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Maternal techno-space: Assisted Reproductive Technology (ART) and the ontological construction of motherhood in Thailand

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Abstract

For over 30 years, Assisted Reproductive Technology (ART) has been used to meet the needs of married couples experiencing fertility problems in Thai society. The operation of ART compels us to consider the impact of technology on human nature and how it contributes to the construction of motherhood. The purpose of this article is to introduce a new analytical lens for examining the role of ART in the construction of the human body and motherhood from a post-humanistic perspective. The study used a qualitative methodology and drew samples from infertility patients and ART laboratory work. In-depth interviews, field notes, observations and photographs of tools/equipment were used to determine how the technology works in a laboratory setting within a clinic. The study demonstrated that ART is not only a technique for fixing physical defects in humans, but also a techno-space that shapes the human body to facilitate reproduction and motherhood construction. Spatiality, as performed by ART, denaturalizes and technicalizes the body. As a result, the ontological construction of motherhood takes on a spatial dimension and transcends human nature, resulting in what is referred to as *techno-maternity*.

Introduction

Motherhood is the result of a series of social and biological events. Gender socialization within a particular system of gendered power relations, most notably patriarchy, has an effect on the realization of motherhood. These practices reinforce the gendered hierarchy by designating men as head of household and expecting them to assume leadership roles in public affairs, while women dominate the domestic and reproductive spheres (Whittaker, 2014). According to many Thai women, reproduction is an integral part of motherhood because it represents complete womanhood, completes a family, secures relationships with husbands and stabilizes married life.

However, over 15 percent of married couples of reproductive age in Thailand experience fertility problems (Vichinsartvichai, 2019). Over the last two decades, research on infertility has revealed a variety of negative effects on women, including stress, anxiety and the development of stigma among infertile women (Chaowatthanakun, 2004). Some women choose to solve the problem by adapting in order to free themselves from

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the stress, such as rebuilding their self-esteem (Miadthaisong et al., 2016) or using reproductive technologies to solve the fertility problems (Chiamchanya & Su-angkawatin, 2008).

Assisted Reproductive Technology (ART) was developed to overcome human limitations or to resolve fertility issues in married couples of reproductive age (Inhorn & Birenbaum-Carmeli, 2008). Adoption of ART, like other technologies, is context dependent. In Thailand, the development of ART has paralleled the advancement of scientific and medical procedures. Mung Ming, born in 1987, was Thailand's first IVF-conceived boy. Initially, knowledge about ART was developed in state-owned teaching hospitals before being transferred to the private sector (Whittaker, 2016). At present, the number of ART service users tends to be increasing. Statistics show that from 2001 to 2007, the number of initiated cycles per year rose from 2,481 to 11,717, in line with the increase in the number of ART centers (Vutyavanich et al., 2011).

ART has become the option offered to couples suffering from infertility. The operation of technology has fundamentally altered the ways of reproduction and contributes to the construction of motherhood. Because ART aids in resolving fertility problems caused by human physical limitations and enables the body to perform the function of reproduction while also producing artificial fertilization, the technology calls into question the belief that motherhood is a biological reproduction determined solely by humans. On the other hand, fertilization can occur outside the human body via connections in scientific laboratories.

Literature Review

Motherhood and ART

Motherhood has long been a central focus of feminist scholarship. For feminist scholars, motherhood is not a *natural* state of being for women (Chodorow, 1978; Dally, 1983; Rich, 1976). Rather, it is based on societally determined physical and sexual characteristics that raises women's expectations of motherhood throughout the pregnancy, delivery and childrearing process. Additionally, motherhood idealization, which is perpetuated through social institutions, has created, maintained and legitimized women's subordination (Neyer & Laura, 2011). Thus, in the feminist perspective, motherhood is not a natural state, but a *socially constructed* one.

