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on

*the effects
of blindness
and other
impairments
on early
development*

Zofja S. Jastrzemska Editor

The American Foundation for the Blind
New York 1976

Reprinted by the
U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
National Institutes of Health

SOMATOSENSORY DEPRIVATION AND ITS RELATIONSHIP TO THE BLIND*

Formal Presentation: James W. Prescott**

The objective of this paper is to illustrate how a visual defect can result in deprivation to the somatosensory modality and that behavioral deficits usually attributable to the primary visual sensory deficit may, in fact, be attributable to deprivation of the somatosensory system. It is suggested that this type of confounding may also occur when other sensory channels suffer deprivation. Neurobiological and neurobehavioral principles derived from animal sensory deprivation studies are briefly sum-

*The original presentation included a showing of films and slides accompanied by informal commentary. The present article is a more structured presentation with more recent data of these ideas and hypotheses that relate somatosensory functioning to blindness.

It should be recognized that this paper is primarily a theoretical and speculative venture to link a number of different issues from several disciplines within a common frame-of-reference. It is acknowledged that certain points of view have limited support from experimental data, however, it is hoped that this conceptual effort may prove heuristic in developing new research approaches to some basic scientific questions that have unusual relevance for human development.

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The viewpoints expressed in this article are those of the author and do not necessarily reflect those of the National Institutes of Health or the U.S. Department of Health, Education and Welfare.

marized in order to clarify the meaning of behavioral symptoms occurring in humans who also have been deprived of sensory stimulation during early development.

SOCIAL DEPRIVATION AS
SENSORY DEPRIVATION

A major conceptual dilemma characterizes a number of studies on the effects of early experiences upon development. Specifically, studies of infants separated from their mothers have been characterized as "maternal-social deprivation," "perceptual deprivation," and/or "emotional deprivation." In addition to the error of using the term "maternal" rather than "parental" there has been little effort to describe the separation experience in terms of specific sensory processes. Unfortunately, noted authorities in this area of research have used language to describe their experiments in a way which has led to a conceptual differentiation of *social development* from *neurobiological development* and consequently, the sensory processes that are common to these two disciplines have been neglected.

The failure to conceptualize the studies of "maternal-social" deprivation and isolation rearing within a neurobiological frame-of-reference of *sensory deprivation* can be attributed in part to the orientation of H. F. Harlow [1] who stated:

"The most extreme deprivation condition we have studied is total social isolation (not sensory isolation, only social isolation). The animal has no mother figure of any kind; also it has no opportunity to see, hear, or contact any other animal or even a human being, for during the isolation period it is fed and tested by remote control. Thus these animals have no chance of developing any affectional tie." ([1], p. 154.)

The distinction between social and sensory deprivation was also emphasized by Casler [2] in his review of the effects of "maternal" deprivation where he stated:

"One may agree that it is social rather than perceptual or sensory deprivation that is involved in these cases." ([2], p. 23.)

This point of view, or conceptual schema, has received support from another noted authority in "maternal-social" deprivation, namely, R. A. Spitz [3], who states:

"In conclusion, I call the reader's attention to the terms I have used in dealing with this subject. I have spoken advisedly of *affective* (emotional) deprivation. In recent years a great deal of illuminating and interesting work has been done with animals and humans on the effects of sensory deprivation. . . it should be realized that sensory deprivation and emotional deprivation are not interchangeable concepts. Granted, in the present state of the art, it is practically impossible to inflict the one without involving the other . . . accordingly, I believe that further experimentation and study will be required before we can delineate the nature of the two forms of deprivation and isolate their effects from each other." ([3], pp. 281-284.)

This disassociation of affective (emotional) processes from sensory processes is also evident from Spitz's discussion on infant perception. He states:

"Particularly during the first six months of life, and, to a certain extent even later, the perceptual system, the sensorium of the infant is in a state of transition. It shifts gradually from what I have called coenesthetic reception toward diacritic perception. The sensorium plays a minimal role in coenesthetic reception; instead, perception takes place on the level of deep sensibility and in terms of totalities, in an all-or-none fashion. . . . Furthermore, perception through the sensorium (diacritic perception) does not yet operate; this absence of diacritic perception intensifies coenesthetic 'reception,' since only coenesthetic signals will be received, experienced and become effective." ([3], pp. 140-41.)

