often positioned as a feminist technology, shifting pregnancy diagnosis from the
4 institutional gaze of the doctor to the private gaze of the user (Leavitt, 2006) and giving women greater
5 control over their reproductive bodies. However, Layne (2009) argues that prior to the test's inception,
6 women were always the first to know about their pregnancy, albeit through other means, such as
7 'quickening' (Duden, 1992), the moment when a woman feels the foetus move for the first time.
8 Practised until the early 1900s, quickening was gradually replaced by technologically mediated
9 knowledge of the foetus, such as pregnancy tests or ultrasound scans. This shift, Duden argues, meant
10 that women came to know their bodies through medical professionals and accompanying technology,
11 rather than through their own sensory experiences, 'forced to see, to represent, to imagine, we have
12 a restricted sensorium for the invisible shapes inside of us. The Enlightenment has removed from our
13 bellies, as from our minds, any reality that is not perceived by the eye' (1993:8). Similarly, devices such
14 as the home pregnancy test, Layne argues, can devalue the knowledge women have about their own
15 bodies, and encourages them to spend money on unnecessary products, thus leading to a 'pharma-
16 technological dependency' (2009:61).

17 However, theorists of science and technology studies argue that users are not passive recipients of
18 technology but instead shape this through practices (Oudshoorn and Pinch, 2005). Users can modify,
19 domesticate, reconfigure and resist technologies. For example, in its early stages, the home pregnancy
20 test was located within discourses of privacy whereby women were 'the first to know' about their
21 pregnancy. Yet in contemporary contexts, by posting images of their positive tests online, or videos of
22 the moment in which they discover their pregnancy (see 'Womb Tube'), women are not only the 'first
23 to know', but also 'the first to tell' (Childerhose and MacDonald, 2013).

24

1 Feminist scholarship has also explored the ways in which women and couples draw on reproductive
2 technologies to manage uncertainties around conception and fertility. Technologies such as IVF may
3 be used by women to help them conceive but also to resolve an 'infertility limbo' (Franklin, 1997). In
4 the context of conception and infertility, 'trying' has moral value. It allows women and couples to feel
5 they have explored all the options, thereby managing not only their present suffering, but also any
6 regrets they may have in the future, or judgments by others for not having children (Throsby, 2006).

7 Scholars have also shown how reproductive technologies enable women to manage the stigma around
8 fertility by reclaiming the body as fertile in some ways but not others. For example, during IVF
9 treatment, women might produce multiple eggs. Embryos are placed inside their bodies and women
10 may come to see these on screens; conception may have taken place for a short moment. Similarly, in
11 women's accounts of undergoing IVF, attention is often drawn to particular areas of the body which
12 prevented them from conceiving, such as blocked fallopian tubes, rather than infertility as a whole.
13 As Throsby highlights, 'within these redefinitions, conception, gestation and birth are no longer
14 treated as the defining criteria for female fertility; instead eggs, ovulation, hormones and
15 menstruation stand in as equally valid evidence' (2006:87).

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17 Women also draw on 'egg banking' to manage bodies and fertilities that have become out of kilter or
18 are existing on different times scales (Waldby, 2014) such as the 'biological clock', or careers and
19 relationships. Egg freezing seemingly allows women to reconcile different forms of time, placing
20 fertility on hold while bringing other areas of their lives into line. In this way, the past and future
21 become meaningful and valuable, rather than as time ill-spent or lost (Waldby, 2014:8). In contrast,
22 Kylie Baldwin's study on egg freezing (2018) argues that it is neoliberal discourses that compel women
23 to engage in such practices. These locate women as responsible for their fertility, and thus, 'morally
24 culpable for any failure to manage risks such as of ovarian ageing' (2018:11). In this context, Baldwin
25 argues, women can be understood as 'reproductive entrepreneurs', or 'repreneurs' (Kroløkke and

1 Pant 2012); they access costly procedures and treatments in order to fulfil a 'biographical project'
2 (Baldwin, 2018:12).

3

4 It is clear that women engage with reproductive technologies to manage conception and (in)fertilities
5 in multiple ways. Such technologies create new meanings around reproductive bodies and processes.
6 This paper focuses on practices of ovulation biosensing; on what women are doing when they track
7 ovulation, and how such technologies become meaningful and helpful in their trajectories of trying to
8 conceive.

9

10 **Methods**

11 This article is based on a doctoral study of women's practices of ovulation biosensing. It is guided by
12 Annemarie Mol's theory of understanding objects as manipulated in practices, developed in her
13 ethnographic study of atherosclerosis in a Dutch hospital in which the author accompanied doctors,
14 health professionals, and patients during the diagnosis, testing and treatment of this disease. Mol
15 argues that knowing an object involves following it around, and foregrounding the practicalities,
16 materialities and events in which it is situated (2002:13). This goes against a 'perspective approach'
17 (2002:12) whereby different people look at a single object, 'this multiplies the observers but leaves
18 the object observed alone. All alone. Untouched. It is only looked at. As if it were in the middle of a
19 circle' (2002:12). This 'perspective approach', Mol adds, makes the object solid and 'intangibly strong'
20 (2002:12). However, if we follow the object around, and try to understand the object through the
21 practices in which it is situated, then the object becomes different; it becomes multiple.

