



# Age Changes and Employability

By L. F. KOYL, M.D., D.T.M.H.

THE Department of Veterans Affairs of the Dominion of Canada is comparable to the Veterans Administration in the United States. Among the employees in its Toronto district, it has about 250 persons who are reaching retirement age each year during the fiscal years 1954-64. The facilities of the DVA's 1,800-bed teaching hospital, Sunnybrook, offered an opportunity to study the problems of these aging employees.

In 1954, the assessment unit of Sunnybrook Hospital was publishing data about the problems of the older deteriorating veteran. We requested and were allotted the problem of studying the whole employee in his total environment. Other studies, including an atherosclerosis project and an arthritis study, parallel our work. If the group studying the aging employee detects a problem of interest to any of these groups, their facilities are available to us. Other DVA hospitals in other university centers have special interests under study.

Our terms of reference are:

1. To study a large group of aging employed persons over a period of years to discover the incidence and the rates and direction of change in the various pathological processes accompanying age, including social, economic, medical, and psychological processes.

2. To establish a valid clinical method of assessing the aging worker as an individual and of comparing him with his fellows.

3. Therefrom, to establish criteria for continued employment beyond fixed retirement ages.

4. Therefrom, to develop a practical method for examination of the aging employee to determine his suitability for continued employment.

5. To study the rate, direction, varieties, and measurement of intellectual deterioration and to develop practical, accurate, and brief testing procedures.

6. To explore the possibility of correlating clinical evidence of deterioration with laboratory evidence in a practical manner.

7. As a corollary to the above, to study (*a*) the positive prevention of total or partial deterioration in older workers and (*b*) means of keeping older workers working and free from disability.

8. As a further corollary to the above, to study methods of preparing individuals for successful retirement.

We thus began a 5-7-year study, using the multidisciplinary approach, with medicine, psychology, sociology, and economics all involved. We favor placing no limitations on the inventiveness of our members except the tolerance of volunteers to an examination already requiring 6 hours.

It is difficult or impossible to do quantitative analyses on any except the simplest aspects of human behavior, such as chemistry. We therefore had to devise methods of converting qualitative data into semiquantitative data. We

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chose functional profiles of our own devising, including the Gulhemp scale. It is important to note the two words "functional" and "profile." A profile can be graphed, machine coded, and so on. If it is a profile of functional ability and is explicit enough, it can be used for job descriptions, employment examinations, and so on.

A most important factor in our work is accuracy of prognosis. We are deliberately making 5-year prognoses when we feel that we have the knowledge to do so and we shall check the accuracy of the prognoses by seeing all volunteers again at 2½- and 5-year intervals. We have already made many repeat examinations for reemployment after age 65 and have been pleased to see that we are very close in our estimates of the type and direction of change in pathological processes. How accurate we are in our estimates of the rate of these changes will not be known for a few months.

### Medical Report

There is no real difference in the type of disease found in the working population in this study (median age 61.05 years) and the type found in deteriorating veterans (median age 70.0 years) applying for domiciliary care (1, 2). The difference found is one of degree.

A discussion of preliminary findings follows. The work of our medical and psychology workers is emphasized since reports on the social and economic aspects of the study have been published (3).

In only 6 of the 150 volunteers could the diagnosis of "no appreciable disease" be made. However, all were working; therefore, none were truly disabled.

There were 65 fixed disabilities, mostly from wounds, injuries, and operations. Osteoarthritis caused recognizable symptoms and signs in 38 persons. Varying degrees of atherosclerosis were observed in 33 persons, 2 of whom have since died after massive coronary occlusions. Other disease processes were observed in 119 persons. Varicose veins were a problem in 13. Varying degrees of deafness were noted in 33, while 78 had decreasing visual efficiency. There were 8 possible premalignant skin lesions.

### Laboratory Findings

In all 150 volunteers, the hemoglobin reading was over 80 percent; the average was 90 percent (15.6 gm. percent=100 percent).

In 24 of 60 cases the sedimentation rate was over 20. Two females were not counted as abnormal because their rates were marginal (22 and 24); in the remaining 22, none of the usual causes of an elevated rate were present.

