

# LONGITUDINAL STUDY OF CHILDREN WITH A LANGUAGE IMPAIRMENT

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# Outline

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# Introduction

## LANGUAGE IMPAIRMENT

- Language Impairment is a communication disorder in where the individual has problems expressing and/or perceiving needs, ideas, and information.
- The disorder deals with comprehension and meanings instead of sounds.



# Background

- 502 students were selected from the Child Language Research Center Project to complete the CREVT Test. The CREVT is the Comprehensive Receptive and Expressive Vocabulary Test.
- Test yielded 5 composite scores (scores based on local norms):
  - Receptive language
  - Expressive language
  - Vocabulary
  - Grammar
  - Narrative
- If a child obtained two or more composite scores less than -1.25, he/she was considered language impaired.

- ▣ The data from the expressive vocabulary subtest was used in this study.
- ▣ Each child was required to provide definitions for up to 25 words in four different grades, 2<sup>nd</sup>, 4<sup>th</sup>, 8<sup>th</sup>, 10<sup>th</sup>.
  - First word: knife
  - Last word: teamster
- ▣ The first word that for each child depends on their age.
  - If they are under 12 years of age- Knife (number 1 on list)
  - If they are over 12 years of age- Kettle (number 14 on list)
- ▣ Scoring
  - 1 for each correct definition
  - 0 for an incorrect definition

# Methods for Data Analysis

- ▣ For this analysis, we used the linear mixed effects model.
- ▣ Linear Mixed effects model is an extension of a regression model used for correlated observations. It typically is useful for studies in which repeated measures are made on the same statistical unit.
- ▣ Using R 2.15.1, we installed the package lme4 in order to use the lmer function. We fit various models and retained a model with main fixed effects and a random subject effect.

# Data Analysis

- In our study, we used the estimated model:

$$\begin{aligned} \text{Number of Words} = & \\ & 5.508 + 0.25317 * \text{Income} - 2.61765 * \text{Group} + 1.01291 * \text{Grade} + \\ & 0.31338 * \text{Mother's Education} + 0.02816 * (\text{Group} * \text{Grade}) \end{aligned}$$

- Variables :

- Mother's Education- number of years of education of the mother
- Income of parents- level of income for each set of parents
- Group- classification of individuals : Learning Impaired or Normal
- Grade- 2<sup>nd</sup> , 4<sup>th</sup> , 8<sup>th</sup> , 10<sup>th</sup>
- Group\*Grade- Interaction term between Grade and Group

Here, the mother's education, income of parents, group, and grade are fixed effects. All individual subjects are random effects.



# Data Analysis

- ▣ With the preceding model, the interaction term was found to be not statistically significant (t-value = .72) which leads to a final model.
- ▣ Our final model:

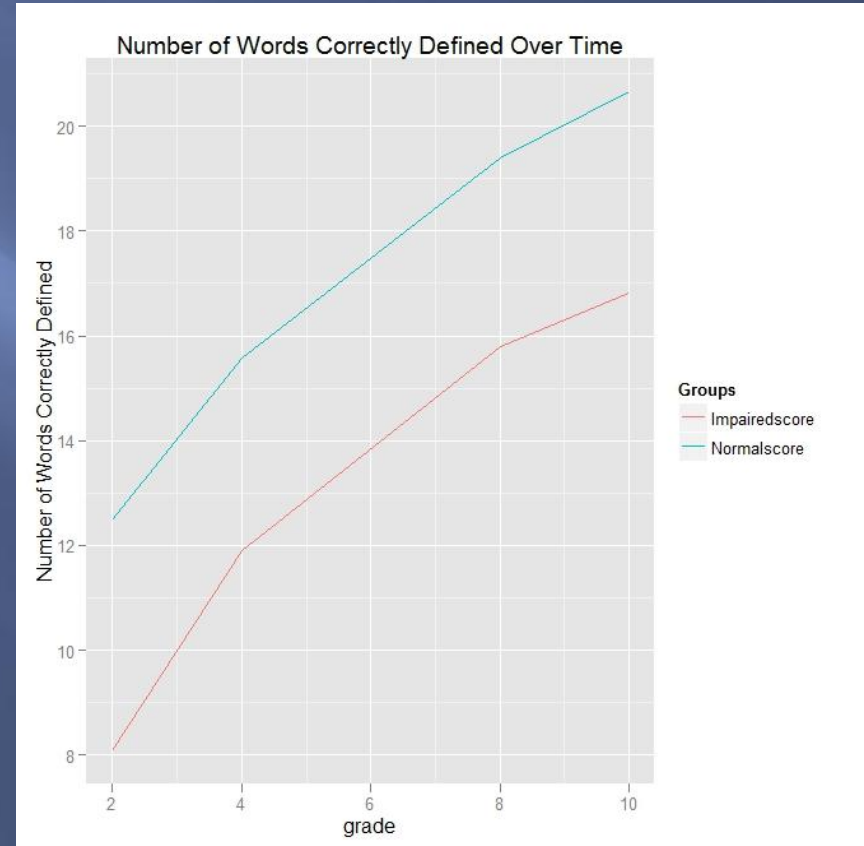
$$\begin{aligned} \text{Number of Words} = & \\ & 5.46074 + 0.31365 * \text{Mother's Education} + 0.25220 * \\ & \text{Income} - 2.44888 * \text{Group} + 1.02071 * \text{Grade} \end{aligned}$$



# Results

For our first fitted model:

- We found that the group and grade interaction was not statistically significant at the level  $\alpha=0.05$
- The predictor variables, including Mother's Education, Income, Group, and Grade, were all highly statistically significant at the level  $\alpha=0.05$
- We have used an exchangeable correlation structure which leads to an estimate of the correlation coefficient between number of words correctly defined at each grade level to be 0.3788598.



# Results

- ▣ For our final model, the predictor variables were highly significant as well, at  $\alpha=0.05$ .
- ▣ Again, we used an exchangeable correlation structure to obtain a correlation coefficient of 0.3796056.

# Conclusions

- In conclusion, a linear mixed effects model was fitted to assess whether mother's education, income, group and grade affected the number of words correctly defined by each of the 502 subjects.
- The effects of all the predictors were highly statistically significant.
- We used exchangeable structures which lead to estimates of correlation coefficients, around 0.38, for both models.
  - Note that the correlation between scores at each grade level was weak.
- Lastly, the group and grade interaction term was withdrawn from the model because it was not statistically significant. This implies that while the normal hearing group has a larger number of words defined correctly than the language impaired group, both groups are increasing their number of words defined correctly over time. In addition, they are increasing at the same rate.

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