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Neuropsychological consequences, emotions and length of alcohol abuse: a preliminary study

Giada D'Amico*[1], Mariagrazia Pasinato[2], Massimo Prior[3]

[1] Ca'Dolce - Studio di Psicologia - Belvedere di Tezze sul Brenta, Vicenza, Italia
[2] Dipartimento per le dipendenze - Distretto di Asolo Azienda ULSS 2 Marca Trevigiana, Treviso, Italia
[3] Dipartimento di Salute Mentale – Servizio di Neuropsicologia - Azienda ULSS 2 Marca Trevigiana

***Corresponding Author:** damicogiadavittoria@gmail.com

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Abstract

Objective: Neuropsychological impairments are prevalent among patients with Alcohol Use Disorder (AUD). Clinical practice currently lacks neuropsychological assessment and cognitive retraining. This study aims to preliminarily investigate the neuropsychological deficits and emotional characteristics in a population of chronical alcoholics who have been abstinent for nearly 30 days.

Method: Neuropsychological assessment was conduct using the ENB-2 on a group of 22 chronic alcoholics, divided into two subgroups based on the duration of alcohol intake (long term: ≥22 years, and short term: <22 years). Emotional aspects were evaluated using the TAS-20.

Results: No statistically significant differences were observed between the groups. Frequency distribution of performances was utilized to observe the ENB-2 and the TAS-20 score distribution.

Conclusions: Following 30 days of detoxication, qualitative analysis revealed persistent neurocognitive deficits in the total sample, particularly in executive and visuospatial functions.

Keywords alcohol, abuse, abstinence period, cognitive disorder, emotional disorders

Introduction

Several studies in the global literature have noted the association between brain and cognitive impairments and chronic substance and alcohol misuse (Maillard et al., 2020; Charlton & Perry, 2022; Maharjan et al., 2022; Deniel et all., 2023). Regarding alcohol use disorder, it results in various cognitive deficits across different components of executive functioning, supporting the hypothesis of a dysexecutive syndrome in this clinical population (Fertonani et al., 2013; Ioime et al., 2018). Education appears to be a protective factor (Maillard et al., 2020).

The DSM-5 introduced a diagnosis of "alcohol- induced neurocognitive disorders", with severity ranging from mild (affecting 30-40% of cases of abstinence) to major. Major alcohol-induced neurocognitive disorder can arise from nutritional deficiencies, such as Wernicke's encephalopathy (WE), Korsakoff's syndrome (KS), as well as hepatic encephalopathy (HE), Marchiafava- Bignami disease (MBD) and central pontine myelinolysis (CPM). Despite unknow prevalence data, neurocognitive disorders are more likely in individuals with longer alcohol use histories and are frequently undiagnosed due to the lack of systematic neuropsychological assessment in this population (Maillard et al., 2020).

This cognitive decline affects treatment effectiveness and increases the risk of relapses, as maladaptive executive functions (e.g., problem solving, learning from experience), which are associated with the prefrontal cortex, promote the addiction (Ioime et al., 2018). Chronic alcoholism

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and abstinence are linked to morphological abnormalities in the frontal lobe (Moselhy et al., 2001; Maharyan et al., 2022). Identifying impaired and preserved neuropsychological functions can inform the treatment of this disorder and enable early detection of patients at risk for developing neurological complications (Maillard et al., 2020).

In their study Caneva et al. (2020) described impaired performance in executive function, visuospatial abilities, and memory in a group of early detoxified Alcohol Use Disorder (AUD) patients during their 28-day residential rehabilitation program. Furthermore, impairment was associate with age, education, and abstinence at admission.

The literature exhibits a high variability in methods employed to investigate the relationship between cognitive decline and alcohol consumption (length of exposure, abstinence period, etc) , making it challenging to draw definitive conclusions regarding the observed results (Liappas et al., 2007; Charlton & Perry, 2022).

The primary aim of this preliminary study was to explore the relation between alcohol abuse and neuropsychological impairments, particularly considering the duration of alcoholism. Based on existing literature (Ghogare & Saboo, 2019), we hypothesized that impairment would be more pronounced in individuals with a longer histories of alcohol abuse. Chronic abuse appears to contribute to the severity of deficits (Charlton & Perry, 2022).

