The neuroethics of surrogacy

La neuroética de la gestación subrogada

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Abstract

Concerns over the commodification of life posed by commercial gestational surrogacy often overshadow the discussion on the forms of surrogacy that are not commercial. Moreover, discoveries of the neurosciences and empirical evidence on the possible psychological damage on the mother-child binomial are seldom considered when discussing the permissibility of surrogacy. In this pilot study I made a review on the available literature about the impact of perinatal neurophysiology on maternal-child bonding and empirical psychological evidence, inquiring whether surrogacy could be proven to damage the binomial, rendering it unethical from a personalist neuroethics approach. Recent studies on the neural and hormonal pathways leading to maternal bonding do suggest an association between it and maternal psychological well-being overall. However, empirical translational evidence on the clinical implications of surrogacy arrangements on both the gestational carriers and the children was limited and inconclusive. Further studies are necessary to make a conclusion regarding this subject.

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1. Introduction

Surrogacy is the oldest assisted reproduction technique. Its documented history goes back as far as the Bible's Old Testament, when Hagar begot Ishmael with Abraham after his wife, Sarah, failed to conceive (1). Nevertheless, it was not until the controversial case of *Baby M* that widespread interest and ethical debate on this technique was sparked in modern times. In 1985 a married couple from New Jersey, who were unwilling to conceive since the wife suffered multiple sclerosis –a condition that would have entailed a high-risk pregnancy– entered into a surrogacy contract with a woman who was willing to be impregnated through artificial insemination using semen from the intended father, carry the foetus to term, and later deliver it to the couple, in exchange for 10,000 USD. *Baby M* was born on March, 1986 (2). The case brief published by the Supreme Court of New Jersey narrates the subsequent events:

Mrs. (gestational carrier) realized, almost from the moment of birth, that she could not part with this child. She had felt a bond with it even during pregnancy. Some indication of the attachment was conveyed to the (intended parents) at the hospital when they told Mrs. (gestational carrier) what they were going to name the baby. She apparently broke into tears and indicated that she did not know if she could give up the child (2, p. 415).

After the gestational carrier refused to relinquish the baby, the intended parents filed a complaint and later entered the gestational carrier's home aided by the police seeking the enforcement of the surrogacy contract. The gestational carrier's husband fled with *Baby M,* who was handed to him through a window while the police were executing the search order. The gestational family later fled to Florida with *Baby M.* Eventually the intended parents discovered where they had fled, and obtained a legal order requiring the

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gestational family to turn over the child. After these events took place, the Supreme Court of New Jersey ruled in favor of the gestational carrier, invalidating the surrogacy contract because it conflicted with the law (2).

Ever since this event, much has been said on the ethics of commercial and transnational gestational surrogacy. Arguments regarding the autonomy, informed consent, reproductive equality, and commodification of life are usually wielded in the debate on the moral permissibility of commercial surrogacy (3-9). However, there is remarkably less literature on the ethical question of altruistic surrogacy. Moreover, scientific evidence on the possible effects that surrogacy could bring on the carrier-child binomial from a neuropsychological perspective is seldom taken into account. The purpose of this pilot review is to consider the question of altruistic surrogacy from a personalist and neuroethical approach, inquiring whether recent discoveries about the impact of perinatal neurophysiology on maternal-child bonding and empirical studies on the possible psychological effects on the mother-child binomial provide evidence that surrogacy damages the mother-child binomial, rendering it unethical.

2. Hypothesis

The main hypothesis of this pilot research is the conclusion stemming from the following arguments:

a) The emotional bond between the gestational carrier and the product of conception is a natural and physiological phenomenon, not merely a social construct or gender role.

b) By separating this natural and physiological bond, surrogacy causes psychological damage on both the gestational carrier and the product of conception.

c) Moreover, surrogacy entails unnecessary medical risks for both members of the mother-child binomial.

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d) Therefore, altruistic surrogacy could be rendered unethical from a personalist and neuroethical perspective because it damages both physically and psychologically the mother-child binomial by unnecessarily exposing it to increased medical risks and by breaking the physiological mother-child bond as evidenced by recent discoveries on the neurophysiology of maternal bonding.

