Wah Academia Journal of Social Sciences
Volume 4, Issue 2, Dec 2025, pp. 404-423
ISSN – E 2958-8731 P 2958-8723
https://doi.org/10.63954/WAJSS.4.2.20.2025

The Epistemic Gaps in Thomas Verny's Theory of Prenatal Psychology: A Critique and Current Reflection

Dr. Lenin José Torres Silva[1]

Abstract

This article examines the epistemological gaps in Thomas Verny's influential theory of prenatal psychology, particularly in his seminal work, The Secret Life of the Unborn Child. Although Verny was a pioneer in underscoring the importance of the intrauterine environment in emotional development, his theory presents significant limitations when contrasted with contemporary developmental neuroscience and molecular biology. The study employs a critical conceptual analysis framework, contrasting Verny's central hypotheses with high-impact, peer-reviewed literature selected using rigorous inclusion criteria (longitudinal studies and the use of objective biomarkers). Key gaps identified include: the scarcity of robust empirical evidence supporting claims about conscious fetal emotional perception (contradicted by the developmental timetable of the thalamocortical pathway), the lack of integration of genetic and epigenetic factors (failing to account for placental cortisol mediation and NR3C1 methylation), and the underestimation of cultural and socioeconomic diversity (overlooking the role of social determinants of health in toxic stress exposure). The results suggest that prenatal psychology must advance toward a multidisciplinary, biopsychosocial model, prioritizing longitudinal research with objective biomarkers (fetal neuroimaging and epigenetic analysis). It is concluded that while Verny's theory was crucial for raising public and clinical awareness, a comprehensive theoretical and clinical update grounded in mechanistic, inclusive scientific research is required to ensure the field's academic validity and reduce the risk of maternal culpabilization.

Keywords: Prenatal psychology, Prenatal bonding, Fetal emotional development, Epistemological gaps, Perinatal mental health, Fetal neuroscience

[1] Independent Researcher, Author, and Lecturer – USA

Introduction

Thomas Verny was a Canadian psychologist who gained prominence for his research in prenatal psychology. He was one of the first to highlight the importance of the emotional environment during pregnancy on the child's psychological and emotional development. His most influential work, The Secret Life of the Unborn Child (1981), argued that the fetus was not a passive being in the maternal womb but possessed consciousness and the capacity to feel and respond to emotional stimuli. Verny argued that emotional and psychological factors during pregnancy, such as stress and maternal interactions, could have a significant and lasting impact on the child's emotional well-being, both during early development and throughout life (Verny, 1981).

In his theory, Verny adopted an ecological and holistic approach to pregnancy, considering that fetuses were exposed not only to physical influences but also to the effects of maternal stress and other emotional factors, such as the mother's anxiety or depression. According to this perspective, fetuses were capable of perceiving not only chemical and hormonal changes but also their mothers' emotions and mental states, which had important implications for their emotional and mental development. This became a fundamental area of Verny's theory: emotional transference during pregnancy.

Verny was also known for his contributions to the field of prenatal bonding and for his work on the impact of the fetus's emotional experiences on its subsequent behavior, suggesting that early interactions during pregnancy can influence the development of attachment patterns and emotional regulation in the child in adulthood (Verny & Kelly, 2000). His work was key to recognizing the importance of maternal mental health for the child's well-being, an approach that had a significant impact on the field of perinatal psychology and in clinical practice related to early attachment.

Throughout his career, Verny advocated integrating prenatal psychology with other disciplines, such as medicine, neuroscience, and developmental biology, and suggested that a deeper understanding of pregnancy required collaboration among professionals from multiple fields. His work influenced numerous researchers who explored the impact of prenatal stress, fetal perception, and fetal neuroscience on the child's later development, which opened new lines of research on the role of pregnancy in shaping emotional well-being throughout life (Verny & Kelly, 2011).

The objective of this article is to identify and explore the epistemological gaps in Thomas Verny's theory of prenatal psychology. Although his work was fundamental in raising awareness about the importance of emotional factors during pregnancy, his theory presented several limitations that needed to be addressed to advance the field of perinatal psychology. Specifically, the incomplete or insufficiently developed areas of his approach were examined, with emphasis on the following aspects:

Lack of Robust Empirical Evidence: The scarcity of studies supporting claims about conscious fetal perception.