Alcohol use can negatively impact brain development, although the specific effects on cognitive functioning remain unclear (de Goede et al., 2021).

The secondary aim was to examine alexithymia in alcohol dependence and investigate its neuropsychological correlates in this population. There appears to be a strong association between alexithymia and alcohol or illicit drugs use, particularly with the dimensions “Difficulty in Identifying Feelings (DIF)”, “Difficulty in Describing Feelings (DDF)”, and “Externally Oriented Thinking (EOT); (Honkalampi et al., 2022). Herman et al. (2023) found higher level of alexithymia and interpersonal issues among high-drinking university students, the majority of whom were female, compared to low-drinking peers.

Alexithymia, defined by Sifneos (1973) in the context of psychosomatic diseases, involves a *combination of neurophysiological and psychological defects*, including difficulty identifying feelings, distinguishing between feelings and bodily sensations, verbalizing emotions, reduced fantasy and an externally oriented cognitive style (Sifneos, 1973; Taylor et al., 1991; Bagby et al., 1994). This has clinical implications; individuals with psychosomatic diseases and alexithymic difficulties may benefit more from supportive psychotherapy, behavioral therapy, hypnosis, and case work than insight-oriented psychotherapies (Sifacos, 1973).

Regarding the relationship between alcohol and alexithymia (Ortolani et al., 2007; Thorberg et al., 2009; Cruise & Becerra, 2018), two reviews have highlighted the prevalence of alexithymia among alcoholics, ranging from 45 to 67% (Thorberg et al., 2009) and 30% and 49% (Cruise and Becerra, 2018). Alcohol Use Disorder (AUD) and drugs addiction are considered as dissociative reactions in individuals with alexithymia and difficulties in regulating emotions (Craparo et al., 2014).

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Methods

Participants

We enrolled a total of 24 participants (18 males and 6 females) with a mean age of 47.42 (range 25- 73, SD = 14.79). Participants were recruited from the Service of Addiction, specifically: 18 from a residential rehabilitation community for alcohol addiction and psychiatric comorbidity, 2 from the addiction clinic at Castelfranco Veneto Hospital, and 4 from the daily hospital in Altivole, located in Northern Italy. Of these, 2 individuals were excluded from the sample because their primary substance of addiction was heroin. The final sample consisted of 22 individuals (17 males and 5 females), with ages ranging from 25 to 73 (M=49, SD=14,33). Most of them had never received a neuropsychological assessment. All participants had been abstinent from alcohol for at least 30 days prior to the assessment. Some were undergoing treatment with anti-craving therapy or pharmacological therapy. Participation in the project was part of the therapeutic protocol.

Participants has been divided into two groups.

To be eligible and admitted into the study, the inclusion criteria were: (a) being 18 years old or above, (b) having Alcohol use disorder (AUD) as the primary diagnosis, according to DSM 5 criteria, (c) understanding spoken and written Italian.

The exclusion criteria included: (a) a history of any brain damage, (b) sensory or neurological disorders, and (c) a history of illicit drug abuse as the primary diagnosis.

On medical advice, we intended to consider blood ammonia levels, as they appear to be correlated with the severity of hepatic encephalopathy (Kinagi & Dattu, 2020). In their study, the authors found that chronic alcoholism was a potential factor in the causation of cirrhosis, liver damage and hepatic encephalopathy, where ammonia can be used as a diagnostic and prognostic factor (Kinagi & Dattu, 2020).

Procedure

The study was conducted between 2021 and 2022. According to clinicians, subjects were assessed after a 30-days period of alcohol detoxification. The neuropsychological evaluation was a specialized assessment part of the therapeutical protocol. Evaluations were carried out by a psychologist at Castelfranco Veneto's Hospital and/ or at the Residential Rehabilitation Community.

The tests were administered in three stages: during the first, participants underwent a clinical interview and were assessed with TAS-20; during the second, they were assessed with ENB-2; the final interview provided feedback, as described in Figure I. One subject only received the clinical interview and the ENB-2 due to her release from the Residential Rehabilitation Community.

