DEVELOPMENT OF ALCOHOLISM: INTERACTION BETWEEN HEAVY ADOLESCENT DRINKING AND LATER LOW SENSE OF CONTROL OVER WORK

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Abstract — The combined effects of heavy use of alcohol in late adolescence and later unfavourable psychosocial work-environment may contribute to the development of alcoholism. Data on circumstances during childhood and adolescence, including alcohol use, history of police and/or childcare contacts, and emotional stability, were collected for 49 323 young men, born during the period 1949–1951, at the time of enlistment for compulsory military training in 1969/1970. On the basis of census data on occupation in 1975, all individuals were classified into groups with regard to the level of work-control (i.e. participation in decision-making, variation in job task, etc.) in accordance with a job exposure matrix. The background of those men who acquired a diagnosis of alcoholism according to in-patient psychiatric care registers in 1976–1983 was examined in relation to their alcohol consumption in adolescence and the nature of their subsequent work environment. It was found that young men with heavy alcohol consumption had an increased risk of developing alcoholism if they later worked in an environment characterized by low control. This finding was not due to selection of heavy drinkers into low control jobs. Similar results were obtained when data from blue-collar workers were analysed separately.

INTRODUCTION

Several circumstances in childhood and adolescence are risk factors for alcoholism appearing in early adulthood (reviewed by Hawkins et al., 1992). Clapper et al. (1995) found that the number of intoxications from alcohol before the age of 16 years is a strong predictor of adult abuse; such early established drinking patterns can continue into adulthood and lead to adult drinking problems (Kilty, 1990). Kandel and Andrews (1987) reported that alcohol consumption is normally initiated at the age of 18 years and that peer influences are important in predicting initiation. They also showed that the most intense use of alcohol declined after the age of 22 years. It has been suggested that the decline in intense use of alcohol at around that age reflects a process of psychosocial maturation and is related to an adjustment to roles in adulthood, such as getting married, entering the labour force or becoming a parent (Kandel and Yamaguchi, 1985). The outcome of this adjustment process might depend on exposure to risk factors in the early adult environment. However, several studies have reported that it is not adolescent alcohol use which predicts adult abuse, but, rather, a constellation of adolescent behaviours such as smoking, problem behaviour, parental divorce, and psychological well-being (Donovan and Jessor, 1978; Andréasson et al., 1993; Clapper et al., 1995).

Several workplace-related explanations, such as placement in stressful or non-rewarding jobs, participation in job-based drinking networks, and absence of work-based social support have been offered for why some occupations are more associated with alcoholism than others (Martin et al., 1996). We have previously found low work control to be related to alcoholism among young men (Hemmingsson and Lundberg, 1998). Low work control (or decision latitude) was, according to Karasek and Theorell (1990), defined as a combination of skill discretion, meaning the degree of variation concerning job tasks, and decision authority, the opportunity for making autonomous decisions at work.

The individual risk of developing alcoholism depends on both individual predisposition (biologically, genetically or socially determined) and environmental factors (Schuckit, 1987; Skog, 1991; Edwards et al., 1994). Accordingly predisposed persons may be at elevated risk of developing alcohol abuse if exposed to unfavourable work environments, such as work characterized by low work control. The relationship may be synergistic, i.e. some persons develop misuse only under the influence of both factors acting together.

We employed data from Swedish men, born during the period 1949–1951, gathered at time of conscription to compulsory military service at age 18–20 years. Information on individual risk factors for alcoholism from late adolescence were available. Information on specific psychosocial work environment risk factors was based on information on occupation in 1975. Our hypothesis was that those risk factors, separated in time, would interact to increase the risk of alcoholism.

SUBJECTS AND METHODS

Study population

The study was based on data from a cohort of Swedish males who participated in conscription for compulsory military service in 1969/1970. They were 49 323 men who were born between 1949 and 1951 accounting for 97.7% of all conscripts in 1969/1970; the remaining 2.3% were born between 1943 and 1949. The background to the Swedish conscription surveys and the variables included have been presented in detail in previous reports (Andréasson et al., 1991, 1993). Only 2–3% of all Swedish men are exempted from military service, in most cases due to severe handicaps or congenital disorders. For the purpose of this study, there were 42 001 men who reported an occupation in the 1975 census.

