

Chapter 15

Using the Language Environment Analysis (LENA) System to Investigate Language Input in Greek Speaking Children

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ABSTRACT

This study sought to assess the effectiveness of the language environment analysis integrating wearable audio recording with automated voice analysis, within the context of Greek-speaking families, aiming to discern evolving patterns of child-directed speech in typically developing children. Audio data from children aged 6-46 months were recorded during home interactions. The LENA Pro software calculates parameters like conversational turn count, child vocalizations, and adult word count. The findings underscored a pronounced duration of silence-background noise and distant sounds. Strong correlations also emerged between parental linguistic input, adult-child conversational exchanges, child vocalizations, and meaningful interactions between children and adults. An inverse association between electronic device engagement and child vocalizations was also observed. LENA demonstrates its power in effectively mapping non-English linguistic environments, such as Greek, offering invaluable insights to stakeholders on refining language inputs for optimal language development.

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INTRODUCTION

Language development in early childhood is a crucial aspect of cognitive and social development. The ability to communicate effectively lays the foundation for various cognitive processes and social interactions. Language acquisition research frequently relies on the use of short recordings of children's spontaneous or semi-spontaneous speech and interactions, periods of in-person observations (Keller et al., 2007) or questionnaires filled by adults (Fenson et al., 1994). Although these methods offer valuable insights into the language development process, they do not come without their drawbacks. Recordings can be laborious and time-consuming in terms of data collection and analysis (Keller et al., 2007), while questionnaires and observations can be subjective, especially when younger children are concerned (Oliver, Schofield & Kolt, 2007). The challenges associated with these traditional methodologies are particularly evident for speech-language pathologists who often face practical limitations due to the costs and logistical constraints involved.

To address these challenges, technological advancements have provided alternative approaches for studying language acquisition. For instance, the use of electronic devices and innovative software has facilitated more efficient data collection and analysis methods. One such tool is the Language Environment Analysis (LENA) system, a revolutionary device designed to objectively analyse and assess the linguistic environment of young children. LENA combines wearable audio recorders with automated vocal analysis (Cristia, Bulgarelli, & Bergelson, 2020). This system allows for the seamless monitoring and quantification of language input in naturalistic environments, offering researchers and speech-language pathologists a more practical and streamlined approach to studying language acquisition (Cristia, Bulgarelli, & Bergelson, 2020). By incorporating these technological advancements and remote data collection methods, researchers and speech-language pathologists can overcome the limitations associated with traditional methodologies, making language acquisition research more feasible, cost-effective, and accessible for both researchers and practitioners in the field (VanDam & Yoshinaga-Itano, 2019).

The revolutionary software known as the Language Environment Analysis (LENA) system acts as a “talk pedometer,” which combines a wearable audio recorder with automated vocal analysis (LENA Research Foundation, 2014). It consists of a small recording device, known as a “LENA recorder,” worn by the child. The recorder captures and analyzes verbal interactions and sounds from the child's surrounding environment, offering insights into the quality and quantity of language exposure. The LENA software then processes the recorded data to provide comprehensive reports on the child's language environment, including the number of adult words, child vocalizations, conversational turns, and the duration of audio input. Its primary objective is to enable adults, teachers, and clinicians to effortlessly monitor the quantity and quality of language input that children receive (Binos, Papastefanou & Psillas, 2021).

The LENA system has garnered considerable attention due to its unique functionality. By utilizing a wearable audio recorder, LENA records the linguistic exchanges occurring in the child's natural environment. The software subsequently employs automated vocal analysis algorithms to decipher and quantify the amount and quality of language input (Cristia et al., 2021). This valuable information equips adults, teachers, and clinicians with vital insights into the child's language exposure and provides a basis for optimizing language development strategies (Duncan et al., 2023).

The LENA system has been instrumental in identifying language gaps and disparities in children's language exposure. Research has shown that children from low-income families often have less exposure to rich language environments compared to their more affluent peers (Hart & Risley, 1999). These findings underscore the importance of targeted interventions to bridge this language gap and ensure equitable

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