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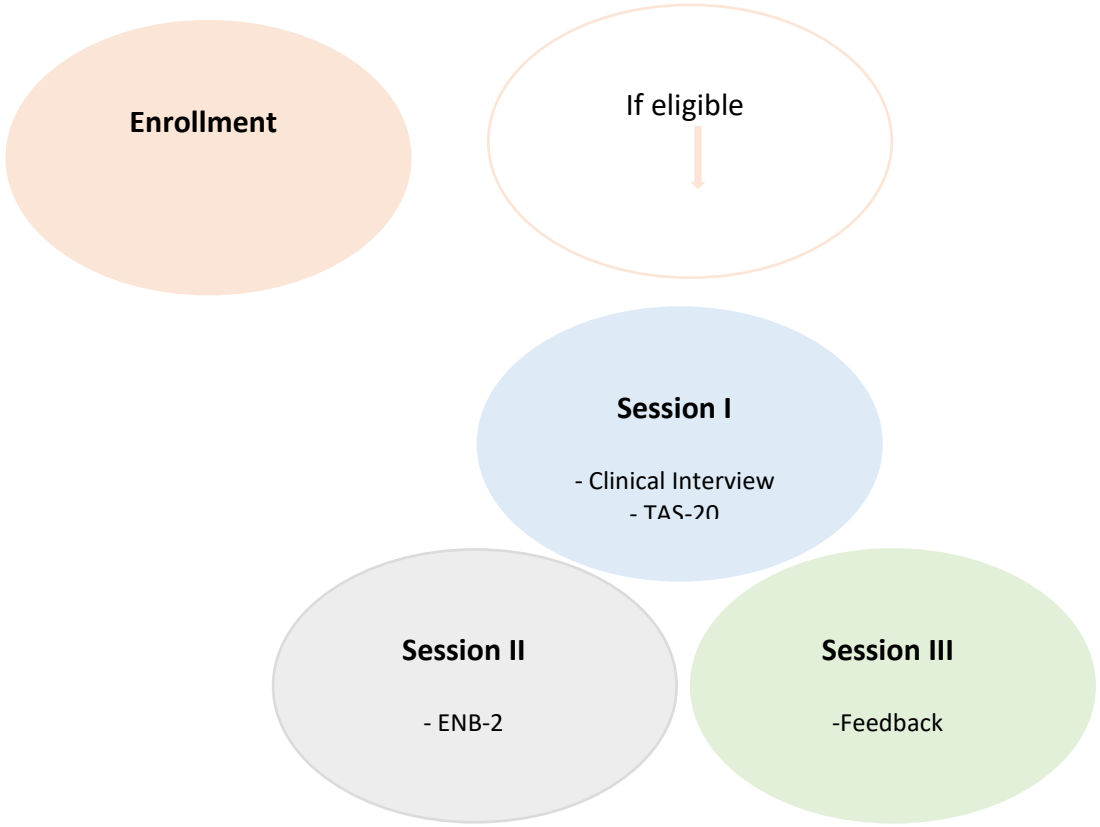

Figure I Study Procedure Overview
This figure illustrates the comprehensive three-session procedure of the study conducted between 2021 and 2022. Session I involved a clinical interview and the administration of the TAS-20 to assess alexithymia. Session II focused on the ENB-2 neuropsychological assessment. Session III provided participants with feedback on their results. This visual representation underscores the systematic approach to evaluating the neuropsychological and emotional characteristics of participants post 30-day alcohol detoxification.

Assessment

All patients were assessed using the following materials:

Brief Neuropsychological Examination 2 (ENB- 2*; Mondini et al., 2011*) is a neuropsychological battery consisting of 16 subtests standardized for the Italian population. For each subtest, a profile score is obtained and adjusted for age (8 levels) and education (≤8 or >8 years). The battery assesses various cognitive domains, including memory, attention/ executive functions, visuospatial abilities and praxis abilities. Mean and standard deviation (SD) values are available for each subtest, along with a global value indicative of cognitive status. The administration typically lasts approximately 1 hour.

