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Prenatal Development and the Structure of Experience

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Abstract

Developmental psychology has been challenged by the recent findings in various areas of research regarding the significance of prenatal development. Presently there is a tendency among psychologists working in the area of prenatal development to use either medical or psychoanalytic concepts when describing prenatal psychological processes.

For developmental psychology to take its place as a valid approach next to endocrinology, neurology or psychoanalysis, it is necessary to develop new concepts in order to incorporate research findings in prenatal development.

It is suggested that the concept of experience and its psychobiological significance for development and growth could provide a new approach. It will be suggested that prenatal experiences are necessary; firstly because we are predetermined to expect certain experiences and secondly because our individual survival is dependant upon having certain experiences. Questions about the difference between prenatal "sensation" or "behavior" and the content of experience will be raised. It will be hypothesized that the interaction of genetics, other endogenous factors and environment constitutes the prenatal experience which may be the main factor in early pre- and postnatal development.

Zusammenfassung

Die Entwicklungspsychologie ist durch die neueren Befunde in verschiedenen Forschungsbereichen aufgefordert, die Bedeutung der pränatalen Entwicklung neu zu bewerten. Zur Zeit besteht bei den Psychologen, die im Bereich der pränatalen Entwicklung arbeiten,

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die Tendenz, entweder medizinische oder psychoanalytische Konzepte zu verwenden, wenn sie pränatale psychologische Prozesse beschreiben.

Doch ist es für die Entwicklungspsychologie, um ihre Eigenständigkeit neben Endokrinologie, Neurologie oder Psychoanalyse zu bewahren, notwendig, neue Konzepte zu entwickeln, um Forschungsbefunde zur pränatalen Entwicklung zu integrieren.

Es wird in dieser Arbeit vorgeschlagen, daß das Konzept der Erfahrung und seiner psychobiologischen Bedeutung für die Entwicklung und das Wachstum ein solcher Rahmen sein kann. Es kann angenommen werden, daß pränatales Erleben und pränatale Erfahrung stattfinden, und zwar zum einen weil wir psychobiologisch auf Erleben und Erfahrung angelegt sind und zum anderen weil die Anpassung an unsere individuelle Lebenssituation und unser individuelles Überleben davon abhängt, Erfahrungen zu machen und erleben zu können. Es werden Überlegungen zum Unterschied zwischen pränataler „Empfindung" oder pränatalem „Verhalten" gemacht und ebenso zum Inhalt des Erlebens. Dabei wird die Hypothese entwickelt, daß die Interaktion zwischen Genom, anderen endogenen Faktoren und der Umgebung die pränatale Erfahrung und das pränatale Erleben konstituiert, welche möglicherweise den Hauptfaktor in der frühen pränatalen und postnatalen Entwicklung darstellt.

Introduction

During the last twenty years, our knowledge of prenatal processes and their significance has increased tremendously. Numerous studies have been conducted in various areas of medicine, psychoanalysis and the behavioral sciences. They have provided us with a wide range of results supporting the importance of prenatal development for postnatal emotional and cognitive experiencing and functioning.

While other disciplines have implemented important findings, all this work and study has shown little effect on traditional psychological textbooks. Although a few of them do include a chapter on prenatal development, they do not include much more than prenatal development, they do not much more than reviewing facts drawn from experimental studies, both medical and psychological, or psychoanalytical concepts based on regression work or theoretical deduction. Psychology has agreed to consider some isolated facts, but has not yet learned to include them consequently either in their general thinking or in the planning of actual intervention. Traditional psychology as it is taught and practiced may have its reasons for not fully implementing research findings on prenatal life, but it would be wrong to place the full responsibility on stubbornness or lacking insight. Prenatal psychologists may not have tried hard enough or not in an acceptable manner to formulate a concept worth being acknowledged or even implemented. In other words, "we" still may not have met neither "their" needs

nor "their" language. This must eventually be of our concern, since prenatal psychologists have a wish to pass on their important insights. Therefore, it must be in our interest to be informed about research in prenatal development and ongoing work being done in other disciplines and with other approaches. On the other hand, we must critically review present theories and concepts of prenatal growth as developed by prenatal psychologists. Only an active endeavor from our side towards a synthesis and a common language can help to get important knowledge and attitudes across the abysmal gap between prenatal and traditional developmental psychology.

