Comparing daycare and home environments using the LENA system: A preliminary report

Melanie Soderstrom and Joanna Bhaskaran
M_Soderstrom@umanitoba.ca

UNIVERSITY OF MANITOBA

Abstract

We compare the language environments of toddlers in two busy daycare centres and toddlers of seven stay-at-home mothers using the LENA recording system. Quantitative measures of infant vocalization and adult language input were numerically higher in the home environments, however the differences were not great. The percentage of meaningful speech was also comparable across samples. There were significant differences in qualitative measures however, including the percentage of distant input, silence periods, and overlapping speech.

Research Question

What are the characteristics that differentiate the linguistic environments of toddlers in daycare and home settings?

Introduction

About a third to one half of children in North America are in child care outside the home before the age of 2 years [1, 2]

Overall, children at home and in daycare show similar overall language development [3]
•But... The language environment matters
•Higher quality child care is correlated with better language scores [ibid]
•Language input measures are correlated with better vocabulary scores [e.g. 4]

*What are the characteristics of a high-quality **linguistic** environment?*
•Amount of child-directed speech?
•Fluency or clarity of speech?
•Total amount of speech?
•Quality of speech (e.g. TV, background noise)?
•Particular lexical, phonolotical, syntactic characteristics?

If home and daycare environments are so different, why are there similar outcomes?

Participants

All recordings were done in the Winnipeg area, a city of about 700 thousand people in Central Canada.

For the daycares...
• Approximately 7-8 hours of recording were obtained per day.
• A research assistant was present to operate the device and take notes

For the home recordings...
• Parents took the device home and recorded for 7-12 hours during the day.

Details	Daycares: Two daycares have been recorded to date. Daycare 1 samples include "young" (2 recordings) and "old" (3 recordings). Daycare 2 included only a two-year-old group (3 recordings).	Homes: Seven infants of stay-at-mothers have been recorded to date. Four infants were recorded 3 times each, and one infant (child 5) twice. Two younger children were recorded once each.
Target Child's Age	Daycare 1 (young): 17-18 months; Daycare 1(old): 25 months; Daycare 2: 29 months	Child 1: 23-25 months; Child 2: 21 months; Child 3: 20-22 months; Child 4: 22 months; Child 5: 21-23 months; Young 1: 15 months; Young 2: 8 months

Basic LENA outputs
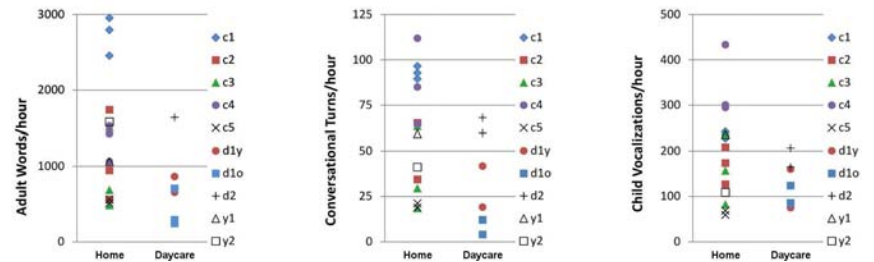
Figures 1A, 1B, 1C. LENA estimates of adult words, conversational turns between the target child and an adult, and child vocalizations.
These measures did not differ significantly between homes and daycares

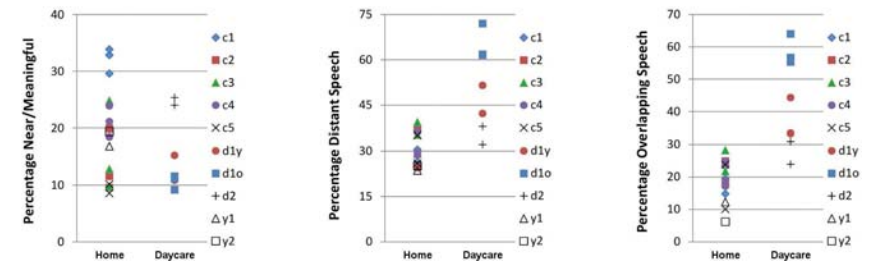## Other Language Measures

Figure 2. Percentage of sample classified by LENA as near, meaningful speech used in Figure 1 estimates.
No significant difference.

