

A Perusal into Supremacy of Education in the Cascading Cognitive Pragmatics in Chronic Alcoholic Users

Girija P C¹, Nayana Narayana² & Fathima Sisiliya³

¹Associate Professor and Head, Department of Audiology and Speech Language Pathology, AWH Special College, Kozhikode, Kerala, India

²Assistant Professor, Department of Audiology and Speech Language Pathology, AWH Special College, Kozhikode, Kerala, India

³MASLP student, Department of Audiology and Speech Language Pathology, AWH Special College, Kozhikode, Kerala, India

Corresponding Author: **Ms. Girija P C**

Abstract

Purpose: cognitive pragmatics is an essential element for effective communication. Impact of alcohol of cognitive pragmatics is less researched. There are many factors that affect the decline of cognitive pragmatics in alcohol users, education being a favourable one. Investigating how education can prevent the decline in cognitive pragmatics is necessary. **Method:** A total of 40 chronic alcohol users in the age range of 50 to 70 years were divided into 4 groups based on education and AUDIT score. These participants were assessed on the cognitive pragmatic domain **Findings:** Both educated and lesser educated participants in low risk as well as high risk group performed worst on humour. Chronic alcohol users with higher levels of education did better on the domains of discourse, figurative language 1, and narratives, whereas those with lower levels of education did better on the domains of discourse, narratives, and figurative language 1. **Conclusion:** Irrespective of education, the overall cognitive pragmatics was impaired in chronic alcohol users. The impact of alcohol was most evident in domain humour as it required more sophisticated mental faculties. However, overall, the performance of educated group was much better than their less educated counterpart in all the domains. From this we can conclude that education somewhat limit the erosion of cognitive pragmatics by providing a scaffold.

Introduction

Cognitive pragmatics is the ability of a person to use cognitive faculties including working memory, analytical skills, and problem-solving capacities for efficient language use with regard to social situations. It is a sophisticated skill that requires thorough control over cognition. Any damage to the cognitive faculties will impede the individual's ability to use language in a socially effective manner. Cognitive pragmatics is sensitive to many factors including aging, neural pathologies, substance abuse, alcohol abuse etc.

Education plays an inevitable role to refine the overall aspects of human behavior. It is one of the primary stimulants that helps to nourish our cognitive reserve. Education has the power to positively alter the human brain's cognitive reserve since the brain is malleable. By impairing faculties such as processing speed, sustained attention, memory and learning, as well as overall executive function, alcohol abuse can stymie this complicated thought process.

Research investigating the impact of alcohol on neurocognition and the influence of education in strengthening cognitive reserve have been conducted separately, few studies have amalgamated the two. We have therefore made an effort to probe into the scope of education in retaining the cognitive pragmatic abilities in alcohol consumers.

Literature review

Many authors have reported the influence of alcohol on general neurocognitive abilities. According to several accounts, the effect of alcohol depends on the amount consumed. On the one hand, some authors have claimed that drinking alcohol in moderate to extreme amounts negatively impacts neurocognitive abilities (Topiwala et.al, 2017), while other research claim that drinking alcohol in smaller doses protects cognition (Stott et.al, 2008). Several researchers have documented that drinking causes grey matter atrophy (Mukammal et.al, 2001), increased ventricular size (Ding et.al,2004), a reduction in frontal and parietal grey matter density (Heijer et.al ,2004) and a reduction in overall brain capacity (Paul et.al,2008).

Objective

To determine how alcohol consumption affects the hierarchical cascade of cognitive pragmatic abilities in both highly educated and lesser educated individuals.

Method

Data used

A total of 40 chronic alcohol users in the age range of 50 to 70 years were divided into 4 groups based on education and AUDIT score. Group 1 consists of 10 educated individuals with AUDIT score 8 – 12 (risky). Group 2 consists of 10 educated individuals with AUDIT score 13+ (high risk). Group 3 consists of 10 uneducated individuals with AUDIT score 8 – 12 (risky). Group 4 consists of 10 uneducated individuals with AUDIT score 13+(high risk).

Inclusion criteria

- All participants should be native speakers of Malayalam.
- Participants should have normal/corrected vision and hearing.
- Educated participants must have minimum 12th grade of education.
- Uneducated participants must have below 10th grade of education
- Individual with risk factors includes the one with alcohol consumption and should have AUDIT score \geq 8.