Genetic and Environmental Interaction: The insufficiency in addressing the interaction between genetic and environmental factors (epigenetics) in the emotional and cognitive development of the fetus.

Cultural and Socioeconomic Diversity: The omission of differences in the prenatal experience.

Clinical and Applied Relevance: The need to update the theory to ensure clear, evidence-based applications in current clinical contexts, while accounting for population diversity.

This article aims to provide a critical review of Verny's theory and to suggest areas for improvement and expansion, both theoretical and practical, so that future research and practice in prenatal psychology can more fully address the complexity of prenatal emotional development and the factors that influence it.

Thomas Verny's Theory and Initial Proposal

❖ Summary of Thomas Verny's Theory

Thomas Verny was a pioneer in prenatal psychology, especially in the study of the emotional and psychological effects of pregnancy. His theory, presented in The Secret Life of the Unborn Child (1981), argues that the fetus is not simply a developing organism, but a sensitive and conscious being that can perceive and respond to the mother's emotions and environment, including her interactions with others, her emotional state, and her social environment.

One of the most influential aspects of his theory is the idea that maternal emotions can directly influence fetal development, thereby affecting the child's long-term psychological and emotional well-being. Verny maintains that the fetus can feel emotions by perceiving chemical, hormonal, and emotional changes in the mother's body. In particular, maternal stress and negative emotional experiences, such as anxiety, depression, or trauma, have important effects on fetal neurobiological development, which could result in permanent changes in brain structure and function (Verny, 1981; Field, 2010).

A crucial element of Verny's theory is its focus on prenatal emotional bonding. Verny proposed that attachment formation does not occur only after birth but begins in the womb, where the maternal emotional environment profoundly influences the fetus. The earliest moments of pregnancy, according to Verny, lay the foundation for the formation of the child's personality, emotional regulation, and capacity to establish healthy bonds in adult life (Verny & Kelly, 2000). This view broadened understanding of early development, showing that it is not limited to the first years of life but begins much earlier, in the intrauterine environment, highlighting the critical importance of maternal mental health for the child's future health.

- **Key Contributions of Verny's Theory**

Thomas Verny's theories have had a fundamental impact on perinatal and prenatal psychology, contributing to a paradigm shift in the way pregnancy and child development are perceived. Before his work, the fetus tended to be considered a more passive being, and emotional development was seen as something that only began after birth. Verny, however, showed that the fetus is a psychic and emotional being that actively interacts with its environment and responds significantly to stimuli, especially the mother's emotions and well-being (Verny, 1981).

The concept of prenatal stress was one of Verny's main contributions. His research showed that high levels of maternal stress affect the production of hormones such as cortisol, which cross the placenta and alter fetal brain development. These alterations can lead to emotional and cognitive problems later in the child's life, including anxiety disorders, learning difficulties, and emotional regulation problems (Glover, 2011; Field, 2010). Based on this understanding, the importance of early interventions to support the mother's emotional health during pregnancy has been promoted in order to prevent adverse long-term effects on children.

Another key point of his work was the incorporation of prenatal bonding into the clinical field. Verny was one of the first to highlight how the fetus's emotional experiences can influence its subsequent behavior and its capacity to form affective relationships. In fact, Verny argued that the emotional bond formed between the mother and the fetus could directly influence the development of attachment patterns, which are crucial for emotional well-being throughout life. This approach contributed to the development of a more integral understanding of attachment, not only as something that occurs after birth, but also as a process that begins in the uterus (Verny & Kelly, 2000).

His work also had a profound impact on education and public policy. By raising awareness among health professionals about the importance of maternal mental health, Verny helped open new lines of research that addressed prenatal psychology holistically and interdisciplinarily. His approach influenced health policies that consider the emotional well-being of women during pregnancy, leading to greater integration of prenatal psychology with other fields such as obstetric medicine and neuroscience (Van den Bergh et al., 2017).

- **Contemporary Theories and Their Relationship with Verny's Work**

Verny's theory is closely related to advances in neuroscience and psychobiology that highlight the importance of the prenatal environment in neural development. More recent research has confirmed that maternal stress and emotional experiences during pregnancy can alter fetal gene expression through epigenetic mechanisms, which can have long-term consequences on the child's physical and mental health (Glover, 2011). This finding complements Verny's theory by reinforcing the idea that environmental factors have a lasting impact on an individual's mental and emotional health from very early in life, including during pregnancy.