Risk factors established in late adolescence

At conscription, all men were asked to complete two questionnaires. The first concerned social background, behaviour and adjustment, psychological factors, and health. The second dealt specifically with substance use, e.g. alcohol
consumption and tobacco smoking. All the conscripts were seen by a psychologist for a structured interview, assessment of intellectual capacity and emotional control, and ratings on a few other predetermined scales.

The variable ‘heavy use of alcohol’, as measured at the examination at conscription, was previously shown to be a strong risk factor of alcoholism diagnoses in this study group (Hemmingsson et al., 1998). Heavy use of alcohol is a composite variable including at least one of the following indicators of problem drinking: consumption of at least 250 g of 100% ethanol/week, to have taken an eye-opener during hangover, to have been apprehended for drunkenness, or to have often been drunk. Each factor included in the composite variable has previously been shown to be related to an alcoholism diagnosis in this study group (Hemmingsson et al., 1997; Upmark et al., 1997).

Five other variables were chosen for inclusion in the analyses on the basis that they were previously known predictors of alcoholism diagnoses (see Appendix 1). We have shown that the predictors included are more common among those with unfavourable psychosocial work characteristics (Hemmingsson and Lundberg, 1998). The variables are used in a multivariate model to control for confounding effects.

Occupation and social class

Information on occupation for each conscript was obtained by record linkage with the National Population and Housing Census of 1975, for which there was a response rate of 99%.

Occupations were coded according to the Nordic modification of the three-digit International Standard Classification of Occupations. A classification into two social classes, non-manual employees and manual workers (i.e. white-collar and blue-collar occupations) was also made on the basis of information on reported occupation in 1975.

Job characteristics

Low work control (or decision latitude) was defined according to Karasek and Theorell (1990) as a combination of skill discretion (meaning variation concerning job tasks) and decision authority (referring to the scope at work for making autonomous decisions).

A job exposure matrix (JEM) was used to rate all occupations on a 10-digit scale for work control and other work-related factors (Johnson et al., 1990; Karasek and Theorell, 1990). The JEM was developed for application on population-based data. The source of information was the annual Swedish Surveys of Living Conditions 1975–83 (ULF) (Statistiska centralbyrån, 1985), which included questions on work control (12 questions); 242 occupations, including 42 001 individuals, were attributed values for work control.

Based on the value attributed to each occupation, ranked from low to high, all subjects were grouped as being below or above the median value for work control. In the analyses of the relationship between heavy use of alcohol, work control and alcoholism diagnoses, subjects with values of work control under the median (exposed) were compared with subjects with values above the median (reference category). Common low control jobs (jobs within the lowest quartile) included toolmakers, welders, woodworking machine operators, and truck drivers. Common high control jobs (jobs within the highest quartile) included engineers, bank employees, buyers, and officers in the armed forces.

Separate analyses were conducted for blue-collar workers alone. In those analyses, group limits, concerning level of exposure for work control, for the entire material were employed for the purpose of categorization.

Men who received an alcoholism diagnosis during the period 1976–1983

We utilized the unique civic registration numbers assigned to every Swedish resident at birth to perform record linkages with the Register of Diagnoses at Discharge from In-patient Psychiatric Care, to determine whether or not men in the cohort had received an ‘alcoholism diagnosis’ [alcohol psychosis (ICD-8 291), alcoholism (ICD-8 303), and alcohol intoxication (ICD-8 980)] during the period 1976–1983. Primary and secondary diagnoses at any discharge were included. In 1984, the register of psychiatric diagnoses was discontinued, and such data were no longer available for research. Subjects who received an alcoholism diagnosis at conscription or in the Register of Diagnoses at Discharge from In-patient Psychiatric Care 1973–1975 were excluded from the study population.

