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California verbal learning test trial among the polish homeless

Anna Romaszko-Wojtowicz[1], Alina Borkowska[2], Cezary Opalach[3], Małgorzata Romaszko[4], Anna Łowczak[1], Adam Buciński[5]

[1] Department of Pulmonology, School of Public Health, Collegium Medicum, University of Warmia and Mazury in Olsztyn, Poland
[2] Department of Clinical Neuropsychology, Collegium Medicum in Bydgoszcz, Nicolaus Copernicus University in Toruń, Poland
[3] Faculty of Theology, University of Warmia and Mazury in Olsztyn, Poland
[4] Provincial Psychiatric Treatment Unit in Olsztyn, Poland
[5] Department of Biopharmacy, Ludwik Rydygier Collegium Medicum in Bydgoszcz, Nicolaus Copernicus University in Toruń, Poland

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Abstract

Introduction: Reports on the low intellectual level of the homeless are quite numerous and independent of the geographical location of the study.

Aim: The aim is to assess cognitive functions among the homeless as measured by the California verbal learning test (CVLT).

Material and methods: In our study we included 102 homeless people to assess the functioning of verbal memory using the CVLT. The absolute value of the sum of the results in tasks 1–5 amounted only to 36.21 (SD 10.63). Almost 42% of the subjects obtained a sten score of 1 or 2 for this task.

Results and discussion: In all tested CVLT parameters the homeless people, who were the respondents of the present study, obtained results that were significantly below standards (low or very low).

Conclusions: These results indicate the presence of large numbers of people with severe verbal memory disorders among the homeless.

Original version of this paper is available here

Corresponding author: Anna Romaszko-Wojtowicz, Department of Pulmonology, School of Public Health, Collegium Medicum, University of Warmia and Mazury in Olsztyn, Jagiellońska 78, 10-357 Olsztyn, Poland.

E-mail: anna.romaszko@uwm.edu.pl

1. Introduction

Cognitive functions such as memory, attention, language functions, and above all, frontal functions, such as working memory and executive functions, are essential for the adaptation to changing environmental conditions, coping with difficult situations, solving complex problems, and planning, while their efficiency affects individuals' psychosocial functioning. Cognitive deficiencies are most likely associated with the worse functioning of homeless people in the environment, difficulties in adapting to social standards and requirements, and dysfunctional coping strategies. Cognitive dysfunctions can also be a significant cause of the weakened ability to plan and predict the impact of actions taken by the homeless, as well as increase the risk of conflict with the law. The research on cognition of the homeless has been scarce so far; however, the global decrease in the intellectual level of this group of people has been pointed out. Significant intellectual dysfunctions have been found in homeless people studied in Europe,[1,2] North America,[3] India[4] and Japan.[5,6] Cognitive deficits exhibited by the homeless seem to be common and likely to have multifactorial etiologies (mental illness, substance abuse, head trauma, poverty, malnutrition).[7] McMillan et al. proved that multiple head injuries were higher in homeless populations.[8] Moreover, it has been proven in the literature that in a group of homeless people with a history of alcohol dependence, the interval between successive head injuries decreases with the subsequent injury.[9]

The last official data published on government portals on homeless people in Poland comes from 2019. In this period, 30 330 homeless people were recorded in Poland, most of whom were men (25 369 people; 83.6%). In Poland, a decrease in homeless people has been observed over the years. Compared to the data from 2017, the number of these people decreased by 9%. Most often, they are people aged 41–60 (13 801 people; 45.5%). Most homeless people (80.2%) live in institutional facilities.[10] Most homeless people in Poland have vocational or primary education.[11]