For example, Bowlby's work on early attachment (1969) has been highly relevant for understanding how early affective bonds are crucial for children's emotional regulation and social development. Verny's theory and research on prenatal stress also align with the contemporary concept of fetal neuroplasticity, which holds that the fetal brain can adapt and change in response to environmental influences, including emotional ones, during pregnancy (Poulton et al., 2015).

Identification of Epistemic Gaps

❖ Definition of Epistemological Gaps in the Context of Psychology

The term epistemological gaps refer to areas within a theory or field of study where knowledge or understanding is lacking, whether due to insufficient empirical evidence, overly general hypotheses, or the absence of theoretical approaches that address specific aspects of the phenomenon. In Thomas Verny's theory, epistemological gaps refer to limitations within his approach to prenatal and emotional development that may stem from a lack of solid empirical support or from the fact that some of his concepts have not been sufficiently explored or contextualized within a diversity of sociocultural and genetic factors.

In psychology, theories must be supported by solid empirical research, as this provides the necessary basis for validating the proposed hypotheses. Epistemological gaps can exist in any theory that does not adequately address the complexities of the phenomenon it attempts to explain, or that is not updated as new data and scientific discoveries emerge. In the context of Verny's theory, some of his claims about the prenatal emotional impact may lack a sufficient empirical basis, constituting a significant epistemological gap.

❖ Gap in Scientific Evidence

One of the most relevant criticisms of Verny's theory is the lack of empirical support for several of his claims about fetal perception and prenatal emotional effects. Verny postulated that fetuses have the capacity to perceive and respond to maternal emotions, which influences their subsequent psychological and emotional development (Verny, 1981). Although many studies point to the existence of connections between maternal stress and fetal development (Field, 2010), Verny's claims about conscious fetal perception and emotional interaction remain a subject of intense debate within the scientific community.

Modern neuroscience has definitively shown that the fetal nervous system develops gradually and that the brain processes sensory experiences as pregnancy progresses. However, the idea that the fetus possesses full emotional consciousness or the capacity for complex subjective experience in the early stages of pregnancy remains difficult to prove objectively and is mainly contradicted by developmental neurobiology.

The Developmental Timetable of Fetal Senses

The primary epistemological gap here stems from equating fetal reactivity (a reflexive, subcortical process) with fetal consciousness (a complex, cortically mediated subjective state). The fetal sensory systems mature sequentially, imposing strict limits on the type and complexity of information the fetus can process:

Touch and Vestibular Sense (First Trimester): These are the first senses to develop, allowing reflexive responses to movement and environmental cues.

Hearing (Second Trimester, ~20 weeks): The fetus can perceive the rhythm, pitch, and prosody of the mother's voice and external sounds, leading to demonstrable prenatal learning (habituation studies). This is the basis for Verny's claims, yet perception of sound does not equate to emotional understanding.

Vision (Late Third Trimester): The visual system is the last to mature and is highly limited in utero. The light exposure is minimal, precluding complex visual perception.

Pain and Emotional Processing: The thalamocortical connections—the neural circuitry necessary to integrate sensory input into a unified, subjective experience (consciousness and complex emotions)—do not fully mature until late in the third trimester or, more accurately, postnatally. The capacity to interpret the mother's internal hormonal state (cortisol) as a distinct "feeling" or "emotion" (like fear or sadness) requires higher cortical function that is still nascent or inactive in utero.

Reconciling Learning with Consciousness

The ability of the fetus to learn and remember simple stimuli, as demonstrated by studies showing neonatal preference for stories or music heard prenatally, is well-established. However, this prenatal learning is considered an implicit memory function, mediated by subcortical structures and basic habituation processes. It is fundamentally different from the explicit, conscious emotional perception proposed by Verny, which requires a mature hippocampus and prefrontal cortex.

The epistemological gap in scientific evidence lies, therefore, not in the absence of fetal experience but in the difficulty of empirically demonstrating the existence of

emotional consciousness in fetuses, which limits the universality and clinical applicability of Verny's theory. Although research on prenatal stress has progressed, the methodology still limits studies, and many cannot directly demonstrate subjective fetal emotional perception (Glover, 2011). This represents a significant gap that needs to be filled with more controlled, longitudinal studies that further explore the connections between the mother's emotional experiences and their impact on the fetus, focusing on objective neurobiological and epigenetic mechanisms rather than subjective conscious transference.