Results of 24-hour steroid tests on 60 cases were as follows:

Test	Number cases	Range (mg. percent)	Average (mg. percent)	
			60-65 years	49-59 years
17 ketosteroids.....	30	5-15	6.8	6.8
Crude corticoids.....	{ 29 1	{ 1-3 3.8	1.7	1.8

The frequency of abnormal sedimentation rates is interesting. Possibly emotional stress due to the prolonged examinations caused this abnormality. Two-thirds of all abnormalities were recorded at 4:00 p. m., after the volunteers had been under emotional tension for 6 hours.

The lack of correlation of steroid values with age is contrary to the findings of previously published studies on hospitalized groups. The studies on sedimentation rates and steroid values will be continued and coordinated. It will be necessary to obtain electrophoretic serum protein studies on a group with abnormal sedimentation rates plus adrenal steroids and, possibly, C-reactive protein studies.

### Physical Findings

General physique is the most important determinant of general employability as distinct from fitness to engage in a specific occupation. The accompanying frequency distribution chart (fig. 1) illustrates this aspect of fitness for continued employment. An artificial cutoff (except for one case) in the number of persons over 65 years of age is included in this early stage of the survey. This cutoff will disappear as we re-examine our increasingly large sample at intervals of 2½ years.

In the top half of the chart, which shows the results of examinations, there is no slope to the mean or median lines. There is no evidence, therefore, of correlation between age and general physique in the limited sample aged 50-64 years.

Our estimates of probable change are plotted in the lower half of the chart. It will be noted that age plus 5 years is the abscissa so that the overall pattern is comparable in the two halves of the chart. The artificial cutoff now occurs at age 70. The sharp bends from G5 to G6 and from G6 to G7 are obviously due to the small samples at G6 and G7. Otherwise there is a slight angulation toward the right in both mean and median lines. Such angulation to the right suggests decreasing fitness with increasing age. The standard deviation of G1 is 3.5, which makes this suggestion probable as the mean curve moves to the right at least 7.1 points relative to G1 between G1 and G5.

The number and degree of the pathological processes going on in the middle-aged employee

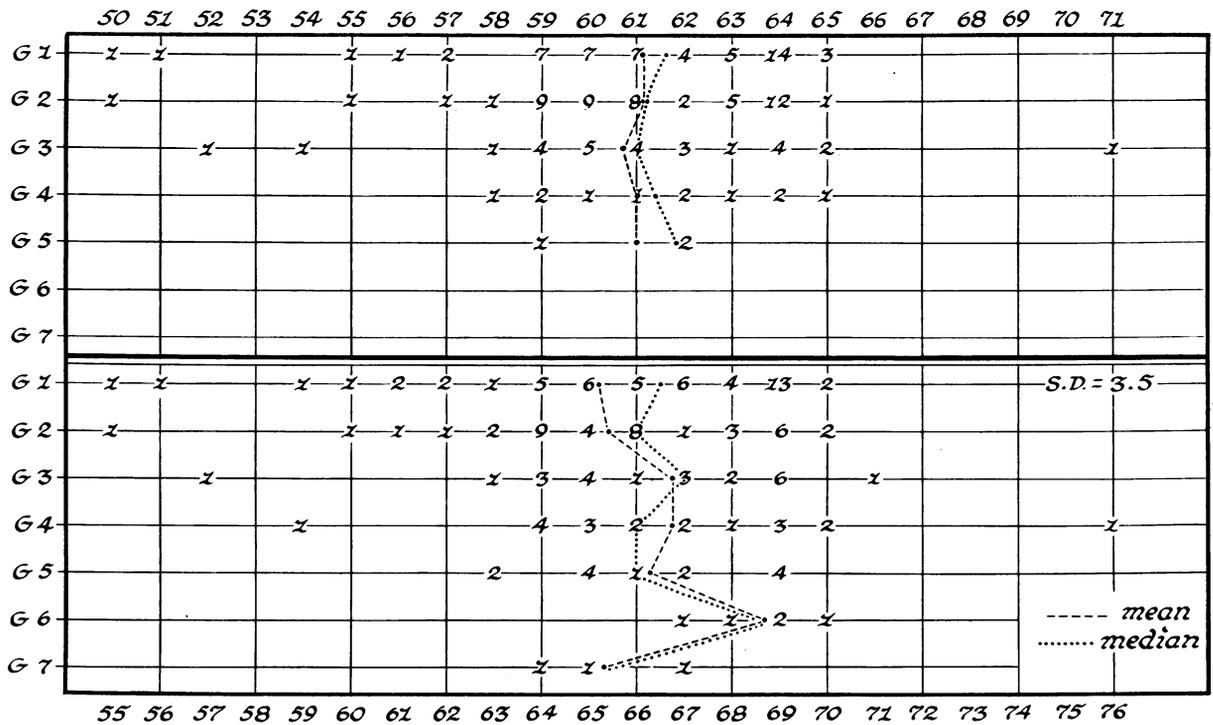
will be no surprise to the practicing physician, although the universality of these processes may be surprising. They become evident gradually in the forties so that the rate of deterioration in health is a straight-line curve to the late sixties. Health begins to deteriorate more rapidly as the seventh decade approaches.

