

Is the outcome of alcohol dependence treatment related to intelligence of patients?

Aleš Friedl

*Javni zavod Psihiatrična bolnišnica Ormož, Ormož, Slovenia
Damjan Fajhtinger, CRI Celje d.o.o. – REHA storitve Celje, Slovenia*

Summary – Among all diseases, the incidence of alcohol dependence in most developed countries is in the 3rd place. Alcohol dependence is characterized by a group of behavioral, cognitive and physiological phenomena that have many negative effects on an individual's psychological well-being and physical condition. Through the process of inpatient care, the patients are trying to establish abstinence. Since the successful completion of inpatient care does not necessarily mean effective cessation of alcohol abuse, in our study, we have tried to find out whether patients who succeeded to maintain the abstinence differ from those who failed regarding their intelligence. The study included 42 patients who were divided into »successful« (N = 28) and »failure« (N = 14) group. In the »successful« group were patients who succeeded to maintain abstinence after the hospital discharge. We have found that »successful« and »failure« group did not differ neither in verbal and non-verbal ability nor in the full level of intelligence quotient (IQ).

Key words: alcohol dependence syndrome, treatment, abstinence, intelligence, reaction time

INTRODUCTION

Alcohol is considered to be the leading cause of addiction in the world and its use over time does not diminish. Alcohol not only causes problems to people who are de-

Correspondence to: **dr. Aleš Friedl**, Čufarjeva ulica 21, 2250 Ptuj, Slovenia, tel.: +386 2 777 1851, e-mail: alfr777@gmail.com

pendent on alcohol but also for a society as a whole because of its impact on health, welfare and the economy.¹

In Slovenia, for a decade or more, the officially registered consumption of pure alcohol per capita is around 11 liters. However, it is more realistic to estimate the pure alcohol consumption at around 15 liters because of the unchecked consumption of uncontrolled domestic production.²

Harmful alcohol use is a transitional stage between a prudent drinker and a man who is alcohol dependent. Confirmation of the diagnosis of harmful alcohol use needs to meet one of the following criteria:³

- repeated drinking prevents successful performance of the tasks at home or in the workplace;
- the person drinks in circumstances where this may endanger himself or others;
- recurring legal consequences, such as hardening of peace, driving under the influence of alcohol etc.;
- repeated drinking despite problems in relationships caused by drinking.

Longer harmful alcohol use may develop in the syndrome of alcohol dependence. Dependence is a medical condition in which a person, due to frequent, prolonged and excessive drinking becomes mentally or physically dependent on alcohol. The result is the typical behavior and thinking which is guided by a craving for alcohol and stick to drinking despite physical illness and adverse consequences in interpersonal relationships.³

Treatment of alcohol dependence

Treatment may be roughly divided into three stages:

- the preparatory phase,
- the level of intensive care,
- rehabilitation.

In the preparatory phase a patient is deployed in a psychiatric clinic where psychiatrist performs ambulatory inspection and, if necessary, refers the person to check in to the clinical psychologist. The intensive treatment takes place in a mental institution or psychiatric hospital. »Length of stay« in the hospital is about 3 months. The second phase is followed by a third phase, which means the inclusion of the patients in the club for recovering alcoholics (in which their family members are also included) or inclusion in Alcoholics Anonymous (AA).

The goal of therapy is the abstinence. Patients who complete the treatment mostly return to the same environment in which they came up with excessive alcohol consumption, so it is important that the person after treatment is able to solve everyday

problems without alcohol. Usually the patients are forced to treatment under pressure from family or employer and threatened with dismissal. During the treatment, patients become familiar with the consequences of excessive alcohol consumption and negative effects on their social life, cognitive ability and health. Modern methods of treatment allow a shift from inpatient to outpatient care but hospital care is often necessary, especially for people who can't establish abstinence in their own environment, have severe abstinence symptoms or mental illness or other medical complications, are deeply depressed or prone to suicide, or live in difficult social circumstances with weak support in their environment.³