- **Absence of Diversity in the Approach**

Another epistemological gap in Verny's theory is his lack of consideration for diversity, particularly cultural, socioeconomic, and ethnic factors. Verny primarily focuses on a model of child development based on universal assumptions. Although his work highlights the importance of prenatal bonding, it does not sufficiently consider the cultural and socioeconomic factors that can influence maternal emotional well-being and, consequently, fetal development.

The lack of an inclusive approach can lead to the excessive generalization of specific claims. For example, prenatal stress can have different impacts depending on the mother's social or cultural context (Van den Bergh et al., 2017). Women in situations of socioeconomic vulnerability or cultural inequality may experience exacerbated prenatal stress due to external conditions such as poverty, violence, or discrimination, which could influence their children differently compared to mothers in more favorable contexts. This gap in Verny's theory limits the applicability of his model to diverse populations. It underscores the need for a more integrative vision that considers broader sociocultural factors in the prenatal context.

- **Limits in Genetic-Environmental Interaction**

A third important epistemological gap in Verny's framework is the inadequate attention to the complex interaction between genetic and environmental factors during prenatal development. While Verny correctly identified the intrauterine environment as influential, his model primarily operated on a simplified, linear model of environmental causality: maternal emotion directly programs fetal outcome. This perspective is outdated in light of the molecular revolution in developmental psychology.

In modern developmental psychology and behavioral genetics, it is universally recognized that human development is the product of a complex, dynamic interplay between genetics and environment, a perspective fundamentally reflected in theories such as Bronfenbrenner's ecological systems of development (Bronfenbrenner, 1979). However, Verny's theory tends to emphasize environmental factors (i.e., maternal emotional stress) broadly, without a deeper analysis of the biological mechanisms by which the environment modulates gene expression in he fields of epigenetics.

The Epigenetic Blind Spot

The epistemological gap here lies in the underestimation of the importance of genetic mediation and biological factors in prenatal development. In current research on prenatal stress, it is known that the fetus's physiological and neurological responses to the mother's emotional experiences are not uniform; they are mediated by the mother's and the fetus's own genetics and biological characteristics (Glover, 2011).

For instance, the vulnerability of the fetus to maternal cortisol is partially determined by the efficiency of the 11\beta-hydroxysteroid dehydrogenase type 2 (11 \beta-HSD2) enzyme, which is highly expressed in the placenta and acts as a barrier, deactivating most maternal cortisol before it reaches the fetal bloodstream. Individual differences in the gene encoding 11\beta-HSD2, or environmental factors that epigenetically suppress its expression, directly determine the level of fetal stress exposure. This implies that two fetuses exposed to the same level of maternal psychological stress may have vastly different neurobiological outcomes depending on their placental enzyme efficiency, a critical factor absent from Verny's model.

Furthermore, some studies have found that differences in maternal gene expression, particularly in pathways related to inflammation and stress regulation, can influence the fetus's response to stress (Poulton et al., 2015). This means that genetic polymorphisms in the glucocorticoid receptor gene (NR3C1) in either the mother or the fetus can determine sensitivity to prenatal programming. This level of biological nuance has not been adequately addressed by Verny, generating a significant gap. Future iterations of prenatal psychology must embrace a biopsychosocial model in which stress is a signal interpreted, amplified, or mitigated by the underlying biological and genetic architecture.

- **Lack of Consideration of Socioeconomic and Cultural Factors (Expanded)**

Finally, the epistemological gap regarding socioeconomic and cultural factors stems from Verny's limited attention to how these broad external forces affect the mother's emotional well-being and, therefore, the child's prenatal development. The concept of prenatal stress in Verny's work often defaults to a generalized, internal psychological state (e.g., anxiety or relationship issues).

However, in reality, stress associated with Social Determinants of Health (SDH) factors such as poverty, lack of access to quality health services, precarious working conditions, food insecurity, or chronic social exclusion can negatively affect pregnancy and the mother's well-being by creating a state of toxic stress (Van den Bergh et al., 2017). This type of stress is chronic, unpredictable, and often unmanageable by individual coping strategies alone.

