

Cumulative Health Trauma and Age Changes  
in Cognitive Behavior

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## Introduction

My paper in this symposium represents a significant departure from the themes which have dominated a decade of work for myself and my associates. That is, it is the first of a series of attempts to go beyond the description of the presence and/or absence of cognitive deficit, by trying to delineate some of the parameters which might be likely to account for the vast individual differences in the attainment of peak levels of cognitive behavior, their maintenance or their decline. I am intrigued by the fact that strictly speaking I am the only "pure" behavioral scientist on this symposium, if by "pure" one means the lack of medical training, and perhaps that is why I am allowed to speak my piece first. Also, this allows me from the vantage of the non-expert to take a critical look at the disease model as an explanatory principle in aging, and before my more learned colleagues can convince me with their data, to show why, on both logical and logistic grounds, the disease model of aging may be rather useless for purposes of behavioral science analyses; but that data involving physical disability and disease may be of considerable interest, once one transforms data ostensibly collected for medical reasons into indicators of quite another dimension which may be extremely relevant to the understanding of individual age changes in cognitive behavior. But one thing at a time, and first of all let me legitimize my interest in the problem at hand.

### Age Changes in Cognitive Behavior

My work in the psychology of aging began two decades ago (Schaie, Rosenthal & Perlman, 1953) by showing that there was apparent differential decrement in the performance of old people on different dimensions purported to be measures of intelligence. This work led in a number of directions. First of all I tried to demonstrate that factors such as speed of performance, loss of memory or increasing rigidity could account for the fact that old people performed less well than did the young (Schaie, 1958; 1959; Strother, Schaie & Horst, 1957). Another concern investigated was the possibility that peculiar sampling procedures might result in detecting only those individuals who had suffered significant impairment unknown to the investigator (Schaie & Strother, 1968a; Schaie, 1973).

More important in the long run were the investigations which led to the understanding of the relationship between ontogenetic and cohort differences (Schaie, 1965, 1970; Schaie, Labouvie & Buech, 1973; Schaie & Strother, 1968a, 1968b). These latter studies have led to the recognition that for a given cohort under consideration, at least with respect to the crystallized abilities (Cattell, 1963), there is little within cohort age decrement, but that there are substantial differences in level of function between successive cohorts, later-born cohorts performing at higher levels than do cohorts who have entered a progressively enriched environment at an earlier point in historical time.

Nevertheless, we have also accumulated evidence which shows that individual patterns of change over time (and these data, of course, come from short-term longitudinal studies) reflect patterns of increment, decrement or maintenance for individuals regardless of cohort membership, even though maintenance or increment is more characteristic of members of the more recent than the older cohorts. I have tried to give an example of this fact from the fourteen year

study of 161 subjects who participated in psychological examinations in 1956, 1963 and 1970 respectively. Table 1 shows frequencies of stable, declining and gaining individuals over the fourteen year period for a number of cognitive variables. When examined <sup>for</sup> two separate seven year periods, matters become more complex, because we can now find individuals who show patterns of decline and increment or vice versa when the two periods are compared to one another.

Table 2 presents frequencies of gains, losses and stable performance for the two seven year periods. It will be noted that socio-cultural change and/ or generational differences have significant impact on all variables except verbal meaning and the composite measure of educational aptitude. The observed changes are in the positive direction (i.e., more individuals showing gain or stability and less decline) for Reasoning, Word Fluency, Personality-perceptual Rigidity, Psychomotor Speed and the composite measure of intellectual ability, but negative shifts from Space and Motor-cognitive Rigidity.

With this evidence in hand it becomes clear that we must not only continue to monitor the impact of socio-cultural change upon cognitive performance, recognizing that this impact provides major variance for age differences in performance on at least the crystallized abilities, but moreover we must begin to determine the nature of this impact particularly as it bears upon patterns of individual change.