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23 In her ethnography, Mol follows atherosclerosis around by watching people, places and events in
24 which this disease is *done*, performed or enacted. However, Mol adds that objects can also be followed
25 through people's stories; stories about practices. She argues, we can listen to people as if they were
26 their own ethnographer, telling us how living with an object is done in practice; 'The stories people

1 tell do not just present grids of meaning. They also convey a lot about legs, shopping trollies or
2 staircases. What people say in an interview doesn't only reveal their perspective, but also tells about
3 events they have lived through' (2002:15). For Mol, as well as observing practices, it is important to
4 listen to people's stories and to the particular events they describe; these events give shape to the
5 object of study.

6

7 Guided by Mol's approach, the study follows ovulation biosensing around within women's
8 descriptions, paying particular attention to what women are doing when they sense ovulation. By
9 foregrounding the practices in which ovulation biosensing is situated it aims to capture, as far as
10 possible, the multiplicity of ovulation biosensing, and to show that women's practices of sensing
11 ovulation mean that biosensing is not one thing but is complex and varied. Although the activities of
12 testing or collecting data were not observed in situ, women sometimes presented their basal body
13 temperature monitoring graphs during the interview and described what they considered to be
14 significant moments during the cycle. Discussions about how women make sense of the data they
15 collect are not within the scope of this paper but are an important element of the doctoral study (see
16 author of this paper, forthcoming paper).

17

18 **Ovulation Biosensors: Devices and Methods for Tracking Ovulation**

19

20 Ovulation biosensing is defined in the study as devices, techniques or activities to monitor the changes
21 in hormones relating to the ovulatory cycle. These changes can sometimes, but not always, be
22 detected through bodily fluids such as urine, saliva, cervical mucous, and through bodily
23 temperatures. Devices include testing sticks, basal body thermometers, (wearable) monitors, or
24 microscopes. Techniques may involve testing at specific times of the day or rubbing cervical mucous
25 between the fingers in order to identify its texture. There are a number of devices currently available
26 on the market of varying costs and complexity which draw on these methods. However, biotech

1 industries are in a race to develop seemingly easier-to-use and more accurate ovulation biosensors,
2 as can be observed in the recent media coverage of the development of a chewing gum to track
3 ovulation (Russell, 2019).

4
5 The most commonly used devices during the period of study were the ovulation testing sticks. These
6 small strips of paper detect the luteinising hormone (LH) surge which takes place approximately 24
7 hours before the egg is released from the ovary. When dipped in urine, the strips reveal two lines; for
8 the result to be positive, the testing line should be darker than the control line. Although they look
9 very similar to the pregnancy test, which produces two lines when positive and one line for negative,
10 ovulation testing strips will always produce two lines. This is because the luteinising hormone is always
11 present in small quantities in the body over the ovulatory cycle. Women must therefore identify a
12 darker line – an indication that the LH hormone has increased significantly. The testing strips can be
13 purchased in bulk at low cost (approximately £10 per 100 strips) allowing women to test repeatedly
14 throughout the day.

15
16 Basal body temperature (BBT) monitoring was also a commonly used method and often combined
17 with ovulation testing sticks. The basal body temperature (the lowest temperature after a period of
18 rest) is lower during the first half of a woman's cycle than in the second. Ovulation is the moment of
19 change between the two parts of the cycle, often shown on a graph through a dip and a sharp rise in
20 temperature. The change is a response to the rise in progesterone, which enables the egg to be
21 released from the ovary (see Weschler, 2003). To record this, a woman must take her temperature
22 every day on waking, using a special thermometer that can be bought online for between £3 and £10,
23 and then record this on a graph. However, although this method allows women to record ovulation
24 retrospectively, it does not give them advance warning of when this will take place. If temperatures
25 are recorded over several months, a pattern can sometimes be established around when ovulation
26 generally takes place, and predictions can be made from this data.

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The two methods outlined above form the basis for discussion in this paper. These methods were often combined with observations of bodily changes in the texture of cervical mucous around the time of ovulation, pain around the lower abdomen, and increased libido. Women came to recognise these changes as they engaged with ovulation biosensing and through their discussions with women on online forums who were also trying to conceive.

