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Predictors of Alcoholism in the Lundby Study

II. Personality Traits as Risk Factors for Alcoholism*

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Summary. In 1957 all inhabitants (2,612) in a delimited geographical area, Lundby, were examined by a psychiatrist. Personality traits were scored for each individual. During the following 15 years 58 men became alcoholics (44 who had been 15 years or over in 1957). Among the men who in 1957 were scored 'subsolid in combination with symptom neurosis' the risk of becoming an alcoholic was increased 13.5 to 15.8 times. Protective against alcoholism was 'subvalidity in combination with psychosomatic symptoms'. The men with this combination had their risk decreased 12 times. The prediction of alcoholism depended on which factors and which combinations were used. With a sensitivity of 50% a specificity of almost 90% was reached; with a sensitivity of 60% specificities between 70% and 80% were reached.

Key words: Alcoholism – Epidemiology – Personality traits – Background factors – Prospective longitudinal study – The Lundby study

Introduction

Personality factors have been assessed in a prospective, longitudinal study of a total population. The assessment was made before anybody knew who would become an alcoholic. Material and methods have been described earlier (Hagnell et al. 1986a).

The background factors of alcoholism seem numerous. In order to be able to handle them, we have divided them into three groups: (1) personality; (2) social; and (3) drinking pattern factors. Later we shall also investigate interactions between these factor groups.

This paper deals with the personality factors. Personality was taken in a wider sense than usual. In addition to personality traits proper we have, in this study, included mental illnesses, psychosomatic symptoms, admission to mental hospital or a psychiatrist, and registration by the Temperance Boards. Those who later on became alcoholics, who had previously been seen by a psychiatrist or 'registered by a Temperance Board' were not always alcoholics according to our definition. Often it has been impossible for the psychiatrist to formulate an exact diagnosis. In psychiatric epidemiology 'admission to a mental hospital' has previously been used as a kind of diagnosis. However, these cases were few in our study. The main stress was on personality traits proper.

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Personality Factors

Normal Personality Variation According to Sjöbring

The description of personality was partly constructed in accordance with the system of Sjöbring (Sjöbring 1958, 1963, 1973; Essen-Möller 1980). Here we present a short summary of the underlying concepts.

Henrik Sjöbring (1879–1956), professor of psychiatry at the University of Lund, Sweden, developed a theory of personality variation that assumes the existence of (at least) four independent "constitutionally" determined, continuously varying dimensions of personality function. Each dimension considered is to be represented in the population according to a normal (Gaussian) distribution. The physiological model assumes that the CNS of each individual has a disposition to react in a particular fashion. The environment is conceived to be capable of molding the individual within limits which are determined by a constitutional disposition of the CNS.

This classification does not account for abnormal mental functioning. Abnormal functioning is conceived to be the result of other forces acting on the nervous system or personality; these other forces can be toxins, traumata, malnutrition or pathological gene substitutions.

Each of the four dimensions can be described as a personality factor (the terms used in these exemplifying paragraphs are descriptive – they never refer to pathological phenomena).

Capacity Factor. Intellectual Ability

Stability Factor. The maximum level of tracking or habituation of which the CNS is capable. This relates to a higher degree of emotional control in the sense of coolness, and a higher degree of abstract thinking, precision and elegance of thought, and also of movements.

Solidity Factor. The inertia in nervous system functioning; that is, the degree of lability and suggestibility in intellectual

as well as emotional life. It is related to the degree of long-range organization of mental life.

Validity Factor. The amount of energy supply in nervous system functioning; degree of energetic investment possible. Thus, forcefulness, confidence, and overview of life vs cautiousness, insecurity and uncertainty, and narrowness of viewpoint.

A normal distribution is assumed for each of these variables independent of the others. Hence the majority of the population is assumed to fall in the middle of the range on each variable. This middle range is designated by the factor's name with the prefix *medio*. Values above *medio* are designated as *super*. Values below *medio* are designated as *sub*. The *sub* and *super* categories could each be divided into "slight" and "evident" degrees. There are thus 625 possible positions available for the classification of personality. In this study because of the limited number of alcoholics, we have collapsed "slight" and "evident" into one category and thus work with 81 positions.