While Verny addresses prenatal stress, he does not sufficiently explore how social and economic factors can amplify or mitigate its biological effects. For example, a middle-class mother with anxiety and good social support may experience a stress response that is brief and self-limiting. Conversely, a mother experiencing structural violence (poverty and systemic racism) experiences chronic stress that leads to sustained allostatic load, overwhelming the HPA axis and placental defenses. This represents an important limitation, as the socioeconomic context can play a fundamental role in prenatal development, affecting the mother's physiological capacity to manage stress and other emotional factors, thereby limiting the generalizability of a theory that focuses solely on individual emotional dynamics.

Impact of Epistemological Gaps on Current Practice

- **Implications for Research (Expanded)**

The epistemological gaps in Thomas Verny's theory, particularly the lack of empirical support for some of his claims about fetal perception and prenatal emotional impact, have significant implications for future research in prenatal psychology. While Verny's theory was influential in underscoring the importance of the intrauterine environment, its limited empirical basis hinders the field's progress by providing an insufficient framework for hypothesis testing.

One of the main gaps in Verny's theory is the lack of solid empirical evidence supporting the idea that fetuses can perceive maternal emotions in the early stages of pregnancy (Glover, 2011). While the field of prenatal psychology has advanced, the lack of rigorous, controlled studies in areas such as fetal perception and emotional consciousness remains a barrier to future research. To develop a more precise understanding of the prenatal impact on development, it is necessary to design more detailed longitudinal studies that more thoroughly explore the relationships among prenatal stress, fetal perception, and neurobiological impact.

- **The Need for Biomarkers and Genetic Profiling**

The primary limitation of Verny's model for contemporary research is its reliance on subjective maternal report (self-reported stress or anxiety). Modern research must pivot to objective biological measures (biomarkers). These biomarkers include:
Hormonal Measures: Repeated assessments of maternal and placental cortisol and corticotropin-releasing hormone (CRH) across gestation.

Fetal Neuroimaging: The use of fetal MRI and fetal magnetoencephalography (MEG) to correlate maternal psychological state with measurable changes in fetal brain structure (e.g., changes in hippocampal volume) and functional connectivity (Van den Bergh et al., 2017).

Epigenetic Analysis: Examining the methylation levels of key regulatory genes (like the NR3C1 gene, which codes for the glucocorticoid receptor) in cord blood or placental tissue.

Verny's theory, by not fully addressing the interaction between biological and psychological factors, limits the scope of future research. Specifically, it fails to promote the integration of biological and psychological perspectives, necessary for a complete view of fetal development. For example, a deep integration between biological theories (e.g., the programming hypothesis) and developmental models is required to advance the field (Poulton et al., 2015).

- **Impact on Clinical Practice (Expanded)**

The epistemological gaps in Verny's theory can also significantly affect clinical practice, particularly in psychology, psychiatry, and obstetrics. Many health professionals working with pregnant women rely on models that, although useful

for sensitization, may lack sufficient empirical foundation, potentially leading to ineffective or even harmful interventions.

- **Risk of Maternal Blame and Iatrogenesis**

The idea that fetuses are capable of perceiving the mother's emotions and that this directly programs the child's entire emotional life, a central tenet of Verny's popularized work, carries a significant risk of maternal culpabilization and iatrogenesis. When a mother experiences unavoidable stress (due to poverty, domestic violence, or job loss), hearing that her emotional state is directly harming her child can exacerbate feelings of guilt, anxiety, and depression. This negative emotional spiral can ironically increase the very biological stress markers (cortisol) she is trying to mitigate. A more balanced, epigenetically informed approach emphasizes opportunities for mediation and intervention rather than guilt.

- **Limited Intervention Scope (The Sociological Blind Spot)**

Verny's focus on the individual mother-fetus dyad, while groundbreaking, overlooks the broader social ecology that defines the majority of prenatal risk.

Inadequate Contextual Treatment: Verny's theory on prenatal stress and its impact often leads professionals to focus primarily on internal maternal emotions (e.g., relaxation techniques), without considering the primary drivers of that stress: genetic, socioeconomic, and cultural aspects (Van den Bergh et al., 2017).