Exclusion criteria

- Individuals with history of neurological disorder (stroke and neurodegenerative diseases), cancer and other psychiatric illness
- Individual with cognitive dysfunction, Mini-ACE $<$ 21
- Individual with history of CNS (central nervous system) condition and head injuries

Procedure

The study was done in two phases

Phase I- Development of test material

Phase II- Administration of test material

Phase 1- Development of test material

Stimuli and Structure

The test material was developed on the basis of Assessment of Pragmatic Abilities and Cognitive Substrates (APACS) test. The current test evaluates two key parts of pragmatics: pragmatic production and pragmatic comprehension, across six domains: Discourse, Description, Narratives, Figurative language 1, Humor, and Figurative language 2.

I. Discourse

The task aims at assessing the ability to engage in conversation and eliciting discourse through a semi-structured interview. A pilot study was conducted on 10 adults in the age range of 20 to 30 years to evaluate the appropriateness of selected topic and to fix the duration of the interview. Most appropriate topics were considered for the study and the duration was

fixed for 5 min. The conversation was organized around four topics: family, work, hobbies and organization of the day. The discourse elicited was analysed under 3 main domains (Topic, Purpose and Visual/gestural cues) of a Protocol to Assess Pragmatics in Malayalam Speaking Adults (Ramya, 2018).

The scoring was given as “2” for correct response, “1” for partial response and “0” for no response.

Maximum score: 60

II. Description

The task aims at assessing the ability to produce meaningful descriptions and sharing information of everyday life situations. The expressive abilities were estimated in a structured way by providing 10 photographs that depicts various real-life scenes (e.g., a man buying vegetables in the market, a woman cooking in the kitchen). A pilot study was conducted to choose the stimulus and to fix the duration. Ten healthy adults in the age range of 20 to 30 years were shown 15 photos and asked to describe them. A total of ten photos were chosen as the most acceptable for eliciting a response and the duration was fixed to 5 minutes. The photographs are presented one by one and asked the subject to describe the main elements in the scene (the location, the agent(s) and actions performed by them).

The scoring was given as “2” for correct response, “1” for partial response and “0” for no response.

Maximum score: 20

III. Narratives

The task aims at assessing the ability to comprehend narration and answer appropriately for the questions asked. Based on real news articles, two stories were made with increasing length (number of sentences ranging from 5 to 8), and complexity. Two stories were selected after conducting a pilot study on 10 healthy adults in the age range of 20 to 30 years. Each story is embedded with two non-literal expressions. Stories are read to the subject at normal rate. And several questions are asked following each story.

- a. An open question about the global topic of the story, scored “1” for correct response or “0” for incorrect response.
- b. yes/no questions, either main or detail, either stated or implied, as in previous story comprehension tasks (Ferstl et al., 2005), scored “1” for correct response or “0” for incorrect response.
- c. 2 questions to elicit verbal explanation of the 2 non-literal expressions embedded in the story, Score “3” for a good description of the actual meaning of the figurative expression, “2” for an incomplete explanation, such as concrete examples, but fails in providing a general meaning, “1” when provide some relevant information, “0” when the subject paraphrases the figurative expression, provides a literal explanation, or ignores the expression.

Maximum score: 20

IV. Figurative Language 1

The task aims at assessing the ability to infer non-literal meanings through verbal explanation. To choose the stimulus and to fix the duration required for completing the task, three high school instructors were given ten idioms, ten metaphors, and ten proverbs from a Malayalam grammar book. A three-point rating scale was used to determine appropriateness (highly appropriate, appropriate, and inappropriate). Five highly appropriate items were chosen from each category and the duration was fixed to 15 min. Fifteen sentences which includes 5 highly familiar idioms, 5 metaphors, and five common proverbs were selected. The participants were asked to explain the meaning of each expression.

Responses are scored as “2” for a good description of the actual meaning of the figurative expression, “1” for an incomplete explanation, such as concrete examples, but fails in providing a general meaning, “0” when the subject paraphrases the figurative expression, provides a literal explanation, or ignores the expression.

Maximum score: 30.