Toronto Alexithymia Scale – 20 (TAS 20*; Taylor et al., 1991*) is a 20-item self-report scale used to assess alexithymia. Each item is rated on a 5-point Likert scale (1= strongly disagree; 5= strongly agree). The TAS-20 evaluates three characteristics of alexithymia: "Difficulty in Identifying Feelings" (DIF), "Difficulty in Describing Feelings" (DDF) and "Externally Oriented Thinking" (EOT). The TAS-20 cut off scores identify subjects as alexithymic (≥61), borderline (52-60) and non-alexithymic (≤51).

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SUBTEST	AIM	ADMINISTRATION
Digit Span	short-term memory	The examiner reads a sequence of increasing numbers and then the participants have to recall it. The longest remembered sequence of numbers correctly recall is the digit span (score range= 0-8).
Trail Making Test A	visuospatial-search, selective attention, psychomotor speed	The examiner asks to connect a set of 25 numbers in ascending order, as quickly he/she can. (score in seconds).
Trail Making Test B	psychomotor speed, visuospatial-search, working memory, selective attention, alternating attention divided attention	The examiner asks to connect a set numbers and letters in ascending order alternating them, as quickly he/she can (score in seconds).
Copy Drawing	copy ability	The examiner asks to copy a familiar figure (score range=0-2).
Interference memory at 10 and 30 seconds	working memory	The examiner shows a triplette of letters and asks to read them aloud. Then the triplette is removed and is asked to count by two adding two from a given number, for 10 and then 30 seconds. The participants have to report the triplette of letter correctly (range=0-9, for each version).
Abstraction	abstraction, reasoning abilities	The examiner presents two words and the the subject has to find another word to link the first two (score range= 0-6).
Token Test	comprension abilities	The examiner gives commands of progressive complexity.
Immediate and delayed recall prose memory	long-term memory	The examiner reads a short story that has to be repeated immediately and after a distracting test (Overlapping Figure).
Overlapping Figure	visual recognition, control inhibition	The examiner asks to the participant to identify the overlapping figures in 4 minutes (score range=0-50).
Spontaneous Drawing	praxis abilities access to visual representation	The examiner asks to draw a daisy with one leaf and one stem (range= 0-2).
Word Phonemic Fluency	ability to recall words on basis of initial letter	The examiner asks to report words on basis of the initial letter in 1 minute.
Cognitive Estimation	ability to answer correctly to ambiguous questions	The examiner asks to answer to ambiguous questions (range=0-5).
Ideative and Ideomotor Praxis Test	perform gesture	The examiner asks to perform gestures and to replicate examiner's gestures (range=0-6)
Clock Drawing	executive function visuospatial/ praxis abilities	The examiner asks to place number in a printed circle and to set the hands of the clock for 45 after 2.

Table I Participant Demographics and Clinical Characteristics
Table I presents a detailed breakdown of the demographic and clinical characteristics of the study participants, totaling 22 individuals. It includes data on gender, age, education level, psychiatric comorbidity, history of substance abuse or gambling, and the duration of alcohol abuse. The table further divides the participants into two groups based on the length of alcohol use, providing a clear comparison of these characteristics across different durations of alcohol consumption.

Data Analysis

Descriptive statistics were used to analyze the demographic and clinical characteristics across all study partecipants. The median length of alcohol use (in years) was considered to create two groups: one comprising participants who used alcohol for a longer period (≥22 years) and another comprising those with a shorter period (<22 years).

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	Lenght to access (years)
N	22
Missing	0
Mean	24.8
Median	22.0
Standard deviation	13.4
Minimum	4
Maximum	58

Table 2 Global Sample Median Analysis
Table 2 provides statistical analysis of the median length of alcohol use among the study participants, based on years. It encompasses the mean, median, standard deviation, and the range of years of alcohol use, offering a quantitative overview of the alcohol consumption duration within the sample.

Frequency distribution was employed to observe the distribution of ENB-2 and the TAS-20 scores within each group (G1 and G2) and between them.