What then are the parameters that deserve early investigation in defining the nature of such individual change? While there are many different approaches which could be taken (Baltes & Labouvie, 1973) I have elected to approach this problem by examining the individual's micro-environment. By this term I mean to imply that I intend to investigate successively those variables present in the day-to-day experience of adults which may be assumed to make a difference in the maintenance of cognitive functions. I shall restrain myself from

re-inventing the wheel and will lean heavily on other investigations, notably such studies as the Langley-Porter investigations of adult life transitions (cf. Lowenthal, 1971, 1973). But before proceeding even to the most proximal external variables, there is one other step which I feel must be taken. That is, the most proximal parameter of impact upon cognitive function, at least in my judgment, is the impact of physical health and resultant well-being. Particularly, I am concerned about the cumulative impact of various health trauma as deducible from health history data.

#### The Effect of Cumulative Health Trauma

One of the interesting aspects of the panel of subjects used in my short-term longitudinal studies is the fact that all panel members have received all their health care (with the rare exception of emergency procedures while subjects were away from home) from the health maintenance organization which forms the basis of our sampling universe. Complete records are therefore available on the frequency and kinds of illnesses requiring medical care, as well as anecdotal records of treatment history. During the past year we have consequently worked intensively with the medical and research staff of the health agency to develop procedures to quantify the health records of our panel members in such a way that we can index them both in terms of the age of the individual as well as the historical point in time when the incident of ill health occurred. When I was invited to participate in this symposium, about a year ago, I had hoped to have data available by now to document some of the hypothesized relationships. This I cannot do, because we ran into difficulties of both conceptual and logistic nature, which as I have prefaced bear directly on the utility of the disease model for aging, and I shall now address myself to these issues.

Let me first deal with the logistic issues: It was of considerable interest to me to discover that while most physicians generate medical histories, few physicians have experience or interest in retrieving data from such histories, particularly in a form which lends itself to research purposes. True, there are some formal ways in which medical history data can and have been coded. We might consider using the international system of coding (and we have). Unfortunately, as others interested in abstracting from medical records have found (Hurtado & Greenlick, 1971), it is quite difficult to relate descriptive disease categories to outcome parameters and moreover it requires the specialized services of individuals such as medical record librarians to begin to decipher and detect the necessary information which must go into such coding. Indeed, if one is to relate such data to outcomes of a non-medical nature one must perhaps be more concerned with episodes of illness or medical care than with individual diagnostic entries. Such an approach has recently been provided by Solon and his associates (1967, 1969), but considerable definitional problems remain before consistent data can emerge. For our purposes we have begun to code data on our fourteen-year sample both with respect to a given disease condition as well as applying the episode or "spell of illness" approach. Specifically we have begun to ask the following questions:

(1) Are there differences in frequency of illnesses (any unspecified episodes for which health care has been solicited) between members of different cohorts?

(2) Are there differences in the incidence of recorded physiological trauma (illness and accidents), respectively increased use of medical care facilities for maintenance of an optimal physical status, between subjects for whom maintenance gain or decrement in intelligence test performance has been noted?

### How meaningful is the Disease Model?

Although we shall not abandon these questions, we have had to re-examine some of our basic assumptions. That is, we have raised the question whether there ought to be a direct relationship between raw indices of disease diagnoses or incidence of medical care and behavioral criteria. I am much impressed by the work of Aron Antonovski and his associates in Israel, who have addressed themselves to this question in some detail. These investigators, hold that the concern of the social scientist in dealing with the consequences of physical illness should concern itself not with the particular physiological dimensions involved but rather address the social consequences embedded in the concept of "breakdown."

More specifically, Antonowski (1972) argues that there are basically four dimensions of such breakdown which deserve attention: First, a disease may or may not be directly painful to the individual; second, it may or may not handicap him in the exercise of his faculties or performance of social roles; third, it can be characterized along the dimension of acuteness-chronicity with respect to its possible threat to life; and fourth, is it or is it not recognized by society's medical institutions as requiring care under the direction of such institutions.

Now, I believe a very similar system of classification can be arrived at with respect to the impact of a particular disease entity may have with respect to gain, loss or maintenance of cognitive function, particularly if we begin to reclassify medical histories in terms of the degree of breakdown presented therein rather than the specific disease entity which may be represented thereby.