Study population

The decision to focus on women’s rather than men’s fertilities was influenced by a number of factors. As a feminist researcher, I am deeply interested in women’s health and in the potential for ‘home health technologies’ to reconfigure, shift, affect and intervene in the complex, powerful and sometimes exploitative relationships between women’s bodies and medical institutions. On a more practical level, there were a greater number of devices and methods available to women to track ovulation. In the initial stages of the research, nine separate devices for tracking women’s fertilities were identified whereas only one device was available to male users (home sperm testing kit). Similarly, online discussions among women about how to make sense of the data were easily accessible whereas discussions among men were rare. The lack of personal devices readily available to track men’s fertilities may have suggested that this group of users was either not interested in fertility or that male fertilities could not be quantified in non-clinical settings. Nonetheless, the relationship between male fertility, nutrition, stress and toxins has been under the microscope for some time (see Dixon et al., 1979). This paper in some ways contributes to the pushing of men’s fertilities even further out of focus. However, a paper relating to this study (author of this paper et. al. 2016) examines men’s involvement in women’s practices of tracking ovulation. In particular, it focuses on their participation (or lack of) in organising reproductive heterosexual intercourse around the time of ovulation in order to make conception work.

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Women who were pregnant or trying to conceive and tracking ovulation were invited to take part in the study. Some of the women that were pregnant had not used ovulation biosensing although were aware of this as an ‘option for later’, as outlined in the findings here. Before deciding to ‘try’ for a baby, the participants knew very little about ovulation or about the technologies for tracking this. Once the decision was made to try, they began to access conception- and fertility-related information, which for many was exciting and fun. They soon became aware of ovulation as something they needed to know about, and although they often tried to conceive initially without tracking (up to three months), they quickly began to adopt sensing practices. The length of time women spent trying to conceive ranged from 2 months to 3 years.

Participants were recruited through posters, word of mouth and through a local NHS Primary Care centre, for which ethics approval was awarded. This group of women had visited the Primary Care setting for general information on conception, or were struggling to conceive and had sought professional advice, but were not undergoing invasive treatment for infertility such as IVF. The study was also publicised within local lesbian and bisexual women’s networks. In total, 27 women were interviewed, all of whom were white and British with the exception of one Canadian participant. Although the study did not specify sexualities, only women involved in heterosexual relationships came forward. It is important to add here that none of the women interviewed identified as ‘infertile’ but were simply ‘trying to conceive’, characterised by engaging in specific activities such as reproductive heterosex, ovulation tracking or healthy eating, and in some cases, ‘struggling to conceive’, which indicated that conception did not take place within the women’s expected time frame.

Managing Conception with Ovulation Biosensing

1 ‘*Seeing what happens*’: Ovulation Biosensing as Something for Later

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3 For the women I interviewed, trying to become pregnant began with a period of ‘seeing what
4 happens’, also described as a time of ‘taking it easy’, ‘taking a relaxed approach to conception’, or ‘not
5 monitoring yet’. This indicated that no special activities, or planning, in order to help them become
6 pregnant would be taken up. Thus, women described how they would have sexual intercourse,
7 ‘whenever they felt like it’ rather than time this specifically with ovulation, as Melissa describes below:

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10 **Melissa:** We said that we’d give it a year or so and if it wasn’t working then we would
11 have started looking at ovulation, but we left it to see what happened. It could take
12 us a long time, we’ve no idea, so let’s start now, and we’ll deal with it, however long
13 it takes. And then for it only to take two months, it was like, oh! That was nice and
14 easy, but we very much went into it thinking, it could take a long time, so let’s not
15 worry about it. None of this working out when the middle of the cycle was. Let’s just
16 see what happens.

17

18 Here, Melissa and her partner decided they would try for a baby for a year without monitoring
19 ovulation and said they were prepared for conception to potentially take longer. Although they
20 describe a ‘let’s see what happens’ approach, their account suggests a level of planning and
21 preparation for conception *not* taking place, and an awareness of strategies they may use for this.
22 Although many women chose not to monitor initially, they were aware of this as an ‘option’ available
23 to them if conception did not go to plan. It indicates a ‘wait and watch’ approach, creating a sense of
24 anticipation about becoming pregnant and a calling into question of the likeliness of this. Ovulation
25 biosensing locates women as ‘risk-managers’ in relation to (in)fertilities (see Locke & Budds, 2013) and
26 although they had chosen not to use such devices here, they nonetheless marked their experience of

1 trying to conceive. Wajcman (1996) observes a similar effect with IVF, 'the very existence of the
2 technologies changes the situation even if the woman does not use them' (p.62). In the case of
3 ovulation biosensing, the 'option' to begin monitoring at a later stage if conception does not happen
4 reflects a new stage in the process of trying to become pregnant.

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6 *Managing Changing Fertilities*

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8 Ovulation biosensing also emerged as a tool to manage and negotiate changing fertilities. While trying
9 to avoid pregnancy in their teenage years and early 20s, the women I interviewed had perceived their
10 fertility as overflowing, risky and needing to be managed through hormonal contraceptives such as
11 the pill or patches. Such medication is taken every day or placed on the body permanently during
12 treatment. It creates continuous 'protection' and thus configures women's bodies as continuously
13 fertile:

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15 **Robyn:** I think a lot of it is when you're young and you get scaremongered, cos it's
16 every parent's worst nightmare that your daughter comes home aged 13 and says I'm
17 pregnant. And so, it's always really drummed into you about using protection, about
18 the risk of pregnancy and being careful. I thought it was going to be a lot easier than
19 it was. I hadn't realised that it was just this little window.