### Psychological Report

#### *Some Aspects of Intelligence*

The calculated intelligence of the volunteers and a clinical prediction of the rate of change is shown in figure 2. The prediction in the lower half of the chart is based on clinical evidence from the various types of disease already present and otherwise is based on the pre-

**Figure 1. General physique of 150 employees of retirement age. Upper half, results of examination; lower half, estimated probable changes.**



Courtesy of Sunnybrook Hospital, Department of Veterans Affairs, Canada.

- G1 Fit for heavy manual work, including digging, lifting, climbing, regularly as main occupation.
- G2 Fit for manual work, including incidental or occasional heavy work as in G1—can work on shifts.
- G3 Fit for all employment except heavy labor, liable to deteriorate if meals and rest inadequate.

- G4 Fit for sedentary employment with regular hours for meals.
- G5 Fit for restricted employment or part-time employment. "The handicapped worker" in home or out.
- G6 Self-care only.
- G7 Bedfast.

vious experience of the authors. Intrapolation of results was also possible because the procedures had been tested on younger and fitter, as well as on older, more deteriorated groups before beginning this survey.

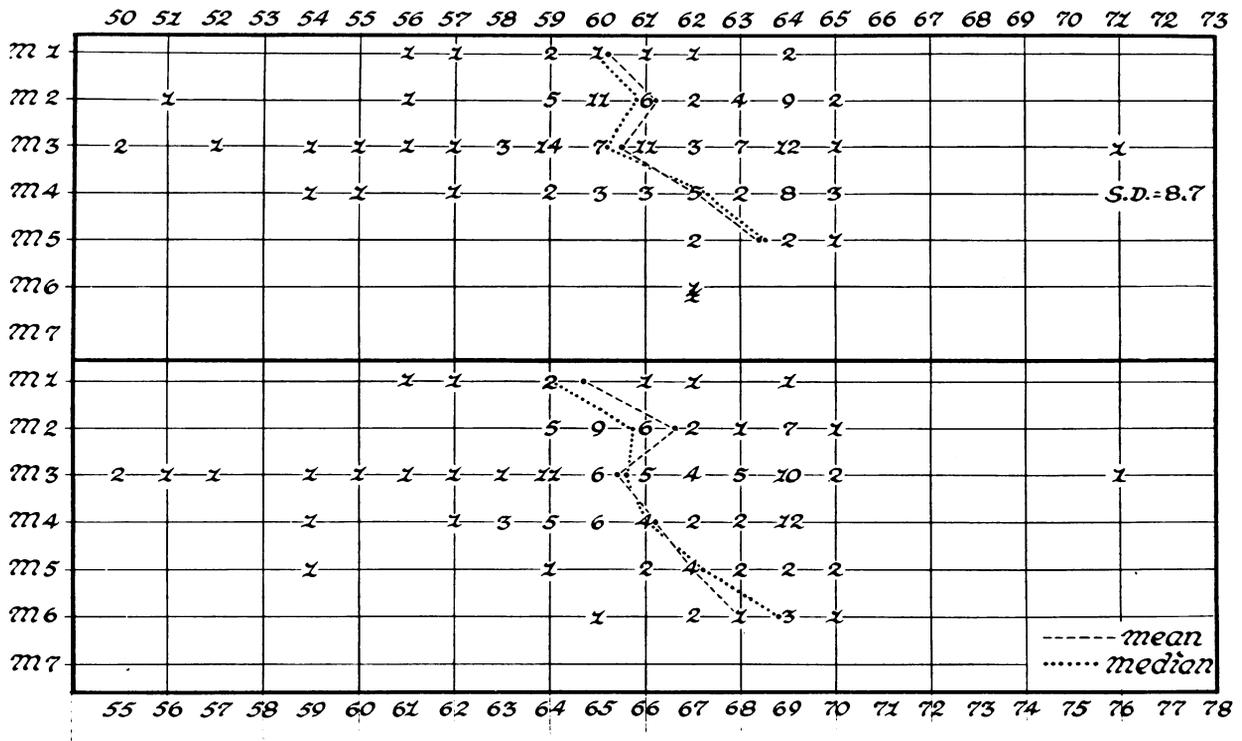
In both upper and lower halves of the chart, both median and mean lines curve sharply to the bottom right. The standard deviation of M4 in the top half of the sample is noted to be only 8.7. This is probably significant.