There are some questions which need to be addressed to, if one is to formulate an acceptable and verifiable psychology of prenatal development. Some of these questions will be discussed to illustrate the complexity of prenatal development. Concepts which should be suited for prenatal development also have to be able to incorporate the findings of many sciences or fields of research. Some thoughts on experience and its function in structuring the brain during prenatal development will serve as an example of how a conceptualization could be approached.

Issues in Prenatal Psychology: Thoughts on Development

Because of the complexity of prenatal development, numerous questions on prenatal psychology have been left unanswered. It will be an important task to identify these questions and to try to find answers. The acceptance of prenatal psychology may depend on it. The following questions on prenatal development will try to illustrate the need for more complex concepts (e.g., prenatal interaction, the development of the psyche and the cause-and-effect problem). There is also a need for an interdisciplinary approach which should also draw from the research done in other areas of science.

How do the genes, prenatal environment and other factors of prenatal development interact? It is to Sepp Schindler's credit for having been concerned about the conceptualization of prenatal development for many years. He has presented an ecologically orientated model (1987) and since then made it known to many professionals working outside of prenatal psychology (see for example 1991). Some of the authors own efforts were concerned with similar models (Hollenweger 1989, 1991) of prenatal interaction on a physiological as well as on a psychological level.

Still unclear is the weight specific factors have and how their influence can be identified. Behavioral genetics (Plomin 1986,1990) has come to the conclusion, that 50 % of who we are can be attributed to inheritance. Inheritance here means postnatally correlated psychological characteristics in identical twins, fraternal twins, siblings and adopted or other unrelated children reared together. At birth the newborn has already experienced environmental influences. It should be of our concern to look at other research and to discuss it under this aspect.

For example, studying behavioral genetics may help us to understand the influence of prenatal environment better, which in humans cannot be manipulated experimentally for ethical reasons. Konner (1920, p. 234) expresses this in his es-

say "Genes and the Soul": "No one doubts that the environment is important – the genetic studies prove that as much as they prove the importance of genes. Half the variation may be heritable, or perhaps a bit more than half; but the rest – a very large amount – is still environmental. Some of that environmental influence is undoubtedly prenatal – nutrition, hormones, maternal-fetal immune response, even the process of birth itself – and child psychologists still underestimate the importance of such environmental forces. But however sceptical the hard-liners may be about the importance of human childhood experience, studies of early deprivation and simulation in rats, dogs, and monkeys show decisively that such experiences change the personality. It's just that in humans, we don't know *how*; it is perhaps the crowning irony of current research that we need behavior genetics to help us find out."

It is valuable to look at research opposed to the prenatal psychologist's expectations. Even contradictory premisses help to find the truth. And we need to look at their premisses, just as they need to look at ours.

How does the psyche evolve before birth? Additional to the ecological view, there will still be a need for a model which focuses on the explanation of the development of the psyche before birth. This model should explain development and individual differences.

Winnicott (1988) developed the outline of a possible theory of early development in his book "Human Nature" which was published seventeen years after his death. In this book he includes prenatal development explaining his thoughts on "The Dwelling of the Psyche in the Body" or "The Earliest Stages" and describing "Pre-Primitive States". As he spoke of the good-enough mother in his earlier works, he describes the good-enough environment. He also mentions possible factors of pathological development originating in the environment and the fetus, or both. This book is a classic for anyone interested in earliest development of the psyche and the meaning of early experience.

Prenatally, all we can see is behavior. Following traditional psychological concepts, we can only assume if behavior and the developing sensory processes are accompanied by psychological processes such as feeling, information-processing, or memory. A concept ought to address issues such as the connection between observable behavior, changes in the environment and inner experience of the unborn which may be formative for his psyche.

How can we formulate a concept which explains prenatal influences on postnatal psychological functioning and experiencing? Causality is one of the most delicate issues in prenatal psychology. There have been comparable case studies of similar prenatal complications where children developed completely differently, one healthy and the other one unable to cope with life. The mistake of a too narrow cause-and-effect thinking has been made regarding early childhood trauma and does not need to be repeated with prenatal trauma. This similarity regarding the discussion about the effect of early trauma may actually be one of the main reasons why child psychologists are so unwilling to look at prenatal trauma. They themselves – still traumatized by the numerous studies written to disqualify the relevance of early development – may perceive the case of prenatal trauma as too much for them to deal with. Prenatal psychologists may first have to present a

different model of prenatal influence on postnatal life and put the very tempting idea of cause-and-effect aside.

