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Senile Dementia of the Alzheimer Type in the Lundby Study

II. An Attempt to Identify Possible Risk Factors*

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Summary. In recent years research on senile dementia of the Alzheimer type (SDAT) has made progress within the field of pathology and to a certain extent in that of heredity. Within epidemiology, the search for risk factors is intensifying but the findings are still inconclusive. The present study of possible risk factors concentrates on environmental and personality factors. The total population of 2612 persons from a geographically delimited area, Lundby, two neighbouring parishes in southern Sweden, was examined in 1957 by one psychiatrist (Hagnell). A follow-up study of the same population, irrespective of domicile, was performed 15 years later, in 1972. Various precipitating as well as protective personality background factors were found to be significant for the outcome of SDAT, but no environmental factors appeared to be statistically significant in this cohort.

Key words: Alzheimer – Dementia – Longitudinal – Risk factors – Lundby Study.

Introduction

In a preceding paper (Hagnell et al. 1991), we reported on the incidence and risk of SDAT in the Lundby 1957 cohort during the period 1957–1972.

The incidence of clinically evident cases of illness in a population depends on each individual's resistance to the pathogenic agents. In contrast to the growing appreciation of the presence of neuropathological mechanisms in senile dementia of the Alzheimer type (SDAT), our knowledge of its root cause(s) remains inadequate. One might hope for important clues from epidemiological studies linking SDAT with specific environmental factors (Breitner, 1990). Apart from some genetic findings, the search for risk factors has not yet given any clear-cut results (Henderson, 1988; Jorm et al., 1990). However, the possible risk factors may be numerous and interrelated. In this study, we have concentrated on personality traits and environmental conditions in the search for precipitating factors.

Like the original investigators in 1947, the investigator of the 1957 study (Hagnell) was interested not only in observing mental disorders and in the proband's life history, favourable or unfavourable, but also as much in describing every individual's personality, e.g. classifying him/her according to Sjöbring's normal or lesional traits. This made the examiner as interested in sick as in healthy subjects. The present paper describes premorbid personality traits and social factors in probands of the 1957 Lundby cohort who during the subsequent 15 years after the 1957 examination developed SDAT.

Method

The population of this study consists of all persons who lived in a geographically defined area, Lundby, in southern Sweden on July 1, 1957 (Table 1). Those already recognized as cases of SDAT were excluded. The remainder, so far healthy in this respect, were

Table 1. Survey of the Lundby 1957 cohort and obtained information in 1957 ($n = 2612$)

Description of cohort	Number of persons	Personally examined in 1957		With enough information in 1957[a]	
	n	*n*	%	*n*	%
Men ($n = 1335$)					
Remaining 1947 cohort	824	821	99.6	824	100.0
Newcomers	511	494	96.7	506	99.0
Women ($n = 1277$)					
Remaining 1947 cohort	775	775	100.0	775	100.0
Newcomers	502	493	98.2	497	99.0

[a] Including individuals not personally examined but with extensive information from various independent sources

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divided into those who contracted SDAT and those who did not during the following 15 years, including those who died. Personality traits and social background data of these two groups were used in comparing those who became sick with those who remained healthy. For a detailed description of the Lundby population, methods and the Lundby diagnosis of SDAT, see Hagnell (1966) and Hagnell et al. (1990; 1991).

As a necessary consequence of the epidemiological method used, our group of SDAT also contains some unspecified type of dementia. Probands with a dementia with focal symptoms were diagnosed as multi-infarct dementia (MID), even if some could be regarded as mixed cases of SDAT and MID. No presenile cases, i.e., diagnosed before 60 years of age, were found in this cohort.

Personality

In the field examinations, each proband was evaluated for personality. One of the theories used for classifying the personality in the 1947 and 1957 studies was that developed by Sjöbring (1963, 1973; Essen-Möller, 1980). This theory has proved to be of great value in clinical work as well as in epidemiological psychiatric research. Since it is not very familiar to psychiatrists outside Scandinavia, a summary (mainly from Hagnell, 1966) is given below.

Normal personality traits according to Sjöbring

Based on the observations of numerous patients Sjöbring formulated a theory of personality variation assuming the existence of (at least) four independent, "constitutionally" determined, continuously variable dimensions of the personality function. The variation of each dimension within the population is assumed to be independent of other dimensions and normally distributed. Further, this psychophysiological model assumes that the central nervous system of an individual is prediposed to react in a particular pattern. The environment is conceived to be capable of moulding the individual within limits set by such a constitutional disposition of the central nervous system.

The Sjöbring personality classification system does not account for abnormal or pathological mental functioning. Abnormal functioning is conceived as the result of internal or external factors influencing the functions of the nervous system or mirrored by personality.