Figure 3. Percentage of sample classified by LENA as originating over 6 feet away from target child.
The amount of distant speech was significantly lower for homes than daycares.

Figure 4. Speech classified by LENA as multiple speakers overlapping, using the ADEX analysis tool.
The amount of overlapping speech was significantly lower for homes than daycares.
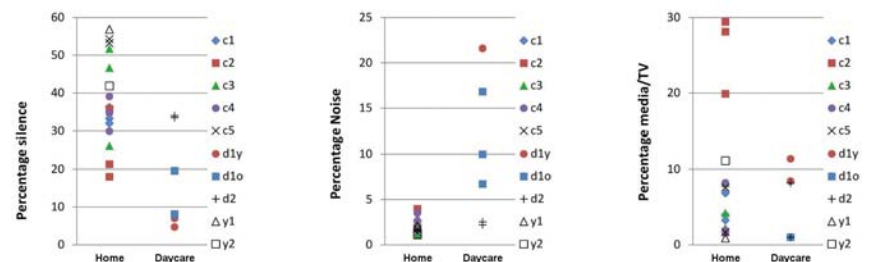
Environmental Measures

Figure 5. Percentage of sample classified by LENA as quiet, vegetative sounds, or silence.
The amount of silence was significantly lower for homes than daycares.

Figure 6. Speech classified by LENA as non-human noise, using the ADEX analysis tool.
The amount of noise was significantly lower for homes than daycares.

Figure 7. Percentage of sample classified by LENA as TV, radio or electronic media.
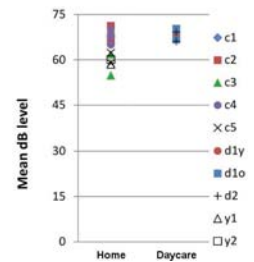*No significant difference.*

Sound Levels

Figure 8. Mean intensity measured in 30 s increments every 30 minutes across each sgample, using Praat [6].

The mean decibel level was significantly lower for homes than daycares.

Findings Summary

Daycares had significantly...
• Higher sound levels
• More overlapping speech
• More distant speech
• More non-language noise

Homes had significantly...
• More silent periods

But **both** had...
• Similar adult words, conversational turns, child vocalizations
• Similar percentage of near/meaningful speech

Discussion & Future Plans

Discussion
As expected, the daycares differed from the home environments in significant ways.

However, at least with this preliminary sample and based on basic LENA outputs, *the gross amount of high quality language input was similar in the two environments.*

There were some large individual differences even within our small sample of daycares.

Future Plans
These data only provide a preliminary comparison of the two language environments. Future plans for this project include:
• Collecting a much larger sample, including home daycares
• Controlling for effects of time-of-day and number of hours per day of recording
• Examining activity-related differences
• Transcription of portions of the recordings to examine characteristics not directly analyzed by LENA (e.g. phonology, syntax), and reliability testing
• Correlations between particular linguistic characteristics and child outcomes

References and Acknowledgments

References
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[4] Pan, B. A., Rowe, M. L., Singer, J. D., & Snow, C. E. (2005). Maternal correlates of growth in toddler vocabulary production in low-income families. *Child Development*, 76(4), 763–782.
[5] http://www.lenafoundation.org/Research/TechnicalReports.aspx [LTR-05-2:Reliability of the LENA™ Language Environment Analysis System in Young Children's Natural Home Environment]
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Data Availability
For reasons of confidentiality, these recordings will not be publicly available. However, we would welcome requests for analyses to be performed on-site.