Sometimes, there even might be a cause-and-effect connection which is detected through research. Many times, provable cause-and-effect connections can be established in very specialized questions but the findings remain isolated facts. Although interesting and true, they are not implemented into a generalized concept. Too often these isolated findings are forgotten or "disproved" by somebody with a slightly different research design.

Remember the case of Lee Salk. In his much read article "The role of the heartbeat in the relation between mother and infant", Salk suggested that mothers could sooth their babies better when holding them on the left side of their chest, near the heartbeat. Analysis of many paintings of madonnas and other mothers revealed that about 90 % of them were actually holding their babies on the left arm. These suggestions were derived from a study in a hospital nursery. Salk (1973) presented the babies a regular heartbeat which resulted in less crying and better weight gain. He implied that the results show the importance of the heartbeat in the interaction between mother and child – even after birth. But other scientists (Tulloch 1964, Palmqvist 1975, Dettermann 1978, Maurer & Maurer 1988) have failed to replicate Salk's results. They attributed his results to the fact that Salk's clinic was near a main approach to New York's busy La Guardia airport and suggested that any continuous noise, masking the unexpected roaring sound of airplanes would have soothed these babies. The case of the soothing effect of the heartbeat was seemingly disproved. But some years later, Bogren (1983) was looking again at the holding behavior of mothers. In his study, psychopathology was significantly higher in mothers who preferred to hold their babies in their right arm – irrespective of their handedness. Clearly, this study was another piece in the puzzle of the heartbeat. Another piece may be found in William Calvin's essay on "The Throwing Madonna"(1991). Calvin is a neurobiologist at the University of Washington and has published various essays on the philosophy of mind. He presents a very creative hypothesis on the connection of handedness, the heartbeat and lateralization which has occurred throughout the last million years. He suggests that in ancient times mothers had to hold their babies while hunting or doing other things, since leaving them might have resulted in their being eaten by a wild animal. According to him, women holding their babies on the left side had been more successful in hunting or "throwing stones at little animals", since their babies were quieter. Since their babies were calmer, evolution was in their favor and brought about a lateralization favoring the right hand for doing fast tasks. This is just one detail from his argument full of finesse and very enjoyable to read. But it does imply that there may be much more to the case of the heartbeat than a simple cause-and-effect relation in terms of soothing babies.

Prenatal Development – Structuring Experiences

I have tried to illustrate the problem of prenatal psychogenesis due to the multilayered life-situation and the complexity of a possible relationship between pre-

natal and postnatal life. I would like to present some thoughts on the concept of experience which may help us to deal with these difficulties.

It must be clearly expressed at the beginning: A science of experience in the positivistic understanding of science cannot exist. There is the human element of subjectivity included – sensation will never equal the content of experience and the meaning of a happening for an individual can never be measured objectively. But the gaps and discontinuities between reality, experience and its expression should not be a reason to deny their existence. By accepting these discontinuities, it might be possible to investigate the meaning and the content of experience. Looking at experiences instead of "facts" we can avoid a lot of problems and contradictions. Its conceptual premisses do not contradict the prenatal situation. On the contrary, it is well suited to explain prenatal interaction without either getting stuck in the cause-and-effect trap or having to decide who is the victim or perpetrator if emotional harm has occurred.

"Experience" as a philosophical term has a long history, especially in German philosophy and was recently reintroduced by several philosophically, neuropsychologically and culturally orientated thinkers (e.g., Flanagan 1991). Twenty years ago, only scientists involved in animal research had something to say about the influence of enriched or impoverished prenatal development. But since the mid-eighties there have been several neuroscientists presenting theories and concepts on how this process may occur in humans.

Our brain has a certain structure and not all parts of it develop and mature at the same time. Neuropsychology suggests that at every phase of development we need to look at the brain as the independant and the dependant variable. The brain does not just determine behavior and experiences but changes in behavior or experience also have a durable impact on the brain. How exactly the development of the brain, the mind and the psyche go together cannot be answered yet. But neuropsychologists have developed a concept of how experiences provided by the environment may influence or even determine the maturation of the central nervous system. These processes are very similar to Piaget's (1983) concept of adaptation by accomodation and assimilation.