In addition, social determinism, which is associated with the unequal power of gender relationships and patriarchal structures, also plays a significant role in defining motherhood. Largely, feminist explanations of motherhood focused on subjective analysis that reflected women's thoughts and experiences (Rich, 1976), on the power of scientific and medical discourses to understand motherhood representations (Apple, 1995; O'Reilly, 2010), and on the media's role in determining motherhood representations (Heffernan & Wilgus, 2018).

Assisted Reproductive Technology is another area of concern for feminism because it is one of the factors contributing to the technologization of female reproduction. Feminism has examined ART's ethical, political and personal implications and has criticized its effects on women's pregnancy and childbirth experiences, as well as their agency in relation to technology (Hartouni, 1991; Mahjouri, 2004; O'Brien, 1981; Rowland, 1987; Woliver, 1991). While these studies demonstrate that ART increases women's freedom and empowers them to reproduce, it also puts their bodies at risk of being subordinated to men's power.

Feminist analyses of women's bodily rights and the possibility of influencing how new reproductive technologies are used continue to be significant (Meskus, 2015). However, one frequently overlooked issue is the impact of ART on the human body and ontologically constructed motherhood. This article argues that it is worthwhile to study technological ontology by paying equal attention to the various actors, which include human substances and technological matters, operating within the contexts of ART used to modify and create new bodily processes. This perspective should aid in our comprehension of the various actors involved in the technological operations that construct the human body and motherhood.

Numerous scholars have examined ART ontologically. Thompson (2005), for example, coined the term 'ontological choreography' to refer to the dynamic coordination of various ontological orders that are negotiated, coordinated and worked on in order to come together through ART. Others have focused on the idea of agential multiplicity in medical treatment of ART, for example, the study of feelings as participants in IVF treatment and as components of women's embodied experience (Meskus, 2015), and the temporality of affective embodied experiences of infertility following IVF conception (Helosvuori, 2020).

The circumstances surrounding the operation of ART to create a new human body have necessitated a reconsideration of the ontological question of motherhood. Technology forces us to rethink motherhood ontologically

as a hybrid entity that emerges from a complex relationship with its environment and necessitates an understanding of the relationship between human and non-human entities that collaborate to construct the human body and motherhood (Sharon, 2014). This article takes a fresh look at the impact of technology on motherhood construction. The paper focused on the role of assisted reproductive technology in assisting humans in overcoming physical limitations and creating a new body as a mother. Motherhood, in this view, is not a social construction based merely on unequal gendered power. On the contrary, it is considered as an ontological construction that incorporates multiple entities involved in the operation of ART and how they interact to shape the new body and motherhood.

The purpose of this article is to demonstrate that ART not only corrects physical defects in humans, but also designs the body spatially in such a way that reproduction is enabled by the creation of fertilization space outside the body. The human body is technologically denaturalized in order to construct motherhood. ART modifies the ontological construction of motherhood by moving away from human-centered maternity toward techno-maternity through the incorporation of non-human elements.

ART and the Body

Because it involves the body, particularly the female body, ART is a gendered technology (Konrad, 1998). This assertion reflects the gender relation perspective on the study of ART and women, which views technology as a tool for men to enhance their potential and power, or even to oppress and control the female body. Nonetheless, ART not only reflects the male-female power relationship, but also encourages us to think more deeply about the role of technology in denaturalization and its ability to assist in the construction of motherhood in humans.

Medical technology has a detrimental effect on the reproductive body's inherent abilities and fragments the female body (Lauro, Gilmore, & Halpin, 2007). The body becomes something that can be managed through ART's components and processes, such as ovarian stimulation and egg retrieval, or the reintroduction of blastocysts into the body to enable pregnancy and maternity. The human body is no longer a natural body or an inviolable structure as a result of ART, and technology should not be viewed in isolation from or as a supplement to the human body, but as a determinant of its ontology (Kull, 2002). Thus, an assemblage reproductive body, or so-called techno-body, has influenced the construction of motherhood outside of human ontology, referred to as *techno-maternity*.