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21 As Robyn indicates, women's understanding of fertility changes as they begin trying to conceive.
22 Experiences of fertility as continuous and overflowing are replaced by the 'fertile window'; a few hours
23 or days of fertile time. The risk of 'falling pregnant' morphs into a risk of not being able to conceive.
24 These two fertilities overlap in women's reproductive trajectories, and biosensing emerges as a way
25 to negotiate the transition from one to another. The fertile window appears to place conceiving out
26 of arm's reach but ovulation biosensing brings it closer; it offers a way into this newly encountered

1 restricted fertility. Thus, as women begin to try to conceive and fertility becomes more complex,
2 ovulation biosensing seemingly provides a way to manage this new uncertainty.

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4 *From 'seeing what happens' to 'doing something'*

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6 Practices of ovulation biosensing also enacted taking control of trying to become pregnant; it denoted
7 a move away from 'seeing what happens' towards engaging in activities to make conception happen,
8 often referred to as 'actively trying', 'trying properly' or 'taking things seriously'. Sam and Jo refer to
9 this in their accounts of trying to conceive below:

10

11 **Sam:** It's always been something that we were planning on doing, but because I'm
12 now in my 30s, and I want to have more than one, I want to get on with it. So I've
13 been taking it quite seriously and I've bought these various sticks and kits and things.

14

15 **Jo:** I decided to do it because I felt like it would be better to have a bit more control
16 over it, because leaving it to chance wasn't working. And you could tell that you were
17 ovulating and that this would seem a really quick way to do it, so then we'll know
18 when to have sex and it will just work.

19

20 The shift from 'seeing what happens' to 'taking control' is an important marker in women's trajectories
21 of trying to conceive. Ovulation biosensing performs this shift; it enacts doing conception 'better' and
22 making this more likely. The notion of timing is important here; both Sam and Jo make reference to
23 this in terms of when in the ovulatory cycle to engage in sexual activity (the right time to try) and
24 chronological age (the right time to have a baby). For the women of this study, biological age was
25 experienced as a concern ("I'm now in my 30s"), and time as a limited resource ("I want to get on with
26 it"). Women's biological age is configured here as a disadvantage; as a potential handicap and as a

1 loss. It is sometimes referred to as a 'biological clock' but as Waldby highlights in her study of egg
2 freezing:

3
4 "clock time ticks away in regular increments, each the same value as the last,
5 equalising one moment to the next and organising time in an instrumental,
6 homogenous forward flow. However, for the women interviewed, their sense of
7 urgency arises from the way the loss of fertile capacity steadily accelerates,
8 compounding loss on loss, so that the sense of lost time becomes more acute and
9 compelling" (2014:8).

10

11 Ovulation biosensing emerges as a way to manage this tension ("a quick way to do it"). It seemingly
12 enables women to manage the responsibility of deciding when to have a baby and to negotiate the
13 associated risks. It compensates for a potential absence of 'biological clock time' by providing users
14 with a specific and focused time – ovulation – thus allowing women to turn down the potential effects
15 of biological age on fertility. Ovulation biosensors act as technologies of time and when women
16 engage with such devices, they are managing and negotiating past, present and future reproductive
17 losses.

18

19 *'Seeing' Ovulation and the Making of Conceptive Trails*

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21 For many women, biosensing enabled them to 'see' ovulation. For example, points on a graph or
22 patterns on a microscope came to stand in for the release of the egg from the ovary or ovulation
23 advancing. Basal body temperature monitoring was found in this study to be the most powerful
24 representation of ovulation. It appeared in women's accounts, at least for a period of time whilst
25 trying to conceive, as an informative and exciting way of tracking ovulation.

26

27 **Chloe:** I was quite amazed actually when my temperature went up, it was just like
28 magic. I just had no idea that I was hotter in one half of the cycle than another. And

1 that's why it made me feel empowered I think because I was able to sort of physically
2 see it, that that was when it {ovulation} happened.

3

4 Points on a graph produced through ovulation biosensing create a tangible connection to ovulation;
5 the point of 'dip and rise' indicating the moment in which the egg is released creates a materiality
6 between the user and conception that was not present before, making conception seem closer and
7 more possible. Ovulation is made durable and tangible on the user's trajectory of trying to conceive.