V. **Humor**

The task aims at assessing the ability to comprehend humor. In order to confirm the appropriateness of the stimulus selected and to fix the duration required to complete the task, a pilot study was carried out using 10 brief stories that includes humor component and three speech language pathologists were asked to select the most appropriate stimulus using a three-point rating scale (highly appropriate, appropriate, and inappropriate). Five highly appropriate stories were chosen for the study and the duration was fixed to 5 min. Five brief stories with three possible endings were provided and the participants were instructed to select the ending that would serve as the punchline of the story. The choice provided include: a correct funny ending; an incorrect straightforward non-funny ending; an incorrect unrelated non-sequitur ending.

The scoring was given as “1” for correct response or “0” for an incorrect response. Maximum score: 5

VI. **Figurative Language 2**

The task aims at assessing the ability to infer non-literal meaning through multiple choice questions. Three high school instructors were given ten idioms, ten metaphors, and ten proverbs from a Malayalam grammar book in order to choose the stimulus and to fix the duration. The suitability was assessed using a three-point grading scale (highly appropriate, appropriate, and inappropriate). Highly appropriate 5 items from each category were selected and duration was fixed to 8 min. Fifteen sentences with five highly familiar idioms, five metaphors, and five common proverbs were presented. All sentences were provided with a minimal context. Each sentence is provided with three possible interpretations and asked the subject to choose the one that correctly expresses the figurative meaning. Choices include one correct figurative interpretation, and two incorrect interpretations, one literal and one unrelated with respect to the target word.

The scoring was given as “1” for correct response or “0” for incorrect response. Maximum score: 15.

Pilot study

A pilot study was conducted to ensure that all the selected stimuli were appropriate. Ten healthy adults between the ages of 20 and 40 were chosen and the created test material was administered to them. The test material was found to be capable of eliciting cognitive pragmatic abilities.

Phase II- Administration of test material

The test procedure began by obtaining the formal consent from the participants. Prior to testing, the participants were told about the objective and nature of the evaluation. A clinical interview was conducted to acquire demographic data, medical history, and other pertinent information, after which the Mini-ACE was administered to screen for cognitive dysfunction. The AUDIT test was used to classify individuals with harmful alcohol use. The participants were seated in a relaxed manner. Before initiating the test, the clinician made a rapport with the individual. Each participant was administered using the developed tool “Assessment of Cognitive Pragmatic Abilities in Adults” in a single session of approximately 45 - 50 min. The pragmatic production and pragmatic comprehension were assessed under the domains of above-mentioned assessment tool.

Scoring

Each response was assigned a score, which was mentioned under each domain. The total cognitive pragmatic abilities were calculated by combining the scores from each domain.

Data Analysis

Low risk category (AUDIT score 8-12)

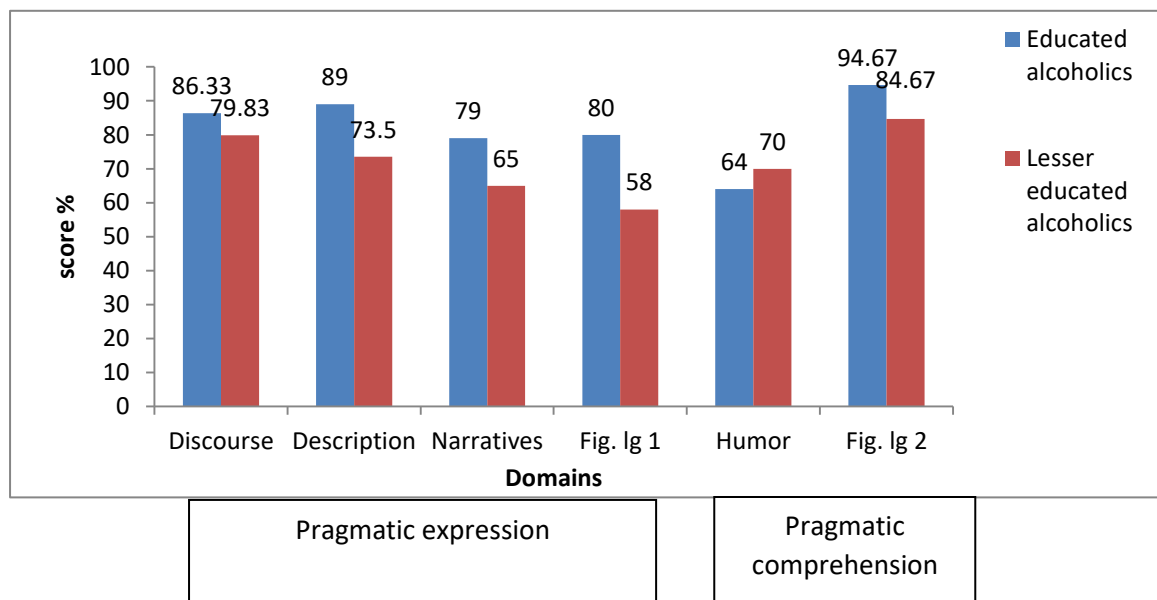
The mean and standard deviations of the educated and uneducated groups for each domain is given in the table