3. Materials and methods

A qualitative bibliographical review was performed. The sources used for the literature search were taken from five databases (*Science Direct, NCBI, Google Scholar, Springer and EBSCO*) from September through November 2020, in both English and Spanish, using the following keywords: *altruistic surrogacy, neuroethics, motherhood, oxytocin, post-partum depression, separation anxiety, brain imaging, and bonding*. Articles written exclusively on commercial surrogacy were excluded from this review.

4. Results

Most of the articles found using the inclusion and exclusion criteria were mainly focused on the ethics of commercial and transnational surrogacy, though most of them treated the topic of altruistic surrogacy as well. Others spoke about the physiological role of oxytocin and other neural, hormonal and non-hormonal, pathways of maternal bonding during pregnancy and lactation, and other important features of the neurophysiology of gestation. No publication was found on the specific topic of the neuroethics of gestational surrogacy.

4.1 Ethical considerations

Papers that favored altruistic gestational surrogacy as ethically valid were centered on the questions of bodily autonomy, informed

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consent, and non-discriminatory reproductive justice. According to Oakley (3), arguments against surrogacy based on the claim that the gestational carrier cannot autonomously consent to surrogacy because she does not fully know the future emotional responses she might have in the moment of relinquishing the child are not valid, since informed consent does not require having this kind of information about one's future emotional states.

Gunnarsson (4) addresses a dilemma between reports of the Swedish National Council of Medical Ethics and an investigation conducted by the government of Sweden which arrived at different conclusions when considering the issue of bodily autonomy versus self-determination in the topic of surrogacy. The Swedish National Council of Medical Ethics suggested the foregroundedness of the autonomy of the intended parents on the foetus as long as the gestational carrier has autonomous and altruistically entered into the agreement, while the Swedish government investigator granted more rights to the gestational carrier on the basis of the *mater est* law, which states that the gestational carrier of a child is the one who has the ultimate rights and autonomy on her body and the child, and therefore deemed surrogacy illicit.

In Gunnarsson's view, the solution is not in the strict adherence to any of these two principles, but in an option that respects both the rights of the intended parents over the child and the autonomy of the mother over her own body as any other pregnant woman. According to the author, when the right of the intended parents is considered more important than the autonomy of the gestational carrier (kinship grammar of parental intent), it would constitute a form of oppression. However, if the *mater est* law were imposed as an 'essentialist' and normative view of motherhood (kinship grammar of gestation) it would be incompatible with «an intersectional, queer and non-discriminatory approach to reproductive justice» (4, p. 66) and respect for the reproductive vulnerability of involuntarily childless people. For this reason, the author proposes moving beyond the «strict norm» that a child can have maximum two pa-

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rents, creating a «queerer» kinship grammar and more inclusive ways of reproducing and creating families.

Opponents of altruistic surrogacy argued mostly from a perspective of autonomy and informed consent, but also from the physiological bond created by gestation, the increased risk of medical complications for both the gestational carrier and the child, and the necessary commodification of the persons involved in the transaction. Tieu (5) and Al-Adib (6) both claimed that the physiological and psychological response triggered by the secretion of oxytocin and other neurotransmitters creates a bond that is broken by surrogate pregnancy, making it unnatural and thus unethical. Besides, argues Al-Adib (6), surrogate pregnancy poses an unnecessary increase of adverse risks both on the gestational carrier and the child.

Schurr and Militz (7) claim that, whether it is commercial or altruistic, surrogacy always involves a process of commodification and mercantilization, in which both the gestational carrier's body and the child become a product for consumption in an «affective economy». The reason for this is that surrogacy arrangements always imply a persistent process of affective and effective detachment between the gestational carrier and the relinquished child, in order to assign market value to the latter. Schurr (8) explains how the surrogacy and reproductive medicine market can be commodified for eugenic and racial motivations by reporting on the surrogacy market in Tabasco, Mexico: *While the normal egg donors earn about 500 USD, the VIP egg donors are paid 1,200 USD. Depending on the characteristics of the donor –including physical appearance, body mass index, and education– an international donor can cost up to 50,000 USD* (8, p. 251), normal donors being *mestizo* Mexicans, VIP donors being *white* Mexicans, and international donors being mostly *European*.