In terms of M4, the change between M3 and M5 is 11.4.

In this sample, intelligence probably begins to deteriorate at between 50 and 65 years of age. If our predictions are valid, deterioration will continue at approximately the same rate in the following 5 years. (The slope of the "examined" and the "predicted" mean lines are the same.)

There is little or no correlation between de-

**Figure 2. Mentality of 150 employees of retirement age. Upper half, results of examination; lower half, estimated probable changes.**



Courtesy of Sunnybrook Hospital, Department of Veterans Affairs, Canada.

- M1 Intelligence of a superior order capable of understanding and undertaking long-range planning, organization of details, integration of different aspects of a plan; flexibility and individual initiative. I.Q. 140-129.
- M2 Intelligence sufficient to plan and carry out work accurately without supervision. Knowledge of job's relationship in broader setting and ability to assume and execute responsibility under supervision. Capable of working accurately under pressure. I.Q. 128-110.
- M3 Intelligence sufficient to work accurately under normal supervision and normal conditions. Capable of learning new skills as required. Skilled labor. Normal intelligence. I.Q. 109-91.

- M4 Intelligence sufficient for simple routine tasks under supervision, can learn related tasks. Semi-skilled and labor. Dull normal intelligence. I.Q. 90-80.
- M5 Requires extra supervision due to slowness and failure to understand. Unskilled labor. High-grade defective. I.Q. 79-70.
- M6 Requires almost constant supervision and direction at each stage of work. Learning ability poorly demonstrated. Constantly supervised labor. Moron. I.Q. 69-60.
- M7 Unable to understand nature of job or remember steps in an operation. Unemployable in any capacity. Imbecile and idiot. I.Q. 59-0.

**Table 1. Summary of Wechsler-Bellevue performance**

Subtest	Number of cases	Range <sup>1</sup>	Mean <sup>1</sup>	Standard deviation of mean	Rank	Median <sup>1</sup>	Correlation coefficient (R) with I.Q.
Information.....	149	4-18	11. 17	2. 72	2	10. 72	0. 784
Comprehension.....	148	4-16	10. 61	2. 59	3	10. 31	. 679
Digit span.....	147	2-17	9. 12	3. 36	7	9. 06	. 624
Arithmetic.....	148	1-18	9. 73	4. 38	6	8. 96	. 787
Similarities.....	149	1-17	9. 02	3. 37	9	8. 75	. 802
Vocabulary.....	148	6-17	11. 86	2. 61	1	11. 84	. 812
Picture arrangement.....	149	1-14	7. 77	2. 86	10	6. 92	. 686
Picture completion.....	149	3-14	10. 03	2. 47	4	9. 45	. 685
Blocks design.....	149	1-16	9. 08	3. 33	8	8. 53	. 836
Object assembly.....	149	0-16	9. 87	3. 30	5	10. 32	. 668
Digit symbol.....	146	0-15	7. 25	2. 37	11	6. 46	. 678
Intelligence quotient:							
Full.....	148	79-143	113. 79	13. 11		114. 80	
Verbal.....	148	76-139	111. 35	12. 45		111. 50	
Performance.....	148	89-144	118. 46	11. 74		118. 71	
Deterioration quotient.....	146	-68%+57%	+1. 98	19. 95		+1. 83	-. 436
Efficiency quotient.....	147	55-134	98. 37	16. 07		100. 32	

<sup>1</sup> Weighted score.

terioration in intelligence and organic brain damage. Only five cases had clinically perceptible brain damage and, therefore, organic deterioration. In 122 cases, beginnings of functional deterioration were determined by psychometric or clinical methods of observation, or both.