Table 1: Results of comparison of specified domains between educated and uneducated chronic alcohol users with 8-12 AUDIT Score

Domain	Educated chronic alcohol users		Uneducated chronic alcohol users	
	Mean	SD	Mean	SD
Discourse	51.800	2.201	47.900	2.234
Description	17.800	1.317	14.700	1.418
Narratives	15.800	2.573	13.000	2.055
Figurative language 1	24.000	3.399	17.400	2.366
Humor	3.500	1.179	3.200	1.874
Figurative language 2	14.200	1.317	12.700	0.949

Each individual mean was transformed into its appropriate percentage because our aim was to determine the hierarchal order in which each domain was influenced. While the maximum score for each domain varied, we were required to administer this exercise. Hence, conversion was necessary for the sake of comparison.

Figure 1 represents the results of our study after the conversion of each domain’s mean into its corresponding percentages.



According to the aforementioned findings, educated participants in the low-risk category (AUDIT Score 8–12) performed tasks related to pragmatic production better than their lesser educated counterparts. Chronic alcohol users with higher levels of education did better on the domains of discourse, figurative language 1, and narratives, whereas those with lower levels of education did better on the domains of

discourse, narratives, and figurative language 1. As far as pragmatic comprehension was concerned, the findings indicated that figurative language 2 clearly prevailed over humour for both groups. In fact, compared to all other areas, humour performed substantially inferior.

High risk category (AUDIT score 13+)

Table 2: Results of comparison of specified domains between educated and uneducated chronic alcohol users with 13+ AUDIT Score

Domain	Educated chronic alcohol users		Uneducated chronic alcohol users	
	Mean	SD	Mean	SD
Discourse	42.200	6.844	27.500	3.274
Description	15.700	1.703	9.900	1.595
Narratives	10.200	3.011	7.400	1.647
Figurative language 1	8.500	2.173	8.900	3.929
Humor	1.5000	1.64992	1.100	1.197
Figurative language 2	12.100	2.424	5.000	2.160

The mean and standard deviation of selected domains of educated and lesser educated chronic alcohol users with AUDIT Scores 13+ are shown in table 2 for both groups of chronic alcohol users. With the exception of the category "Figurative language 1," the results of the mean scores showed that educated chronic alcohol users performed all tasks better than their lesser educated counterparts.

Figure 2 displays the percentage conversion of the target group's mean scores, which was done similarly to the preceding low risk group.