8

9 Women place these new materialities of conception alongside one another. Dips and rises are placed
10 alongside other markers of ovulation such as cervical mucous or libido, creating a 'conceptive trail'. I
11 draw on the concept of 'trail' to indicate a collection of materialities produced by women through
12 sensing practices, and from which they come to understand ovulation. The notion of trail suggests a
13 path along which women can move forwards or backwards; however, unlike a path, a trail is not
14 marked out; instead, rather like a snail's trail, it is produced in the activity or moving, doing or sensing.
15 These trails seemingly connect the women with conception, enabling them in part, to 'do something'
16 (be on a point of the trail) and 'see something' (observe ovulatory changes), as the following users
17 indicate:

18

19 **Cora:** I think it helped me looking at the times and seeing how I felt in myself, if I felt
20 more horny or if my cervical fluid had changed or whatever. I was able to look back
21 and think this is what happened around the time that I ovulated.

22

23 **Annabelle:** I was thinking, it would be good just to know the signs beforehand so that
24 I could know whether that month was going to be good or not, so that I didn't get
25 upset at the end of the month. It was more that than about the timing of it really.

26

1 Cora describes how she was able to look back at the time of ovulation and compare this with bodily
2 changes. Eggs, cervical mucous, pain and other representations of fertility materialise on a conceptive
3 trail from which women can begin to calculate their chances of conceiving, and their 'performance' at
4 trying. Did the couples have enough reproductive heterosexual intercourse? Was it at the right times?
5 Did this coincide with the right kind of cervical mucous? Ovulation biosensing allowed the user to try
6 to identify the likely outcome of their efforts ('a good or bad month') and to prepare emotionally for
7 this. It also created a platform for users to investigate why they did not conceive or which aspect of
8 fertility was missing. Women were also able to move forward along the trail (albeit a dotted line) by
9 drawing on this data to predict ovulation. They observed at which point in the cycle ovulation took
10 place, reinforcing or adapting this prediction with each newly recorded cycle. However, as ovulation
11 is this case remained a prediction, the trail is tentative; a dashed line which becomes completed once
12 the drop and rise in temperatures has been established. Ovulation biosensing thus emerges as a
13 reflective and calculative tool that enables bodies to be retraced and theories about conception to be
14 developed. Women's fertilities are configured as repairable, and sensing practices enable users to
15 identify which parts of the body need attention.

16

17 *'Doing Time' with Ovulation Biosensing*

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19 The extended use of ovulation biosensing whilst trying to conceive also provided a basis for women
20 to request – and to be viewed as deserving of – further support from medical health services. Initially,
21 women were advised by general practitioners to try to conceive for a period of 12 months and to
22 return if 'nothing happened. When women returned, they were able to talk about their body with
23 more certainty and in some cases, show the data they had collected to the GP.

24

25 **Mel:** I made the decision that after a year if I hadn't got anywhere, I would go and
26 speak to the doctor about what else we could do to make sure everything was ok. But

1 when I went to speak to the doctor, I wanted to be able to clearly outline my situation
2 so I wanted to say, look I've been taking my temperature, I'm sure that I'm ovulating,
3 I believe that the second half of my cycle is long enough to..., cos if the second part of
4 your cycle's too short you can't conceive so I wanted to make sure, I wanted to have
5 as much evidence as possible to show her so that she would be able to say, well we'll
6 do this this and this next. So, I wanted to be able to clearly articulate my problem – I
7 don't know if it's a problem, but to clearly articulate my scenario. And so that did
8 happen, I went to the doctor after twelve months with all of my little graphs and my
9 book and she didn't really want to see them but, you know, I was determined to show
10 her them and tell her I was doing a PhD and I was good at this kind of thing. And, I
11 don't think she was particularly interested in them, she just referred me for some
12 blood tests.

13

14 In Mel's case, on returning to see the doctor she wanted to be able to clearly lay out her situation and
15 to provide 'evidence' of this. Mel's understanding was that her evidence would spur the next
16 appropriate stage of treatment. She observed however that the GP was not really interested in this
17 data but nonetheless continued with the next stage of treatment, in this case blood tests. Ovulation
18 biosensing provided Mel with a fertility trajectory, which could later be brought into line with her
19 request for medical support.

20

21 Similarly, I observed that for many women of this study, doing ovulation was a way of 'doing time'; of
22 collecting conceptive materialities over a period of 12 months which could serve as evidence they had
23 *tried* to conceive, and, as Throsby discovers in her study on women's experiences of IVF, 'trying' is of
24 moral value in this context (2006:84). Ovulation biosensing materialises women's practices of trying;
25 it converts the moral value of 'trying' into materiality, and although for the GP in the example above,
26 the collection of ovulation data played no role in the decision to offer further support or treatment,

1 women's efforts to become pregnant *matter*. It matters in that it allowed the women to feel more
2 deserving of the next stage of treatment or support and gave them more confidence to request it.

