

## INTRODUCTION

Alzheimer's disease (AD) is one of the most common neurodegenerative diseases resulting in cognitive-communication disorders, a disruption of cognition causing difficulty with any aspect of communication (e.g., listening, speaking) and language (ASHA, 2005). In mild AD, common cognitive deficits include reduced memory and executive functioning while common language deficits include reduced content, syntax, and coherence (Boschi et al., 2017; Mueller et al., 2018). However, there are gaps in the literature concerning cognitive-linguistic impairment for persons with mild AD. For example, most linguistic studies of mild AD do not analyze cognitive function together with language output.

A recent systematic review suggests that current screening tests may not be sensitive enough to detect early stages of AD (De Roeck et al., 2019). Since early detection of AD is thought to be an effective strategy to improve the quality of life of persons with AD, ultimately assessment materials must be effective and sensitive to mild AD (Alzheimer's Association, 2021; Liang et al., 2015). Thus, this study aims to inform assessment materials through analysis of speech samples and language outcome measures that may be sensitive to mild AD.

## RESEARCH QUESTIONS & HYPOTHESES

1. Do microlinguistic measures of syntactic complexity and lexical diversity and macrolinguistic measures differ between a group of participants with mild AD and age-sex-, and education-matched controls for a picture description task?

**Hypothesis 1:** Participants with mild AD will exhibit less syntactic complexity, lower lexical diversity, less coherence and more irrelevant comments compared to healthy controls.

2. Is there an association between global cognition as measured by the *Mini Mental State Examination* (MMSE; Folstein et al., 1975) and microlinguistic measures of syntactic complexity and lexical diversity and macrolinguistic measures within each group for picture description?

**Hypothesis 2a:** Poorer global cognition will be associated with linguistic decrements.

**Hypothesis 2b:** Cognition will have a stronger positive correlation with syntactic complexity than lexical diversity for speakers with mild AD.

## METHODS: Participants

- 76 participants were selected for study from the TalkBank DementiaBank Pitt Corpus (Becker et al., 1994).

Table 1: Participant characteristics are summarized.

	Mild AD	Control
Number (N=76)	38	38
Sex	22 female, 16 male	22 female, 16 male
Age range (mean)	55-78 (67)	54-80 (66.7)
Years of educ. range (mean)	12-18 (13.1)	12-17 (13.2)
MMSE range (mean)*	10-28 (20)	26-30 (28.8)

\*significant between group-differences at  $p < .001$ .

## METHODS: Tasks

### Language Task

- **Cookie Theft Picture Description** (Goodglass & Kaplan, 1983): This simple line picture was presented to each participant and the participant was asked to "Please tell me everything you see going on in this picture."

### Cognitive Task

- **Mini Mental State Examination (MMSE):** This is a 10-minute measure frequently used to screen for cognitive problems. A perfect score is 30 and scores under 21 suggest increased risk of dementia (Cockrell & Folstein, 2002).

## METHODS: Measures & Procedures

### Language Measures

Conventions of the Systemic Analysis of Language Transcripts (SALT; Miller & Iglesias, 2016) were used to code and analyze the data except for macrolinguistic measures. All coding was completed by two coders who were blinded to group assignment.

Table 2: Linguistic measures are summarized.

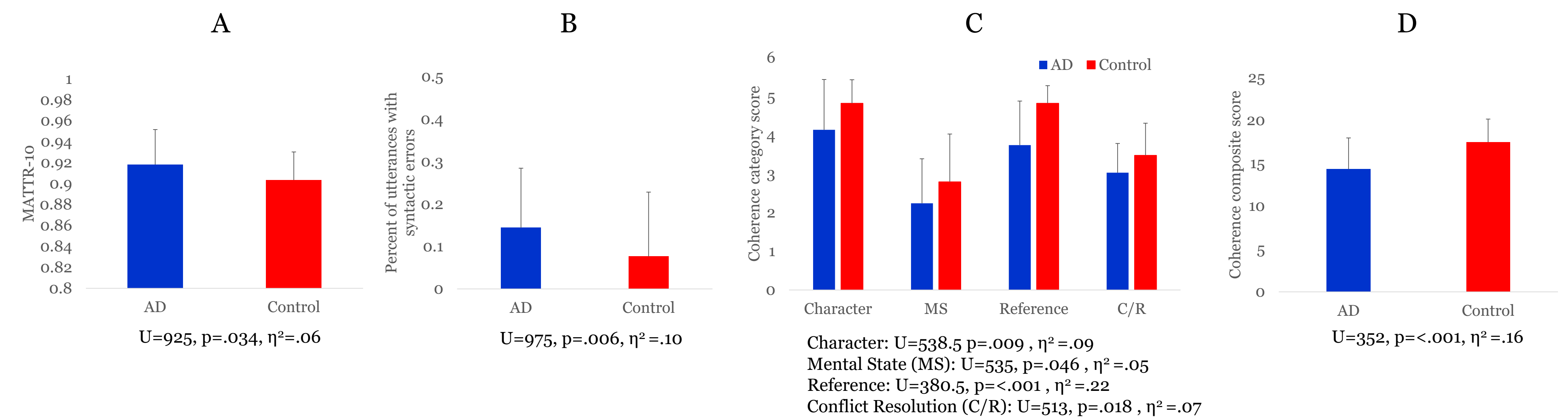
Microlinguistics	
<b>Syntactic Complexity</b>	
<b>MLU</b>	Mean Length of Utterances (Number of morphemes) / (Number of utterances)
<b>Subordination Index</b>	Ratio of the total number of clauses to the total number of C-units (Total number of clauses) / (Total number of utterances)
<b>Syntactic errors</b>	Erroneous or omitted inflection of a verb, omitted copulas, auxiliaries, or content words, and pronoun errors
<b>ND</b>	Noun determiners Use of nouns with and without necessary determiners (i.e., one dog, many cards)
<b>Lexical Diversity</b>	
<b>MATTR</b>	Moving-Average Type Token Ratio Estimates the number of different words using a moving window (10 words) to avoid length effects (Moving-Average of number of different words) / (Moving-Average of number of total words)
<b>Macrolinguistics</b>	
<b>Story Coherence</b>	Receives a score of 1-5 on each category (setting, characters, mental states, references, and conflict/resolution) for a total possible score of 25
<b>Irrelevant comments</b>	Utterances not related to task including questions and off-topic comments

