Effects of Nutrition on Behavior

AAAS Symposium • 30 December 1969 • Boston

The effects of nutrition on behavior, as opposed to effects on growth and health, are not very well documented. Such effects are of great interest in view of the many areas of the world where malnutrition prevails and in view of the many people in our own society who are not adequately nourished. In the past, both in the research laboratory and in the experiences of countries in World War II which suffered severe malnutrition, it was found that effects on the behavior or apparent capabilities of persons did not appear to last after malnutrition was corrected. Even in these data, however, there is some question that motivational differences may not have been allowed adequate expression due to the nature of the tests. In addition, the great increases in fetal and neonatal deaths in those periods, taken together with the frequently posited continuum of reproductive casualty, would lead one to expect some diminution of capability as a function of the severity of malnutrition.

More recently we have seen a burgeoning of animal studies which show severe effects of protein calorie malnutrition which appear in some instances to be lasting. The effects appear to be highly dependent upon the age of the organism at the time that nutritional deprivation takes place. If it occurs in the period of rapid growth of the central nervous system, effects appear to be maximum. Such studies lead easily to speculation about the effects of severe malnutrition during early stages of development in the human organism. The reality of such effects is pertinent to a number of pressing social questions, both nationally and internationally: (i) What is the long-range impact of severe malnutrition on the children in populations such as the Biafran? (ii) What are the cumulative effects of lesser degrees of malnutrition over a lifetime, or over many generations? (iii) What role may nutritional deprivation play in relation to "cultural deprivation"? Are such effects additive or interactive? These questions are not only relevant for countries in crisis, but to the problems of developing nations and to the poverty subculture of the United States.

While we are a long way from having adequate answers to these questions, this symposium will attempt to call attention to new data which are relevant. It will also try to clarify the methodological issues involved in studying these complex problems.

Inasmuch as clear-cut experiments can be performed only on animals below man, we will present reports on animal experiments as well as on studies involving humans. The species to be reported on vary from rats to monkeys. One of the important variables studied, both directly and implicitly (due to differences between the studies included), is the timing of the malnutrition. One concern with timing has also led us to focus on studies of young organisms only. These animal studies have all tested behavior after periods of rehabilitation. Hence their most immediate relevance is to situations where adequate corrective measures have been taken. This should, of course, be most favorable for finding normal behavior. It is at one end of a continuum whose other end is death due to continued malnutrition, with all levels of improved nutritional status short of full compensation (probably the most frequent situation in real life is in between). A variety of behavioral tasks or tests has been used to assess differences in behavior as a function of previous nutritional status. Thus it is hoped that the results found will not be situation- or task-specific, but give an indication of the types of performance most apt to be affected.

Over the past few years there has been great interest in studying available human populations where medical and nutritional intervention are taking place. Some of these studies have looked not only at the effects on growth and health, but also at behavior. Central and South America are areas where much of this work has been done and all of the data on children to be presented will come from these areas, specifically from Colombia, Guatemala, Mexico, and Peru. While some of the data will focus on growth and health indices, most of it will be concerned with behavioral measures, especially cognitive ones. It is the area of cognitive behavior which is of great concern to workers with "deprived" children and to programs which try to equalize their opportunity to profit from schooling.

Overall then, it is our hope that we can better understand the issues, known facts, and types of data most needed if we are to plan best for our own society and for other parts of the world. In particular, with the current emphasis on intervention to correct for deficits in the preschool period, we may see the potential relevance of nutritional intervention for the children (or for the mothers before the children are born).

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Program information and registration forms for the meeting, hotels, and tours appear in the 31 October issue of Science. *Information about Tours, Special Exhibits, Educational Exhibits, the Science Film Theater, and Musical Events appear in the 31 October issue. Reports about symposia appear in the following issues: 19 Sept., "Tektite: A Study of Human Behavior in a Hostile Environment"; 26 Sept., "Expanding Horizons in Medical Education"; 3 Oct., "Education of the Infant and Young Child"; 10 Oct., "Is There An Optimum Level of Population?," "Approaches to Policy Sciences," and "Sea-Level Panama Canal"; 17 Oct., "Quantitative Studies of Urban Problems" and "Our Food Supply"; 24 Oct., "Physiological Effects of Audible Sound," "Climate and Man," and "Rational Use of Water"; 31 Oct., "Technology Assessment and Human Possibilities," "Pattern Perception," and "Youth: Ego-Ideals and Impact of Culture"; and 7 Nov., "Space Astronomy," "Science Policy and State Government," "The Nature and Dignity of Man," and "Behavioral and Social Sciences: Outlook and Needs."*