Calculation of interaction effects

In the analyses, relative risks (RRs) for combinations of risk factors, i.e. heavy use of alcohol and an unfavourable work environment, were calculated with those jointly unexposed as reference category. The hypothesis is that the RR estimate among those exposed for both risk factors will be at least additively increased. The interaction effect was calculated according to Rothman (1986) and the synergy index (SI) is reported. Synergistic interaction refers to a situation where two exposures are component causes in the same sufficient cause. If some persons develop alcohol abuse only under the influence from both factors acting together (i.e. heavy use of alcohol and low work control) synergistic interaction occurs. An interaction effect is proven by departure from additivity of absolute effects, i.e. the relative excess risk among those with combined exposure should exceed the sum of the relative excess risks for each of the component causes where those unexposed to both causes are used as reference category (Rothman, 1986; Hallquist et al., 1996). Synergy index is defined as:

\[ SI = \frac{RR(A \& B) - RR(\bar{A} \& \bar{B})}{[RR(A \& B) - RR(\bar{A} \& B)] + [RR(\bar{A} & B) - RR(A \& B)]} = \frac{RR(A \& B) - 1}{RR(\bar{A} \& B) + RR(\bar{A} \& B) - 2} \]

where ‘\( \bar{\} \) denotes unexposed and RR(A B) the RR among those exposed to both factors where RR(\( \bar{A} \& \bar{B} \)) is used as reference category (RR = 1.0). SI >1.0 indicates more than additive interaction, i.e. synergy. SI = 2.0 denotes a RR among those exposed to both factors twice as high as would be expected from additivity and implies that 50% of the increased disease occurrence among those jointly exposed is attributable to the interaction (Rothman, 1986).

A program developed in the SAS computer package for the calculations of SI with confidence intervals was used (Lundberg et al., 1996). Confidence intervals were calculated as proposed by Hosmer and Lemeshow (1992).
RESULTS

A total of 334 diagnoses in the Register of Diagnoses at Discharge from In-patient Psychiatric Care related to alcoholism during the period 1976–1983 were found among the cohort of 38,913 individuals who contributed full information concerning the relevant variables and could be classified according to the JEM.

Combined effects of heavy use of alcohol in late adolescence and later exposure to low control at work in relation to alcoholism diagnosis

Persons who in late adolescence reported heavy use of alcohol more often received an alcoholism diagnosis if they were later exposed to a work environment characterized by low control when compared to those jointly unexposed (Table 1a). When, for each risk factor, the other risk indicators were taken into consideration, the risk estimates in each cell decreased markedly, indicating a confounding effect (Table 1b). However, the estimate of the synergy index changed only marginally and remained significantly increased while its confidence intervals became wider.

The separate analyses for manual workers showed results very similar to those concerning the entire study population. Some men in manual occupations with low control, who reported heavy use of alcohol, seemed to receive an alcoholism diagnosis only because of the joint exposures (Table 2). Among blue-collar workers, low work control showed an elevated RR only in combination with heavy use of alcohol reported in adolescence.

The classification of psychosocial work environment was based on information on occupation in the 1975 census, i.e. 5–6 years after the conscription examination in 1969/1970. It may be that persons who developed problem drinking, or increased their alcohol consumption, during this period — due to restricted opportunities to get a job — were selected into more undemanding work environments, e.g. with low work control. In order to investigate whether the increased RR attributed to low level of work control actually was due to health-related selection between 1969/1970 and 1975, we compared level of work control based on occupation in the 1975 census with level of work control classified on the basis of occupation in the census of 1970. Four possible combinations concerning levels of control in 1970 and 1975 were considered: low70/low75, low70/high75, high70/low75, and high70/high75.

Of the individuals who were included in the analyses in this paper, i.e. those who held an occupation according to the 1975 census, only 64% could be attributed a value for level of work control from the 1970 census. At this point in time, some subjects were still studying, whereas others were doing their military service. In the remaining group, 75% of those who were classified as having low work control in 1975 were also classified as having low control in 1970. Those who changed from low to high work control, or from high to low work control, did not show an increased RR, compared with those with long-term high work control (reference category). But we found a significantly increased RR among persons in jobs with low work control in both censuses when other risk indicators were taken into account (Table 3). The same pattern was seen when only manual workers were investigated. Accordingly, it seems as if long-term exposure to low work control was related to high level of alcohol consumption.