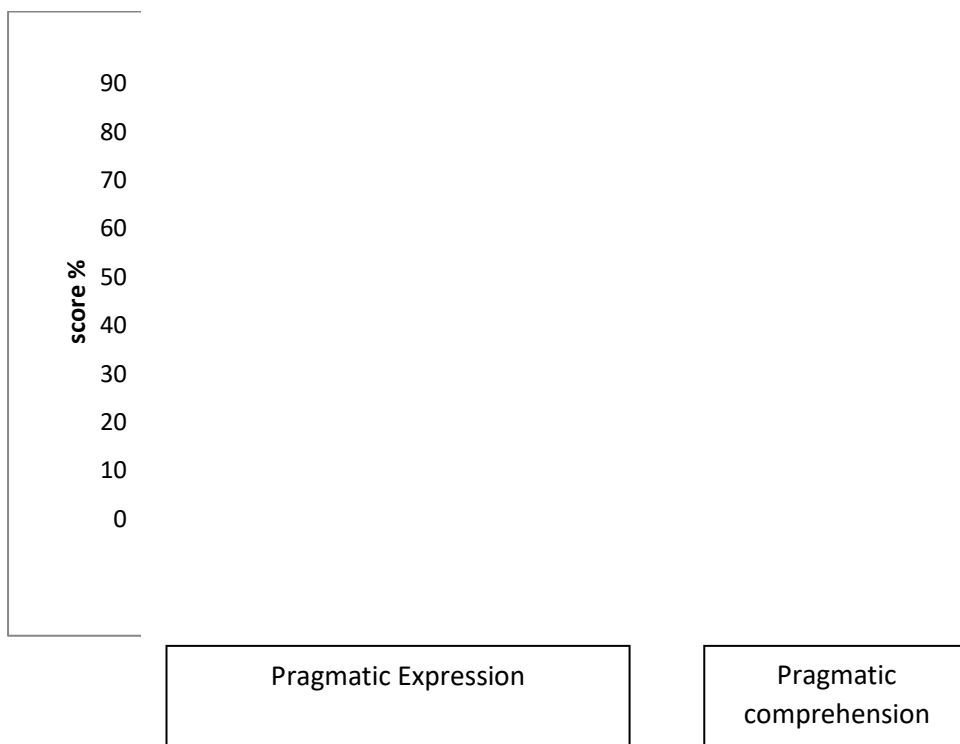


Figure 2: Results of percentage score for comparison of specified domains between educated and uneducated chronic alcohol users with AUDIT score 13+ (high risk)

Both groups performed better in the area of description, which was followed by the domains of discourse, narratives, and figurative language 1, respectively, in the assessment of pragmatic production.

Conclusion

Low risk group (AUDIT 8-12)

The description task was a strong suit for the educated chronic alcohol users. This is due to the fact that educated chronic alcohol users exhibit better visual attention than participants with lower levels of education. In educated participants, the expanded cognitive reserve enhances their capacity for visual attention, leading to more rapid activation of the visual attentional pathways. For top-down voluntary modulation of attention to stimuli, visual attention largely requires activation of the dorsal attention network (DAN), which includes the bilateral intraparietal sulcus and frontal eye fields. The temporoparietal junction and the ventral frontal cortex make up the ventral attention network (VAN), which is actively involved in shifting attention and detecting unanticipated or unexpected inputs. Regions of the default-mode network (DMN), which disengages during purposeful cognitive tasks, are likewise connected with attentional deactivation (Raichle, 2015). When doing a task, unexpected salient stimuli might activate the VAN (Corbetta and Shulman, 2002; Raichle, 2015) and divert attention, which can cause distractions (Zehra et al., 2019). Due to their increased cognitive stimulation, educated chronic alcohol users have stronger DAN, VAN, and DMN activation, which in turn enhances their visual attention. The activation of the aforementioned areas is particularly crucial because the description task we utilised mostly relies on visual attention (image stimuli) to generate replies. This allowed them to accomplish the assignment quite well.

Chronic alcohol users with lower levels of education excelled in the discourse task. This happened because we addressed familiar subjects like job, family, etc., on which there was a wealth of background knowledge. Also, the scoring process relied on nonverbal cues that required less cognitive effort from the participant, such as eye contact, facial expressions, and visual gestural cues. Also, the fact that alcohol doesn't initially impair the crystallized memory contributed to the superior response from the less educated chronic alcohol users. Despite the fact that participants with more education still outperformed those with less education. This can be further explained by the fact that educated chronic alcohol users have greater cognitive reserve than their less educated peers.

Since this task was simple, people with lower levels of education did better in narratives. Current events and broad topics were covered, and participants were required to offer polar replies (yes/no) as well as a general and in-depth explanation. Although our participants had less education, they were knowledgeable about societal issues, hence education level did not significantly affect the results. Also, their social (drinking) circle was highly active and provided a forum for interactions with others.

Working memory, sustained attention, strong analytical reasoning and inferential skills, word retrieval abilities, inhibitory skills, cognitive flexibility, and the ability to inhibit are all required for figurative language task 1. Chronic alcohol users with higher levels of education did better on these tasks owing to their superior cognitive reserve.

Analysis of the pragmatic comprehension skills of educated and lesser educated low risk (AUDIT Score 8–12) participants revealed that both groups excelled in the figurative language 2 and humour domains.