ART subverts the polarized thinking that exists between nature and culture, or even between humans and non-humans (Inhorn & Birenbaum-Carmeli, 2008). Haraway (1991), a post-humanist feminist, proposed that the advancement of biological or enhancement technology enables us to recognize the limitation of the classical humanist framework of binary opposition and to rethink the human physical body, as well as to encourage new ideas about the transformed human nature. In other words, techno-science compels us to consider fundamental questions about human nature and value (Sharon, 2014).

Finding answers to questions about the relationship between humans and technology necessitates the development of new analytical tools. The purpose of this article is to describe how ART denaturalizes the human body and creates motherhood through the lens of post-humanism and actor-network theory. The human body is viewed as a composition in the same way that an assemblage object is viewed. This view of the human body reflects the early twenty-first century concept of materialism over culture and meaning interpretation through language, representation and discourse. The interest in materiality prompted a more thorough reconsideration of the rematerializing geography, including objects, materials and the body (Müller, 2015).

Space and Actor-Network Theory

The Actor-Network Theory is a theory that emphasizes objects and bodily assemblages. According to Law (2002) article *Objects and Spaces*, the body is treated as an object in the same way as a vessel, an airplane, a speech or a gesture under the Actor-network Theory. All objects are manifestations of strategic logics that connect and organize the various components. In other words, objects do not exist independently of networks of relations that are associated and flow through networks to form the objects. Any movement of these objects reflects the spatial relationship that contributes to the formation of identity or even distinctions between them.

Thus, according to Actor-network Theory, the "space" of an object or even the body is neither pre-existing nor measurable by metric distance. On the contrary, space is constructed as a "network" and possesses a variety of spatial properties as a result of the association of humans and non-humans, or the so-called "socio-material," in order to construct objects. Thus, space connects the components into a network (topological space) or at the very least makes visible the co-operation of networks in the construction of objects, but not in the conventional sense of pre-existing physical space (Müller, 2015).

As a result, the body, should not be regarded as a prefabricated entity or as a mere representation of the truth. Rather, it should be viewed as a tracing of the functions of the material elements mobilized in order to produce and generate a relational network or space that assists in the construction of the body.

Given the constructability and adjustability of the human body by nature, the critical question is how ART denaturalizes the body and constructs motherhood. The paper addresses this question by tracing ART operations in lab spaces.

ART is referred to in this article as a *techno-space*. Its operation reflects the body's relationships with spatiality, which are formed by networks of relationships between humans and non-humans. These networks are entwined to assist the body in reproducing and moving through multi-scalar spatiality. The paper demonstrates this perspective through an examination of a laboratory and other working spaces in conjunction with operational spaces such as petri dishes, sperm bottles, and even incubators. Additionally, the network's operation is contingent upon the spatial conditions, which include infection prevention, temperature, light and odor control, as well as strict adherence to appropriate operational times.

Since the body is a "thing" composed of a network of material and spatial relationships, motherhood is no longer natural or physically connected to the body. Motherhood, on the other hand, is a spatializing network or a hybridization of human and non-human actors and networks that associate, move and translate the co-functioning of the body's internal and external spaces.

Methodology

The article's central question was how assisted reproductive technology (ART) denaturalizes the body through the construction of the fertilization space and motherhood. Qualitative research methodology was used to determine the answer. The samples were divided into two major groups and then purposively selected. The first group consisted of ten infertile women between the ages of 25 and 45 who used ART. The second group consisted of six experts, including physicians, nurses and scientists, who worked in a private ART clinic in central Bangkok. The data were gathered through participatory observation, in-depth interviews and field notes, as well as observation notes and photographs of tools/equipment taken to the extent permitted. Data collection took place over a six-month period, from March to August 2019.