Each of the four Sjöbring dimensions can be described as a personality factor. He named these factors capacity, validity, solidity, and stability, and hypothetically associated certain physiological functions underlying each of these factors.

Capacity. Intellectual ability. (Severe mental deficiences are not considered normal variants but lesions).

Validity. The amount of energy supply available in the nervous system; degree of energetic investment possible. Thus, forcefulness, confidence, and broad outlook are contrary to cautiousness, insecurity and uncertainty, and narrowness of viewpoint.

Solidity. The inertia functioning in the nervous system, i.e. the degree of firmness versus flexibility and suggestibility in intellectual as well as emotional life. It is related to a degree of "maturity" or long-range organisation of mental life.

Stability. The maximum level of tracking or habituation of which the central nervous system is capable; this relates to a higher or lesser degree of abstraction and precision in thought as well as motility connected with a lesser or higher degree of emotional engagement, respectively.

A normal distribution is assumed for each of these factors independent of the others. Hence, the majority of the population is assumed to lie within the middle of the span of each variable. This middle range is designated by the factor's name with the prefix "medio". Values above the middle range are designated as "super", and values below are designated as "sub". The "sub" and "super" categories are each divided into "slight" and "evident" degrees. In the current presentation slight and evident are combined. Only persons over 15 years of age were scored. Individuals with an IQ below 70 are not referred to as subcapable, because their low IQ is beyond the normal variation and assumed to be due to a lesion.

Table 2. Some illustrative expressions for an easier understanding of the Sjöbring personality factors

Valid	*Sub-*	*Super-*
	retiring, unobtrusive	active, enterprising
	considerate	pushing
	careful, scrupulous	effective
	narrow	alert
	insecure, uncertain	self-assured
	restless, industrious	composed
Solid	*Sub-*	*Super-*
	quick, agile, flexible	slow, steady
	involved, subjective	objective
	enthusiastic, defiant	balanced, controlled
	pleasing	earnest, dry
	suggestible, inconstant	consistent
	acts on spur of moment	circumspect
Stable	*Sub-*	*Super-*
	warm, hearty	cool
	concrete, matter of fact	abstract, sophisticated, discursive
	interested in people	interested in ideas, meaning, and implications
	social, tending to personal interrelations	introvert
	heavy	elegant movements, precise

The validity, solidity, and stability factors are best illustrated by quoting some descriptive adjectives which indicate extreme forms of each variable. No undue weight, however, should be laid on a single word; these descriptions serve only as leads for a "Gestalt" view of the particular variable (Table 2). A rating is arrived at not only by the proband's report but largely by behavioural observation. For a comparison between the hypothetical dimensions validity, solidity, and stability and certain hypothetical personality variations according to Heymans, Jung, Bleuler, Sheldon, Cattell, and Eysenck, see Nyman (1956).

When Essen-Möller and Hagnell made a comparison between their 1947 and 1957 scorings regarding the Sjöbring personality factors, they found a high inter-rater reliability (Essen-Möller and Hagnell, 1975).

Pathological personality traits and factors (lesions) according to Sjöbring

For every inhabitant the examiner also noted, at the examination, whether he considered him/her from a psychiatric standpoint as a pathological or an abnormal variation in the lesional sense. Such a lesion could be caused by disturbances in the neuronal transmissions, e.g. by toxins, traumata, infections, malnutrition or pathological gene substitutions. Though evident to the clinical examiner, such a condition cannot always be detected and delineated with objective investigation methods. (Sjöbring, 1963; 1973; Hagnell et al. 1991).

Social background factors

Social background factors classifying or grading living conditions and the course of life are expressed within the Lundby Study. The present study comprises a set of items chosen for data processing from the abundant material. These selected data express among others educational background, civil status, occupation, multiple job engagements, shift work along with a graded classifiction of leadership and responsibility at work, physical effort in the work situation and the standards of dwelling.

Statistical methods

The statistical procedure used in this study is multiple, logistic regression. For an extensive description, see Hagnell et al. (1986). Since the frequency of SDAT increases with age (Hagnell et al., 1991), an age standardisation in 5-year age groups was performed. The premorbid background factors were analysed as single or combined ones. To be included in the combined factor group, ten or more items were a minimum. Under this criterion, some relevant information might have been lost, but the limited sample did not allow a lower frequency of combined factors.

Table 3. Single personality background factors with a significant, prognostic value for the outcome of senile dementia of the Alzheimer type (SDAT)

Background factors	Odds ratio
With a precipitating influence	
Men ($n = 244$, 19 with SDAT)	
Capacity below medio	13.7
Women ($n = 282$, 22 with SDAT)	
None	–
With a protective influence	
Men ($n = 244$, 19 with SDAT)	
Other personality traits: eccentric, suspicious	0
Other personality traits: intensity above medio	0
Subjective complaints: strain when injustice/ misfortune, harassed, difficulty in coping with expectations, hypersensitive	0
Women ($n = 282$, 22 with SDAT)	
Other personality traits: primitive, immature	0

Results

The selected, recorded social background data used in this investigation expressing among others living conditions, family background and the occupational situation *did not in any case* reach the 5% significance level of correlation with the outcome of SDAT.

