

## Evaluation of psychomotor agility of patients with type 1 and type 2 alcohol dependence during the period of withdrawal symptoms dissipation

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*Twenty-eight alcohol dependent men were examined three times (on the 1st, 3rd or 4th, and 7th day of withdrawal). The results confirmed reported differences in the course of withdrawal syndrome between type 1 and type 2 alcoholics. Patients with type 2 alcoholism had more pronounced psychophysiological and cognitive disturbances. Tremor was more intensive in these patients and their reaction time was slower. Their impaired estimation of passing time also lasted longer, but at the same time, their mood improved more quickly with diminished intensity of withdrawal symptoms than in patients with type 1 alcoholism. The results confirm the possibility of diverse aetiology in alcohol dependence.*

*Key words:* alcoholism, Cloninger's typology, alcohol withdrawal, psychophysiology

### Introduction

Alcohol dependence is a heterogeneous set of disturbances, characterised by diverse aetiology, pathogenic mechanisms, psychopathological framework, and duration [2,3,7,8,10,11]. This fact is often not considered by researchers, even though the choice of patients used in research can have a profound effect on the results [2,11]. Our previous research has shown variability in the typology of patients when using detoxification and infirmary withdrawal therapy [11], as well as differences in the action of enzymes that metabolise neurotransmitters in both type 1 and type 2 alcohol dependence (Cloninger's typology) [3].

Research on the dynamics of psychophysiological changes of alcohol withdrawal syndrome [19] was conducted using patients with type 2 alcoholism (Cloninger's typology), in the belief that this group is more homogenous. Results from our previous research confirmed observations that dissipation of alcohol withdrawal symptoms is coupled with mood changes and psychomotor agility improvements [19]. We have now returned to this problem, to test the hypothesis that the course of alcohol withdrawal

differs between type 1 and type 2 alcoholics (Cloninger's typology), especially in the psychophysiological aspect. Differences between type 1 dependence and type 2 dependence include: minimum age in the onset of excess drinking, personality characteristics, self-criticism, duration, and standard of drinking. One could also assume that different types of alcohol dependency would be coupled with variable abilities to respond to stimuli as well as diverse dynamics of withdrawal symptoms. With these considerations in mind, we compared hand-eye coordination, motor responses, and mood self-evaluation, together with changes in the dynamics of these parameters in patients with type 1 and type 2 dependencies. These comparisons were conducted during the period when withdrawal symptoms are strongest and at the time when they begin to diminish.

### **Subjects and methods**

Research included 28 men placed in therapy at the Department of Prevention and Treatment of Addiction, Institute of Psychiatry and Neurology, Warsaw. The mean age of patients was  $38.8 \pm 2.3$  years. All patients tested fell under the criteria of alcohol dependency (303.90) DSM IV [1] and hospitalisation was a result of severe (above 30 points on the CIWA-Ar scale) [15] alcohol withdrawal syndrome (291.8). Research excluded patients with serious somatic disorders and psychiatric diseases and disturbances with aetiology different than alcohol dependence, as well as patients who required treatment with  $\beta$ -blockers or calcium channel blockers. All patients were subjected to the typical treatment used in cases of severe alcohol withdrawal symptoms and delirium tremens. The majority of patients were hydrated intravenously for 1-4 days; all patients received vitamin B<sub>1</sub> (first intravenously, later orally). Twenty-four patients received benzodiazepines (mainly diazepam) in a dose that did not exceed 40mg/24 hrs (or equivalent to that dose) during 4-7 days, which was gradually reduced to zero; all other patients received clomethiazole in doses not greater than 4g/24 hrs, which were gradually reduced to zero. After one week, when the intensity of withdrawal symptoms on the CIWA-Ar scale was no greater than 10 points, patients were discharged from the ward.

Among the investigated patients, 12 men met the criteria of type 1 alcoholism and 16 of type 2 (Cloninger's typology). Classification of different types of dependencies was based on the most pronounced differences: family history of alcoholism, early onset of excessive drinking (prior to age 20), antisocial personality characteristics present before the onset of dependence, and lack of criticism of the dependency (1-3 grade on the Breuer and Goldsmith scale [4]).

Research was conducted in the Psychophysiological Laboratory between 9 and 11 a.m. Tests were conducted three times: during the period when withdrawal symptoms were most severe (test I), on the third or fourth day (test II), and on the seventh day of detoxification and withdrawal treatment (test III).

Before each test patients were asked to evaluate their current mood using an analogue scale [17].