Result and Discussion

Clinical Operation

Clinical operations began prior to entering the scientific laboratory. They are considered significant because they serve as entry points to the network and aid in the preparation of actors and networks for transfer into the laboratory. The space of clinical operation was divided into two distinct sections. The first section was for *information spatiality*, with different kinds of space representing various types of information, such as instructions, pamphlets and posters, documents, simulated images, statistics, graphs and numbers or even photographs. Mothers benefit from information spatiality when they are able to comprehend fertility problems, comprehend the treatment process, compare costs and learn about doctors' specialties. The researcher ran into "Yo," who had decided to see a doctor at this clinic. Yo explained that she had two previous IVF failures before deciding to seek information from various sources in order to change doctors. "*I have been let down before. I was nervous and stressed this time, before starting over. I attempted to gather more information, and I believe that having enough information will be one of the factors that contribute to our success in having a child.*"

The other section dealt with *classification and examination spatiality*. Numerous techniques were used in this space, including physical preparation with a physician and internal examination using an ultrasound machine. Other networks, including scientists, information, medicines, tools, chemical substances, medical equipment and personal components from patients, specifically blood, eggs and sperm, were brought into collaboration with the doctors. The physical screening space funnels well-prepared actors and networks into the Laboratory space, which is the most critical space because it is where actors and networks are collected, tested, analyzed and selected for placement in the specific spatial circumstance.

Laboratory Operation

Laboratory operations focused on naturalizing space *outside* the body for fertilization and purification using sterile techniques on tools and equipment such as an ultrasonic cleaner, hot air, a HEPA filter, an air shower, a laminar flow hood, an absolute HEPA filter and electronic screening. Additionally, the environment was controlled in specific spaces such as ovarian fluid tubes, petri dishes

for egg and sperm fertilization and embryo culture and Planer BT37 incubators in order to achieve the appropriate temperature and environment to simulate the natural state of the human body, including time control.

The Hormone Room and Andrology Laboratory were used to classify, test and analyze the vital components of male reproduction, namely blood and sperm. Transferring these components into these spaces necessitates the use of networks comprised of containers such as tubes, petri dishes, bottles and incubators, which are also useful for transferring components between test stations. Acceptance of components for further transfer (e.g., blood and sperm that pass the test) and rejection of components (e.g., blood and sperm that fail the test and are about to be discarded) are also clearly visible during the test. As a result, several tools are used in conjunction with one another and are subject to the appropriate temperature requirement.

If the male's sperms are found to be weak or abnormal, the test results will be used in conjunction with the treatment space once more. The doctor may need to test the sperms and select those that are strong and in good condition in sufficient quantity, before injecting them into the uterus cavity via a tube inserted through the cervix. The sperms are delivered inside and can meet the eggs more easily, resulting in "natural" fertilization or what is referred to as "assisted in-vivo fertilization" via Intrauterine Insemination (IUI). This method of treating infertility is relatively simple and inexpensive, with a high chance of pregnancy.

Assisted in-vivo fertilization using the technical method described above may be ineffective in severe genetic defects, particularly in married couples where the female has problems with both fallopian tubes or has endometriosis, or where the male has a low sperm count or whose cause of infertility cannot be determined. In this case, the doctor will use a "assisted in-vitro fertilization technique," in which fertilization occurs outside the body and the zygote or blastocyst is then returned inside.

The process of assisted in-vitro fertilization begins with human reproductive cells, specifically eggs and sperms. Thus, eggs are drawn into the technical network and must undergo the same tests as sperms. Quantitative and qualitative egg testing are processes that require collaboration between the human body and laboratory environments. The doctor assists in the preparation of the female body. Certain tools and medications are used to regulate the body hormones that affect the ovaries and induce ovulation on a predetermined schedule. Meanwhile, the doctor uses vaginal ultrasound to monitor the growth of eggs within the body.