The personality factors identified as having a statistically significant, predisposing influence, precipitating or protective, on the development of SDAT are summarized in Tables 3, 4a, and b.

Only one single *precipitating* personality factor 'capacity below medio' (subnormal intelligence) in men was recognized. Among men, the following three single *protective* personality factors were found: the personality traits 'eccentric, suspicious', 'intensity above medio', and subjective complaints formulated as: 'strain when injustice/misfortune, harassed, difficulty in coping with expectations, hypersensitive'. There was one single *protective* factor among women, namely 'primitive and immature' (Table 3).

Combined personality factors with a *precipitating* influence are given in Table 4a, while combined *protective*

Table 4a and b. Combined personality background factors **a** with a significant *precipitating influence* and **b** with a significant *protective influence* on the outcome of senile dementia of the Alzheimer type (SDAT)

	Background factors	Odds ratio
a	Men ($n = 244$, 19 with SDAT)	
	Validity above medio + Other personality traits: torpid, shallow	7.3
	Validity above medio + Psychosomatic musculo-skeletal symptoms	6.6
	Solidity above medio + Other personality traits: dry, brittle	6.6
	Women ($n = 282$, 22 with SDAT)	
	Validity below medio + Subjective complaints: headache, hemicrania	∞
	Validity above medio + Other personality traits: emotional lability, vegetative symptoms	81.6
	Solidity below medio + Other personality traits: good contact	20.2
	Other personality traits: low tonus + Subjective complaints: sensitive to weather changes	18.9
	Validity below medio + Other personality traits: dry, brittle	14.0
b	Men ($n = 244$, 19 with SDAT)	
	Subjective complaints: tired, cries easily + Other personality traits: fatigue, nerves, lachrymose, vegetative lability	0
	Other personality traits: fatigue, nerves lachrymose, vegetative lability + Subjective complaints: sensitive to weather changes	0
	Women ($n = 282$, 22 with SDAT)	
	Solidity below medio + Other personality traits: dry, brittle	0
	Other personality traits: dry, brittle + Subjective complaints: strain when injustice/misfortune, harassed, difficulty in coping with expectations, super sensitive	0

Table 5. Success of prediction of senile dementia of the Alzheimer type (SDAT) over a 15-year period using personality background factors

Specificity at different levels of sensitivity							
Men ($n = 244$, 19 with SDAT)							
Sensitivity	%	40	50	60	70	80	90
Specificity	%	99.11	99.11	94.40	89.82	78.58	72.06
Women ($n = 282$, 22 with SDAT)							
Sensitivity	%	40	50	60	70	80	90
Specificity	%	99.31	98.46	97.35	93.08	88.61	77.76

personality factors are given in Table 4b. For the Tables 4a and b, it might be appropriate to emphasize that the factors only become significant when combined. Thus, taking the findings for men in Table 4a as an example, only when the factors 'validity above medio' and 'other traits: torpid, shallow' occur together in combination, do they become potent enough to have a *precipitating* influence. All *protective* factors, single as well as combined, seem to be strongly so.

The success of prediction is high for both men and women (Table 5).

Discussion

To our knowledge there do not exist any other prospective, epidemiological, psychiatric studies of premorbid personality factors of those who contract SDAT in a total normal population. However, some authors have stressed the significance of the premorbid personality and its characteristics for a later development of SDAT. Rotschild (1947) formulated it thus: the same pathogenic factor that produces age psychosis in one case may not do so in another. Evidently, different individuals vary greatly in their ability to compensate functionally for a degenerative cerebral process. Therefore the factor of individual mental vulnerabiltiy must be taken into consideration. Anything which lowers a person's mental resistance may thus be of significance in the causation of age psychosis, such as an unfavourable genetic load or constitutional tendencies, as well as specific personality traits or a situational stress.

Together Sands and Rotschild (1952) tried to form a diagnostic concept of the premorbid personalities of some different groups of age psychosis. They emphasized that the judgements are based on individuals who were already sick and hospitalized. The concept of senile psychosis in their investigation conforms with SDAT in this study. They described the premorbid personality of those who later develop a senile psychosis as characterized by an egocentric object relationship, rigid adjustment patterns, and sensitive and dependent traits.