The average I.Q.'s of the 148 subjects on whom complete Wechsler-Bellevue tests were done are shown in table 1.

Manual ability has not deteriorated to the expected extent in these subjects. The age credits for this need revision.

There was an inverse relationship between the deterioration quotient and intelligence. Exactly one-half of the subjects showed the expected deterioration; 32 percent showed more deterioration than expected and 18 percent, less than expected.

The deterioration quotient as presently calculated is only of qualitative value. The "hold-don't hold" formula needs revision. Some of the "hold" items for example, require sensory acuity of a degree which is not usual for this age group.

Rigidity is an outstanding characteristic of these subjects, especially when thinking at an abstract level is required. Our volunteers had difficulty in tasks requiring concentration or a focus of attention. In some, considerable tension was generated by such requirements.

We would prefer to use efficiency quotients as a standard instead of intelligence quotients, but we are not sufficiently sure of the true meaning of the efficiency quotient.

#### *Some Aspects of Personality*

The distribution pattern of the personality types of our volunteers as recorded at the weekly meeting is shown in figure 3. The predicted rate of change shown in the bottom half of the chart is based on clinical knowledge of the usual rate of change in known syndromes as seen by experienced observers. Ages have been offset by 5 years to allow direct comparison of the slope of the means.

The difference between P1 and P2 in the top half of figure 3 is undoubtedly due to the smallness of the sample. Otherwise there is no visible slope to the mean or median line. If our predictions are valid, there is a slope downward and to the right in the half of the chart which represents our 5-year predictions. To test the importance of this trend, the standard deviations of P3 and P4 were calculated. The CR difference calculated from these is 1.75, which is at the 5 percent level of confidence.

It is safe to say, therefore, that there is no significant deterioration in personality in this group in the age range 49-59 years. If our predictions are valid, there will probably be deterioration in personality in the sample at a

statistically significant rate in the group aged 65-70 years (1 man aged 70).

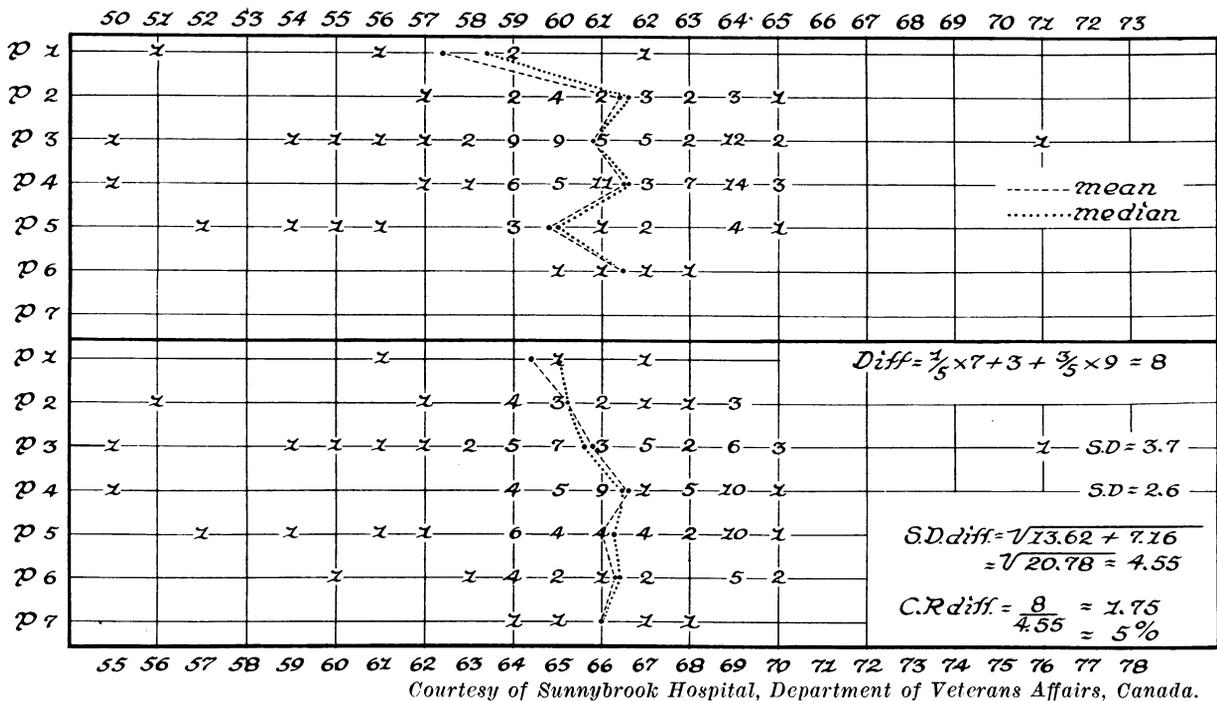
The personalities of our sample are a cross section of their age group. It must be emphasized that all these employees are earning their living and are therefore "normal." Any other criteria of normalcy are rather unrealistic in this far from perfect world.