Mental Health

In accordance with psychiatric observations obtained at the interviews and available information from psychiatric hospital records and other relevant information a classification was made concerning individuals with mental health problems. The basis for classification has been extensively discussed elsewhere (Hagnell 1966; Hagnell et al. 1986b), and involves the following types of psychopathology:

a) Psychotic states include schizophrenic syndromes, affective psychoses of manic-depressive type, unipolar depression, maniform psychosis, cycloid psychosis, and states of confusion (including toxic psychosis).
b) Neurotic Disorders. Symptom neurosis with such manifestations as depression, anxiety, tiredness (asthenia).
c) Pathological personality refers largely to character neurosis and psychopathy.
d) Oligophrenia includes intellectual level below IQ 70, as judged by psychiatric interview, school performance and/or in most cases testing.
e) Organic brain syndromes include dementias, brain lesions and related conditions.
f) Psychosomatic syndromes include an array of psychophysiological reactions to adaptation and psychic stress.
g) Other adherent traits include defined, observed or reported psychopathology not referable to classification above, such as observed sensitivity, tension, dysphoria, hypomania, irritability, or immaturity, and reported excessive tiredness, forgetfulness, emotional lability, and circadian variation of mood.

In total, assessment of personality and psychopathology referred to fully 150 primary variables (generally subdivided by intensity). Specific states have also been formulated by selected clusters of individual items representing e.g. depressive equivalence, various anxiety symptoms, or vegetative symptoms of tension.

Results

In the male population delineated in the present study the occurrence of alcoholism at the census dates of 1957 and 1972 is given in Table 2 (Hagnell et al. 1986a), which also illustrates the age distribution of the alcoholics identified. Further risk analyses with consideration of the mortality in the population were not performed.

The 27 one-factor models (see Hagnell et al. 1986a), are summarized in Table 1. As is seen, only 7 of them were significant at the conventional 5% level; if we relaxed the level of significance to 10%, another 7 were so. The most influential variable was the Temperance Board variable, which increased the risk of becoming alcoholic by a factor 8.8. Among the remaining 6 variables that were significant at the 5% level, 4 of

Table 1. Twenty-seven preliminary single background factors with possible prognostic value for the outcome of alcoholism

	n	Alcoholic in 1972	Odds ratio	
			Single factor	All factors
Sjöbring variants				
Subcapacity	96	8	2.1[b]	2.2[b]
Supercapacity	189	10	1.2[c]	1.2[c]
Subvalidity	234	9	0.78[c]	0.57[b]
Supervalidity	313	14	0.93[c]	0.73[c]
Subsolidity	182	12	1.6[b]	0.98[c]
Supersolidity	289	10	0.66[b]	0.99[c]
Substability	148	4	0.57[b]	0.51[b]
Superstability	362	15	0.81[c]	0.78[c]
Other personality traits				
Circumstantial, torpid, rigid	145	4	0.58[b]	0.50[b]
Sensitive, tense, strained	224	14	1.5[b]	1.5[c]
Tired, poor concentration, heavy, gloomy	134	2	0.33[a]	0.25[a]
Poor contact	125	7	1.3[c]	1.1[c]
High consciousness, alertness	57	4	1.7[c]	2.1[b]
Low consciousness	46	3	1.6[c]	1.2[c]
High tonus	172	10	1.4[c]	1.3[c]
Low tonus	67	5	1.8[c]	2.1[b]
Mental disorders				
Psychopathy	55	9	4.8[a]	3.8[a]
Cerebral lesion, MBD, etc.	129	2	0.35[a]	0.12[a]
Child neurosis	8	1	4.0[c]	2.2[c]
Symptom neurosis	39	6	4.3[a]	2.2[b]
Subjective complaints				
Tired, vegetative symptoms, feelings of stress and time pressure	235	16	1.8[b]	1.3[c]
Strain when troubles, misfortune, injustice, sensitive	176	10	1.3[c]	0.96[c]
Psychophysiological symptoms				
With evident psychiatric component	241	10	0.86[c]	0.87[c]
Psychiatric component cannot be excluded	138	5	0.78[c]	1.0[c]
Psychiatric care and Temperance Boards' registration				
Inpatient, mental hospital	38	6	4.4[a]	2.9[b]
Other psychiatric care	110	12	3.1[a]	1.6[c]
Temperance Boards' registration	39	10	8.8[a]	6.6[a]

[a] Significance < 0.05
[b] Significance 0.05–0.10
[c] Significance > 0.10

them were not surprising: the 2 variables indicating psychiatric care and the 2 indicating mental disorders seemed to be natural risk factors for alcoholism. The remaining 2, "tired, and so on" and "cerebral lesion, etc", were protective against alcoholism. The prediction capacity Sp_{50} for these 27 variables was between 51% (meaning virtually no capacity whatever) and 63%. The variable "symptom neurosis" had $Sp_{50} = 61\%$.