Results

The final sample was comprised 22 patients classified into two groups based on the duration of alcohol use (p=0.008). Clinical and socio- demographic aspects of the sample are described in Table I. Of the sample, 77.2% were male and the 22.7% were female, with a middle education level (>8 years) for 59% of participants. Half of the patients (50%) were undergoing their second treatment, 27.2% had a history of psychiatric disorders, and 54.5% had a history of substance use or gambling disorder.

- Group 1:11 participants who had been drinking for a long period (≥22 years). Their mean age was 50.3 (SD= 11.6, range 38- 73) and the mean education was 9.7 (SD= 2.6).
- Group 2:11 participants who had been drinking for a shorter period (<22 years). Their mean age was 47.6 (SD= 17.0, range 25- 72) and the mean education was 10.3 (SD= 2.8).

For each ENB-2 subtest and the global index, we calculated the mean, standard deviation scores, and the frequency distribution (percentage) of impaired and normal performance at ENB-2 (results are described in Table 5). After 30 days of detoxification, the overall comparison of the two groups indicated that the 45.4% of participants had low performance on at least one subtest, while the remaining 54.5% had impaired performance on two or more subtests (Table 4 shows the percentage of impairment in each group). In Group 1, the majority of cognitive defects were observed in the Clock Drawing (45.4%), Overlapping Figure (45.4%) and the Global Index (45.4%), while in Group 2, impairments were primarily observed in the Trail Making Test Part B (45.4%) and the Copy Drawing (45.4%).

The comparison of Group 1 and Group 2 suggested a test- specific sensibility. A total of 31.8% (4 patients in Group 1 and 3 patients in Group 2) of the sample exhibited alexithymia, while the 27.2% had a borderline index (2 patients in Group 1 and 4 patients in Group 2). Unlike Honkalampi et al. (2022), we observed a higher incidence of its dimensions: “Externally Oriented Thinking” (EOT, mean=20.42, SD=5.2), followed by “Difficulty in Identifying Feelings” (DIF, mean=17.28,

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SD=7.02), and "Difficulty in Describing Feelings" (DDF, mean=15.23, SD=4.6). Considering the two samples, the correlation between length of abuse and a lower performance on TAS-20, we found it was stronger in G1 (p=61) rather than G2 (p=0.14).

G1 (=11) ≥22				
Test	**Mean/SD**	**Frequencies (%)**		
		Normal	**Limits of norm**	**Impaired**
Digit span	6,09±0,83	10 (90%)	1 (9%)	0
Trail Making Test A	46,72±27	9 (81,8%)	0	2 (18,1%)
Trail Making Test B	211,54±180,44	7 (63,6%)	0	4 (36,3%)
Copy Drawing	1,54±0,52	7 (63,6%)	0	4 (36,3%)
Interference memory at 10 seconds	0,01±1,8	10 (90%)	0	1 (9%)
Interference memory at 30 seconds	6,18±2,22	9 (81,8%)	2 (18,1%)	0
Abstraction	5,36±0,92	11 (100%)	0	0
Token Test	5±0	11 (100%)	0	0
Immediate recall prose memory	11,18±5,49	10 (90%)	0	1 (9%)
Delayed recall prose memory	16,45±5,46	10 (90%)	0	1 (9%)
Overlapping Figure	31,09±7,95	6 (54,5%)	0	5 (45,4%)
Spontaneous Drawing	1,81±0,40	9 (81,8%)	0	2 (18,1%)
Word Phonemic Fluency	13,09±3,36	10 (90%)	0	1 (9%)
Cognitive Estimation	4,54±0,68	9 (81,8%)	1 (9%)	1 (9%)
Ideative and Ideomotor Praxis Test	5,90±0,30	10 (90%)	0	1 (9%)
Clock Drawing	5,5±3,55	5 (45,4%)	1 (9%)	5 (45,4%)
Global score	73,63±12,04	6 (54,5%)	0	5 (45,4%)

