



LEXICAL DIVERSITY IN COVID-19 RECOVERY PATIENTS

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ABSTRACT

COVID-19 pandemic has led to a remarkable loss of human life worldwide and presents a unique challenge. The long-term effects of the virus are indefinite. They increase the risk of damage to blood, kidneys, brain, heart and gastrointestinal system. Structural abnormalities were observed in the brain during a MRI study in neurologically intact COVID-19 recovery patients (Qin et al; 2021). The present study aimed to explore the discourse abilities in COVID-19 recovery patients. Type token ratio was measured to analyse the discourse abilities. Results showed that COVID-19 group exhibited less lexical diversity. Gender distinction was also observed. Females performed better compared to males. This investigation is one of the first in its form which assessed the discourse abilities in COVID-19 recovery patients. These findings are vital because they attach to recent lines of research which point to language production issues in COVID-19 recovery patients

KEYWORDS

COVID-19, Discourse, Language.

INTRODUCTION

COVID-19 may increase the risk of damage to blood, kidneys, brain, heart and gastrointestinal system. Although the patient experienced mild symptoms of the disease, there was sleepiness, confusion, poor cognitive function, delirium, uncomfortable skin sensations and intense headaches. In very severe cases, many of the patients noticed serious complications such as strokes (Backman, 2022).

In young people, COVID-19 can form a basis for strokes and seizures with an increased risk of developing Parkinson's disease and Alzheimer's disease. Although some individuals recover completely from COVID-19 pneumonia, the disease's long-term repercussion on the brain remains unknown. Qin et al (2021) investigated individuals with COVID-19 with no particular neurological signs and found that there were changes in grey matter morphometry, cerebral blood flow (CBF) and white matter (WM) microstructure during MRI study. The anomalies in these brain regions must be observed after recovery in order to understand the potential neurological consequences of COVID-19.

Fergadiotis & Wright (2011) state that discourse analyses would be helpful in observing multifaceted cognitive/linguistic behaviours. Discourse production requires a combination of various cognitive skills like linguistic organization, linguistic planning and working memory. Discourse analysis would provide an adequate sample to evaluate lexical diversity.

Lexical Diversity is a collection of vocabulary used in a text by an individual which focuses on the capacity to retrieve the actual words from a comparatively intact knowledge i.e., lexicon for the creation of superior linguistic units. It depends on 3 major components of language: phonology, syntax and semantics. Tools used for analyzing lexical diversity include type token ratio (TTR) (Wright & Silverman; 2003), VOCD and measure of textual lexical diversity (MTLD). One of the most frequently used approaches to evaluate lexical diversity is to use the ratio of unique lexical items divided by the total number of words in a sample termed as TTR (Chotlos, 1944; Templin, 1957).

A type-token ratio (TTR) is analyzed as the total number of unique words (types) divided by the total number of words (tokens) in a given segment of language. (Williamson; 2014). High TTR (score of one) reflects large amount of lexical variation and a low TTR (score of zero) shows relatively little lexical variation.

METHODOLOGY

Data was collected from 30 control participants and 30 severe form of COVID-19 recovery patients divided into two groups and having equal number of males and females. Group A: Control group and Group B: COVID-19 recovery group. Age range of the participants

was between 21-30 years who were native speakers of Tamil language. Time of recovery from COVID-19 was about 6 months

Informed consent was obtained prior to the study. Subjects were instructed to talk about a typical day for a minimum of three minutes and the sample was recorded. If the subjects stopped before 3-minutes, a verbal cue ("Speak more about that") was given to continue the description until the 3-minute discourse was achieved. To examine the lexical diversity, type token ratio (TTR) was calculated. Rating of communication units was done by three speech language professionals having an experience of about 10 years. Descriptive statistics and Independent t test was used to determine the significant difference between the variables. Significance was set at $p < .05$ for all variables.

RESULTS AND DISCUSSION

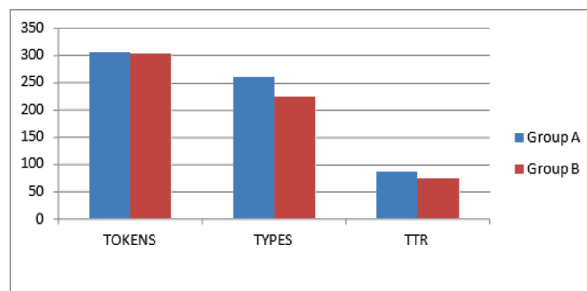
The results are discussed under following sections:

Comparison of type token ratio for each group.

