Examining the Impact of Medical Cannabis Prescribed for Post-Stroke Chronic Pain on Speech and Language Abilities: A Case Study

Brett Anderson, J. Claire Burry, Brittney Rude

Supervisors: Esther S. Kim PhD, R.SLP, Michael Burrows MSLP, R.SLP

INTRODUCTION

Background:

- Beyond its utility for managing pain, the clinical implications of medical cannabis use are unclear. [1-3]
- With legalization and increased societal acceptance of both recreational and medicinal uses of cannabis, patients may be more receptive to using cannabis to treat chronic pain.
- It is important that medical professionals have an understanding of the effects of cannabis, as it may impact domains such as speech and language.
- Currently, the literature contains no research directly focused on the effects of cannabis on speech or language.

Purpose:

The purpose of this study was to examine the effects of medical cannabis use on speech and language abilities in an individual with aphasia and apraxia of speech.

METHOD

Design:

- A retrospective, single subject, ABAB research design was employed.

Participants

- *P1*. 1 individual with post-stroke aphasia, apraxia of speech, and chronic shoulder pain taking medical cannabis for pain management.
- 20 participants blinded to on-dose/off-dose condition.

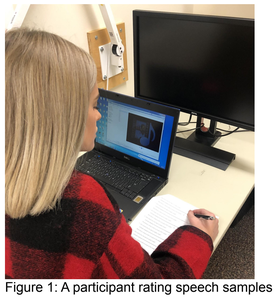


Figure 1: A participant rating speech samples

Table 1: Participant Demographics

	Age	Gender	Education	Experience Rating Speech	Time Post-Onset
P1	58	Female	Post-graduate		5 years
20 Participants	18+	15 Female 3 Male 2 Non-binary	1 High School/GED 13 Undergraduate 6 Post-graduate	6 No experience 13 Some experience 1 Very experienced	

Procedures

- P1's speech and language abilities were assessed using spontaneous speech samples during periods without cannabis exposure (off-dose period) and periods of cannabis intake (on-dose period).
- 20 blinded participants analyzed the speech quality of the samples.
- Blinded student researchers performed language analyses on all samples using Systematic Analysis of Language Transcripts (SALT) software.

Dependent Variables

- **Speech**: Rate, Fluency, Naturalness
- **Language**: type-token ratio (TTR), mean length of utterance (MLU), maze words as percent of total words, percent of utterances with errors, percent of utterances with mazes, percent of words with word-level error codes (EW), percent of utterances with utterance-level error codes (EU), percent of obligatory bound morphemes omitted, percent of pronouns in error
- **Pain:** P1's self-ratings on a 10-point scale

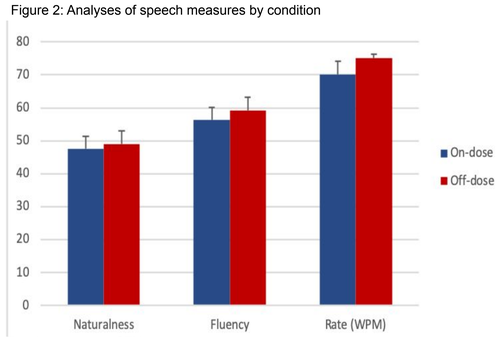
The results of this study indicate that **the use of medical cannabis for chronic pain did not negatively or positively affect speech and language** for this individual.

ANALYSIS & RESULTS

- 10 speech samples (6 on-dose, 4 off-dose) rated by 20 participants were compared based on dose condition.
- 24 language samples (16 on-dose, 8 off-dose) analyzed in SALT were compared based on dose condition.
- Independent samples t-tests for speech measures, language measures, and pain ratings yielded **no significant differences (*p=0.05*) between on-dose and off-dose samples.**

Speech

Figure 2: Analyses of speech measures by condition



Error bars represent SEM

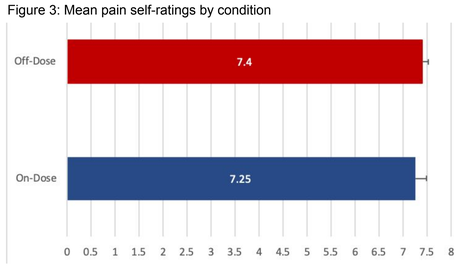
Language

Table 2: Language measure means by condition

	TTR	MLU	% Maze Words	% Utts w Errors	% Utts w Mazes	% Words w EW	% Utts w EU	% OBM Omitted	% Pronoun Errors
On-dose	0.51	5.79	16.04	35.34	49.59	4.19	4.75	11.67	9.49
Off-dose	0.47	5.86	18.51	32.06	50.3	3.07	3.64	5.46	4.84
Sig. (p)	*0.260*	*0.888*	*0.264*	*0.627*	*0.924*	*0.403*	*0.593*	*0.128*	*0.610*

Pain

Figure 3: Mean pain self-ratings by condition



Error bars represent SEM

DISCUSSION

- The current study was clinician-driven, as the perceptual change in P1's speech was presumed to be caused by her medication change; however, P1 attributed this change to "good days and bad days."
- The medication did not result in a significant decrease in P1's pain, which may have contributed to null findings.
- The subjective nature of naturalness and fluency ratings meant that participants could perceive the same sample very differently; furthermore, some participants used the full range of possible ratings, whereas others stayed within a restricted range. See Figures 4 and 5.

Figure 4: Naturalness rating variability by participant

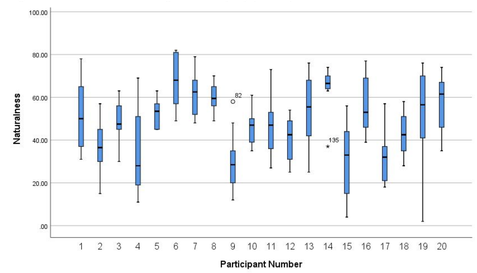
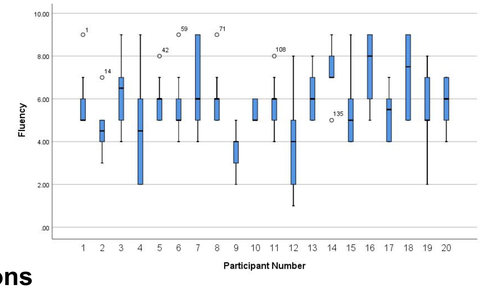


Figure 5: Fluency rating variability by participant



Limitations

- The study's retrospective nature made it difficult to control for variables.
- Methods of cannabis consumption and THC-CBD ratios were variable across on-dose periods.
- Single subject design.
- Consistency of speech sample content and type.

Future Directions

Future studies should consider:

- Teasing apart the effects of medications, pain, and psychosocial factors on speech and language.
- Designing prospective studies that can better control for variables.

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1. Deshpande, A., Mailis-Gagnon, A., Zoheiry, N., & Lakha, S. F. (2015). Efficacy and adverse effects of medical marijuana for chronic noncancer pain: Systematic review of randomized controlled trials. *Canadian Family Physician*, *61*(8), e372-e381.

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Department of Communication Sciences and Disorders