Intelligence in alcoholics

Intelligence is one of the major areas of psychological research. Most of authors understand intelligence as a general mental ability or general ability of effective thinking and problem solving, i.e. general intelligence factor.^{4,5}

General factor (g-factor) of intelligence is defined as a common denominator of all the components of our mental abilities. Spearman has an opinion that the achievements on tests of general intelligence are dependent on g-factor as well as the specific additional factors which he described as s-factor.⁴ Cattell introduced a division between fluid and crystallized intelligence.⁵

Fluid abilities develop earlier and faster and are dependent on cognitive flexibility, adaptability and speed of information processing (e.g. speed of perception, understanding of relations of objects in space, psychomotor coordination, working memory), while crystallized abilities develop slower and longer (e.g. verbal comprehension and fluency, general information recall). However, it should be noted that without fluid intelligence, crystallized intelligence would not exist because fluid intelligence is the foundation for the subsequent development of crystalline intelligence. The gap between them starts later (due to the training) and the result is that the fluid intelligence begins to decline while crystallized intelligence continues to grow.⁶

Wechsler had focused primarily on the concept of IQ which was at that time considered to be relatively constant. Psychologists have been convinced that the given IQ is a precise and objective criteria for defining human intelligence. Wechsler criticized such definitions of IQ and argued that the relationship between mental and chronological age is nothing but a normal test value obtained from the sum of the number of points of subtests which is then transformed into mental age. The relationship between mental and chronological age is for Wechsler only an index that tells us the average achievement of a person on intelligence tests. He felt that this result is statistically biased, since all revisions of Binet-Simon scale showed that at the same IQ

various arithmetic means and standard deviations arise in different chronological ages. Wechsler therefore introduced a different way of creating IQ which was based on the relationship between the test results and the expected average for each age group. This ratio tells us the proportion of an individual's mental ability in regards to the average achievements of people of the same age.⁷

The impact of alcohol on intelligence

Although many studies clearly show the link between risk for alcoholism and cognitive abilities there doesn't exist a generally accepted theory that would explain this. Various studies are coming up with results that are not entirely consistent.⁸

Alcoholism is often associated with lower intellectual and cognitive abilities. Finn and Hall,⁸ for example, argue that there is a reasonable connection between the deviant behavior, alcoholism and short-term memory capacity. They found that the link between deviant behavior and alcoholism was increased for persons with lower short-term memory capacity.

Schottenbauer, Momenan, Kerick and Hommer⁹ summarize that the cognitive deficits in alcoholics and the pace of change in the size of the brain during the aging process can be explained through the prism of two different mechanisms. The first is that the alcohol physically damages the brain and reduces brain weight which in turn leads to lower results in IQ tests. A reduction in brain weight correlated mainly with a decline in fluid abilities and overall intelligence. The other explanation is that persons who drink alcohol heavily often have previously poorer cognitive and social skills. That means that they more readily sink into alcoholism because they are more tolerant to excessive alcohol consumption. In contrast to these studies, some others (e.g. Ryan and Butters,¹⁰) didn't identify any difference in weight of the brain between alcoholics and non-alcoholics.

Schottenbauer et al.⁹ conclude that the reason for worse results in alcoholics lies somewhere in between, because alcoholism has different links with different mental capabilities. Crystallized intelligence so should not be primarily associated with alcoholism itself but its decline and the lowest level in the case of alcohol consumption is primarily due to habits and lifestyle of alcoholics. The authors stated that the level of crystallized intelligence in alcoholics is similar to the level at the beginning of alcoholism. This means that in alcoholics who showed a lower level of crystallized intelligence, that level had been lower even before they became addicted to alcohol. Crystallized intelligence, therefore, can't be related solely to the excessive drinking of alcohol. Crystallized intelligence increases with age both in alcoholics and in non-al-

coholics which further confirms that alcohol is not a crucial factor. Pearson¹¹ also notes that alcoholism is more common in environments with lower socio-economic status where the emphasis on education is less common, and the unemployment is greater.