The authors of many reports indicate the presence of various addictions quite commonly observed among this subpopulation. Fazel et al. in their meta-analysis published in 2008, determined the percentages of individuals dependent on alcohol at 8.5%–58.1%.[12] In more recent studies, these values are even higher. Krausz et al. estimated that 82.6% of homeless Canadians were dependent on alcohol or drugs.[13] Similar values (78.6%) were provided by Romaszko et al. in 2017 based on data collected in Poland.[14] One of the relatively scarce publications from Africa concerns an Ethiopian study (Addis Ababa) according to which 60% of homeless individuals declared risky drinking or alcohol dependence.[15] A very interesting point was made by McVicar et al., who arrived at the following generalisation: 'We find that the two are closely related: homeless individuals are more likely to be substance users and substance users are more likely to be homeless.'[16] It is difficult to disagree with this statement. A similar argument can be adopted with reference to psychiatric disorders. The higher prevalence of psychotic disorders (12.7%) in this group of people, similarly to the high prevalence of homelessness among the sufferers of schizophrenia spectrum disorders, is logically relatively easy to explain and most likely secondary to the underlying mental illness.[12,17–19] The levels of mental illnesses, such as depression and schizophrenia, amongst the homeless are undoubtedly much higher than in the general population.[20] The overall mental well-being, including psychomotor functions, can be assessed using various tests.[21–24] Over the years, many papers have been published on cognitive dysfunction in the environment of homeless people. In 2021, Zanjbeel et al. in Psychiatric Services, based on questionnaires (such as psychiatric diagnostic screening questionnaire – PDSQ, simple screening questionnaire, and test of adult basic education), proved that cognitive dysfunction is a common phenomenon among homeless people.[25] The California verbal learning test (CVLT) is one of the most widely used tests in North America.[26] The first version of the CVLT was published in 1987.[27] Then, in 2000, the second edition of the CVLT test was published.[28] The reliability of the test over the years has been repeatedly confirmed in many research.[29–31] Homeless adults with mental illness exhibit impairment in multiple neuropsychological domains.[26]

Cognitive functions are influenced by many factors, including: nutrition, physical activity, stimulants (alcohol, smoking). Eating disorders – nutritional deficiencies, especially during critical developmental periods, can affect cognitive functions and learning.[32] Additionally, there are some evidence to support a positive association between physical activity and cognitive function and academic achievement.[33,34] It has been suggested that increased aerobic fitness may improve cognitive development in children by changing the volume of specific brain regions involved in cognitive function.[35] The correlation between stimulants and cognitive disorders seems obvious – long-term alcoholism leads to extensive brain damage, affecting cognitive functions. In contrast, there are studies proving that nicotine has a cognitive-enhancing effect, improving fine motor functions, attention, working memory,

and episodic memory, which undoubtedly requires further research.[36] This is observed by Stergiopoulos et al., according to whose study, nearly three-quarters of homeless adults with mental illness show evidence of neurocognitive impairment, with approximately seven people out of 10 experiencing problems with verbal learning and memory, and four out of 10 experiencing problems with the speed of information processing and executive functioning.[37,38] On the other hand, the authors of meta-analyses and systematic reviews of the literature on the subject point to the lack of data based on population studies performed using standardized neuropsychological assessment tools.[39,40]

2. Aim

The aim of our study was to assess verbal episodic learning and memory among homeless people. The present study assesses cognitive functions as measured by CVLT, which allows one to evaluate the efficiency of various aspects of verbal memory and learning, the dysfunctions of which can be significant in the homeless. To the best of our knowledge, this test, with one exception, has not been used by other researchers in studying the homeless.

3. Material and Methods

3.1. Sample and Participants

The study included the homeless of the roofless type (street homeless people), residents of night shelters and homeless hostels, i.e., the homeless in classes 1, 2 and 3.1 by ETHOS.[41] The research was conducted in Olsztyn, Poland. Theirs city is home to approximately 175 thousand residents, including 153 homeless people in the above mentioned classes (data as of 2014, according to the Regional Centre for Social Policy in Olsztyn, Poland).

All volunteers who lived in a the Shelter for the Homeless in Olsztyn (Poland) or appeared there episodically were included in the study. In addition, people who lived in the surrounding illegal campuses popular amongst the homeless and invited roofless type homeless people were invited to the study. However, due to the type of research that required focus and concentration on the part of the subjects, research procedures were conducted solely on the premises of the shelter (physician's office). The exclusion criterion was the lack of consent to participate in the study expressed at any of the stages, state after alcohol consumption, and speech disorders preventing the patient from understanding spoken words (e.g., aphasia).

Participation in the study was voluntary and no compensation was provided for participants. Subjects had the right to refuse to answer any of the questions without stating a reason. Each subject first received detailed written information on the purpose of the study and then provided written consent to participate.

3.2. Design and Procedure

Verbal memory was assessed using the CVLT by Delis et al., in Polish adaptation by Łojek and Stańczak – version for adults.[27,42] This test involves learning a list of 16 words (List A) in 5 attempts, and the person tested is asked to recall as many words as possible. Then, List B (distraction list) is presented, consisting of different words than those on List A, whereas following that the subject is asked to provide as many words from this list as he/she remembers. After 20 minutes of delayed recall, the person undergoing a test is asked to recall, independently and with the examiner's help, the words he/she remembers from List A. Then, the examinee is given a third list of 44 words, including 16 from List A, 8 from List B, and 20 words, which are neither on List A nor on List B. The person's task is to identify words he/she learned previously from List A. This test allows one to not only assess verbal memory performance but also to evaluate learning strategy of the material.[43]

Using a structured interview the basic demographic information was collected, enhanced by information on the education level and learning time of the homeless under study.