There are two different categories of plasticity for the storage of environmentally originating information (Greenough et al. 1987). The first category of plasticity called experience-expectant, may account for the sensitive- or critical-period phenomena. We are – by evolution and physiology – expecting to have certain experiences at certain times, and a normal environment will provide these experiences to all species members. Human babies, for example, expect to be born after about nine months of pregnancy. These experiences are needed to alter the way the brain functions and can be compared to what Piaget described as accomodation. If these experiences are not provided, the brain may lose some of its plasticity, which results in a delay of maturation or pathology. Studies in early childhood deprivation have shown the tragedy of children who could not experience what they desperately would have needed for their well-being and development.

The second category of plasticity of the brain, called experience-dependant, is more involved with the storage of experiences unique to the individual. Although

they are not exactly the same for all individuals, they are crucial for adaptation, and therefore for survival. If the unborn child has very little oxygen at its disposal, it will adapt to this experience by breathing and moving less (Hollenweger 1991). This adaptation, although necessary, will somehow influence later development. Piaget's assimilation can explain this process. In Piaget's theory, assimilation and accomodation are the two sides of adaptation. Experience-expectant respectively experience-dependant plasticity should as well be viewed as two aspects of one developmental process.

Prenatal hearing and the development of the experience of listening should serve as an illustration of how these neurological processes may be linked with behavior and psychological development.

The Prenatal Experience of Listening

If we look at the experiences all unborn humans share, we can gain some insight into the experience-expectant plasticity in the development of hearing (example taken from Turkewitz 1987). The development of hearing is sensitive to the following physiological changes which occur during every pregnancy. Early in pregnancy the uterus and the abdominal wall are thick, which makes it likely that a high proportion of the sound perceived by the unborn is originating within the maternal body (e.g., heartbeat and gastrointestinal noises). Later in development, the uterine walls become thinner and tauter and therefore would even amplify externally originated sounds. This shift would increase the amount of sounds transmitted by airborne conduction. The continuous stimuli would then be the maternal voice, which is both transmitted by conduction along the vertebral column inside and by airborne conduction outside of the maternal body.

This experience of slow shift from inner "noises" to outside "voices" probably influences earliest lateralization of the brain. The development of the right hemisphere is more advanced early on in pregnancy, implying that these early noises would be more of a right brain experience. Later acoustical experiences then would rather be imprinted in and processed by the left hemisphere which at this time in pregnancy is growing more. Only if early right hemisphere specialization for "noise" has been established, can there be a left hemisphere specialization for speech:

"This view suggests, first, that only relatively early-occurring events would interfere with or disrupt the establishment of the right-hemispheric specialization for noise, whereas both early- and late-occurring events could affect the development of the left-hemisphere specialization for speech. (Early events would affect the left-hemisphere specialization indirectly by reducing the right-hemisphere specialization for noise). Second, as it is suggested that the left-hemisphere specialization for speech is a result of the generalization of the fetal specialization for maternal speech, a bigger left-right difference would be expected to maternal than to other speech at the time of birth." (Turkewitz 1988/78)

Trying to find other implications either on behavioral, psychological, neurological or philosophical levels will lead to a better understanding of the nature and the structure of the experiences we all have before birth.

To give an example of the experience-dependant plasticity, we need to look at individual differences in acoustical experiences during prenatal life. In this area, we do have results reported from scientists within the prenatal community. Since this will be more familiar ground, I would only like to give a short example of what normal and pathological processes in this area might be. Tomatis (1987) has suggested that before birth unborns are already experiencing and even adapting to the specialities of the language their mothers speak. This might be part of our individual culturally biased experiences before birth. We also know from other studies that infants can identify their mother's voice right after birth (e.g. in DeCasper et al. 1980) and normally this recognition insures bonding and helps the baby with the transition after birth. From case studies in the field of early childhood autism, it has become clear that autistic children somehow have not made the transition to process human speech differently than other noises.

By observing research in various areas and comparing little pieces of information, there is hope that one day we will be able to present a concept which is acceptable to a wide range of scientists; a concept from which strategies for interventions can be deduced, and most importantly, a concept which could aid to prevent experiences which do not help the child to live. T.S. Eliot's words may be very true for this investigation ...

We shall not cease from exploration
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time. T.S. Eliot, Four Quartets

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