Spitz's distinction between coenesthetic reception and diacritic perception is made even more clear by the following:

"It is my opinion, however, that a large proportion of the pathways involved belong to a system of 'sensing' basically different from the system of perception that operates at a later age and with which we are familiar. I have discussed the nature of these two systems and the differences between them elsewhere (Spitz, 1945, [4]) and have called the one present at birth the *coenesthetic* organization. Here, sensing is extensive, primarily visceral, centered in the autonomic nervous system, and manifests itself in the form of emotions. Accordingly, I prefer to speak of this form of 'perception,' which differs so fundamentally from sensory perception, as reception. It is an all-or-none phenomenon operating as a binary system.

In contrast to this stands the later development of what I have called *diacritic organization* where perception takes place through peripheral sense organs and is localized, circumscribed, and intensive; its centers are in the cortex, its manifestations are cognitive processes, among them the conscious thought processes." ([3], p. 44.) (See also Spitz, 1945 and 1946 [4-6].)

It is clear that Spitz views the emotional (affective) processes as primarily a visceral process localized in the autonomic nervous system and unrelated to sensory mechanisms and higher brain processes. This unusual psychoanalytic interpretation of the neurobiology of emotional processes which denies the primacy of sensory mechanisms and higher brain processes in these functions can have only contributed to a misdirection of scientific thought and research on the neurobiology of emotional ("maternal-social") deprivation phenomena.

The continuing distinction between social, emotional, and sensory processes in "maternal" (parental) deprivation phenomena has contributed to a lack of clarification of mediating mechanisms which is reflected in Yarrow's [7] summary of the effects of maternal-social deprivation:

"We can only speculate on the processes through which the mother comes to acquire special meaning to the child." ([7] p 486.)

This writer advocates a sensory-neuropsychological orientation to the study of parental deprivation and isolation rearing phenomena. Studies reviewed below and elsewhere have led this writer to the conclusion that the somatosensory system (cutaneous, visceral, proprioceptive and vestibular afferents) is the sensory modality that mediate the abnormalities consequent to isolation rearing; and that deprivation to the other sensory modalities during the formative periods of development will not lead to abnormal social-emotional behaviors provided somatosensory stimulation is present.

From the above it would seem appropriate to suggest that it is timely to move from speculation "on the processes through which the mother comes to acquire special meaning to the child" to basic research on the sensory processes in the parent-child relationship.

It is recognized that many investigators have acknowledged the importance, if not the primacy, of physical contact in isolation rearing studies and the Harlows' emphasis on "contact comfort" attests to this recognition [8-10]. Mitchell [11] summarizes this point of view succinctly:

"Rearing in *social* isolation produces severe behavioral pathology in all primates. The most important source of stimulation that is absent in such a rearing condition is physical contact from another animal involving a complex combination of skin or fur contact clinging, movement, oral contact, and warmth." ([11] p. 243.)

Unfortunately, the phenomena of "physical contact" in primate behavioral studies has been restricted to the conceptualizations of "social" behavior and thus has distracted from a *neurobiological* interpretation which could have led to systematic studies of sensory processes and brain functioning which tragically are still lacking today in the isolation reared primate.

The theoretical orientation outlined above does not deny the importance and relevance of the other sensory modalities in the normal development of social relationships. It is the conviction of this writer, however, that the affective/emotional component of social behavior is mediated by the somatosensory system (near receptors) and not by the visual and auditory systems. These latter modalities (distance receptors) do, however, acquire the capability of triggering emotional behavior. This is accomplished through a complex developmental conditional learning process which involves sensory integrative mechanisms. Whether the sight or sound of the parent (conditional stimuli) triggers positive or negative emotional responses in the child is dependent upon the history of the quality of parent/child somatosensory relationships, namely, pleasure or pain (unconditional stimuli).

It is the belief of this writer that the "psychological" or "psycho-social" environments must be understood in terms of their transformation into sensory experiences that are perceived by the organism. The alternative is to invoke extrasensory perception or non-sensory (spiritual) experiences in the development of social relationships and behaviors.

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