The decline in fluid intelligence is mainly due to impairment of the brain as a result of excessive alcohol consumption. This means that alcohol has a direct impact on fluid intelligence and that in case of excessive alcohol consumption the brain is more vulnerable to decline of fluid intelligence than of crystallized intelligence.⁹

Signs of faster mental decline in alcoholics can be seen in several areas. In case of non-verbal intelligence the signs are noticeable in problem solving, memorizing, psychomotor skills, reasoning and the speed of information processing. Decline of crystallized intelligence is seen in inferiority of information obtaining and inferiority of general knowledge but the decline is in comparison to the fluid intelligence more temporary.¹¹

It is confirmed that alcoholics have a greater cognitive decline than non-alcoholics.

Results of alcoholics on IQ tests are similar to the achievements of healthy people who are much older than them. From this point of view it can be assumed that the mental decline in alcoholics is greater and faster than the decline in non-alcoholics.^{10,12,13}

Although the abstinence can stop the premature attenuation of the brain, the fact is that abstinence does not return it to its original state. This is also true for the restoration of impaired cognitive functions and the intelligence quotient. Some studies indicate that a restoration is partly possible in the case of young people, because young people are still developing, and in the case of abstinence, the temporary setback gets overcome.⁹

Alcohol affects the individual's intentional responsiveness which is frequently seen as lower on intelligence tests. Studies have shown that excessive alcohol consumption impairs one's ability to deliberate response, while the automatic reactions are less disturbed.¹⁴⁻¹⁷

METHOD

Participants

In this study, we included data collected from 42 subjects aged between 24 and 70 year (the arithmetic mean age was 40,5 years). Among these, 8 were women and 34 men. All patients were hospitalized at the Psychiatric Hospital Ormož.

Determination of failure

The fact that the person has unsuccessfully completed the evacuation of alcohol or treatment was inferred indirectly. Anyone who has completed an inpatient treatment should continue the ambulatory care for at least one year. This includes meetings once a month in a psychiatric hospital Ormož and weekly attendance in the club for recovering alcoholics. On the basis of attendance, we can assume that the person maintains abstinence, which is considered as a success. If a person avoids such meetings or inspections and does not attend or if the person continues to consume alcohol, treatment is not successful. From the total number of 42 alcoholics, we classified 28 in the »successful« group and 14 in the »failure« group.

Instruments

We have used the Wechsler-Bellevue test of intelligence (WB-II).

Description: David Wechsler was an American psychologist who, after World War II, developed several tests of intelligence, covering a wide range of mental ability across the life span. His tests measure general intelligence, which Wechsler separated into verbal and non-verbal. His tests (including WB-II) are using the arithmetic mean of 100 points and a standard deviation of 15 points. Both verbal and non-verbal subscales contain five or six sub-tests. The verbal subscales are: Information, Comprehension, Digit span, Arithmetic, Similarities and Vocabulary; the non-verbal subscales are: Picture arrangement, Picture completion, Block design, Figure completion and Digit symbol-coding.¹⁸

Procedure

Differences between the IQs of the »successful« and the »failure« group were determined using the Wechsler-Bellevue intelligence test. Patients were tested at admission to inpatient treatment of alcohol dependence or in the first few days after arrival. This means that, during the application of the test, the course of the development of treatments and the eventual success was unknown. The follow-up after hospitalization had lasted for 2 years.

RESULTS

The comparison of »successful« and »failure« group was assessed with parametric tests, but we have also examined the difference with nonparametric tests. Since the latter results confirm the parametric tests, we decided to cite the results obtained with the parametric tests.

Table 1 shows the arithmetic means and standard deviations of the Wechsler-Bellevue scale (WB-II) for »successful« and »failure« group.