To what extent the baby, resulting from transnational surrogacy arrangements is commodified hence depends on the intensity of affective ties between the reproductive laborers and consumers, and on the effective detachment of the baby from his/her reproductive laborers. Hence, it is not the legal framework

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of the market, be it altruistic or commercial, that defines whether a baby is commodified, but rather the intimate choices of the members of these world families and their demarcating practices (7, p. 1641).

Anleu (9) responding to whether the absence of monetary exchange in a surrogacy arrangement would rule out exploitation, argues that these imply family pressures and emotional manipulation, which would nullify autonomy and would be as exploitative as contractual relations.

4.2 Findings on the physiology of maternal-foetal bonding

Oxytocin and neuro-hormonal pathways

Oxytocin is a neuropeptide hormone produced in the supraoptic and paraventricular nuclei of the hypothalamus and secreted by the posterior hypophysis (10). Although it is best characterized for its role in lactation and uterine contraction induction during birth, oxytocin is increasingly recognized for its impact on behavior (11). It is thought to be responsible for establishing and maintaining parent-infant bonding, social affiliative behaviors, attention and perception to social information, and social recognition via bio-behavioral feedback loops and projections into the limbic brain, including the amygdala, ventral striatum, nucleus accumbens, and midbrain. In humans, peripheral oxytocin has been linked to empathy, closeness, and trust, besides playing an important role in bonding by lowering stress, increasing trust, and integrating psychological and physiological states of calmness and approach. Mother-infant touch and contact has been shown to stimulate oxytocin release, linked to traits such as rewarding behaviors, emotions and physical sensations when interacting with infants (10).

According to Augustine *et al.* (11), in non-pregnant women under basal conditions, circulating oxytocin levels are relatively constant, but they rise progressively over the course of pregnancy, with large pulses evident during birth. The neural oxytocin system un-

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dergoes remarkable plasticity over the course of pregnancy to favor burst firing during birth and lactation, which includes changes in the morphology and functioning in oxytocinergic neurons, in their surrounding astrocytes, and in their afferent inputs (11). When interacting with their infants, mothers with secure attachment representations and positive relationship attributes produce oxytocin, stimulating the direct projection of the oxytocinergic system to the ventral striatum and dopamine release, thus perceiving the interaction with the young as more rewarding (10) setting the beginning of the bonding relationship between mother and child.

Numan and Young (12) compared neural mechanisms of mother-infant bonding in rats, sheep, and prairie voles. They showed that oxytocin release into certain nuclei in the brain boosts maternal motivation and attraction to young at parturition and promoted synaptic plasticity so that maternal attraction to young persists throughout the postpartum period in the absence of continued pregnancy hormone stimulation. In species of mammals that form selective attachments to particular young, oxytocin action may participate in the neural plasticity mechanisms that regulate the development of selective recognition. According to Olazábal (13) oxytocin has been associated with changes in maternal mood and stress in humans. Low serum oxytocin levels during mid-pregnancy predicted symptoms of postpartum depression two weeks following birth. It was proposed that oxytocin was implicated in stimulating mother's well-being and in reducing anxiety during mother-offspring interaction.

Eapen *et al.* (10) found that anxious attachment in pregnancy had both direct and indirect (mediated via separation anxiety and depression) association with serum oxytocin levels postpartum, suggesting that the inherent attachment style of the mother and its relationship with symptoms of separation anxiety are central to the impact of depressed mood. Reduced serum oxytocin levels have been documented in mothers with lower maternal-foetal attachment

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scores, postpartum depression, and cocaine-addiction. Further, oxytocin release has been demonstrated to be inversely related to stress and plasma cortisol levels (10). In a systematic review by Thul *et al.* (14), which revised twelve studies focused on the relationship between endogenous oxytocin and post-partum depression, eight studies suggested an inverse relationship between plasma oxytocin levels and depressive symptoms, two found no significant relationship, one found a change of oxytocin trajectory, rather than absolute value, significant, and one found a positive rela-tionship between serum oxytocin and post-partum depression (14).