To facilitate future study, the reaction pattern of each person was determined. The group was then subdivided according to predominant reaction (table 2). Such a subdivision is inevitably rough since the higher the personality

and intelligence rating, the more difficult it is to classify an individual. In 32 cases, the attempt was abandoned.

The dominant personality type of each volunteer was determined clinically. At the weekly conference of examiners, the personality of each person in the study is, of course, the subject of group discussion. Each examiner brings to the conference information of value. Some volunteers talk well to the doctor; others become expansive and confidential with a financial officer; others, whose basic desires are batted down under fairly secure hatches, disclose more to

**Figure 3. Personality of 150 employees of retirement age. Upper half, results of examination; lower half, estimated probable changes.**



Courtesy of Sunnybrook Hospital, Department of Veterans Affairs, Canada.

- P1 Personality sufficiently stable to work with others in supervisory or administrative capacity; capable of earning cooperation of co-workers and respect of his abilities. Flexibility in interpersonal relationships and understanding of problems of the job, loyalty to organization.
- P2 Personality sufficiently stable to work well with others and willing to assume partial administrative or supervisory responsibilities if required. Capable of taking direction without rancor.
- P3 Personality sufficiently stable to take constructive criticism or advice. Cooperation with others without need to be on the defensive. Self-reliant.

- P4 Personality shows signs of doubting own ability, hesitancy, and "tentative" attitude. Requires encouragement and support. Capable of cooperation with others.
- P5 Personality shows signs of cracking under pressure of work criticism or staff changes and moves. Manifest in withdrawal or agitation or both.
- P6 Personality shows signs of poor or defensive interpersonal relationships with overt criticism of others and difficulty in work relationships.
- P7 Personality chronically shows signs of tension, anxiety, or withdrawal sufficient to disrupt work efficiency and interpersonal relationships. Severe neurotic or prepsychotic.

**Table 2. Reaction patterns of 150<sup>1</sup> "normal" personalities**

Type of dominant characteristic	Total with dominant characteristic	Type of additional characteristics <sup>2</sup>									
		Schizoid, introverted, seclusive	Paranoid	Withdrawn	Rigid, stereotyped	Dependent, passive	Active, impulsive, aggressive	Psychopathic	Hysterical	Depressed	Anxious
Schizoid, introverted, seclusive.....	23	xxxx	4	7	8	5					10
Paranoid.....	4		xxxx		2	1					3
Withdrawn.....	14			xxxx	3						6
Rigid, stereotyped.....	24			4	xxxx						16
Dependent, passive.....	2					xxxx					2
Active, impulsive, aggressive.....							xxxx				
Psychopathic.....	15		1		4	3	7	xxxx			6
Hysterical.....									xxxx		
Depressed.....	14				2	1				xxxx	11
Anxious.....	17				2	3			2		xxxx

<sup>1</sup> Less 32 too normal to categorize readily, although some showed early signs of slipping, and less 5 with organic deterioration.