Simple reaction time was measured using a system constructed especially for the research. The system emitted stimuli and recorded the time it took to press the but-

ton (in milliseconds) [18]. Ten sound stimuli were emitted and were followed by a 1.5-minute break and then a series of 10 light stimuli. The stimuli were emitted at irregular time intervals (breaks between stimuli were no shorter than 10 seconds and no longer than 20 seconds). The patient's task was to press the reaction button, using the thumb of the dominant hand, as quickly as possible after registering the sound stimuli (pressing the button stopped the sound). During the light reaction test, the task was to press the button after registering a flash of light that lasted around 0.5 seconds, and was displayed on a screen placed 2.5 meters in front of the patient.

To test motoric ability, we used a "tremor" sub-test from the Vienna Battery of Tests (Wiener Testsystem) [20] to note the precision of shoulder and hand movements. Each patient was required to place two pen shaped rods (one held in each hand) horizontally into 7 mm diameter openings on a test board. The rods had to be held in such a position for 30 seconds *without* touching the edge of the opening. If the rods touched the edge of the opening, the computer recorded a fault.

To assess the spontaneous rate, we used a sub-test called "tapping" from the Vienna Battery of Tests.

As a characteristic of spontaneous rate, the combined number of rod tapings of a square area of 40 mm sides held in each hand was used. The computer-registered test lasted 32 secs.

After all the above tests were conducted, the sense of elapsed time span was measured by asking all patients to describe the time span between two defined moments (the timer was stopped after one minute). During the test the conductor distracted the patient by engaging him in conversation.

All calculations and comparisons were conducted using a t-Student test (for both dependent and independent variables) as well as non-parametric procedures from the Statgraphics package.

## Results

Results are presented in tables 1–6. Each table gives the mean variables obtained from subsequent tests for all the groups tested as well as for the subgroups classified as patients with type 1 and type 2 dependency (Cloninger's typology). Standard deviation of means for all set out groups in the same test and between is also included.

## Mood

All results of mood self-evaluation testing are presented in Table 1.

Table 1

Mood measured by self-rating analogue scale in Cloninger's subtypes of male alcoholics

	Testing in days			Statistical significance
	First I	Third or fourth I	Seventh II	
Whole group	34.00 ±4.34	60.26 ±4.58	74.32 ±4.63	Test I/Test II p<.001 Test I/Test III p<.001 Test II/Test III p<.05
Type 1	34.08 ±7.32	51.45 ±6.36	70.54 ±7.93	Test I/Test II p<.001 Test I/Test III p<.001 Test II/Test III p<.05
Type 2	33.94 ±6.89	66.31 ±6.40	77.29 ±6.58	Test I/Test II p<.001 Test I/Test III p<.001 Test II/Test III p<.05
Statistical significance	n.s.	p<.05	n.s.	

It is no surprise that for all patients examined during detoxification and pharmacotherapy, dissipation of withdrawal symptoms was coupled with mood improvements. Decreased mood observed during the period when withdrawal symptoms are most severe (Test I) improved significantly after 2–3 days (Test II). However, patients with type 2 dependency, after dissipation of severe somatic symptoms, experienced more significant mood improvements than patients with type 1 dependency ( $p > .05$ ).

Test III revealed further mood improvements (significant differences between Test I and Test II). However, differences between the groups—similarly to Test I—did not reach the edge of statistical significance, although in relative scores, patients with type 1 alcoholism who were tested evaluated their moods as lower.

### Tremor

The results of involuntary hand tremor testing are presented in Table 2.

During the detoxification treatment, involuntary hand tremor in both groups subsided quickly. Improvements after 3–4 days of abstinence (Test II) were significant ( $p < .001$ ) and further improvements that occurred only in patients with type 2 alcoholism reached statistical significance. There were also significant differences in the intensity of muscle tremor between the various alcoholism types. Patients with type 1 alcoholism had less intensive tremor (34.55 vs. 77.75;  $p < .05$ ) (Test I). Both groups during the 3–4 days of abstinence (Test II) experienced a three-fold reduction in tremor. During the 7th day of treatment (Test III) these differences were still present (7.67 vs. 15.25;  $p < .01$ ).

### Spontaneous rate

The results regarding spontaneous pace/rate are presented in Table 3.