Table 1. Relative risk (RR) of alcoholism diagnoses

<table>
<thead>
<tr>
<th></th>
<th>High control in 1975 and no heavy use at conscription</th>
<th>Low control in 1975 and no heavy use at conscription</th>
<th>High control in 1975 and heavy use at conscription</th>
<th>Low control in 1975 and heavy use at conscription</th>
<th>Synergy index</th>
</tr>
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<tbody>
<tr>
<td>(a) RR of an alcoholism diagnosis 1976–1983</td>
<td>1.0 (n = 73)</td>
<td>1.8 (1.3–2.4) (n = 100)</td>
<td>5.9 (4.0–8.5) (n = 45)</td>
<td>11.2 (8.3–15.0) (n = 116)</td>
<td>1.8 (1.2–2.6)</td>
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<tr>
<td>(b) Adjusted model*</td>
<td>1.0</td>
<td>1.3 (1.0–1.8)</td>
<td>2.8 (1.9–4.1)</td>
<td>4.3 (3.1–6.0)</td>
<td>1.6 (1.0–2.6)</td>
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</table>

RR is given with 95% confidence intervals (95% CI) in categories with different combinations of heavy use of alcohol and level of control at work. Interaction is described by the synergy index, with 95% CI. Based on the entire study population (334 cases). (a) RR; (b) adjusted model. *Adjusted for smoking, contact with police/childcare, low emotional control, ranking on psychometric test, psychiatric diagnoses at conscription.

Table 2. Relative risk (RR) of alcoholism diagnoses

<table>
<thead>
<tr>
<th></th>
<th>High control in 1975 and no heavy use at conscription</th>
<th>Low control in 1975 and no heavy use at conscription</th>
<th>High control in 1975 and heavy use at conscription</th>
<th>Low control in 1975 and heavy use at conscription</th>
<th>Synergy index</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Relative risk of an alcoholism diagnosis 1976–1983</td>
<td>1.0 (n = 47)</td>
<td>1.2(0.9–1.7) (n = 95)</td>
<td>4.3 (2.7–6.7) (n = 30)</td>
<td>7.6 (5.4–10.7) (n = 114)</td>
<td>1.9 (1.1–3.2)</td>
</tr>
<tr>
<td>(b) Adjusted model*</td>
<td>1.0</td>
<td>1.1 (0.7–1.5)</td>
<td>2.2 (1.4–3.6)</td>
<td>3.6 (2.5–5.2)</td>
<td>2.0 (0.9–4.2)</td>
</tr>
</tbody>
</table>

RR is given with 95% confidence intervals (95% CI) in categories with different combinations of heavy use of alcohol and level of control at work, for manual workers only (286 cases). Interaction is described by the synergy index, with 95% CI. (a) RR; (b) adjusted model. n = no. of cases. *Adjusted for smoking, contact with police/childcare, low emotional control, ranking on psychometric test, psychiatric diagnoses at conscription.
DISCUSSION

In this longitudinal study, we found evidence that heavy use of alcohol in late adolescence interacted with later unfavourable psychosocial work environment factors in relation to alcoholism. The interaction effect between heavy use of alcohol in late adolescence and later low work control remained after control for relevant confounding factors.

The study has several advantages. It has a longitudinal design; data on individual characteristics (predisposing factors) were collected when the subjects were 18–20 years of age, work characteristics when the subjects were 24–26 years of age, and alcoholism diagnoses when the subjects were 25–34 years of age. Information was available on several known risk indicators for alcoholism; outcome data were diagnoses from in-patient care; the study population was likely to be highly representative of not only the young male working population in Sweden in one birth cohort but of quite a few adjacent birth cohorts as well, and a large number of occupations were also represented. Weaknesses of the study are that only men were considered, and that the follow-up period was relatively short (8 years).