When all the 27 background variables were considered simultaneously, only 4 of the above-mentioned 7 variables turned out to be significant (Table 1). The two variables relating to psychiatric care were not significant when information on mental disorders was also included in the model. Why the 'symptom neurosis' variable turned out to be non-significant was harder to understand. In this 27-variable model the prediction capacity Sp_{50} was 89%.

Now we turn to the 5-variable model constructed by the forward selection technique as well as the backward elimination technique (Table 2a). The variables in that model were the 4 significant ones from the full 27-variable model, together with 'symptom neurosis'. This means that the reason why 'symptom neurosis' was not significant in the 27-variable model is not that its job was done by some of the 4 variables that were significant in that model; rather, its job was done by some of the remaining 22 non-significant variables. For the model in Table 2a we have $Sp_{50} = 90\%$, i.e. roughly the same as for the full model.

When the Temperance Board variable was excluded from consideration, the forward selection and backward elimination technique both produced the 4-variable model in Table 2b. In relation to Table 2a, two things happened: (i) 2 variables relating to psychiatric care enter; (ii) 'symptom neurosis' and 'cerebral lesion' leave. Here (i) was easily explained: information from the Temperance Board variable can be partly substituted by information on psychiatric care. Now $Sp_{50} = 83\%$, i.e. clearly below the corresponding value when the Temperance Board variable was included; hence that variable contained information that was not present in the other variables.

If we turn to the models containing interactions, first admitting the Temperance Board variable, we obtained a 5-variable model: 3 simple variables and 2 interactions are included (Table 3a). The simple variables are 3 of the 5 variables from Table 2a; the 2 interactions were: (i) 'subsolidity' and 'symptom neurosis'; (ii) 'high consciousness' and 'psychosomatic symptoms'. In particular the first of these interactions was a very interesting result. For this model we have $Sp_{50} = 90\%$, i.e. the same as for the model in Table 2a.

Table 2a. Five selected single background factors with evident prognostic value for the outcome of alcoholism. ('Known by Temperance Boards' included)

Background factors	Odds ratio
With precipitating influence	
Temperance Boards registration	10.1
Symptom neurosis	5.8
Psychopathy	4.1
With protective influence	
Cerebral lesion, MBD, etc.	0.18
Personality traits: tired, poor concentration, heavy, gloomy	0.23

Table 2b. Four selected single background factors with evident prognostic value for the outcome of alcoholism. ('Known by Temperance Boards' not included)

Background factors	Odds ratio
With precipitating influence	
Inpatient, mental hospital	5.1
Abnormal personality, psychopathology	4.4
In- or outpatient (or other) psychiatric care	3.9
With protective influence	
Personality traits: tired, poor concentration, heavy, gloomy	0.18

Table 3a. Five selected single or combined background factors of obvious prognostic value for the outcome of alcoholism. ('Known by Temperance Boards' included)

Background factors	Odds ratio
With precipitating influence	
Solidity below medio + symptom neurosis	15.8
Temperance Boards registration	11.2
Personality traits: high consciousness, alertness + psychophysiological symptoms with evident psychiatric component	5.9
Psychopathy	3.7
With protective influence	
Cerebral lesion, MBD, etc.	0.21

Table 3b. Six selected single or combined background factors of obvious prognostic value for the outcome of alcoholism. ('Known by Temperance Boards' not included)

Background factors	Odds ratio
With precipitating influence	
Solidity below medio + symptom neurosis	13.5
Personality traits: high consciousness, alertness + psychophysiological symptoms with evident psychiatric component	5.5
Psychopathy	4.3
In- or outpatient (or other) psychiatric care	3.9
With protective influence	
Validity below medio + psychophysiological symptoms with evident psychiatric component	0.084
Personality traits: tired, poor concentration, heavy, gloomy	0.21

Table 4. Prediction of alcoholism during a 15-year period using personality background factors. Specificities at different levels of sensitivity