3

4 However, women's practices of ovulation biosensing also matter because they create a process of
5 'anticipatory socionaturalisation' (Thompson, 2005:192). Charis Thompson introduces this concept in
6 her analysis of fertility clinics to refer to the activities that prepare women for the next stages of
7 (in)fertility intervention including: developing a sense of awareness about their menstrual cycle, and
8 the things that can go wrong when trying to conceive and the activities associated with this such as
9 using self-help books for support; watching their own bodies closely for signs of ovulation; familiarising
10 themselves with the likeliness of conception within a given cycle; choosing and rejecting different
11 networks of support; and forming hypotheses about what may be going wrong (2005:192).
12 'Anticipatory socionaturalisation, Thompson explains, "means that when patients come to the clinic,
13 their bodies are already considerably "unblack-boxed" (2005:192). This process, the author adds, is in
14 part what enables women to go on to more invasive procedures; their bodies have been prepared for
15 this. Ovulation biosensing performs a process of anticipatory socialisation which prepares women to
16 go on to the next stage of treatment. Effectively, sensing practices create a new kind of body, a post-
17 novel ovulation biosensing body (see Throsby 2004), which enables women to move between contexts
18 and treatments within their trajectories of trying to conceive.

19

20 *Returning to 'Seeing What Happens'*

21

22 Ovulation biosensing enacted a personal response to making conception work, providing many of the
23 women in the study group with a sense of control over the difficulties and uncertainties of trying to
24 conceive. It was also described by many, for a short period of time, as exciting and fun. Ovulation
25 biosensing represented in some cases the beginnings of becoming pregnant after a long period of
26 trying to avoid pregnancy. Women learned new things about their bodies, in particular about the

1 more specific changes that take place during the menstrual and ovulatory cycle. They developed a
2 connection to ovulation which seemingly placed them closer to conception. However, as women
3 continued to try to conceive, the signs of ovulation became confusing and disturbing, and as a result,
4 they often decided to stop monitoring and engage in reproductive heterosex only, thus returning to a
5 'see what happens' approach.

6

7 **Anwyn:** It was fun at the beginning, plotting the graphs and seeing what happened,
8 because you read the information that tells you that you'll see a dip and then your
9 temperature will go up so seeing that happen, it was fun and it was exciting, and then
10 I think after a while it was less fun because you'd see the dip and temperature go up
11 and then it would repeat the same the following months. I think I actually stopped
12 doing it after a year just to see what happened.

13

14 Ovulation was not the 'key to conception' that manufacturers of ovulation biosensors had claimed in
15 their promotional materials (Author, 2017) and women must begin to undo the connection between
16 ovulation, fertility and conception. However, for many women, to stop sensing was a challenge, as the
17 participant describes below:

18

19 **Keri:** I found it very difficult the month that I didn't do it, really hard because once
20 you've started you can't really stop, you think that you might miss something, and
21 that might have been the month that it would have worked, you know.

22

23

24 The question of what gets 'missed' is, in part, one of materiality such as patterns on a microscope or
25 points on graph. These conceptive materialities begin to represent 'partial successes' (Franklin,
26 1997:167) within practices of trying to conceive; they seemingly place women closer to conception

1 and stand in as 'valid evidence' (Throsby, 2004:87) of women's fertility. Through practices of
2 biosensing, ovulation emerges as one step away from conception. Lines on a dipstick or points on
3 graph begin to symbolise the presence of an 'egg in waiting'; all that is needed is sperm. This leads to
4 a new conceptive reality; the 'almost pregnant' body. When women stop sensing, they must renounce
5 this closeness to conception, and although of course women may still ovulate without biosensing, they
6 can no longer 'see' the almost pregnant body. Ovulation biosensing may for some women provide a
7 connection to fertility, but at the same time, it can create confusion and a sense of loss.

8

9 To stop sensing was challenging in other ways. Although many users gave up tracking with technology,
10 they were able to feel ovulation occur each cycle. Prior to engaging in biosensing practices, women
11 knew little about ovulation, however, they were now deeply physically aware of the changes taking
12 place; sensing practices had marked the fleshy materiality of the body in some way. Women's
13 'sensorium', which Duden claims becomes restricted in the context of modern pregnancy diagnosis, is
14 opened up in the context of ovulation biosensing. For many women, this was a positive experience,
15 yet for those that did not conceive, the continued sensing ovulation without using technology became
16 a burden; a reminder each cycle that bodies and fertilities cannot always be managed.

17

18 *Discussion: Marking out New Paths to Conception?*

19 In this article, I have discussed women's practices of ovulation biosensing with a view to understanding
20 how such practices fit into their trajectories of trying to conceive. I examine why ovulation biosensing
21 seemingly becomes helpful, relevant or important during this time and what it is that such devices
22 come to represent. Through women's accounts of trying to conceive, I observed that ovulation
23 biosensing is not only a way to help women become pregnant, but also a way to manage and negotiate
24 the uncertainties around fertilities and bodies within contemporary society. These uncertainties are
25 multiple. They relate to women's concerns around how long conception may take and how

1 contraceptives may have affected their fertilities; they also encompass the ambiguous and changing
2 relationship between age and fertility.