Table 1. Arithmetic means and standard deviations of the Wechsler-Bellevue scale (WB-II) for »successful« and »failure« group

	»successful« group		»failure« group		t	df	p
	M	SD	M	SD			
Information	11,21	2,86	11,36	2,41	-0,16	40,00	0,87
IComprehension	10,14	2,98	9,14	2,14	1,12	40,00	0,27
Digit span	8,36	3,43	9,36	3,89	-0,85	40,00	0,40
Arithmetic	8,21	2,48	9,14	2,14	-1,19	40,00	0,24
Picture completion	7,61	2,31	6,64	1,82	1,36	40,00	0,18
Block design	9,93	3,68	9,64	2,59	0,26	40,00	0,80
Figure completion	11,39	3,06	10,57	2,24	0,89	40,00	0,38
Digit symbol-coding	9,04	2,43	8,14	3,03	1,03	40,00	0,31
Verbal IQ	103,82	14,78	105,71	11,89	-0,42	40,00	0,68
Non-verbal IQ	107,00	13,83	101,93	7,01	1,58	40,00	0,12
Full scale IQ	106,00	13,84	104,57	8,38	0,41	40,00	0,68

From the table 1, we can see that the »successful« and »failure« group did not differ significantly in IQ, or on any of the subscales.

Table 2. The arithmetic means and standard deviations for reaction times on subscales Arithmetic, Block design and Picture completion. The letter S indicates successfully accomplished tasks and the letter F indicates failure on these tasks.

	»successful« group		»failure« group		t	df	p
	M	SD	M	SD			
Arithmetic-S	7,62	1,42	6,85	1,84	0,32	40,00	0,75
Arithmetic-F	27,22	3,92	20,72	1,93	-1,31	40,00	0,36
Block design-S	31,02	3,37	27,47	3,88	1,17	40,00	0,25
Block design-F	65,54	10,86	71,48	15,53	0,31	40,00	0,75
Figure completion-S	58,48	5,77	76,97	7,95	1,76	40,00	0,08
Figure completion-F	52,46	13,35	64,35	19,68	0,51	40,00	0,62
Sum of S tasks	97,35	7,74	122,06	10,56	1,86	40,00	0,07
Sum of F tasks	145,23	18,93	156,56	21,32	0,36	40,00	0,71

Table 2 shows the arithmetic means and standard deviations for reaction times on subscales Arithmetic, Block design and Picture completion.

From the table 2, we can see that the »successful« and »failure« group did not differ significantly, although the »successful« group was better in solving performance tasks – reaction times of successfully accomplished tasks are much shorter in comparison with a »failure« group.

From results we have observed the following:

- The patient with the highest total IQ is in the »successful« group.
- Detailed examination of the results shows that the person with the highest achievements in verbal IQ (extremely high verbal intelligence) is in the »failure« group.
- The person with the lowest achievement (marginal intelligence) is in a »successful« group.
- In the »successful« group was also the person with the lowest non-verbal IQ performance
- In the »successful« group was also the person with the highest non-verbal IQ performance.

DISCUSSION

Many developed countries are facing the problem of excessive alcohol use.

In our study, we wanted to determine whether alcoholics after hospital discharge, who maintain sober, differ in their intelligence from alcoholics who can't abstain.

Our sample consisted of individuals who were hospitalized at Psihiatrična bolnišnica Ormož due to alcohol dependence, and have been included in the clinical part of the program. However, the complete inpatient care does not necessarily mean effective cessation of alcohol. Better results in maintaining abstinence are achieved by regular monthly clinic checks and visits to clubs for recovering alcoholics or AA. On the ground of visits to the clinic and clubs or AA we got a sample of successfully and unsuccessfully treated people, i.e. a »successful« and a »failure« group.

When patients leave hospital it is expected of them to maintain abstinence, because even the minimal intake of alcohol increases the risk of recurrence of excessive alcohol consumption. That means that patients must avoid not just alcoholic drinks, but also cakes, sweets and other foods that contain alcohol.