<sup>2</sup> Figures indicate number who have these characteristics in addition to dominant characteristic.

the psychologist, who uses tests such as the Rorschach which do not use direct questions. Fairly strong motives are discovered best by such techniques, especially if they are contrary to the principles of action of the integrated patient. Even negative information, such as gaps in work histories, are valuable clues to personality. The composite picture obtained can be translated into the jargon of any profession.

Our psychologist used two unstandardized tests of her own devising to assist in sorting out the personality patterns of this age group. They were an adjective list descriptive of optimistic and pessimistic mood states and a sentence completion test consisting of 60 phrases all beginning with "I" or "My." These have been useful with volunteers but, as practical instruments in an industrial situation, they are subject to evasion, although they would be useful in specific instances.

Our volunteers were very modest about their intellectual endowment; 74 percent specifically denied being clever. They were very free in admitting emotional upset; 53 percent claimed to be chronically tense and anxious. About one-third feel insecure, that they are slipping in their work, are growing more seclusive, and have a lowered frustration tolerance. The lack of structure of the sentence-completion test

threw them on their own resources and was too great a challenge for some, resulting in confusion, superficiality of response, or inability to respond.

The Rorschach test is an extremely useful tool for testing individuals in the older age groups. Unlike younger groups, the older person does not accept or enjoy the challenge of this test, and the lack of a defined structure produced confusion, anxiety, and self-doubt. The majority of the volunteers were unable to handle the intangible or the abstract. They were sure there had to be a "right way" to solve the test. In almost all the records, there was a hint of this superficiality and rigidity. In some, it was predominant. When the patterns were emotionally stimulating, there was actual withdrawal with overt tension.

### Conclusions

1. We have developed methods of assessing older employees which, within 2-5 years, by deletion and rearrangement, can be made practical and economical for industry. By that time, the substitution of a disability retirement plan for a fixed-age retirement plan should be medically feasible and sound efficiencywise. The economics of such a plan need further

study, as do the precise limits of its applicability.

2. Functional deterioration in mentality and personality antedate and overshadow organic deterioration. Rigidity and withdrawal particularly should be susceptible to preventive methods.

3. The increasing rigidity of the aging employee makes large retraining schemes in industry uneconomical, except where an absolute shortage of a skilled trade exists, and suggests that the routine retention of rigid senior executives is unwise.

#### DOCUMENTATION NOTE

Copies of the Gulhemp scales have been deposited as document No. 5063 with the American Documentation Institute, Photoduplication Service, Library of

Congress, Washington 25, D. C. A photoprint copy may be obtained by remitting \$2.50; a 35-mm. microfilm copy by remitting \$1.75. Advance payment is required. Make checks or money orders payable to Chief, Photoduplication Service, Library of Congress.

Copies of the scales may also be obtained from the author.

#### REFERENCES

- (1) Koyl, L. F., Laurence, M. W., Monkhouse, H. B., and Edwards, C. A.: Domiciliary care at D. A. V., Toronto. *Treatment Serv. Bull.* 8: 547-572, October 1953.
- (2) Koyl, L. F., Laurence, M. W., and Monkhouse, H. B.: Domiciliary care at D. A. V., Toronto. Second report. *Canad. Serv. M. J.* 10: 313-339, December 1954.
- (3) Koyl, L. F., Cross, E. G., Laurence, M. W., Monkhouse, H. B., and Holloway, R. D.: Employees' health study. First progress report. *Canad. Serv. M. J.* 12: 317-334, April 1956.

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## Still Going Places

### *Active Management of Disability in the Aged*

16 mm., black and white, sound, 1,450 ft., 40 minutes. 1955.

**Audience:** All physicians, especially specialists in physical medicine and rehabilitation.

**Available:** Film Library, Pfizer Laboratories, 630 Flushing Avenue, Brooklyn 6, N. Y.

A medical documentary film, written and directed by George C. Stoney in collaboration with Frederic D. Zeman, M.D., and Leo Dobrin, M.D., of the Home for the Aged and Infirm Hebrews of New York, this film demonstrates practical ways in which chronically ill or acutely dis-



abled patients of advanced years can be helped to live useful, self-sufficient lives.

A wide range of examples is



shown, each underlining the basic principle of active management: "by promoting movement one preserves the ability to move."