The study group consisted of 102 persons, including 94 men (92.16%) and 8 women (7.84%). The mean age was 54.35 years (SD 9.64).

3.3. Statistical analysis

Statistical analysis was performed with STATISTICA v. 12 (StatSoft, Inc., 2014). The distribution of variables was examined using the Shapiro–Wilk test. The homogeneity of variance in the study group was assessed with the Brown–Forsythe test. To prepare the characteristics of variables, the descriptive statistics (an arithmetic mean, standard, minimum and maximum deviation) were employed. If the assumption of normality of distribution was met, Pearson's linear correlation coefficient was used to test correlation. Otherwise, Spearman's correlation coefficient was used for testing. We adopted a statistical significance level of $P < 0.05$.

4. Results

The average learning time and number of completed classes were diversified, some of the homeless under research repeated a year or more years of schooling. On average, the subjects studied for 10.57 years (SD 2.89), whereas they completed an average of 10.20 grades (SD 3.06). Of these, 61 were divorced, 32 bachelors, 1 widow, 2 widowers, 6 married (i.e. as much as 93.14% living alone). The characteristics of the study group is presented in Table 1.

Table 2 shows the summary results in sten scores (they take the age dependency into account) obtained in carrying out the tasks 1–5 of the CVLT.

Low average values obtained by the homeless in tasks 1–5 draw attention. This is particularly evident in the sten scores where the average value amounts to 3.52 (SD 2.03), thus being much lower than the standard population value. When analyzing the extent of the problem, quantitative analysis may prove to be more reliable in such subpopulations.

Table 3 indicates a large number of individuals with low sten scores (below the standard population value) obtained for tasks 1–5.

Almost 63% of the subjects did not receive sten 5, and as much as 40.25% obtained sten 1 or 2. High sten values (8 and 9) were obtained only by 2 persons.

The obtained results of the CVLT test were employed for the analysis of the correlations between the studied parameters, such as age and education of the subjects.

Table 4 shows the results of the Spearman correlation test between the CVLT parameters and education and age of the respondents.

Weak, but statistically significant positive correlation between education (years of education and number of completed grades) and the sum of results obtained in tasks 1–5 was revealed. Moreover, weak, but statistically significant negative correlation between the subjects' age and delayed recall was found. Additionally, younger individuals made fewer mistakes.

5. Discussion

Homelessness results from existential and random events, a social problem conditioned by many factors. Homeless people have to deal with exclusion at the family and social levels. Homelessness can affect all social classes. Nevertheless, it most often affects the lower classes.[44] Most of the people we surveyed are people with vocational education or without a profession. Lower education in this social group has been confirmed in many studies.

Table 1. Characteristics of the study population.

Characteristics of the study population	Women	Men	Total
Age, mean (SD)	54.14 (8.57)	54.3 (9.82)	54.3 (9.70)
Duration of homelessness, mean (SD)	5.14 (0,69)	4.1 (1.69)	4.2 (1.66)
Years of education, mean (SD)	8.86 (4.74)	10.7 (2.71)	10.6 (2.92)
Completed grades, mean (SD)	7.86 (5.61)	10.4 (2.76)	10.2 (3.09)
Marital status – single, *N* (%)	1 (12)	30 (31.91)	31 (30.39)
Marital status – divorced, *N* (%)	4 (50)	57 (60.64)	61 (59.80)
History of addictions, *N* (%)	1 (12)	34 (36.17)	35 (34.31)
Epilepsy, *N* (%)	2 (25)	17 (18.08)	19 (18.63)
Depression, *N* (%)	1 (12)	8 (8.51)	9 (8.82)
Schizophrenia, *N* (%)	1 (12.5)	3 (3.19)	4 (3.92)
Anxiety disorder, *N* (%)	1 (12)	11 (11.70)	12 (11.76)
Positive family history of mental illness, *N* (%)	1 (12)	8 (8.51)	9 (8.82)
Head trauma, *N* (%)	2 (22.22)	18 (19.15)	20 (19.61)
Cranial trauma, *N* (%)	1 (12)	11 (11.70)	12 (11.76)
Stroke, *N* (%)	0 (0)	6 (6.38)	6 (5.88)
Heart attack, *N* (%)	0 (0)	10 (10.64)	10 (9.80)

Table 2. Average values obtained in the CVLT.

