Health Status Assessment by Age and Implications for Adult Cognitive Change[1]

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A new technique has been developed by us to permit a more satisfactory assessment of the effect of cumulative health trauma upon behavioral variables such as long-term change in cognition through adulthood. The data from our 14-year study of adult cognitive behavior have repeatedly shown substantial differences in intellectual performance between cohorts and differences in slope of performance for successive cohorts. As has been emphasized by aging researchers (Spieth, 1965; Szafran, 1968; Thompson & Marsh, 1973) greater understanding of these differences requires knowledge of the individual's health status. Our technique has enabled us to look more closely at patterns of ill health between and within generations as they might relate to cognitive change data.

Description of the Technique

Health history records were obtained for 150 subjects over a 14-year period. Each physical complaint from a clinic or hospital contact was coded using the International Classification of Diseases (ICDA) for incidents and episodes. Incidents refer to each contact with a physician; episodes refer to the entire set of visits or contacts for one health problem. Although the ICDA contains over 8000 classifications, only about 820 were actually encountered. By collapsing and overlapping categories this number was further reduced to 448 of the most frequently occurring classifications. These were then Q-sorted by twelve physicians on an eleven-point severity scale, ranging from benign to extremely severe. Physicians were asked to rate severity according to the long-range impact of the disease upon the health and well-being of the patient. The

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448 categories were divided into four decks of 112 cards each upon which the disease name and a brief description was typed. Each physician Q-sorted two of these decks; a total of four physicians sorting each deck. Inter-rater reliabilities for the severity ratings were calculated. These inter-rater reliabilities ranged from .82 to .90.

Subjects

Subjects for this study were originally drawn from an 18,000 member pre-paid health care cooperative in a Northwest metropolitan area in the United States. Health record data was obtained for 150 of the 161 subjects whose cognitive functioning had been assessed three times over a 14-year period (See Schaie & Labouvie-Vief, 1974 for complete description). For purposed of analysis the 150 subjects (81 females and 69 males) were divided into seven 7-year cohorts (mean ages 39-81 in 1970).

RESULTS

Incidents and Episodes of Ill Health

Three sets of analyses were performed. Data were first analyzed by a 7 x 2 x 2 (cohort by sex by time) ANOVA. The two time periods studies were 1956-1963 and 1963-1970. Old and young subjects did not differ in number of incidents and episodes of illness; however, a significant main effect was found for cohorts on severity weighted incidents. That is, the severity of the illnesses for each medical contact for older people was significantly greater ($p < .01$) than for the younger subjects. The break occurred between cohort 4 and cohort 5. It was also found that females had a significantly greater number of incidents than did males ($p < .001$). The means for seven-year periods were: males= 27.6 and females= 39.2.

Cognitive Function Adjusted for Ill Health

Cognitive ability measures were covaried for incidents, episodes, and severity weighted incidents over the two seven-year periods, in an attempt to distinguish whether significant cohort differences on specific cognitive abilities would vanish, or be greatly reduced once the effect of illness was removed. The five subtests of the Primary Mental Abilities (PMA) (Thurstone & Thurstone, 1949): Verbal Meaning, Space, Reasoning, Number, and Word Fluency; and the three subtests of the Test of Behavioral Rigidity (TBR) (Schaie & Parham, 1975): Motor Cognitive Rigidity, Personality Perceptual Rigidity, and Psychomotor Speed, plus Intelligence and Educational Aptitude Quotients were the dependent variables.

Succinctly put, the effect of covarying incidents, episodes, and incident weights had no significant effect on the cognitive abilities data. Specifically, the main effect for cohorts for these subtests was not diminished. The only effect of covarying was a slight increase in the F value for sex differences for Word Fluency and Personality Perceptual Rigidity.

Since our health data may be too crude to allow treatment as an interval scale, we next examined episodes weighted by severity, split at their median, for each of the 7-year periods 1956-1963 and 1963-1970, as well as the entire 14-year period. This procedure permitted a 6 x 2 x 2 (cohort by sex by episode severity) ANOVA.

Results from the 1963 analysis showed a significant sex by weighted episode interaction ($p < .05$) for Word Fluency. Males with higher 7-year weighted episode totals did poorer on the Word Fluency subtest than males with lower episode weights. Females were less affected by the episode weight totals, but those with higher weights did slightly better. For Personality Perceptual Rigidity there was a main effect of episode weights ($p < .01$) with subjects with lower weights being more flexible.

For the 1970 ANOVA there was a significant cohort by episode weight interaction for the Verbal Meaning subtest ($p < .05$) with members of cohorts 1, 3, 5, 6, having lower episode weights (more healthy) showing higher scores on Verbal Meaning than those cohort members with high episode weights.

Finally, episode weights were summed over the entire 14-year period and 1970 cognitive data word used as dependent variables. Only a three way interaction (cohort by sex by episode weight) for Word Fluency was significant ($p < .05$). Males with lower episode weights in chohorts 1, 3, 5, 6, did better than men with higher episode weights; the opposite was true for males in cohorts 2 and 4. For females the pattern reversed with those having lower episode weights in cohorts 2(age: 71-77), 4(age: 57-63) and 6(age: 42-49) doing better than their higher episode weight counterparts. Mainly then, by cohort, females and males, except for members of cohort 6 had reversed patterns for Word Fluency.

DISCUSSION

The development of a health history assessment technique has been useful in answering questions on how cumulative ill health differs by cohort and sex, and how such periods of ill health might affect cognitive change. We have found that the severity of older persons' illness is greater than that of younger subjects, which is not unexpected. Also, we found that females had a greater number of illness incidents than did males. However, since there were no sex differences for episodes (periods of illness) or weighted incidents, one might postulate that women, simply by virtue of their specific health needs, have a greater number of routine medical checkups.

The data from the covariance analyses lead us to question seriously the commonly-voiced opinion that differences in cognitive behavior change with age are accounted for mainly by health status. This opinion clearly is not supported by our data. However, we did find that when severity weighted episodes were used as an independent variable some differences in cognitive performance were found. Nevertheless, only three variables of the eleven measured; Verbal Meaning, Word Fluency, and Personality Perceptual Rigidity, showed any significant effect and these significant effects did not occur for each of the three time periods monitored.

Of the three subtests showing significant effects, two were of a verbal skill nature. This finding may point to a greater sensitivity of verbal functioning to disease, from our data such sensitivity is greater for men than for women and less for certain cohorts (2 and 4). The latter finding is compatible with reports that high blood pressure changes in the elderly, in most cases, have a deterimental effect on verbal skills (Wilkie & Eisdorfer, 1973).

It may be concluded then, that our search for major effects of cumulative health trauma on cognitive performance has been less successful than predicted by a number of theorists (Spieth, 1965; Szafran, 1966, Szafran, 1968). These analyses have been useful in yielding further information and insight into the complex dynamics of adult cognitive behavior and have led us to the next step in this area of research, already undertaken in our lab. That is, we will now take a more detailed look, with larger samples, at the effect of specific diseases such as cardiovascular dysfunction, cancer, and hypertension (Butler, 1959; Kissen, 1969; Reitan, 1954; Wilkie & Eisdorfer, 1971; 1973). Perhaps at this level of specificity effect of illness upon the dynamics of adult cognition may become clearer. Alternatively, it may well be that even specific illness accounts for a relatively small proportion of variance in change in cognitive function and that we must look for explanations in more distal environmental variables (cf. Gribbin, Schaie, & Parham, 1975).

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