In such space, several tools are used concurrently and under strict temperature control during the egg collection stage for testing. After collecting the eggs, they are placed in a culture dish along with the culturing agent. A plate warmer regulates and maintains the temperature in the dish at 37 degrees Celsius. To see the eggs in the dish, the lab lights must be turned on and a beam of light focused exclusively on the dish must be used. The scientists use stereo microscopes to determine whether eggs are available and in what quantity, as well as which ones are mature enough to be fertilized by sperm. The egg is then cultured for 4 to 6 hours in the culturing agent within an incubator at a temperature of 37 degrees Celsius, awaiting fertilization with the sperm. At this point, the scientists must coordinate their efforts with the Andrology Laboratory team, which is responsible for examining the husband's sperm collected on the same day as the wife's egg collection. The sperm quality must be re-evaluated to determine whether conventional in-vitro fertilization (IVF) can be used or whether intracytoplasmic sperm injection (IVF-ICSI) is required.

As with conventional IVF, the IVF-ICSI process begins with egg and sperm preparation. At the fertilization stage, however, the scientist drops PVP (Polyvinylpyrrolidone) into the dish to mix with the nurturing agent. PVP causes the sperms to swim more slowly. The scientist then uses the Micromanipulator System ICSI Machine, which includes a tube for extracting strong sperm and injecting them into the nucleus of each egg to increase the likelihood of fertilization. They then await further development via cell division in order to form a blastocyst. The development of blastocysts during laboratory operations is quantified using a blastocyst scoring system. Techniques such as Time-Lapse Monitoring (TLM), which involves monitoring the blastocyst through multiple time-lapse images without removing it from the incubator, are used to ensure its survival for an appropriate period before it is implanted in the uterus.

The study of the scientific laboratory demonstrates that laboratory spaces are segmented for distinct functions and are technologically and environmentally controlled. The operations are designed to screen actors in order to facilitate in-vitro fertilization and the subsequent generation of a blastocyst. The blastocyst conceived through in-vitro fertilization is the result of cooperation between objects that flow and move back and forth within the network, beginning with the blood, eggs and sperm being extracted from the body and then stored within objects before being forwarded to the laboratory space for testing. Additionally, the testing area is clearly divided to

denote which areas are responsible for testing blood, eggs, and sperm, respectively. Following that, numerous actors and networks are involved, including both humans and non-humans in the form of objects. These objective elements are used to collect and test actors and then to transfer them to the fertilization space in order to create the blastocyst, which is then transferred to the petri dish for growth.

Cooperation between networks in collecting and transferring components within the network of relations reflects the spatial relationship involved in fertilization outside the human body. The technological operation, however, does not end with the establishment and nurturing of blastocysts in the laboratory. The blastocyst must still be removed and reintroduced into the human body for further development.

Implantation of the blastocyst into the human body is the process of reintroducing the technological result into the human body space. The body must be prepared, and the uterus adjusted to allow for the transfer and embedding of the blastocyst. The goal is for the blastocyst to implant successfully in the human uterus. All these spaces, both inside and outside the human body, are managed and reconditioned to be reproductively compatible and are subject to spatial conditions. Negative emotions related to infertility treatment, such as fear, pain, anxiety, disappointment or indignation are common among participants in the treatment process, as an informant stated about her own feelings. *"I have had IVF more than ten times. I am nervous because I have been let down so many times in the past. I am terrified and worried about the drug injection. The smell of the drug makes me sick. I became tired and gave up once, but I returned to fight until I am successful. I believe it is my obligation to the family. My parents are desperate for me to have a child."*

Success with ART requires collaboration from a variety of networks and is also case-specific. One of the informants was named "Remy." Remy believed her physical defects were the cause of her infertility, and she had spent the last three to four years treating them with IVF five times and also requested a switch to IUI twice in the hope that those treatments would result in pregnancy. Remy, however, continued to be unsuccessful following the adoption of ART, and the effects of technology, such as feelings of pain and hopelessness, linger. *"I have been through a lot of physical pain with no success. I have always gotten what I wanted in my life. Now I am in pain and hopeless."* Additionally, Remy's story demonstrates that a successful pregnancy requires components with comparable potentials to cooperate. While technology can provide hope for humans, when physical health problems prevent pregnancy, technological body construction cannot succeed.