G2 (=11) <22				
Test	**Mean/SD**	**Frequencies (%)**		
		Normal	**Limits of norm**	**Impaired**
Digit span	5,09±1,04	9 (81,8%)	0	2 (18,1%)
Trail Making Test A	47,90±28,52	10 (90%)	0	1 (9%)
Trail Making Test B	149,27±70,75	6 (54,5%)	0	5 (45,4%)
Copy Drawing	1,54±0,52	6 (54,5%)	0	5 (45,4%)
Interference memory at 10 seconds	7,18±2,78	10 (90%)	0	1 (9%)
Interference memory at 30 seconds	6,54±2,84	8 (63,6%)	1 (9%)	2 (18,1%)
Abstraction	5,36±0,80	11 (100%)	0	0
Token Test	4,90±0,30	10 (90%)	0	1 (9%)
Immediate recall prose memory	12,81±4,49	9 (81,8%)	0	2 (18,1%)
Delayed recall prose memory	16,81±5,49	8 (63,6%)	2 (18,1%)	1 (9%)
Overlapping Figure	29,45±8,15	5 (45,4%)	1 (9%)	5 (45,4%)
Spontaneous Drawing	1,72±0,46	9 (81,8%)	0	2 (18,1%)
Word Phonemic Fluency	11±3,19	8 (63,6%)	0	3 (27,2%)
Cognitive Estimation	4,54±0,93	9 (81,8%)	2 (18,1%)	0
Ideative and Ideomotor Praxis Test	5,90±0,30	10 (90%)	0	1 (9%)
Clock Drawing	7,31±2,66	7 (63,6%)	1 (9%)	3 (27,2%)
Global score	71,27±9,79	8 (63,6%)	0	3 (27,2%)

Table 3 ENB-2 Performance Distribution
Table 3 compares the performance on the ENB-2 neuropsychological battery between two groups of participants, categorized by the duration of alcohol use. It includes mean scores, standard deviations, and the frequency of normal versus impaired test results for each subtest, illustrating the nuanced impact of long-term versus short-term alcohol use on various cognitive functions.

Parametric statistic (t-test) were used to compare the two groups.

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		Statistic	df	p
Age	Student's t	0.4375	20.0	0.666
Education	Student's t	-0.4729	20.0	0.641
Length to access (years)	Student's t	2.9468	20.0	0.008
ENB-2				
Global Index	Student's t	0.5049	20.0	0.619
Digit Span	Student's t	2.4846	20.0	0.022
Immediate recall prose memory	Student's t	-0.7650	20.0	0.453
Delayed recall prose memory	Student's t	-0.1557	20.0	0.878
Interference memory at 10	Student's t	-0.6296	20.0	0.536
Interference memory at 30	Student's t	-0.3340	20.0	0.742
TMTA	Student's t	-0.0998	20.0	0.922
TMTB	Student's t	1.0656 [a]	20.0	0.299
Token Test	Student's t	1.0000 [a]	20.0	0.329
Word Phonemic Fluency	Student's t	1.4959	20.0	0.150
Abstraction	Student's t	0.0000	20.0	1.000
Cognitive Estimation	Student's t	0.0000	20.0	1.000
Overlapping Figure	Student's t	0.4764	20.0	0.639
Copy Drawing	Student's t	0.0000	20.0	1.000
Spontaneous Drawing	Student's t	0.4880	20.0	0.631
Clock Drawing	Student's t	-1.0796	20.0	0.293
Ideative and Ideomotor Praxis Test	Student's t	0.0000	20.0	1.000
TAS-20	Student's t	-1.091	19.0	0.289
DIF	Student's t	-0.435	19.0	0.668
DDF	Student's t	-1.415 [a]	19.0	0.173
EOT	Student's t	-1.241	19.0	0.230

Note. H_a $\mu_1 \neq \mu_2$
[a] Levene's test is significant ($p < .05$), suggesting a violation of the assumption of equal variances

Table 4 Independent Samples T-Test Results
Table 4 presents the statistical analysis of the neuropsychological performance differences between the two participant groups using independent samples T-Test. It includes test statistics, degrees of freedom, and p-values for a range of variables and ENB-2 subtests, facilitating an understanding of significant differences in cognitive impairments related to the duration of alcohol use.