There were no statistically significant differences noted both between subsequent

Table 2

Involuntary tremor measured by subtest „tremor” from Vienna Battery of Tests in Cloninger’s subtypes of male alcoholics

	Testing in days			Statistical significance
	First I	Third or fourth I	Seventh II	
Whole group	59.24 ±11.00	20.57 ±4.21	12.00 ±0.97	Test I/Test II p<.001 Test I/Test III p<.001 Test II/Test III n.s.
Type 1	34.55 ±9.43	11.33 ±2.30	7.67 ±0.69	Test I/Test II p<.001 Test I/Test III p<.001 Test II/Test III n.s.
Type 2	77.75 ±16.24	27.50 ±6.57	15.25 ±0.67	Test I/Test II p<.01 Test I/Test III p<.001 Test II/Test III p<.05
Statistical significance	p<.05	p<.01	p<.01	

Table 3

Spontaneous rate measured by subtest „tapping” in Vienna Battery of Tests in Cloninger’s subtypes of male alcoholics

	Testing in days			Statistical significance
	First I	Third or fourth II	Seventh II	
Whole group	126.11 ±11.85	135.00 ±12.97	142.28 ±14.14	Test I/Test II n.s. Test I/Test III n.s. Test II/Test III n.s.
Type 1	121.17 ±16.91	135.09 ±20.26	140.91 ±21.02	Test I/Test II n.s. Test I/Test III n.s. Test II/Test III n.s.
Type 2	130.07 ±16.94	142.27 ±17.23	143.36 ±19.81	Test I/Test II n.s. Test I/Test III n.s. Test II/Test III n.s.
Statistical significance	n.s.	n.s.	n.s.	

tests as well as between different types of alcoholism; however, figures suggest that patients with type 1 dependency experienced a slower pace than patients with type 2 dependency, and that the pace’s increase began only after a week of detoxification (Test III). However, in patients with type 2 dependency, the period of dissipation of withdrawal symptoms was coupled with an increase in the pace of tapping after just 3 days of treatment (Test II). The differences between the tests did not, however, display a statistical significance.

## Simple reaction time

The results of simple reaction time to sound stimuli are presented in Table 4. Table 5 presents light stimuli values.

Table 4

Simple reaction time (in msec.) to acoustic signs in Cloninger's subtypes of male alcoholics

	Testing in days			Statistical significance
	First I	Third or fourth II	Seventh II	
Whole group	262.38 ±11.12	217.57 ±8.86	205.98 ±4.59	Test I/Test II p<.001 Test I/Test III p<.001 Test I/Test II n.s.
Type 1	226.59 ±8.56	202.38 ±4.74	194.44±8.8 5	Test I/Test II p<.001 Test I/Test III p<.001 Test I/Test II n.s.
Type 2	289.23 ±13.86	238.17 ±4.06	215.03 ±3.46	Test I/Test II p<.001 Test I/Test III p<.001 Test I/Test II n.s.
Statistical significance	p<.001	p<.001	p<.05	

Table 5

Simple reaction time (in msec.) to visual signs in Cloninger's subtypes of male alcoholics

	Testing in days			Statistical significance
	First I	Third or fourth II	Seventh II	
Whole group	252.23 ±2.68	223.77 ±1.87	213.22 ±3.86	Test I/Test II p<.001 Test I/Test III p<.001 Test I/Test II n.s.
Type 1	239.17 ±3.66	208.74 ±3.33	204.06±3.9 9	Test I/Test II p<.001 Test I/Test III p<.001 Test I/Test II n.s.
Type 2	262.46 ±4.01	234.13 ±3.74	218.47 ±3.40	Test I/Test II p<.001 Test I/Test III p<.01 Test I/Test II p<.01
Statistical significance	p<.05	p<.001	p<.001	

All patients showed a significantly reduced reaction time to both types of stimuli after Test II. Patients with type 1 dependency reacted equally efficiently to stimuli after 3 days of treatment as at the end of treatment (Test III). Patients with type 2

dependency showed a gradual improvement in the reaction time to stimuli; Test II revealed a significant reduction in reaction time and a further reduction in reaction time was observed in Test III.

During the time of most severe abstinence symptoms as well as during the time of their dissipation, patients with type 2 dependency had a significantly slower reaction time to both light and sound stimuli than patients with type 1 dependency.

#### Elapsed time span evaluation

The ability to accurately evaluate the elapsed time span is presented in table 6.

Table 6

The accuracy of estimation of the time elapsed 1 min. (in seconds)

	Testing in days			Statistical significance
	First I	Third or fourth II	Seventh II	
Whole group	100.00 ±15.09	88.54 ±12.51	76.74 ±11.09	Test I/Test II n.s. Test I/Test III n.s. Test II/Test III n.s.
Type 1	100.00 ±25.07	66.00 ±14.00	63.64 ±7.64	Test I/Test II n.s. Test I/Test III p < .05 Test II/Test III n.s.
Type 2	100.00 ±13.62	104.6 ±18.17	69.75 ±9.88	Test I/Test II n.s. Test I/Test III n.s. Test II/Test III n.s.
Statistical significance	n.s.	p < .05	n.s.	