Socioeconomic Determinants: In clinical settings, insufficient attention to factors such as poverty, housing instability, and access to prenatal care results in limited interventions. For example, offering psychotherapy alone to a woman experiencing food insecurity may be largely ineffective because the biological stress response is being constantly reactivated by external, unaddressed social determinants of health (SDH). The current practice needs to integrate social work and public health initiatives directly into perinatal care to achieve a lasting reduction in toxic stress exposure.

The incorporation of more inclusive, multidisciplinary approaches into prenatal and perinatal care will be essential to overcoming these gaps. For clinical interventions to be effective, health professionals must have a broader understanding of how socioeconomic, cultural, and genetic factors interact with prenatal development

(Glover, 2011). This comprehensive approach helps avoid excessive generalization and offers more personalized, effective treatment for pregnant women.

Methodological Framework

This article is based on a critical review and conceptual analysis of Thomas Verny's theory of prenatal psychology. The adopted methodological approach is qualitative, focused on the decomposition, contrast, and synthesis of Verny's central hypotheses against contemporary empirical advances in developmental neuroscience, epigenetics, and sociocultural studies of motherhood.

- **Sources and Scope of the Review (Expanded)**

The review focused on two main groups of literature, with defined criteria for selecting the contemporary evidence used to evaluate Verny's claims critically:

- **Verny's Foundational Works**

A deep analysis of The Secret Life of the Unborn Child (1981) and other key publications (Verny & Kelly, 2000, 2011; Verny & Thomas, 2013) was conducted to identify the central claims and their original theoretical foundations (e.g., fetal consciousness, emotional perception, and direct personality programming). This foundational literature served as the primary object of critique.

- **Contemporary Scientific Literature**

High-impact articles (from the last two decades, 2000–2023) indexed in specialized databases such as PubMed, PsycINFO, and Scopus were reviewed. Rigorous inclusion criteria governed the selection of these articles to ensure that the contrasting evidence was methodologically superior to the anecdotal and observational reports standard in the early stages of prenatal psychology:

- **Inclusion Criteria for Empirical Studies**

Longitudinal Design: Preference was given to studies with prospective longitudinal designs that tracked maternal stress exposure during gestation and assessed child outcomes (emotional, cognitive, or behavioral) years later (e.g., Poulton et al., 2015). This addresses the critical need for a demonstration of causality lacking in Verny's work.

Use of Objective Biomarkers: Inclusion of studies that utilized at least one objective biological measure, such as maternal or placental cortisol monitoring, epigenetic analysis (DNA methylation of stress-related genes), or fetal neuroimaging (MRI, MEG) to establish a biological pathway between the environment and the fetal phenotype (Glover, 2011; Field, 2010).

Focus on Environmental Interaction: Studies explicitly addressing the interaction between genetic risk factors and environmental stressors, particularly research on the impact of socioeconomic and cultural diversity on prenatal programming (Van den Bergh et al., 2017).

Exclusion Criteria: Studies relying exclusively on retrospective maternal reports of stress, cross-sectional designs, or those lacking psychometrically validated instruments for measuring maternal mental health were generally excluded to maintain the rigor of the conceptual contrast.

- **Critical Analysis Procedure (Expanded)**

The analysis proceeded through the following critical stages, applying the selected contemporary literature as the gold standard for evidence:

Decomposition of Verny's Hypotheses: Central claims (e.g., "full emotional consciousness of the fetus" in the second trimester) were isolated and defined as testable theoretical constructs.

Empirical Contrast and Falsification: Verny's claims were directly contrasted with current neurobiological evidence on the maturation of the fetal nervous system. For example, evidence of delayed maturation of the thalamocortical pathway was used to argue against the functional capacity for the subjective emotional experience Verny described.

Analysis of Theoretical Omissions and Gaps: Verny's theory was evaluated to identify gaps in integrating key factors from modern research. This stage focused specifically on quantifying the impact of omitting genetic-environmental interactions (epigenetics) and failing to consider social determinants of health (socioeconomic and cultural factors) on the theory's generalizability.

Synthesis and Update Proposal: The final stage involved synthesizing the identified limitations with current scientific consensus (Sections 4 and 5) to develop the Update Proposals (Section 7), thus providing a constructive path forward for prenatal psychology to become a truly multidisciplinary and empirically supported field.