We shall discuss below the limitations of the study and the generalizability of the results.

In survey investigations, considerable under-reporting of alcohol consumption is likely, and under-reporting is assumed to occur in proportion to actual consumption level (Kühlhorn, 1998). Although the other risk indicators used in this study, to control for confounding, are subject to misclassification, the factors employed are strongly related to an alcoholism diagnosis and explain a large proportion of the social class differences in alcoholism in this material (Hemmingsson et al., 1998).

A differential misclassification of outcome could occur if persons from lower social strata, where low job control is more prevalent, more easily receive an alcoholism diagnosis and are given comparable symptomatology, than persons from higher social strata. It has been suggested that such misclassification occurs, e.g. due to the attitudes of physicians (Wolf et al., 1965). If such differential misclassification of outcome occurs, it is more likely that it occurs in in-patient care, where the patient is present, and less likely for diagnoses at death. However, socio-economic differences in alcohol-related mortality in Sweden show the same pattern as for alcoholism diagnoses from in-patient care.

Johnson and Stewart (1993) have found that JEM scores accounted for 63.5% of individual variance in work control.

These authors concluded that job control is a work characteristic. Given the strength of the relationship between social class and control, it seems unlikely that job changes would have a major impact on degree of control over shorter time periods. There may be some misclassification of individuals in our study with regard to work control. Such misclassification is independent of both background factors and outcomes, and would thus result in a bias towards unity in the RRs associated with work control.

Heavy use of alcohol was a composite variable based on four indicators of problem drinking (see Appendix 1). Those who were classified as exposed to at least one of those indicators were classified as heavy users of alcohol. There were no differences in average exposure level for the separate indicators among those classified as exposed to heavy use of alcohol between low and high control workers in 1975. The proportion exposed to more than one indicator of heavy use of alcohol was only marginally higher among low control workers (19%) compared with high control workers (15%).

A possible criticism of our findings is that they could reflect a selection of heavy drinkers to low control jobs, rather than a combined effect of early established heavy drinking and the low control in low control jobs. For several reasons, we argue that the interaction effect cannot to any major extent be explained by selection. First, in the analyses we controlled for several other previously known risk factors for later alcoholism that were already established at late adolescence. Those risk factors were important to decrease the RR in each group, but there were still significantly increased RRs in almost all groups, as were the synergy indices in most groups. Second, as shown in Table 3, the RR of alcoholism was not increased among those who changed from high to low control jobs between 1970 and 1975. This indicates that persons with heavy alcohol consumption at conscription were not selected from high to low control jobs during this period. Third, we did not find a tendency for persons who developed problem drinking between the conscription survey, where data on heavy alcohol consumption were collected, and the census in 1975, where data on work control were collected, to move to low control jobs. Persons with no heavy alcohol consumption at time of conscription, but who later increased their alcohol consumption, and with later low work control would be classified into the less than heavy drinking category, with low job control in our analyses (see Table 2) and there contribute to an increased RR. Those categories showed only very small increased RRs of an alcoholism diagnosis. Our interpretation is that the increased RR of an alcoholism diagnosis in low control jobs could be explained only to a very limited extent by a selection effect when other risk factors at conscription are controlled for.

It has been suggested that the individual risk of developing alcoholism depends on both individual predisposition and environmental factors (Schuckit, 1987; Skog, 1991). The results of this study are in accordance with such suggestions: heavy use of alcohol in late adolescence interacted synergistically with low control at work to increase the risk of alcoholism. The consequence is that some cases of alcoholism diagnosis occurred only because of these factors acting together. From a health policy perspective, knowledge of processes of interaction is important. If risk factor A interacts with risk factor B, intervention directed at risk factor A, besides its effect on A, also contributes to lowering the risk from risk factor B.