All patients tested during the period of most severe withdrawal symptoms showed subjective underestimation of the elapsed time span. Asked to describe how much time had gone by, all patients evaluated 60 seconds as 100 seconds. During Test II, patients with type 1 dependency accurately estimated the time span; the average noted error was 10%, while in Test III it fell to 5%. However, patients with type 2 dependency in Test III, similarly to their results in the beginning, made an error in estimation of around 70% of the time, while during Test III, the error rate fell to 40%.

#### Discussion

All tests were conducted within small groups of patients; therefore, any conclusions should be made with caution. Nevertheless, results seem to validate the concept of heterogeneity in mental disturbances characteristic of patients diagnosed with alcohol dependence, especially the different nature of characteristic of alcohol dependency types described by Cloninger. Differences in the course of the treated withdrawal syndrome seen in men with type 1 and type 2 dependencies (Cloninger) were confirmed

on the basis of mood self-evaluation and ability to estimate elapsed time, as well as measurements of muscle tremor and simple reaction time to sound and visual stimuli. Differences in the parameters measured were seen on the first day of abstinence as well as during the week after drinking was discontinued.

Patients with type 1 dependency (in comparison with patients with type 2 dependency) regained their mood more slowly, although they were quicker to begin to accurately estimate elapsed time. It was also observed that the muscle tremor and reactions to sound and visual stimuli, less retarded when the withdrawal symptoms are severe, improved more quickly in this group of patients. The measure of both parameters was reaction time.

We observed a decreased mood and more intense muscle tremor in all patients. These symptoms, which displayed directly after patients discontinued drinking, are typical symptoms of alcohol withdrawal. Quicker mood improvements seen in patients with type 2 dependency correspond with Cloninger's classification [7,8] and observations of other researchers [3,11]. This effect can be thought of as characteristic of type 2 dependency; e.g. less self-criticism, a lack of signs of depression, and antisocial personality characterised by the need for quick gratification. In contrast, patients with type 1 dependency, who show criticism of their illness, have decreased mood states that persist longer.

Alcoholic tremor is sometimes considered the main characteristic of alcohol withdrawal syndrome. Strong manifestations of muscular tremor and improved hand-and-eye coordination in patients with type 2 dependency can be the result of a specific drinking standard. It is known that patients with type 2 dependency often commence drinking in their youth and consume larger doses of alcohol. It is often harder to distinguish intervals of consumption and periods of abstinence in their drinking pattern [7,8], so one can expect to observe in this group of patients more intense and lasting disturbances in the cerebellar structures [6,16].

Prolonged reaction time and inaccurate estimation of elapsed time can be seen as evidence of concentration and attention disturbances as well as memory lapses [5,9,13]. Subjective assessment of elapsed time can be one of the many signs of improved perception of the surrounding world [21]. Such disturbances are most severe in patients with type 2 dependency (Cloninger's typology) during the period when abstinence symptoms are intense, as well as during the period of their dissipation.

It is not clear if the above differences are connected with differential sensitivity of neurotransmitter systems to the toxic effect of alcohol (type 1 dependency, according to Cloninger, is characterised by hypofunction of the noradrenergic and dopaminergic systems; type 2 dependency - serotonergic system [7]), or if they are dependent on the amount of consumed alcohol (patients with type 2 dependency began to drink earlier on and consumed large doses of alcohol compared to type 1 dependants). It seems more probable that the delayed simple reaction time, more intense muscle tremor, and delayed dissipation of retarded recognition functions that are evident in type 2 dependency patients, are a result of the toxic effect of a larger dose of consumed alcohol.

Differences between type 1 and type 2 alcohol dependency (Cloninger) suggests the need of using different procedures of psycho- and pharmacotherapy [11,12,14] in the continuation of treatment (after detoxification and dissipation of severe symptoms



of alcohol withdrawal). Research confirms the heterogeneity of the group of alcohol dependent patients, which results from the different types of alcoholism. The lack of consideration for this heterogeneity can have a profound effect on the results of population studies of alcohol dependent patients.

### Conclusions

1. It was found that differences between type 1 and type 2 alcohol dependency (Cloninger's typology) are evident during the first day of abstinence as well as during the entire period of treatment of the disorder. Differences are manifested in the patients' ability to estimate elapsed time, measurement of muscle tremor, simple reaction time, and mood self-evaluation.
2. The above results provide evidence for Cloninger's hypothesis, which assumes pathogenetical differences between type 1 and type 2 alcohol dependence.
3. Research confirms the heterogeneity of alcohol dependence groups, suggesting the need to consider this fact when interpreting results of population studies, as well as the necessity for differential therapeutic approaches for type 1 and type 2 alcoholism (Cloninger).