Variables		Counts	% of Total
Gender	Male	17	77,2 %
	Female	5	22,7 %
Age	25-50	14 (39,7±6,9)	63,6%
	≥51	8 (65,1±7,7)	36,3%
Education	≤8	9 (7,3±1,3)	40,9%
	>8	13 (11,8±1,4)	59%
Psychiatric comorbidity	Yes	6	27,2%
	No	16	72,7%
Previous substance abuse/ gambling	Yes	12	54,5%
	No	10	45,4%
Lenght of alcohol abuse		24,7±13,4	

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Groups			Mean/sd	% of Total
N	1			11
	2			11
Lenght to access (years)	1		32,0±10,7	
	2		17,5±12,1	
Gender	1	Male		9 (81,8%)
		Female		2 (18,1%)
	2	Male		9 (81,8%)
		Female		2 (18,1%)
Age	1		50,3±11,6	
		25-50	43,2±4,3	7(63,3%)
		≥51	62,75±9,7	4 (36,3%)
	2		47,6±17,0	
		25-50	36,2±7,5	7 (63,3%)
		≥51	67,5±5,4	4 (36,3%)
Education	1	≤8	7,4±1,3	5 (45,4%)
		>8	11,6±1,5	6 (54,5%)
	2	≤8	7,2±1,5	4 (36,3%)
		>8	12±1,5	7 (63,6%)
Psychiatric comorbidity	1	Yes		3 (13,6%)
		No		8 (36,4%)
	2	Yes		3 (13,6%)
		No		8 (36,4%)
Previous substance abuse/gambling	1	Yes		7 (63,6%)
		No		4 (36,3%)
	2	Yes		5 (45,4%)
		No		6 (54,5%)

Table 5 - Participant Demographics and Clinical Characteristics
Table 5 presents a detailed breakdown of the demographic and clinical characteristics of the study participants, totaling 22 individuals. It includes data on gender, age, education level, psychiatric comorbidity, history of substance abuse or gambling, and the duration of alcohol abuse. The table further divides the participants into two groups based on the length of alcohol use, providing a clear comparison of these characteristics across different durations of alcohol consumption.

Discussion

This aim to this study is to provide data on alcoholism, specifically exploring cognitive deficits in alcohol- dependent patients, considering the duration of alcohol use over their lifetime and after 30 days of detoxification. Both the duration of AUD and the severity of abuse appear to play a crucial role in the neuropsychological functioning post-treatment and should be considered when designing experiments (Charlton & Perry, 2022; Fiabane et al., 2023). Additionally, we aim to integrate these findings with observations on emotional functioning.

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The overall comparison between the two groups did not reveal any statistically significant differences in the cognitive performance. However, upon examining the frequency distribution, the data suggest that after 30 days of detoxification, patients still exhibit cognitive deficits, with specific differences observed between individuals in the two groups. Notably, the Global Index in Group 1 indicates a more compromised profile compared to Group 2, with five participants displaying impaired scores. The differences among subjects may be attributed to variations in premorbid characteristics and cognitive reserve, factors which were not evaluated in this preliminary study.

These results align with existing literature indicating short-term recovery but persisting cognitive difficulties post-detoxification (Caneva et al., 2020; Fiabane et al., 2023).

Several studies have investigated neuropsychological changes during early abstinence from alcohol (up to 10 days). For instance, Manning et al. (2008) reported improved performance in working memory, verbal fluency and verbal inhibition, as well as enhancement in tasks such as Figure Copy, Semantic Fluency, Coding, Story Recall, and Figure Recall from the RBANS. Similarly, Mulhause et al. (2018) and Fiabane et. al (2023) observed spontaneous recovery in reasoning and processing speed. Joime et al. (2018) found that one year of abstinence from alcohol encouraged recovery of cognitive functioning in all cognitive domains except for non-verbal intelligence, verbal memory, and visuospatial skills. These differences may reflect variations in sample characteristics and test sensitivity.