Alcoholism is often associated with lower achievements on tests of intelligence and lower intelligence quotient (IQ). Studies confirm the negative effects of alcohol

on cognitive abilities. Despite the maintenance of abstinence after hospital treatment, patients do not always improve or recover their mental abilities. The risk for failure in recovery is increasing with chronological age.⁸ In our study, we wanted to know whether the patients who are able to abstain after hospital care differ in their mental abilities from the patients who can't stay sober.

It was assumed that »unsuccessful« patients differ in their mental abilities from patients who were able to abstain but in our case, the groups did not reveal statistically significant differences. We can't confirm that the patients in »successful« group differ significantly in their mental abilities from the patients in the »failure« group although on the Wechsler-Bellevue test (WB-II) they perform better in Picture completion, they have shorter reaction times in successfully accomplished figure completion and have shorter reaction times on all successfully accomplished verbal and performance tasks and have higher performance IQ.

Several authors^{10,12,13} note that the cognitive achievements of alcoholics are similar to the cognitive achievements of elderly healthy subjects and, therefore, suggest that in alcoholics, especially if they are not treated in time, excessive drinking leads to faster cognitive decline.¹¹ We – according to the findings on the IQ performance of both our groups – can't claim that because both of our groups fall in the category of »average intelligence«. This means that the overall average IQ in each of groups is located between 91 and 110 and doesn't deviate from the expected average IQ in healthy population.

The person with the lowest achievement (marginal intelligence) was found in the »successful« group. In this group, we also found a person with a highly above-average intelligence.

Alcohol affects deliberate response or reaction time of the individual which, among other things, explains poorer results on tests of intelligence and, consequently, lower IQ. Studies have shown that excessive drinking impairs one's ability to deliberate response, while the automatic reactions in case of alcoholism are less disturbed.¹⁴⁻¹⁷ For tasks on the Wechsler-Bellevue test (WB-II) where the score is achieved not only with the right answer, but is also dependent on the time in which the answer or solution is given, we assessed whether there are differences in the reaction time between our two groups. We didn't find any significant differences, although the »successful« group performed better in Picture completion, Figure completion and had shorter reaction times on all verbal and performance tasks and had higher performance IQ.

Finally, we would like to note some limitations, which we encountered during the study. In the case of a »failure« group, we were faced with a small number of 14 patients. Small number is in humanistic sciences often a problem.¹⁹ This is particularly

acute in situations such as ours, where we are dealing with a clinical population, which had to be observed through a certain period of time and for which the treatment success could not be foreseen in advance. That's why we could not affect the number of persons in each group.

JE LI ISHOD LIJEČENJA OVISNOSTI O ALKOHOLIZMU POVEZAN S INTELIGENCIJOM PACIJENTA

Sažetak – Između svih bolesti, incidencija ovisnosti o alkoholu je u većini razvijenih zemalja na trećem mjestu. Ovisnost o alkoholu je karakterizirana skupinom bihevioralnih, kognitivnih i fizioloških fenomena, koji mogu imati negativan učinak na psihičko i tjelesno zdravlje pojedinca. Kroz proces bolničkog liječenja, bolesnici pokušavaju ostvariti apstinenciju. Pošto uspješan završetak bolničkog liječenja ne mora značiti i efektivni prestanak zlouporabe alkohola, u našem istraživanju pokušali smo utvrditi da li se pacijenti koji su ostvarili uspješnu apstinenciju razlikuju od onih kojima to nije uspjelo, prema kvocijentu inteligencije. Istraživanjem je obuhvaćeno 42 pacijenta, koji su podijeljeni u skupine »uspješni« (N=28) i »neuspješni« (N=14). U skupinu »uspješni« uključeni su pacijenti koji su uspjeli održati apstinenciju nakon otpusta iz bolnice. Utvrdili smo da se skupine »uspješnih« i »neuspješnih« nisu razlikovale ni prema verbalnim ni prema neverbalnim sposobnostima, a isto tako niti prema općem kvocijentu inteligencije (IQ).