3 Ovulation biosensing emerged as a tool to manage the unknown within women's own reproductive
4 trajectories. It configured the process of trying to conceive as marked by different stages. For example,
5 of 'waiting to see what happens' or 'leaving it for later', of 'beginning to try', of 'really trying', and
6 then, of stopping sensing and returning to 'waiting and seeing'. These different stages provided
7 women with a framework, either to try out different options, or to move onto the next stage if things
8 did not go to plan. Women's practices of trying to conceive, previously located within an unmarked
9 period of time, became reconfigured by specific and manageable steps.

10 In the same vein, ovulation biosensing created new materialities of conception, such as points on a
11 graph, blue lines on a test strip, the luteinising hormone surge, or a particular texture of cervical
12 mucous. These new materialities helped create a conceptive trail; a visual representation of women's
13 fertilities, and a tangible connection to changes taking place inside their bodies. Women could move
14 back and forth along the trail and search for clues as to when they might ovulate. They could draw on
15 the trail to calculate their chances of conceiving but also to reflect on the ovulatory cycle and any
16 changes that take place. Ovulation biosensing gave shape, context and meaning to the uncertainties
17 around becoming pregnant.

18 For many women, ovulation biosensing offers a way to *do* conception; to influence this in some way
19 and to make this more likely. It helps negotiate the sense of responsibility around fertility in which
20 women are configured as making the wrong 'choices' – of being 'too old' to try, of knowing too little
21 about their fertilities, or engaging in reproductive heterosex at the wrong time or in the wrong
22 manner. *Doing* conception through ovulation biosensing means women can try to neutralise these
23 choices and compensate for any potential losses. In effect, by doing conception women may be able
24 to 'undo' their infertilities.

1 Ovulation biosensing furthermore changes the fleshy materiality of bodies, creating a novel post-
2 biosensing body. Women developed greater knowledge of the ovulatory cycle, but they also began to
3 feel and 'sense' this, and continued to do so once biosensing practices had ceased. Data collected
4 from ovulation biosensing practices sit alongside other kinds of data collected by women and which
5 lead them to make conclusions about ovulation. The 'sensorium', which Duden (1993) argues becomes
6 constrained, reduced, or limited by technology, is opened up in the context of tracking ovulation, with
7 bodies and technologies working together to establish new sensing boundaries. Technology does not
8 automatically displace women's own sensing knowledge but instead can support and help develop
9 this.

10 Importantly however, ovulation biosensing alters the wider landscape of (in)fertilities. 'Trying' to
11 conceive becomes a world within conception; complex and multi-layered, requiring planning and a
12 range of strategic approaches. Women must engage in decision-making around which devices to use
13 and how to use them; when and how often to test. Each stage brings new opportunities, but also new
14 sites of failure and loss. Although the participants of this study did not describe their bodies as
15 'infertile', while trying to conceive they reflected on the reproductive decisions they had had made in
16 their lives. If women felt that time had been lost or 'ill-spent', ovulation biosensing seemingly offered
17 a way to bring fertilities back on track.

18

19

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21 **Bibliography**

22 Baldwin, K. (2018) Conceptualising women's motivations for social egg freezing and experience of
23 reproductive delay, *Sociology of Health and Illness*, 50, 5, 1-15.

24

- 1 Billings, E. and Westmore, Ann. (1980) *The Billings Method. Every Woman's Guide to Her*
2 *Reproductive System*. New York: Ballantine Books.
3
- 4 Chen, H. S. and Wallach, E. E. (1994) Five decades of progress in the management of the infertile
5 couple, *Fertility and Sterility*, 62, 4, 665 -685.
6
- 7 Childerhose, E. Janet and MacDonald, E. Margaret. 2013. Health Consumption as Work: The Home
8 Pregnancy Test as a Domesticated Health Tool. *Social Science and Medicine*. 86, 1-8.
9
- 10 Dixon, R., Sherins, R., & Lee, I. (1979) Assessment of environmental factors affecting male fertility.
11 *Environmental Health Perspectives*. 30, 53-68.
- 12 Duden, Barbara. 1993. *Disembodying Women. Perspectives on Pregnancy and the Unborn*.
13 Cambridge, Massachusetts: Harvard University Press.
14
- 15 Duden, Barbara. (1992) Quick with Child. An Experience That Has Lost its Status. *Technology in*
16 *Society*. Vol. 14: 335-344.
17
- 18 Franklin, S. (1997) *Embodied Progress. A Cultural Account of Assisted Conception*. London:
19 Routledge.
20
- 21 Gambier-Ross, K., McLernon, D. and Morgan, H. (2018) A mixed methods exploratory study of
22 women's relationships with and uses of fertility tracking apps, *Digital Health*, 4, 1-15.
23
- 24 Hamper, Josie. (2020) 'Catching Ovulation': Exploring Women's Use of Fertility Tracking Apps as a
25 Reproductive Technology. *Body and Society*.
26
- 27 Jones, G. and Kraft, A. (2004) Corporate venturing: the origins of Unilever's pregnancy test, *Business*
28 *History*, 46, 1, 100-122.
29
- 30 Kroløkke, C. H. and Pant, S. (2012) 'I only need her uterus': Neo-liberal discourses on transnational
31 surrogacy, *NORA – Nordic Journal of Feminist and Gender Research*, 20, 4, 233-48.
32
- 33 Layne, Linda. 2009. The Home Pregnancy Test: A Feminist Technology? *Women's Studies Quarterly*.
34 Vol. 37 (1/2) Spring – Summer: 61-79.
35
- 36 Leavitt, Abigail, Sarah. 2006. "A Private Little Revolution": The Home Pregnancy Test in American
37 Culture. *Bulletin of the History of Medicine*. Vol 80 (2) Summer: 317-345.
38
- 39 Locke, A. and Budds, K. (2013) 'We thought that if it's going to take two years then we need to start
40 that now': Age, infertility and risk and the timing of pregnancy in older first-time mothers, *Health,*
41 *Risk and Society*, 15, 6-7, 525-542.
42
- 43 Lupton, D. (2013a) Quantifying the body: monitoring and measuring health in the age of mHealth
44 technologies, *Critical Public Health*, 23, 4, 393-403.
45
- 46 Lupton, D. (2014b) Quantified sex: a critical analysis of sexual and reproductive self-tracking using
47 apps, *Culture, Health and Sexuality*, 17, 4, 440-453.
48
- 49 Lynch R. and Farrington C. (eds) (2018) *Quantified Lives and Vital Data: Exploring Health and*
50 *Technology through Personal Medical Devices*. London: Palgrave Macmillan.