If isolated personality variables are assessed, only the Sjöbring factor capacity demonstrates an influence on the outcome of SDAT, in that 'capacity below medio' in men strongly predicts an increased risk. The longitudinal perspective on SDAT might in fact involve a very early onset of the degenerative process, clinically recognized as symptoms of dementia at old age but possibly signalled as an intellectual impairment during an earlier period of life. The link found between intellectual subcapacity and dementia of Alzheimer type is not yet understood. Is there a genetic load like in Down's syndrome?

The present study has indicated that combined precipitating personality factors are most marked among women. The Sjöbring personality factors validity and solidity combined with other specific personality traits proved to be of importance. When comparing with the hypotheses of Sands and Rotschild (1952), agreement seems to appear in many ways.

Combined precipitating personality factors

We found that women with 'validity below medio' combined with traits such as 'headache and hemicrania' run a very high risk of developing SDAT.

A person with 'validity below medio' is assumed to have greater difficulty in compensating for energy consumption. It will be less feasible for such a person to maintain an adequate level, especially when new demands arise with aging, and his/her activity will tend to be even more limited to routine tasks. The person finds it difficult to depart from habits, to perceive novel aspects of a situation, or to approach it in a new way. Such a person is, generally speaking, ill-prepared for anything new that might happen. The subvalid person's difficulties and inability to measure up to anything beyond his own interests may leave such an individual egocentric. In the words of Sands and Rotschild (1952), rigid adjustment patterns have been established together with egocentric object relationships. The subvalid person feels less self-assured, becomes easily uncertain, doubtful, hesitant, and very much needs the feeling of being on firm ground. The customary track is retained as much as possible, and the individual prefers tranquil work that allows feelings of homeliness and preserves the security needed. This might emerge as dependence in accordance with Sands and Rotschild.

At first it seems contradictory that the contrasting factor 'validity *above* medio' in some combinations also shows a precipitating influence on SDAT. The supervalid person rapidly restores energy. When aging takes its toll, and he can no longer go his own way, such a person can be ruthless when overwhelming obstacles show up. He may seem hard and unfeeling, especially when he finds himself thwarted. His force may then become brutal. Since many tasks which others find difficult seem easy to him, he often shows little understanding for the problems of others. In other words, this might well be described as the development of an egocentric object relationship and of rigid adjustment patterns. When other personality traits such as emotional lability, vegetative symptoms or torpidness and shallowness complicate the picture, these traits combined with supervalidity become decisive and make the adjustment even harder.

Within the solidity variation the supersolid's weaknesses are his rigidity, lack of flexibility, lack of empathy, and his poor understanding of people. In combination

with the personality traits 'dry, brittle', this might be a drawback when the aging of the body and mind progresses.

Combined protective personality factors

The person described by 'solidity below medio' has his strength in mobility and flexibility, especially if some other traits in the personality, like 'dry, brittle', keep the mobility and flexibility within certain limits. Such a combination of traits seems to make the individual well prepared to meet the frustrations of aging.

A word of caution must be inserted at this point. Since in the early phase SDAT often has a slow progress over 3–4 years, or even longer, some of the factors identified might not be restricted to being premorbid factors but might in fact comprise early symptoms of the illness. However, we have studied the cases with regard to possible changes in their personality during the preceding 10 years, between the examinations of 1947 and 1957. We found that the personality traits of probands later suffering from SDAT remained largely stable throughout these years. This indicates that we are dealing with premorbid factors rather than early symptoms of disease. Slight differences noted were assumed to be due to normal variations in the psychiatrists' judgements and rating or to a casual behaviour of the proband.

Our findings should be seen as a first attempt to identify possible background factors within a certain limited sector. We found, indeed, some significant interrelations within the range of premorbid personality but not so regarding environmental factors. Of course, in a large epidemiological survey like this, the selection of data at various stages of the research process influences the outcome. For instance, none of the social items turned out to be predictive. Maybe we did not choose the proper ones? Another difficulty is the transformation of the "soft" data obtained at the semi-structured interview into statistically treatable ones. When data are being codified, much information might be lost because of its soft character.

Since the causes of SDAT might be multiple as well as complex, an investigation such as ours ought to be supplemented by studies of other sectors of hypothetical causes, e.g. heredity and earlier illnesses. We have started a prospective study in this direction of the survivors in 1991 of the Lundby 1957 cohort. Around 400 persons are calculated to be alive and to have reached the age of 70 years or more. Knowing each proband's genealogy back to 1/16 kinship (information which has not yet been used), and with a feeding period of more than 30 years, we hope for considerably widened prospects of finding potential background factors of SDAT.

Within the fields of pathological anatomy, neurochemistry and genetics, progress has been made in recent years as regards SDAT. The roots of the disease, however, are still not known. Using the epidemiologic-psychiatric investigation method, as was done here, a trail could presumably be picked up that would hopefully lead to a solution of the enigma of SDAT.

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