From the point of view of the psychologist I would then suggest that it may be fruitless on both conceptual grounds and logistic problems to keep hunting for direct connections between specific disease entities and behavioral

consequences, but that we should rather concern ourselves with organizing information on illness and the utilization of medical care in terms of a psychologically meaningful organizing principle such as "breakdown." Once we do this we escape the conceptual dilemma of having to distinguish between the contribution of the actual disease process and the way in which the individual responds to the disease condition, especially since it may often be the latter which more directly mediates the behavioral consequences, at least at the macro-level most typically accessible to observation and analysis.

#### Health Breakdown and Cognitive Function

It becomes necessary then to code health history data first of all in terms of the degree and dimension of the breakdown of the individual's micro-environment. Here we are proceeding by abstracting health records in terms of the disease episode approach suggested by Solon et al. (1967,1969), and then applying Antonovsky's breakdown scheme which we are modifying by using more psychometrically oriented criteria in assigning scale values to individual illness episodes. We are then ready to chart the cumulative impact of health trauma in two ways. First of all we can assign a cumulative index of physical health breakdown, which is simply the summation of all incidents observed as weighted by their impact upon the life of the subject. Secondly, we can graph the average level of breakdown at each measurement point for which psychological data are available, and relate the slope of physical health states to the slope of observed cognitive change.

Throughout this analysis, it will be just as necessary here as with our cognitive data to be concerned with the effects of cohort differences in the utilization of medical care, as well as the tendency that previous episodes of care may elicit different patterns of subsequent care than would be true for the first occurrence of a given health breakdown. Fortunately, our system of data acquisition permits a reasonable modicum of controls.



Some final thoughts

We have tried to suggest that the psychologist interested in age changes in cognitive function should look at the cumulative as well concurrent effect of physical illness as a possible parameter which may explain both individual differences as well as differences in levels of performance among cohorts. We have further suggested that characterization of illness for this purpose must be in terms of episodes rather than incidents and that moreover it is the element of breakdown as being common to all diseases, which seems most promising as the intervening variable of concern to the psychologist. I had hoped to be able to bring you factual data on these relationships, but the complexity of the problem has made this premature. I trust our further discussion of these matters at this symposium will give us some help in pushing these matters further.

Table 1  
 Frequencies of Gain, Decline and Stability over a  
 Fourteen Year Period

	# of subjects who		
	Gained	Remained at same level	Declined
Verbal Meaning	28	114	21
Space	27	102	32
Reasoning	16	120	24
Number	15	128	17
Word Fluency	11	82	68
Intellectual ability	15	108	38
Educational aptitude	23	118	21
Motor-cognitive Rigidity	19	120	22
Personality-perceptual Rigidity	28	97	35
Psychomotor Speed	17	96	38

Table 2. Frequencies of Gain, Decline and Stability of Cognitive Behavior

	# of subjects who				Significant level of change over two periods		
	For two Seven-year Periods		Declined				
	Gained	Remained at same level	1956-63	1963-70			
Verbal Meaning	26	24	116	109	19	28	$X^2=4.67$ N.S.
Space	32	21	99	107	30	33	$X^2=7.08$ $P > .05$
Reasoning	12	26	120	117	29	18	$X^2=6.23$ $P > .05$
Number	20	10	129	126	12	25	$X^2=7.99$ $P > .02$
Word Fluency	12	24	81	103	68	34	18.03 $P > .01$
Intellectual ability	20	11	106	129	35	21	$X^2=18.99$ $P > .01$
Educational aptitude	26	22	107	113	18	27	$X^2=2.09$ N.S.
Motor Cognitive rigidity	33	14	111	122	17	25	$X^2=7.361$ $P > .05$
Personality-perceptual rigidity	27	34	95	97	39	29	$X^2=2.34$ $P > .05$
Psychomotor speed	14	12	98	144	49	5	$X^2=49.90$ $P > .01$

Footnote

1  
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