1
2 Mamo, L. (2007) *Queering Reproduction. Achieving Pregnancy in the Age of Technoscience*. Durham:
3 Duke University Press.
4
5 Marsh, M. and Ronner, W. (1996) *The Empty Cradle. Infertility in America from Colonial Times to the*
6 *Present*. Maryland: John Hopkins University Press.
7
8 Mol, A. (2000) What diagnostic devices do: the case of blood sugar measurement, *Theoretical*
9 *Medicine and Bioethics*, 21, 1, 9–22.
10
11 Mol, A. (2002) *The Body Multiple: Ontology in Medical Practice*. Durham: Duke University Press.
12
13 Nafus, D. (2016) *Quantified: Biosensing Technologies in Everyday Life*. Cambridge, MA: MIT Press.
14
15 Oudshoorn, Nelly and Pinch, Trevor. 2005. How Users Matter: The Co-construction of Users and
16 Technology: Massachusetts Institute of Technology.
17
18 Pantzar, M. and Ruckenstein, M. (2015) The heart of everyday analytics: emotional, material and
19 practical extensions in self-tracking market, *Consumption Markets and Culture*, 18, 1, 92-109.
20
21 Roberts, C., Mackenzie, A. and Mort, M. with Atkinson, T., Kragh-Furbo, M. and Wilkinson, J. (2019)
22 *Living Data. Making Sense of Health Biosensing*. Bristol: Bristol University Press.
23
24 Russell, H. (2019) University of Copenhagen students on a mission to create chewing gum that
25 accurately predicts female fertility. *The Guardian*, 10 October [Online]. Available at:
26 [https://www.theguardian.com/society/2019/oct/10/in-search-of-smart-chewing-gum-to-help-](https://www.theguardian.com/society/2019/oct/10/in-search-of-smart-chewing-gum-to-help-women-conceive)
27 [women-conceive](https://www.theguardian.com/society/2019/oct/10/in-search-of-smart-chewing-gum-to-help-women-conceive) [10 October 2019]
28
29 Thompson, C. (2005) *Making Parents. The Ontological Choreography of Reproductive Technologies*.
30 Massachusetts: Massachusetts Institute of Technology Press.
31
32 Throsby, K. (2004) *When IVF Fails: Feminism, Infertility and the Negotiation of Normality*.
33 Basingstoke: Palgrave Macmillan.
34
35 Throsby, K. (2006) The unaltered body? Rethinking the body when IVF fails, *Science Studies*, 19, 2,
36 77–97.
37
38 Viseu, A. and Suchman, A. (2010) Wearable Augmentations: Imaginaries of the Informed Body. In
39 Edwards, J., Harvey, P. and Wade, P. (eds) *Technologized Images, Technologized Bodies*. New York:
40 Bergham Books. pp.161-184.
41
42 Wajcman, J. (1991) *Feminism Confronts Technology*. Cambridge: Polity Press.
43
44 Waldby, C. (2014) Banking time: egg freezing and the negotiation of future fertility, *Culture, Health*
45 *and Sexuality*, 17, 4, 470-482.
46
47 Weschler, Toni. (2003) *Taking Charge of your Fertility. The Definitive Guide to Pregnancy*
48 *Achievement, Natural Birth Control and Reproductive Health*. London: Vermilion.
49
50
51