Sensitivity	Specificity				
	With 27 variables (Table 1)	With 5 variables (Table 2a)	With 4 variables (Table 2b)	With 3 single variables + 2 interactions (Table 3a)	With 3 single variables + 3 interactions (Table 3b)
50%	89%	90%	83%	90%	88%
60%	82%	74%	69%	78%	73%
75%	64%	50%	48%	59%	51%
90%	45%	26%	27%	40%	29%

Finally, if we considered interactions but excluded the Temperance Board variable, we obtained a model with 6 variables: 3 simple ones and 3 interactions (Table 3b). 'Subsolidity' in combination with 'symptom neurosis' remained with a high odds ratio, 13.5. However, another factor with protective influence appeared: 'subvalidity' in combination with 'psychosomatic symptoms' with an odds ratio of about 1/12. This model had $Sp_{50} = 88\%$ i.e. somewhat above the 83% obtained in the corresponding model (Table 2b) without interactions.

A summary of the sensitivities of the prediction of alcoholism, at various levels of specificity, is given in Table 4.

Discussion

Post or propter? When evaluating the premorbid personality of persons with mental illness or alcoholism this question is always as actual as hard to answer. Within the frame of the Lundby study this discussion has been taken up in an earlier paper about the prevalence of alcoholism (Hagnell and Tunving 1972). In that study all alcoholism among those who were registered in the catchment area (= Lundby) on July 1, 1957, (2,612 persons whereof 1,335 men) was mapped out. Alcoholism was then related to various factors like personality traits, mental disorder, occupation, removals, etc.

Earlier in the literature symptom neurosis has been looked upon as a possible background factor for at least certain forms of alcoholism. This was pointed out by Hagnell and Tunving (1972) who also found a connection between subsolidity and alcoholism.

In the above-mentioned prevalence study of the Lundby 1957 cohort a striking predominance for alcoholism was shown in subsolid persons compared with mediosolids and a predominance in mediosolid persons compared with supersolids, which is shown by the following (Hagnell and Tunving 1972):

The point prevalence of alcoholics related to Sjöbring's So-factor (Solidity).

	Total population of men aged 20+	Alcoholics		
		O	E	O/E
*Sub*solidity (So−)	208	33	21.4	1.5
*Medio*solidity	445	47	45.8	1.0
*Super*solidity (So+)	297	18	30.6	0.6
C.R. = 2.81; $P < 0.01$				

This trend was clearest with the chronic alcoholics.

The present study was based on the same population as the above alcohol study by Hagnell and Tunving, which means the same investigation methods and the same evaluator (Hagnell) of personality traits and mental disorder. The difference is that those who were established alcoholics in 1957 were not included this time. This study comprised the 44 men who became alcoholics during the 15-year period 1957–1972. The most striking results were found in the calculations where we used an interaction of two background factors. A very high precipitating influence appeared when subsolidity was combined with a symptom neurosis.

In a 10-year prospective study within the Lundby project Hagnell (1966) showed that mental illness in the form of symptom neuroses was over-representated in subsolids and under-representated in supersolids.

Subsolidity on its own did not cause any increased risk for alcoholism, it was only in interaction with symptom neurosis that we found the risk increasing.

According to Sjöbring's (1973) hypothesis about normal personality variants the subsolid person has a more superficial grasp of reality. What predominates is what the moment brings to the fore and the passing interest of one's own, as when a person acts rapidly without reflecting. He lives intensely with the real, immerses himself in it more completely. What is topical and what he experiences himself occupies a relatively prominent position within the whole. His superficial grasp of reality may in itself imply that the particular situation would make fewer demands upon him. But it can also result in difficulties stemming from incomplete adaptation. The real world may readily present something unexpected, a surprise, a stress which would imply resistance. The subsolid individual is prone to decompensation. Given the small extent of the personality in function at this moment, it is chiefly a matter of ephemeral primitive reactions, ranging from mild affective outbursts on the basis of a state of tension, or mood disturbances characterized by marked lability, all the way to extreme dysnoic reactions in the form of ecstasy, elation, rage, anguish or despair. As is generally the case, the decompensation is of extreme severity only when a lesion supervenes. Alcohol intoxication, especially when repeated, often produces such a supervening lesion which possibly in its turn aggravates the alcohol abuse still more.