Humor demands the highest level of cognitive activation out of all the domains. The participants must understand the joke's background, retain the instructions, and choose the appropriate selections from the list in order to understand the joke. Also, the potential alternate meanings need to be contrasted, assessed, and connected to the context of the joke. Additional executive processes including switching between several interpretations and inhibiting prevailing but inaccurate interpretations may also be important. The ability to mentally process information is also essential for understanding comedy. The aforementioned findings made it very clear that education has no positive impact on low-risk educated drinkers' ability to understand humour. Hence, low risk chronic alcohol users who were educated and those who were not did not exhibit significant difference in their performance.

High Risk (13+) Group

Educated and less educated groups both showed better results in the task of description. Nonetheless, the performance on both the discourse and the description tasks was nearly comparable for the group with lower levels of education. Due to their inability to maintain pragmatic abilities, participants with lower levels of education performed poorly on discourse tasks, which can be related to the destructive nature of alcoholism. The people in the group with lower levels of education could not preserve their pragmatic abilities in comparison to the group with higher levels of education owing to the fact that they did not receive enough cognitive stimulation. Due to the lower cognitive demands of the task, narratives were found to be superior than figurative language 1 in both groups, mirroring the findings from low risk, less educated people. Due to the cognitive complexity of the humor, in comparison to figurative language 2, it showed the same tendency as in the low-risk group with poorer results.

Alcohol abuse impairs the cognitive pragmatics in both educated as well as less educated participants. Even though education provides a better cognitive reserve through constant neurocognitive stimulation, it is still unable to overcome the toxic degradation of alcohol.

Reference

- Corbetta, M., Kincade, J. M., & Shulman, G. L. (2002). Neural systems for visual orienting and their relationships to spatial working memory. *Journal of cognitive neuroscience*, 14(3), 508-523.
- Ding, J, Eigenbrodt, ML, Mosley, TH Jr, Hutchinson, RG, Folsom, AR, Harris, TB, Nieto, FJ (2004). Alcohol intake and cerebral abnormalities on magnetic resonance imaging in a community-based population of middle-aged adults: the Atherosclerosis Risk in Communities (ARIC) study. *Stroke* 35, 16–21. [CrossRefGoogle Scholar](#)
- Ferstl, E. C., Rinck, M., & Cramon, D. Y. V. (2005). Emotional and temporal aspects of situation model processing during text comprehension: An event-related fMRI study. *Journal of cognitive Neuroscience*, 17(5), 724-739.
- den Heijer, T., Vermeer, S. E., van Dijk, E. J., Prins, N. D., Koudstaal, P. J., van Duijn, C. M., ... & Breteler, M. M. (2004). Alcohol intake in relation to brain magnetic resonance imaging findings in older persons without dementia. *The American journal of clinical nutrition*, 80(4), 992-997.
- Mukamal, K. J., Jadhav, P. P., D'Agostino, R. B., Massaro, J. M., Mittleman, M. A., Lipinska, I., ... & Tofler, G. H. (2001). Alcohol consumption and hemostatic factors: analysis of the Framingham Offspring cohort. *Circulation*, 104(12), 1367-1373.
- Paul, C. A., Au, R., Fredman, L., Massaro, J. M., Seshadri, S., DeCarli, C., & Wolf, P. A. (2008). Association of alcohol consumption with brain volume in the Framingham study. *Archives of neurology*, 65(10), 1363-1367.
- Remya Radhakrishnan. (2018). Protocol to assess Pragmatics in Malayalam speaking adults. Unpublished Master's thesis). AWH Special College, Kozhikode. Kerala University Of Allied Health Sciences.
- Scott-Sheldon, L. A., Terry, D. L., Carey, K. B., Garey, L., & Carey, M. P. (2012). Efficacy of expectancy challenge interventions to reduce college student drinking: a meta-analytic review. *Psychology of addictive behaviors*, 26(3), 393.
- Topiwala, A., Allan, C. L., Valkanova, V., Zsoldos, E., Filippini, N., Sexton, C., ... & Ebmeier, K. P. (2017). Moderate alcohol consumption as risk factor for adverse brain outcomes and cognitive decline: longitudinal cohort study. *bmj*, 357.
- Zehra, A., Lindgren, E., Wiers, C. E., Freeman, C., Miller, G., Ramirez, V., ... & Volkow, N. D. (2019). Neural correlates of visual attention in alcohol use disorder. *Drug and alcohol dependence*, 194, 430-437.