Non-hormonal pathways

Besides the role of oxytocin, other physiological and medical discoveries on physiological mechanisms of binding independent of hormones have contributed to the better understanding of the gestational process. Hoekzema *et al.* (15) discovered that pregnancy renders substantial changes in brain structure, primarily reductions in gray matter volume affecting the anterior and posterior cortical midline and specific sections of the bilateral lateral prefrontal and temporal cortex, regions that play a key role in social processes and cognitive components of the human association cortex subserving social cognition. Furthermore, the gray matter volume changes of pregnancy predicted measures of postpartum maternal attachment, suggestive of an adaptive process serving the transition into motherhood, which endured for at least 2 years post-pregnancy.

Stolzenberg and Champagne (16) reviewed the non-hormonal bases of maternal behavior. Hormonal stimulation is not *sine qua non* to induce the onset of maternal behavior in rats, but non-hormonal and hormonal pathways inducing maternal behavior are distinct processes that are mediated by overlapping mechanisms. Rats that did not experience pregnancy but were exposed to pups exhibited maternal behavior towards them within 10-15 days of exposure, suggesting the existence of neural pathways for caregiving

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behaviors independent of hormonal stimulation. This also suggests that experience with pups has an epigenetic impact in neuronal plasticity, through pathways that are not yet fully described (16).

The role of epigenetics

According to Loike and Fischbach (17), the discovery of microchimerisms –that is the bidirectional maternal-foetal exchange of cells– has made clear that the gestational carrier is not merely a host mother that lends her uterus. Despite carrying a genetically unrelated fetus, the gestational carrier leaves a lifelong genetic fingerprint in the child and her epigenetics may eventually contribute to future medical risks or benefits for him or her.

4.3 Findings on the psychological damage

As for the psychological impact on both the gestational carrier and the relinquished child, less information is available. A bibliographical review by Ciccarelli and Beckman found scarce empirical research on the topic and that many of them were small sample studies with less than 30 gestational carriers. They found that occasionally women regretted their decision to become a surrogate, though they claimed it was unclear whether the dissatisfaction stemmed from the surrogacy process itself, the lack of therapeutic and preventive interventions, or both. They concluded that the literature on surrogacy revealed a lot of discussion regarding its ethical, moral, legal, and psychological implications, but limited empirical data on the psychological and social aspects to provide empirical evidence as a foundation for counseling (1).

In a prospective, longitudinal, cross-sectional study by Lamba *et al.* (18) in which they interviewed 50 surrogates and 69 expectant mothers during pregnancy and 45 surrogates and 49 expectant mothers post-birth, the results showed that surrogates had higher levels of depression compared to the comparison group during pregnancy and post-birth ($P < 0.02$) and interacted less with and

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thought less about the foetus, but adopted better eating habits and were more likely to avoid unhealthy practices during pregnancy ($P < 0.05$). However, no associations were found between greater prenatal bonding and greater psychological distress during pregnancy or after the relinquishment of the child. Imrie and Jadva (19) interviewed 34 women who had completed a total of 102 surrogacy managements seven years prior to the interview, and they found that most surrogates showed no psychological health problems at the time of data collection as assessed by their questionnaire measures.

Golombok *et al.* (20) examined children in 30 surrogacy families, 31 egg donation families, 35 donor insemination families, and 53 natural conception families in a longitudinal study of psychological adjustment, and showed that children born through gamete donation did not differ overall from naturally conceived children, but surrogacy children showed higher levels of adjustment problems than children conceived by gamete donation at age 7, *suggesting that the absence of a gestational connection between parents and their child may be more problematic for children than the absence of a genetic relationship* (20, p. 7). Söderström-Anttila *et al.* (21) conducted a meta-analysis in which they concluded with very low quality of evidence that *Most surrogate mothers are within the normal range on personality tests. Most psychosocial variables were satisfactory, although relinquishing problems sometimes occurred* (21, p. 268).