Conclusion

ART, as a techno-space, transforms the human body into an assemblage of spatial relationships that are adaptable to the components involved. In other words, technology has entangled motherhood reproductivity with space or spatial ontology, as the body can become pregnant even when it is not determined solely by humans. On the contrary, the heterogeneous element of ART is the grafting of a thing's properties and processes onto those of another thing. Thus, when the body and technology are combined to induce pregnancy in a woman, the instruments' properties and processes are annexed to the body parts in a way that makes pregnancy possible (Thompson, 2005). The human body can be designed, constructed and decoupled from the established spatial network relationship. ART divides the body into distinct components that are then reconstructed as "multiple bodies" (Mol, 2002) composed of blood, organs, liquids, technologies, tools and knowledge, as well as the implanted blastocyst. Thus, the human body is made up of both physical and non-physical components. Haraway (1991) discussed female reproduction in the context of technology, stating that technology transforms the female body into a "posthuman figure" or "cyborg," and that the human body is an organism coexisting with machine, and that this coexistence of body and machine enables human beings to perform the reproductive duty.

As a result of ART, the natural state that underpins motherhood is altered. The body and motherhood are no longer natural and human-centric concepts; they are relegated to the realm of space-making, involving non-human elements. Thus, pregnancy in this technological space is distinct from natural pregnancy, as it is constructed through biological processes and material elements. The relationship is visualized through movement and circulation on a multi-scalar spatial scale.

Motherhood's human-centric perception has been transformed into "techno-maternity," which transcends human ontology. In other words, technology transforms the traditional definition of motherhood, which was bound to gendered humans, into a "thing" grounded in hybridity and contingency. It is composed of subjective and objective networks, is formed from within and without, is biologically and emotionally felt and is scientifically determined. They are inherently uncertain, as they depend on the context in which they are located or

the way they are expressed at the time, i.e., which components are gathered to involve and co-function. Techno-maternity is a matter of spatiality in this case, as it is constructed via body management in order to facilitate reproduction. Additionally, it is a matter of relativism. That is, not everyone experiences such techno-maternity in the same way. On the contrary, the way techno-maternity is constructed in an individual at a particular point in time may be unique. Obviously, reproductive technology is irrelevant to someone who desires to be a mother and is physically capable. However, for someone experiencing infertility, technology becomes a significant actor in the relationship, influencing how motherhood is constructed.

Apart from being contextualized by individualism, techno-maternity reflects the dynamics of constructed times. Motherhood is not a fixed or static relationship in this context. Rather than that, it is a relationship that allows for observation of mobility and adjustment. As can be seen, reproductive technology is critical for an infertile woman who wishes to conceive, and its adoption transforms maternity into a matter of spatial ontology. After the pregnancy, the technology's effects linger, such as physical pain and feelings of hopelessness or even success (Helosvuori, 2020). There is a continuum of motherhood in space and time, possibly even prior to visiting IVF clinics, regardless of the success of the operation.

Techno-maternity is neither fully stabilized nor ready-made. It is built in the manner of a relational network. Its existence is contingent upon the dynamics of actor-networks with diverse ontologies, such as physicians, objects, information, things, tools and infrastructures, which are gathered to contribute to the construction at various points in time. As a result of these characteristics, techno-maternity is destined to be a complex and uncertain relationship that is perpetually mobile, dynamic and changing. Within this relationship context, no single actor has monopolized the ability to construct motherhood. In other words, nothing, not even the human being who will be the mother, possesses the exclusive ability to construct motherhood.

Human beings do not have the capacity to act alone as agents. That is because motherhood is always the result of a network of relationships woven from various ontologies, both human and non-human. While ART may provide an option and opportunity for the infertile human body, the option does not always result in success because the construction of motherhood requires cooperation with other factors such as physical potential, discourses and regulations, money, the technique used, family support, emotions and feelings. The success of ART, which results in the pride of having fulfilled all a daughter's and wife's obligations, serves to emphasize the importance of the mainstream ideology of motherhood, which is still valued and recognized in society.

Conflict of Interest

There is no conflict of interest.

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