This systematic procedure ensures a rigorous, grounded evaluation of Verny's theory beyond mere description, serving as the basis for the necessary theoretical and clinical update proposals.

Discussion, Implications, and Update Proposals

- **Impact of Gaps on Clinical Practice and Research**

The epistemological gaps identified in Verny's theory have significant implications for current practice. The lack of solid empirical evidence for some of his claims about conscious fetal perception can lead to unnecessary blame on mothers for prenatal stress, especially when the biological mechanisms mediating this context are omitted, such as the activation of the Hypothalamic-Pituitary-Adrenal (HPA) Axis, which regulates cortisol, and resulting epigenetic changes.

- **Ethical and Clinical Implications of Oversimplification**

The focus on individual maternal emotions without adequate neurobiological or sociological context introduces serious ethical risks. By popularizing the idea that the fetus is consciously aware and directly absorbing maternal negative emotions, Verny's work inadvertently shifts the burden of fetal health entirely onto the pregnant person, disregarding structural and systemic factors.

This creates a moral mandate for the mother to control her emotions perfectly, which is psychologically unsustainable and clinically counterproductive. An ethically responsible prenatal psychologist must clarify that the risk is mediated by physiological and epigenetic pathways (cortisol, placental function), not by conscious emotional transference. This framing is essential to reduce the immense psychological pressure and guilt often imposed on mothers, particularly those facing challenging circumstances (Lee et al., 2020).

❖ **The Need for a Multi-Level Intervention Framework**

Omitting socioeconomic and cultural factors severely limits clinical applicability. Prenatal stress is not only an individual psychological event, but is aggravated by external conditions such as poverty, violence, or lack of access to healthcare. A clinical practice that does not integrate these social determinants will not achieve effective intervention in vulnerable populations.

To overcome this, interventions must move beyond the dyadic (mother-fetus) focus and adopt a multi-level approach:

Individual/Dyadic Level: Focus on enhancing individual coping mechanisms, psychoeducation on stress and cortisol, and strengthening the parent-child bond post-birth.

Community/Social Level: Integrate social work, policy advocacy, and community resources to address the Social Determinants of Health (SDH). This includes practical support for food security, stable housing, and stress-reducing policies, acknowledging that changing the environment is often more effective than changing the individual (Van den Bergh et al., 2017).

This comprehensive, multi-level framework, grounded in biological science and social ecology, represents the necessary evolution from Verny's foundational but insufficient model.

❖ **Update Proposals: Towards an Integrative and Multidisciplinary Model (Expanded)**

For prenatal psychology to advance and honor Verny's legacy of awareness, it is fundamental to adopt an integrative and multidisciplinary paradigm that overcomes its limitations, combining prenatal psychology with neuroscience, developmental biology, and sociology:

I. Genetic-Environmental Integration: Epigenetic Mediation

Future research must shift from the concept of direct environmental causality (stress directly equals outcome) to epigenetic mediation. It is necessary to design longitudinal studies using robust biomarkers (hormonal monitoring, neuroimaging, and DNA methylation analysis) to understand how the intrauterine environment modulates fetal gene expression.

The HPA Axis and Cortisol Regulation: The most critical biological mediator is the Hypothalamic-Pituitary-Adrenal (HPA) Axis. Chronic maternal stress leads to elevated cortisol levels. This cortisol crosses the placenta and activates the fetal HPA axis. The developing fetal brain, particularly the hippocampus and amygdala, expresses glucocorticoid receptors (GRs). When exposed to excessive maternal cortisol, these GRs may undergo epigenetic modification, specifically DNA methylation, which leads to a reduced capacity to "turn off" the stress response later in life.

This incorporation of epigenetics provides a much more solid scientific basis for claims about the long-term effects of the prenatal environment than Verny's original psychological models. Future research must, therefore, correlate maternal subjective stress measures (psychology) with objective measures of placental function and fetal biomarkers (biology).

II. Fetal Developmental Neuroscience: Refining the Concept of Consciousness

It is necessary to integrate advances in fetal developmental neuroscience to obtain more solid empirical evidence on how prenatal emotions and stress affect fetal brain plasticity and neuronal development. This step directly addresses the epistemological gap concerning "conscious fetal perception."