4.4 Findings on the increased medical risk

According to Simopoulou *et al.* (22), surrogacy and its association with *in vitro* fertilization entails risks during preimplantation, prenatal, and neonatal periods. Nevertheless, the risks posed by surrogate pregnancy are not significantly different from those of *in vitro* fertilization techniques overall. A retrospective cohort study by Woo *et al.* (23) that claimed to be the largest study of its type to its

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date, evaluated 124 gestational surrogates who achieved a total of 494 pregnancies, and reported the following outcomes:

Surrogate births had lower mean gestational age at delivery (38.8 +/– 2.1 vs. 39.7 +/– 1.4), higher rates of preterm birth (10.7% vs. 3.1%), and higher rates of low birth weight (7.8% vs. 2.4%). Neonates from surrogacy had birth weights that were, on average, 105 g lower. Surrogate births had significantly higher obstetrical complications, including gestational diabetes, hypertension, use of amniocentesis, placenta previa, antibiotic requirement during labor, and cesarean section (23, p. 1).

5. Discussion

5.1 Neurophysiology, psychology, medicine and translational impact

Based on scientific studies involving neuroimaging, neurophysiology, neuroendocrinology, and behavioral studies, on both experimental animal models and human models, evaluating both hormonal and non-hormonal pathways of maternal bonding, it is evident that the mother-child bonding is a natural and physiological phenomenon (10-17), irreducible to a mere social construct or gender role. Moreover, evidence suggests an association between positive attachment representations and relationship attributes and maternal psychological well-being overall (10). Nevertheless, the mechanisms of the pathways responsible for these bonds and the ways these can be affected by different behavioral alterations still need to be studied in depth. Furthermore, it is unclear how these findings have a clinical and translational impact in the psychological well-being of the mother-child binomial.

In 2005 Ciccarelli and Beckman (1) found that evidence on the psychological consequences of surrogacy was limited. This appears to still be the case nowadays since empirical research on this topic is scarce and of low quality, probably due to lack of interest

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on this issue. All studies regarding this have small sample sizes and severe methodological limitations (18-21). For this reason, the possibility of there being an increased risk of psychological damage inflicted upon the mother-child binomial through gestational surrogacy could be neither proven nor disproven in this review.

With regards to the increased medical risks associated with surrogacy, it is reported that surrogacy entails at least the same risks as *in vitro* fertilization techniques overall. Surrogacy thus poses increased risks for preterm birth, low birth weight, gestational diabetes, gestational hypertension, use of amniocentesis, placenta previa, antibiotic requirement during labor, and cesarean section (22-23). The fact that surrogacy is an invasive and non-therapeutical procedure performed on a healthy individual that entails increased medical risks, while there exist other alternatives to conceive or foster a child, further puts in question the proportionality of the medical act of gestational surrogacy.

Future discoveries on the role of microchimerisms and *in utero* epigenetics on the mother-child binomial may both increase our knowledge of the physiological implications of surrogacy and also open new ethical and anthropological debates on the definitions of parenthood (17). Weighing the impact of epigenetics as we obtain more evidence about it, could challenge our conception of motherhood relying mainly on the provision of genetic material, as well as provide a new empirical basis for the *mater est* law.

5.2 Personalist neuroethical judgement

The final verdict on the ethical permissibility of altruistic surrogacy in the reviewed papers usually depended on the moral weight assigned to reproductive justice and equality versus the bodily autonomy and integrity of the gestational carrier and the naturality of the carrier-child bond (3-9), as well as on the concern about whether or not the altruistic nature of the act would render the affective

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commodification and manipulation of both the gestational carrier and the relinquished child licit (7-8). However, the approaches proposed for judging the moral act of the present pilot study are those of personalist bioethics and neuroethics, which have their own orienting principles and methodological structure for addressing such dilemmas.

Personalism, at least in its ontological variant, proposes that human rights are grounded on the intrinsic dignity of the person, which is considered to be universal and inalienable, and that a person is always an end in himself/herself (also known as the categorical imperative), and cannot be considered as a means to something else. Its main principles, organized in a hierarchical order, are: the defense of physical life; the principle of totality (also known as the therapeutic principle); the principles of freedom and responsibility; and the principle of solidarity and subsidiarity (24).