Variable	Mean	SD
List A. The sum of results in tasks 1–5, AV	36.21	10.63
List A. The sum of results in tasks 1–5 sten score	3.52	2.03
List A. Task 1, AV	5.56	1.99
List B. AV	4.14	2.02
List A. Short-delay free recall, AV	6.35	3.59
List A. Short-delay cued recall, AV	9.11	3.03
List A. Long-delay free recall, AV	7.35	3.40
List A. Long-delay cued recall, AV	9.39	3.20
Semantic clustering ratio (observed/expected), AV	1.60	0.68
Serial clustering ratio (observed/expected), AV	1.83	1.36
Percentage of correct answers from the first area, AV	26.93	8.72
Percentage of correct answers from the central area, AV	41.15	9.29
Percentage of correct answers from the last area, AV	30.94	8.99
Response conformity ratio, AV	62.90	18.95
Perseveration (The sum of results in free and cued recall), AV	2.81	2.68
Interjections in free recall, AV	3.65	4.11
Interjections in cued recall, AV	3.92	5.11
Total accurate responses, AV	12.74	3.88
Differentiation, AV	83.47	12.64
Incorrect answers, AV	3.58	4.71
Deviation in responses, AV	-0.01	0.53

Comments: *N* = 102, AV – absolute value.

Table 3. The sum of results in tasks 1–5, the analysis of the size of the target groups identified by STEN scores (*N* = 102).

Sten score	1	2	3	4	5	6	7	8	9
Count	24	17	9	14	19	13	4	1	1
Percent	23.53	16.67	8.82	13.73	18.63	12.75	3.92	0.98	0.98

Table 4. Spearmans' correlations analysis between the CVLT parameters and education and age of the respondents.

CVLT	Correlations		
	Completed grades (*N* = 99)	Years of education (*N* = 99)	Age (*N* = 102)
List A. The sum of results in tasks 1-5	**0.269**	**0.336**	-0.144
List A. Task 1	**0.207**	**0.253**	0.147
List A. Task 5	**0.286**	**0.288**	-0.196
List B	**0.278**	**0.288**	-0.030
List A. Short-delay free recall	**0.226**	**0.273**	**-0.254**
List A. Short-delay cued recall	0.134	0.186	**-0.231**
List A. Long-delay free recall	**0.215**	**0.253**	**-0.259**
List A. Long-delay cued recall	0.164	**0.218**	**-0.241**
Semantic clustering ratio (observed/expected)	0.034	0.038	-0.120
Serial clustering ratio (observed/expected)	0.118	0.074	-0.104
Percentage of correct answers from the first area	0.035	0.033	-0.047
Percentage of correct answers from the central area	0.014	0.059	-0.121
Percentage of correct answers from the last area	-0.083	-0.104	0.163
Response conformity ratio	**0.218**	**0.210**	-0.098
Perseveration (The sum of results in free and cued recall)	**0.224**	**0.236**	-0.132
Interjections in free recall	**-0.252**	**-0.254**	0.159
Interjections in cued recall	-0.110	-0.102	0.149
Total accurate responses	0.131	0.172	0.108
Differentiation	**0.348**	**0.375**	**-0.233**
Incorrect answers	-0.155	-0.165	**0.306**
Deviation in responses	-0.054	-0.033	**0.257**

Comments: Bold values indicates a statistically difference ($P < 0.05$)

In the presented study, we proved that homeless people are characterized by cognitive impairment in the form of verbal memory and learning disturbances, and dysfunction in learning verbal material. Our results in the CVLT test were significantly below standards (low or very low). Enis, in his systematic review, notes that virtually all analyzed authors of the publications (apart from Cotman) report significant memory deficiencies in homeless people.[39] These reports are fairly obvious if we take into account the much higher incidence of addiction to alcohol, drugs and nicotine in this subpopulation than in the general population.[12,13,45]

There is no doubt that homeless people belong to the poorest social strata. Poverty and addiction are factors predisposing one to the path of homelessness. However, cognitive deficits are probably an important factor leading to these pathologies and increasing the risk of homelessness.[46–48] Moreover, it seems that mental illness and intellectual disability may be predisposing factors to becoming homeless as well as a recurring consequence of this pathology. Malnutrition, addiction to alcohol and drugs, and very often head injuries, along with limited access to conventional sources of information (press, Internet, television) could re-intensify the existing cognitive deficits as well as constitute their effect.[9,49]