Modern neuroscience establishes that while the fetus is highly reactive and capable of learning (e.g., recognizing the mother's voice rhythm in the third trimester), this is mediated by subcortical structures and does not equate to the complex, self-aware emotional consciousness Verny described. The functional maturation of the cortical circuitry required for complex emotional processing and consciousness is essentially a postnatal event. Research should focus on the critical periods of neuroplasticity, particularly in the second and third trimesters, during which stress-induced alterations (such as reduced hippocampal volume or changes in white matter integrity) can be objectively measured via neuroimaging. This reframes the problem from emotional perception to structural vulnerability and programming of the stress system.

III. Focus on Diversity and Sociological Determinants

It is crucial to expand research to include diverse cultures, socioeconomic statuses, and geographic settings. This will allow for a more holistic understanding and avoid excessive generalization.

The concept of toxic stress, chronic, unmanaged stress often linked to poverty, racism, or food insecurity, must be considered a primary risk factor for prenatal development. Socioeconomic context acts as an environmental amplifier of biological stress responses. For instance, the stress hormone impact may be compounded in vulnerable populations due to co-occurring factors like malnutrition or lack of social support. Therefore, effective clinical interventions must be sociologically informed; they must not only target the mother's individual perception of stress (psychology) but also address the Social Determinants of Health (SDH) through policy, resource provision, and community support (sociology/public health). This ensures that prenatal care moves beyond individual blame and focuses on systemic resilience.

Conclusions

In this article, diverse epistemological gaps in Thomas Verny's theory of prenatal emotional bonding and the intrauterine environment's effects on infant development have been identified and discussed. Although Verny has been a pioneer in highlighting the importance of emotional factors during pregnancy, his theory requires greater empirical grounding and an expansion that more comprehensively addresses the complex interactions among genetic, social, and environmental factors.

In particular, the lack of solid evidence supporting some of his claims about conscious fetal perception and the excessive generalization, without considering cultural and socioeconomic differences, represent important gaps that limit the universal applicability of his proposals (Glover, 2011; Van den Bergh et al., 2017). The central problem lies in adopting a linear causal model (emotion-effect) that fails to account for the molecular and systemic mechanisms that define contemporary developmental science.

Future Directions: The Call for Translational Research

The identified gaps do not constitute a dismissal of Verny's vision, but rather a robust platform for translational research in prenatal psychology. Moving forward, the field must prioritize:

Bridging the Neurobiological Divide: Future studies must incorporate advanced techniques such as longitudinal fetal neuroimaging (fMRI/MEG) combined with epigenetic profiling (e.g., NR3C1 methylation) in both maternal blood and cord blood. This will allow researchers to move beyond correlational associations and establish the mechanistic pathways by which maternal stress physiologically programs the fetal HPA axis, thus providing the necessary scientific rigor that Verny's early claims lacked. This shift reframes the discussion from subjective fetal "feelings" to objective fetal programming.

Addressing Sociological Complexity: The focus must expand to acknowledge the social ecology of stress. Future interventions cannot be limited to individual psychotherapy; they must integrate public health policies aimed at reducing chronic toxic stress stemming from poverty, racism, and structural inequality. This means that prenatal psychological research must partner with sociology and public policy to study stress not just as a hormone, but as a systemic burden (Shonkoff, 2010).

Despite these limitations, Verny's contribution to the field of prenatal psychology remains of great value due to his awareness-raising work. He successfully shifted the paradigm from a passive fetus to an active one, setting the stage for the deeper multidisciplinary exploration happening today. It is essential to continue building on his work, incorporating new perspectives and strengthening the empirical base, to better understand the complexity of prenatal and perinatal development. The criticisms presented here offer an opportunity to improve and expand the theory toward a more robust, inclusive, and scientifically supported biopsychosocial prenatal psychology.

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Article Information:

Received	*9-Oct-2025*
Revised	29-Nov-2025
Accepted	5-Dec-2025
Published	15-Dec-2025

Declarations:

Author's Contribution:

- **Conceptualization, and intellectual revisions**
- **Data collection, interpretation, and drafting of manuscript**
- The author agrees to take responsibility for every facet of the work, making sure that any concerns about its integrity or veracity are thoroughly examined and addressed

- **Conflict of Interest**: NIL
- **Funding Sources**: NIL

Correspondence:

Dr. Lenin José Torres Silva

lenintorresproductions@gmail.com