On the other hand, neuroethics is a relatively novel and increasingly important branch of bioethics concerned with the ethical implications of neuroscience research findings, as well as the neurological bases of ethical thought and behavior. It encompasses theoretical, empirical, practical and policy issues at the intersection of neuroscience and bioethics, and it raises questions about the biological basis of personality and social behavior, and the role of neurobiology in decision-making. One of the tools used by neuroethics are brain imaging techniques, such as functional magnetic resonance imaging, which open the possibility of obtaining measurements of biological correlates of complex human behavior, such as existential thought and decision-making, moral social judgment, etcetera, and the mechanisms that underlie emotion, values, and thought (25). Personalist neuroethics therefore evaluates the discoveries and ethical implications of the neurosciences, as well as the neurological bases of ethics, from the personalist perspective.

From a personalist approach, altruistic surrogacy would violate the principle of totality, since it is a disproportionate and invasive medical procedure that entails increased risks, it is carried out on a

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healthy individual, and there could be better alternatives to solve the problem of being unable to conceive or to carry a pregnancy to term. Moreover, using the gestational carrier as a means to obtain an offspring would violate the categorial imperative. Even if one argued that surrogacy would be an act of solidarity and reproductive justice towards those who, through no fault of their own, are unable to have offspring, and even if a «just compensation» and coverage of medical expenses were offered (while keeping the arrangement altruistic), surrogacy would not be justified since justice due to the gestational carrier, the offspring's right to having parents, the unity of marriage and the parental bond, are values anterior and axiologically more important (26) than the contractual nature of a surrogacy arrangement.

An ontological personalist ethical system, that presupposes the existence of a human nature and a purpose or *telos* according to which one must act in order for one's actions to be deemed as ethically correct, would use the tools of neuroethics as a source of information about the objective neurological bases of human ethical behavior and thus the moral dimension of human nature. Given the overwhelming evidence that the mother-child binomial undergoes significant physiological and affective adaptive changes and development of functions in order to facilitate the nurturing and upbringing of the offspring, one can deduce that these functions have a purpose and are a part of human nature and its fulfillment. From this perspective, one could affirm that the mother-child bond in itself has an axiological weight that must be considered when judging and making decisions in clinical practice, investigation, policy making, and legislation. Even though in the present study the clinical psychological impact of surrogacy on the binomial could not be fully understood and thus exposed as a translational tool in the argument about surrogacy, this theoretical framework could be used to argue that surrogacy can be regarded as unethical from a personalist perspective stemming from a neuroethical basis.

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6. Conclusion

The claim regarding the neurophysiological nature of the mother-child bond was supported by scientific evidence. Furthermore, evidence does suggest an association between certain attachment representations and relationship attributes and maternal psychological health, though the translational and clinical implications of these discoveries are unclear. Moreover, the existence of an increased risk of medical complications for the carrier-child binomial in gestational surrogacy arrangements was verified. This provides a basis for a negative judgement on surrogate pregnancy from the perspective of personalist neuroethics since it separates a natural affective and physiological bond, it poses an unnecessary increase in risks for the binomial, and it commodifies both the gestational carrier and the product of conceptions as means to an end.

However, the hypothesis of the present study could not be fully proven because the claim on the psychological damage inflicted upon the mother-child binomial was neither supported nor refuted by evidence. Articles on this topic reached contradicting conclusions, and all had insufficient sample sizes and several other methodological limitations. This makes evident the necessity for further field studies with larger sample sizes and better methodological quality, and would justify the conducting of a longitudinal multicenter study on the psychological outcome of gestational carriers and children conceived through surrogacy in order to prove or disprove the hypothesis of this pilot study. Nevertheless, the aforestated argumentation on the ethical illicitness of surrogate pregnancy from a personalist and neuroethical perspective provides a theoretical framework to argue about the issue, that could eventually be supported by empirical translational psychological evidence.

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