## METHODS: Data Analysis

- Descriptive statistics and non-parametric tests were performed using SPSS.
- Mann-Whitney U-tests analyzed between-group differences for language outcome measures obtained from the picture description task (Question 1).
- Spearman correlations within each speaker group analyzed the relationship between global cognition (MMSE scores) and language outcome measures obtained from the picture description task (Question 2).

## RESULTS: Question 1

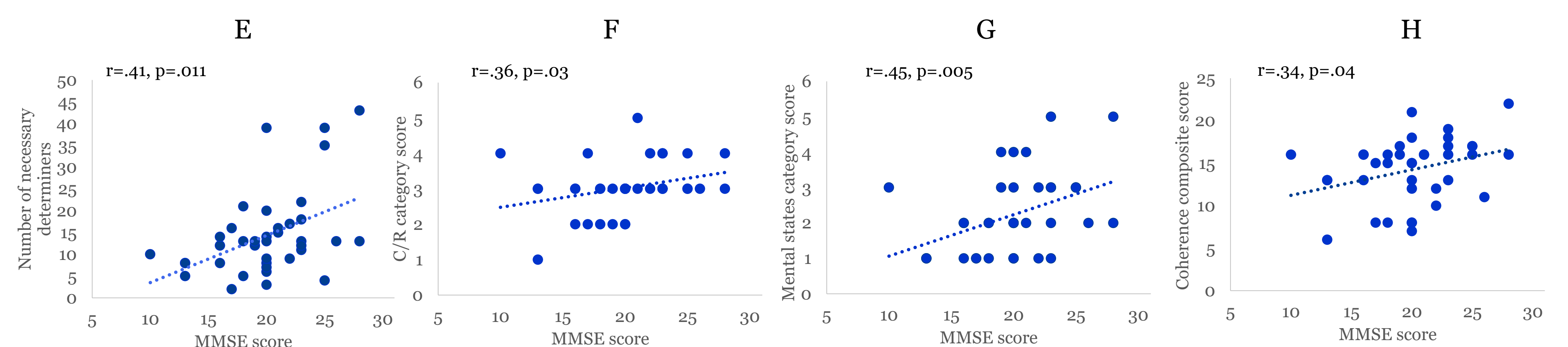
Figures A-D report means (standard deviations) for significant between-group findings for microlinguistic (Fig. A, Fig. B) and macrolinguistic (Fig. C, Fig. D) outcome measures obtained from the picture description task.



- Between-group differences in language outcome measures that were not statistically significant included MLU, subordination index, setting, and irrelevant comments.

## RESULTS: Question 2

Figures E-H report significant correlations between MMSE scores and microlinguistic (Fig. E) and macrolinguistic (Fig. F - H) outcome measures during the picture description task for the mild AD group.



- For participants in the mild AD group, correlations between MMSE scores and language outcome measures that were not statistically significant included MLU, subordination index, MATTR-10, proportion of syntactic errors, setting, characters, reference, and irrelevant comments.
- For participants in the control group, MMSE scores did not significantly correlate with any of the language outcome measures.

## DISCUSSION

- Participants with mild AD had reduced syntactic complexity (noun determiners) but slightly higher lexical diversity (more unique words) compared to controls. Story coherence (4/5 subcategories) also was reduced for participants with mild AD compared to controls.
  - Results are consistent with prior studies suggesting syntax and story coherence in picture description may be impaired in mild AD (Mueller et al., 2018) and may help with early identification. Thus, hypothesis 1 was partially supported because the number unique words and off-topic remarks produced were comparable for the participant groups.
- Global cognition was moderately correlated with syntactic complexity (noun determiners) and story coherence (mental states, C/R) for the mild AD group partially supporting hypothesis 2a. The result that lexical diversity did not significantly correlate with cognition for either group suggests that global cognition may have a stronger association with syntax in picture description supporting hypothesis 2b.

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## ACKNOWLEDGEMENTS

- We would like to thank Valerie Muñoz for acting as a second coder.
- This research is dedicated to the late Eloise Carter.