By means of the above extract from Sjöbring's description of subsolidity as well as his full description (Sjöbring, 1973, pp. 136–139) it is not hard to imagine that a subsolid person may be obviously vulnerable under certain circumstances and therefore more easily contract a mental illness. Often these states come unexpectedly to the subsolid person. With his shallowness and agility he may then easily react, self-centred as he is, by taking to remedies that give a quick relief like e.g. alcohol. Because of his self-centring and suggestibility and also because of the quick relief that alcohol gives, the supersolid easily overlooks and represses the risks of ending up in alcoholism. The shallow reaction of defiance expressed by "I'll show you...", that is frequent with a subsolid personality, may aggravate the abuse into an addiction.

High consciousness in interaction with psychosomatic symptoms gives an increased risk of almost 6 (5.9 and 5.5 respectively). Especially persons with high consciousness and psychophysiological symptoms are probably the type who try to alleviate their symptoms with alcohol. One example of this is the connection that exists between alcoholism and peptic ulcer. When such patients stop drinking, some of them develop peptic ulcers (Hagnell and Wretmark 1957).

Symptom neurosis on its own brings about an increased risk. It is conceivable that persons with this kind of disturbance have taken to drinking as a transquilizer against anxiety, stress, or depression. However, it may be that alcoholism and symptom neurosis have the same background structure (Helgason 1970) and that this could possibly have a genetic basis (Winokur et al. 1970).

The increased risks attached to our background factors 'known by the Temperance Board', and 'psychopathy' were expected.

Also of great interest were the factors that were protective against alcoholism. Most striking was 'validity below medium' (= subvalid) interacting with 'psychosomatic symptoms with an evident psychiatric component', which gave an odds ratio

of about 1/12 (Table 3b). This was probably a synergistic effect. Validity is to Sjöbring "the rapidity with which expected energy can be replaced. Thus the subvalid person is assumed to have greater difficulty in compensating for energy consumption. The subvalid individual may be described as quiet and retiring, cautious and uncertain, habit bound and narrow in perspective, meticulous and considerate, prone to tension and fatigue, possessed of a need to be busy, submissive, circumscribed and vulnerable. If these traits lead to psychosomatic reactions, it is easy to think that a subvalid person, cautious and uncertain as he is, does not dare to use alcohol as a relieving agens.

Another protective factor may 'lesion, minimal brain dysfunction (MBD) etc.' be. This group is heterogeneous with various types and grades of severity. Compared with the probable and conceivable lesions MBD is of a relatively severe impairment. Which role organic brain lesions play in the origin of alcoholism has long been a topic for discussion (Jellinek 1960). The origin of alcoholism among persons who in their childhood have had hyperkinesia-MBD has recently been studied by Obaldia and Parsons (1984).

However, according to Sjöbring (Sjöbring 1973, pp. 159–195) lesions might have various dysfunctions in the CNS. According to Engel (Engel 1977; Engel and Liljequist 1983) the ethanol molecule easily intervenes with many of the normal metabolic processes in the nerve cells. Among all these possible reactions some may as a consequence give an aversion against alcohol. However, so far this is only speculation.

The conglomerates of personality traits: tired, poor concentration, heavy and gloomy may by themselves or in various combinations account for the protective effect. However, this calls for further investigations.

The Lundby study differs from most other investigations, which makes comparisons with other studies very doubtful. What is so unique about the Lundby study is that it comprises a total normal population from a geographically well-defined area; the drop-out figure was negligible; all probands have been repeatedly and personally examined by trained psychiatrists; 'alcoholics' were not only those known by authorities or treatment facilities; the evaluation of collected data has been made by psychiatrists.

Now to the question of why we performed almost all the calculations twice: once with the Temperance Board variable included, and once with that variable excluded. There were two reasons: (i) although our definition of alcoholism was totally independent of whether or not the proband was registered at the Temperance Board, we were aware of the risk of having been influenced by knowledge of such registration when deciding on alcoholism; (ii) Temperance Boards do not exist any more, and hence it might be of some interest to see whether that source of information could be substituted by other sources.

What has now been mentioned in the discussion are some points of view on the results. Further investigations are needed to get further evidence, particularly with the above-mentioned background factors in interaction with background factors describing social state and drinking patterns. Most studies of alcoholism are cross-sectional or retrospective and there are only a few life history studies making use of information obtained in the pre-alcoholic period. It is also hard to find studies about what happened to alcoholics at a later age. An important task for us, since we have most of the information needed for life histories, not only before but also during the alcoholism and after, will be to work with the life history research of the alcoholics.

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