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### References

1. American Psychiatric Association: *Diagnostic and Statistical Manual of Mental Disorders. Fourth Edition. DSM-IV*. Washington DC: American Psychiatric Association; 1994.
2. Babor TF, Hofman M, DelBoca FK, Hesselbrock V, Meyer RE, Dolinsky ZS, Rounsaville B. *Types of alcoholics. I. Evidence for an empirically derived typology based on indicators of vulnerability and severity*. Arch. Gen. Psychiatry 1992; 49: 599-698.
3. Bidziński A, Habrat B, Tonderska A. *Obwodowe wskaźniki aktywności układów cholinergicznego i noradrenergicznego w typie I i typie II alkoholizmu wg Cloningera*. Alkoholizm i Narkomania 1996; 3: 301-309.
4. Breuer HH, Goldsmith RJ. *Interrater reliability of the Alcoholism Denial Scale*. Subst. Abuse 1995; 16: 169-176.
5. Cermak LS, In: *Human Memory and Amnesia*. Hillsdale, New Jersey: Lawrence Erlbaum Associates; 1992. p. 43-59.
6. Charness ME, Simon RP, Greenberg DA. *Ethanol and the nervous system*. N. Engl. J. Med. 1989; 321: 442-454.
7. Cloninger CR. *Neurogenetic adaptive mechanisms in alcoholism*. Science 1987; 236: 410-416.
8. Cloninger CR. *A systematic method for clinical description and classification of personality*. Arch. Gen. Psychiatry 1987; 44: 573-588.
9. Goldman MS. *Recovery of cognitive functioning in alcoholics*. Alcohol Health & Research World 1995; 19: 148-154.
10. Habrat B. *Klasyfikacja alkoholizmu wg Cloningera*. Post. Psychiatr. Neurol. 1992; 1: 155-160.
11. Habrat B, Chachaj L. *Występowanie alkoholizmu typu I i typu II wg Cloningera w populacji osób uzależnionych leczonych ambulatoryjnie i szpitalnie*. Post. Psychiatr. Neurol. 1992; 1: 161-164.

12. Lesch OM, Walter H. *Subtypes of alcoholism and their role in therapy*. Alcohol & Alcoholism. 1996; 31, 63-67.
13. Lister RG, Eckardt M, Weingartner H. *Ethanol intoxication and memory: Recent developments and new direction*. In: Galanter M. eds. *Recent Developments in Alcoholism*. Vol. 5. New York: Plenum; 1987. p. 111-125.
14. Litt MD, Babor TF, Del Boca FK, Kadden RM, Cooney RL. *Types of alcoholics, II. Application of an empirically derived typology to treatment matching*. Arch. Gen. Psychiatry. 1992; 49: 609-614.
15. Sellers EM. *Assessment of alcohol withdrawal: The revised Clinical Institute Assessment for Alcohol scale (CIWA-Ar)*. Brit. J. Addiction. 1989; 84: 1353-1357.
16. Sullivan EV, Rosenbloom MJ, Deshmukh A, Desmond JE, Pfefferbaum A. *Alcohol and the Cerebellum: Effects on balance, motor coordination, and cognition*. Alcohol Health & Research World 1995; 19: 138-141.
17. Ślósarska M, Beręsewicz M, Wójcik M. *Analogowa skala samooceny nastroju jako narzędzie do oceny zmian stanu klinicznego chorych z endogennym zespołem depresyjnym. Porównanie ze skalą depresji Hamiltona*. Psychiatr. Pol. 1992; 26: 197-206.
18. Ślósarska M, Wójcik M, Habrat B. *Ocena zmiany stanu fizjologicznego pacjentów uzależnionych od alkoholu w okresie 10 dniowego leczenia detoksykacyjnego*. Psychiatr. Pol. 1994; 28: 83-90.
19. Ślósarska M, Wójcik M. *Porównanie poczucia upływu czasu oraz czasu reakcji prostej u chorych z depresją endogenną i osób zdrowych*. Psychiatr. Pol. 1995; 29: 243-252.
20. *Wiener Testsystem*. Dr Schlfried GmbH Alta. Katowice 1991.
21. Zakay D. *Subjective time and attentional resource allocation: An integrated model of time estimation*. In: *The time and human cognition*. Elsevier Science Publishers B.V. North Holland. 1989, 365-397.

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