Despite mild cognitive deficits that may be triggered by the brain stress system during withdrawal and craving (Koob, 2008), there are cognitive impairments that persist even after prolonged abstinence, as observed in our sample. However, studies have not determined the duration of abstinence necessary to observe these variable effects (Charlton & Perry, 2022). Consistently with the literature, cognitive impairments predominantly affect visuospatial and executive abilities.

This study has implications for treatment and rehabilitation programs. Firstly, neuropsychological screening should be considered an essential part of the clinical protocol, from the intake to post-detoxification, longitudinally. Considering the timing of neuropsychological impairment recovery, it is necessary to acknowledge that patients in early recovery stages may experience withdrawal symptoms that can interfere with test scores. Cognitive impairment can negatively impact treatment compliance, daily functioning, psychosocial reintegration, and increase the risk of relapse.

Our results demonstrate the crucial role of abstinence in improving cognitive performance, but higher-level cognitive functions appear to remain impaired over time. Therefore, a cognitive retraining approach tailored to individual strength and weaknesses should be considered.

Several limitations of this preliminary study should be noted. First, the sample size was small, which may have biased both qualitative and quantitative analyses. Additionally, performances may have been influenced by anti-craving therapy or pharmacological interventions.

Future studies could benefit from expanding the scope to include ecologically-valid test such as the Rivermead Behavioral Memory Test (RBMT) and the Behavioral Assessment of Dysexecutive Syndrome (BADS). For example, Wester at al. (2013) found that RBMT was valid in differentiating Korsakoff patients from non-Korsakoff patients with alcohol use disorder. Furthermore, it would be essential to consider specific sample characteristics such as duration of abstinence, presence of

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premorbid individual differences, cognitive reserve, addiction severity, poly-abuse, blood ammonia levels, and the vitamin deficiencies.

Conclusion

This study offers critical insights into the enduring neuropsychological deficits and emotional characteristics in individuals with Alcohol Use Disorder (AUD) after a 30-day period of abstinence. Despite the absence of statistically significant differences between groups based on the duration of alcohol consumption, the nuanced analysis reveals persistent cognitive impairments, particularly in executive and visuospatial functions, across all participants. These findings underscore the complex interplay between chronic alcohol use and cognitive function, highlighting the necessity for a comprehensive neuropsychological assessment in clinical practice to identify and address these impairments effectively.

Moreover, the study sheds light on the prevalence of alexithymia within this population, suggesting a potential target for therapeutic interventions. The observed correlation between the length of alcohol abuse and lower performance on the TAS-20 further emphasizes the need for tailored treatment approaches that consider the depth of emotional and cognitive deficits.

The implications of our findings are profound for the design of treatment and rehabilitation programs. Incorporating cognitive rehabilitation strategies that specifically address executive and visuospatial impairments can significantly enhance the quality of life for individuals recovering from AUD. Additionally, understanding the role of alexithymia in alcohol dependence may guide the development of psychotherapeutic interventions aimed at improving emotional regulation and reducing relapse risk.

However, the limitations of this preliminary study, including its small sample size and the potential influence of pharmacological treatments, call for cautious interpretation of the results. Future research should aim to replicate these findings in larger, more diverse cohorts and explore the impact of various treatment modalities on cognitive and emotional outcomes. Longitudinal studies examining the trajectory of neuropsychological changes over extended periods of abstinence are particularly needed to inform the timing and nature of interventions.

In conclusion, our study highlights the critical need for integrating neuropsychological assessment and cognitive rehabilitation into the treatment of AUD. By addressing both cognitive deficits and emotional difficulties, clinicians can better support the recovery and reintegration of individuals with AUD, ultimately improving their overall functioning and quality of life. Further research in this domain is essential to refine our understanding and enhance the efficacy of interventions for this vulnerable population.

Author Contributions

M. Prior, G. D'Amico and M. Pasinato contributed to the conception and design of the studies, and were responsible for data collection. M. Prior and G. D'Amico was responsible for data management and statistical analysis. G. D'Amico and M. Prior were responsible for the drafting and finalization of the manuscript. All authors contributed to the manuscript revision and approved the submitted version.

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Conflicts of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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