### Table 3. Relative risk (RR) of alcoholism diagnoses

<table>
<thead>
<tr>
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<th>RR (95% CI)</th>
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<tbody>
<tr>
<td>High work control 1970 and 1975</td>
<td>1.0 (--)</td>
</tr>
<tr>
<td>High work control 1970 and low 1975</td>
<td>1.0 (0.6–1.7)</td>
</tr>
<tr>
<td>Low work control 1970 and high 1975</td>
<td>1.2 (0.7–2.0)</td>
</tr>
<tr>
<td>Low work control 1970 and 1975</td>
<td>1.5 (1.1–2.1)</td>
</tr>
</tbody>
</table>

Relative risk is given with 95% confidence intervals (95% CI) in categories with different combinations of low and high control at work during 1970 and 1975, based on those 64% of the entire study population who also held a job in 1970, i.e. 23 594 persons (model adjusted for smoking, contact with police/childcare, low emotional control, ranking on psychometric test, psychiatric diagnoses at conscription).
Heavy use of alcohol in late adolescence could for some persons be a link in a chain of negative circumstances during early life (Glenninning et al., 1995). Such circumstances could include poor school achievement, which restricts the opportunities to avoid unfavourable work environments in adult life (Koivusilta et al., 1998). It has been suggested that working conditions may influence the total life situation. Men in jobs with low control appear to apply the lessons of their job to their behaviour ‘off the job’ (Kohn, 1976; Parker and Farmer, 1990). Long-term exposure to poor working conditions combined with low economic reward may lead to feelings of hopelessness and depression as well as poorer behavioural risk factor profiles (Lynch et al., 1997). The results in this study suggest that young men with an early established heavy alcohol consumption more often respond to such work environments by increasing their alcohol consumption compared with young men without an early established heavy alcohol consumption.

Although risk factors probably can accumulate over the entire life course, it has been suggested that the transition from adolescence into adulthood and work life is a critical period for the establishment of adult drinking behaviours (Roman and Blum, 1992). How this age-related ‘window’ exerts influence on future alcohol habits probably depends on background factors, such as individual predisposition.

In the first step of the analyses, we investigated if the risk factors, measured at conscription, and the later work conditions acted independently of each other, or synergistically, to increase the risk for alcoholism. In the second step of the analyses, we also controlled for other predictors of alcoholism established in late adolescence. Since these predictors decreased the RR differences among the groups with different combinations of risk factors/working environments, the findings indicate a differential accumulation of risk factors for alcoholism in the exposure groups.

In conclusion, this longitudinal study indicates that heavy use of alcohol in late adolescence interacts with later working conditions characterized by low control to increase the risk of a later alcoholism diagnosis. Also other risk factors for alcoholism seem to accumulate among those with low work control.

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REFERENCES


APPENDIX: VARIABLES INCLUDED IN THE DATA ANALYSES

†Heavy use of alcohol: Alcohol consumption in g 100%/ethanol/week was calculated on the basis of the answers to the questions on frequency and average consumed volume of beer, wine, and strong spirits (Questions: ‘How often do you drink beer/wine/strong spirits?’ Response alternatives from ‘Almost every day’ to ‘Never’). A composite variable including at least one of the following indicators of problem drinking: consumption of at least 250 g/week, to have taken an eye-opener during hangover, to have been apprehended for drunkenness, or to have often been drunk.

†Smoking cigarettes/day: (1) >20; (2) 11–20; (3) 6–10; (4) 1–5; (5) not smoking

†Emotional control: This variable was assessed by a psychologist at conscription as a summary assessment of mental stability, emotional maturity, and tolerance for stress and frustration

†Psychiatric diagnosis at conscription: (1) Yes; (2) No

†Contact with police or childcare: ‘Have you had any contact with police or child-care authorities?’ (1) >1 time; (2) 1 time; (3) 0 times

*Underlining denotes ‘exposure’.

†Ranking on psychometric test: The psychometric test performed included tests on general intellectual ability, verbal ability, visuospatial ability, and formal reasoning. Ratings were on the scale 1–9. We used three categories where 1, 2 and 3 formed the lowest 20%, and 7, 8 and 9 formed the highest 20%.