Similar conclusions concerning the origins and effects of homelessness in relation to cognitive deficits are posed by Spence and Pluck, who note that in fact, it is difficult to indicate whether homelessness is a cause or a consequence of these problems.[40,50] In our study, the correlation between the results of the CVLT and age and education parameters was observed. Elderly people obtained worse results, while people with higher levels of education scored significantly better results. Similar results have also been noted in the general population.[51]

Age differences in reports on homeless people in America and Europe are well known and have already been described (European data usually concerns a slightly older population).[52–54] Norman in a standardization publication of the CVLT (US, 2000) obtained much higher values in a similar age group of randomly selected people, while the average score of 36.21 in his study comes from a group exhibiting mild to moderate impairment.[55] The authors of the Polish normalization of the CVLT obtained similar results in the group of people 75–79 years of age, i.e., about 20 years older than the study group analysed by us.[42]

Homelessness risk factors include socioeconomic instability, poor cognitive function, low education, or lack thereof. On the other hand, they also contribute to increasing the difficulties in combating homeless-

ness. Due to these factors, homeless people are reluctant to participate in health prevention and support programs, e.g., professional activation. When planning medical (social) care for homeless people, we should remember that this is a unique subpopulation with a high percentage of people who require an effortless, legible transfer of information. Seemingly simple orders can cause problems with understanding and memory. Despite the fact that it has been known that 30%–40% of homeless people have cognitive disorders or even intellectual disabilities, it is easy to forget that not only the assessment of the somatic condition but also the ability to implement recommendations by the patient has an impact on the final therapeutic success.[40,55,56] Our study strongly suggests the need for an individual approach to the homeless.

To sum up, the homeless people under study present significant dysfunctions in various aspects of memory and learning, and the risk of severe cognitive impairment is higher in the elderly and less educated, while higher levels of education can be a protective factor.

5.1. Limitations

Such low values of the CVLT results may suggest that subjects either were interested in obtaining low scores (conscious simulation aimed at receiving social benefits, for example), or took part in the study without much commitment. Although we may be sure that the homeless people surveyed knew that, regardless of the results they obtained, their social situation would not change in any way, the potential lack of commitment here is actually possible. The results presented in Table 3 clearly indicate that there was a large number of people who obtained sten scores of 1 or 2 in the task: List A. If those individuals were excluded from the analysis, the average value for this task would be changed to 43.15 (SD 6.71), which is exactly what Cotman and Sandman report. In our opinion, this simulation confirms that the results of the aforementioned sources include the pre-selection error. In analysing this issue further, we performed another very subjective simulation. In the task under scrutiny we excluded from the study group the individuals (n = 16) with sten scores of 1 and 2, who in the opinion of a social worker (a research team member), with a personal knowledge of the homeless surveyed, should get a higher score (possible simulation, lack of commitment). In such a case, the average value of the task under discussion would amount to 38.07 (SD 10.33), which would be slightly higher than the one presented in the results section. We hope that this simulation confirms the reliability of the data presented.

There may be also some some possible limitations in this study, such as limited access to data, and loss of participants over time, e.g., due to change of homeless shelters. Homeless people are a unique group living on the so-called social margins. Compared to other communities, due to their socioeconomic status, they often neglect hygiene and constitute a difficult and thankless group of respondents. Therefore, the number of conducted studies is much smaller. Moreover, it has to be assumed that not all of the respondents were in remission of psychiatric disorders such as schizophrenia or addictions, which might affect the truth of answers, but our study may not represent the realities of a broader range of homeless participants; On the other hand, the homeless can be a reservoir of diseases, e.g., tuberculosis. Romaszko et al., based on a mathematical model, proved that each found and successfully treated homeless person means a decrease in the incidence of the disease in the general population by 3–4 people in a year and up to 20 people in 5 years. It has been proven that despite some limitations of the study on the homeless population, the research results can be useful for future studies. In the presented study, we draw attention to other, in this case, psychosomatic defects occurring in homeless people. This study may fill another gap in knowledge about the homeless.

6. Conclusions

The results of this study indicate a deficit of cognitive functions among homeless people. Deterioration of cognitive functions, including memory deficit, leads to difficulties in everyday functioning. Moreover, intellectual impairment in this particular group of patients secondarily reduces the willingness to participate in support programs actively, even contributing to their deepening. The social assistance system should pay attention to this issue.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

FUNDING

We declare no financial support from any organization.

ETHICS

The protocol of the study was positively approved by the Bioethics Commission at the University of Warmia

and Mazury in Olsztyn, Poland on 14 November 2013 (Annex dated 24 September 2014). Informed consent has been obtained from each individual.

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