Ključne riječi: sindrom ovisnosti o alkoholu, liječenje, apstinencija, inteligencija, vrijeme reakcije

REFERENCES

1. Goldman D, Oroszi G, Ducci, F. The genetics of addictions: uncovering the genes. *Nature Reviews Genetics* 2005;6:521–532.
2. Može, A. *Odvisnost od alkohola: razvoj in zdravljenje*. Idrija: Bogataj; 2007.
3. Židanik M, Čebašek-Travnik Z. *Sindrom odvisnosti od alkohola : priručnik za strokovnjake, ki se ukvarjajo z osebami z odvisnostjo in vse druge bralce, ki jih zanimajo posledice škodljivega uživanja alkohola*. Maribor: Dispanzer za zdravljenje alkoholizma in drugih odvisnosti, Zdravstveni dom dr. Adolfa Drolca, Ljubljana, Psihiatrična klinika; 2003.
4. Musek J. *Znanstvena podoba osebnosti*. Ljubljana: Educy;1993.
5. Musek J. *Psihološke dimenzije osebnosti*. Ljubljana: Filozofska fakulteta; 2005.
6. Musek J. *Psihologija življenja*. Vnanje Gorice: Inštitut za psihologijo osebnosti; 2010.
7. Jurman B. *Inteligentnost, ustvarjalnost, nardarjenost*. Ljubljana: Center za psihodiagnostična sredstva; 2004.
8. Finn PR, Hall J. Cognitive ability and risk for alcoholism: Short-term memorycapacity

- and intelligence moderate personality risk for alcohol problems. *J Abnorm Psychol* 2004; 113:569–581.
9. Schottenbauer MA, Momenan R, Kerick M, Hommer DW. Relationships among aging, IQ, and intracranial volume in alcoholics and control subjects. *Neuropsychology* 2007;21: 337–345.
 10. Ryan C, Butters N. (1980). Further evidence for a continuum-of-impairment encompassing male alcoholic Korsakoff patients and chronic alcoholic men. *Alcohol Clin Exp Res* 1980;4:190–8.
 11. Pearson T. Alcohol and heart disease. *Circulation* 1996;94:3023–3025.
 12. Blusewicz MJ, Schenkenberg T, Dustman RE, Beck EC. WAIS performance in young normal, young alcoholic, and elderly normal groups: An evaluation of organicity and mental aging indices. *J Clin Psychol* 1977;33: 1149–1153.
 13. Holden KL, McLaughlin EJ, Reilly EL, Overall JE. Accelerated mental aging in alcoholic patients. *J Clin Psychol* 1988;44:286–292.
 14. Grattan-Miscio KE, Vogel-Sprott M. Alcohol, intentional control, and inappropriate behavior: regulation by caffeine or an incentive. *Exp Clin Psychopharm* 2005;13:48–55.
 15. Holloway FA. Low-dose alcohol effects on human behavior and performance. *Alcohol, Drugs Driving* 1995;11:39–56.
 16. Fillmore MT. Acute alcohol-induced impairment of cognitive functions: past and present findings. *The International Journal on Disability and Human Development* 2007;6: 115–125.
 17. Fillmore MT, Vogel-Sprott M. Acute effects of alcohol and other drugs on automatic and intentional control. In: Weirs R.W., Stacy A.W. (eds) *Handbook on implicit cognition in addiction*. London UK: Sage; 2006. p 293–306.
 18. Bucik, V. *Osnove psihološkega testiranja*. Ljubljana: Filozofska fakulteta, Oddelek za psihologijo; 1997.
 19. Cankar G, Bajec B. Velikost učinka kot dopolnilo testiranju statistične pomembnosti razlik. *Psihološka obzorja* 2003;12:97–112.