Mean obtained for tokens was 303.8 in Group A and 302.8 in Group B. Mean obtained for types was 260.2 in Group A and 224 in Group B. Mean for TTR was 0.85 in Group A and 0.73 in Group B. Significant difference was observed for number of types and type token ratio in controls and COVID-19 recovery patients. This shows a decrease in lexical richness for Group B. Group A Group B Mean S.D Mean S.D Tokens 303.88.08 302.87.88 Types 260.214.1 22421.8 TTR 0.850.03 0.730.06

Table 1: Mean of tokens, types and TTR generated for each group

	Group A		Group B		P
	Mean	S.D	Mean	S.D	
Tokens	303.8	8.08	302.8	7.88	0.54
Types	260.2	14.1	224	21.8	0.00
TTR	0.85	0.03	0.73	0.06	0.00



(Group A- Controls and Group B- COVID-19 recovery patients)

Figure 1: Mean of tokens, types and TTR generated for each group

TTR was compared for healthy individuals and neurological disorders. Differences in lexical richness of both the groups can be due to change in lifestyle post covid-19. Use of variety of words is limited in group 2. COVID-19 might be affecting certain cells in the brain leading to such partial or complete deficits in the language skills.

Comparison of type token ratio across gender for COVID-19 recovery patients

Mean obtained for tokens was 302.2 in males and 302.4 in females. Mean obtained for types was 209.4 in Males and 238.6 in females. Mean for TTR was 0.69 in males and 0.75 in females. Significant difference was observed for males and females with respect to number of types and type token ratio in COVID-19 recovery group. Scores obtained were better in females compared to males. MALESFEMALES $\overline{P}$ MeanS.DMeanS.DTypes209.413.2238.618.80.00Tokens302.28.8302.46.70.90TTR0.690.030.750.050.00

Table 2: Comparison of types, tokens and TTR across gender for COVID-19 recovery patients

	MALES		FEMALES		P
	Mean	S.D	Mean	S.D	
Types	209.4	13.2	238.6	18.8	0.00
Tokens	302.2	8.8	302.4	6.7	0.90
TTR	0.69	0.03	0.75	0.05	0.00

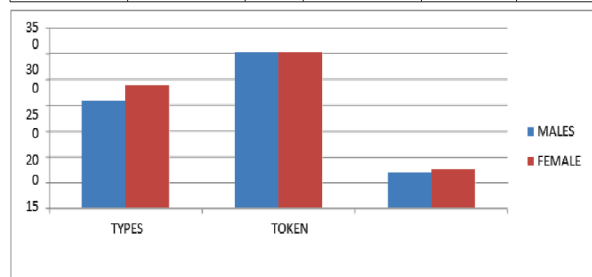


Figure 2: Comparison of types, tokens and TTR across gender for COVID-19 recovery patients

Studies support stating that language acquisition and language production is higher in females (Llach'2009). Same findings are evident in this study too. This could be the probable reason that females were able to produce different number of words in the discourse.

The results of this study emphasized on the hypothesis that COVID-19 recovery patients exhibited less lexical diversity during discourse production when compared to control group. Reductions in lexical diversity have been found in neurological disorders who experienced language deficits. Similar to them, COVID-19 recovery patients exhibited variation in lexical diversity when measured by TTR.

These findings are vital because they attach to recent lines of research which point to language issues in COVID -19 recovery patients. This investigation is one of the first in its form which assessed the discourse abilities in COVID-19 recovery patients. Results revealed that there was distinction in performance for both the groups. For COVID-19 recovery group, gender difference was also observed. Females performed better compared to males.

Language analysis which was done on COVID-19 recovery patient's showed that they had discourse production deficits. Lexical richness is affected to some extent in these individuals. The possible reason could be multi organ effect i.e., the virus may have involved some parts of the brain. Meinhardt (2021) and Woo (2020) stated that patients with COVID-19 presented with cognitive, attention deficits, seizures and suicidal tendencies. These behaviors signify a well defined brain damage due to the disease process. Most of these issues were denoted as "long COVID" which may be observed after very mild infection (Hellewell,2022).

CONCLUSION

An individual who has suffered COVID-19 would be strongly recommended to undergo the screening procedure for language skills. If the individual fails in the screening procedure, he is further sent for a detailed language assessment. This would be helpful to identify which component of language is affected because of the disease process. Investigation should also be focused on long term

effects of COVID-19 in language comprehension and expression. Future studies should be highlighted on comparing the language skills and disease severity. Similar study can be carried out in more number of participants.

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