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Impact of the Childcare Setting and Caregiver Education on Toddler Language Environment

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Walden University

College of Health Sciences

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Snejana Nihtianova

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2017

Abstract

Impact of the Childcare Setting and Caregiver Education

on Toddler Language Environment

by

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MS, Drexel University College of Medicine, 2007

MS, University of Plovdiv, Plovdiv, 2000

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Young children's early language development is strongly related to their school performance, and slow language growth may predict later academic problems. The link between the language quality and amount of speech that children hear and their language development is well documented; however, the factors that impact variability in linguistic input are not well understood. The purpose of this quantitative study was to assess the association between childcare settings and childcare provider education level and toddlers' language environment. The study sample consisted of 29 Bulgarian children. The study used a new technology called Language Environment Analysis, which is the preferred method to assess children's language environment. Vygotsky's theory guided this effort to understand the impact of child caregiver settings and caregiver educational background on the child language environment. Data analysis involved descriptive statistics, percentage agreement, analysis of covariance, and linear logistic regressions. Results showed a significant correlation between the childcare setting and the mean number of adult words spoken around the child, child vocalizations, and conversation turns. However, the educational level of the childcare providers did not have a significant effect on the adult words pronounced by the childcare providers, the number of child vocalizations, or conversational turns. Positive social change may result from improvements in caregivers' practices aimed to advance adult-child daily interaction. Future studies could provide important information to policy makers to improve childcare practices to enhance caregivers' information concerning factors that could greatly influence language and overall child development in countries outside the United States.

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Dedication

This dissertation is dedicated to my family members who have been supportive and understanding through my educational journey. I especially thank my mother, Totka Atanasova who played a special role in this doctoral process. For this, I am forever grateful.

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Table of Contents

List of Tables	iv
List of Figures	v
Chapter 1: Introduction to the Study.....	1
Introduction.....	1
Background of the Study	3
Problem Statement	8
Purpose of the Study	10
Research Question(s) and Hypotheses.....	11
Theoretical Foundation	12
Nature of the Study	14
Definitions.....	16
Assumptions.....	17
Limitations	17
Scope and Delimitations	18
Significance of the Study	18
Summary	20
Chapter 2: Literature Review	22
Introduction.....	22
Literature Search Strategy.....	23
Theoretical Foundation	24
Literature Review.....	27

Childcare Quality and Language Development Outcomes.....	27
Nonmaternal Providers' Education and Practices.....	32
Maternal Education and Responsiveness: Effect on Children's Language Development.....	34
Language Environment Assessment With LENA	38
Summary and Conclusions	43
Chapter 3: Methods.....	45
Introduction.....	45
Research Design and Rationale	45
Study Independent Variables	47
Study Dependent Variables.....	48
Population	49
Sampling and Sampling Procedures	50
Procedures.....	52
Recruitment, Participation, and Data Collection	52
Study Participation.....	53
Data Analysis	54
Research Question(s) and Hypotheses.....	55
LENA Device Validation.....	59
Threats to Validity	61
Ethical Procedures	62
Chapter 4: Results.....	66

Data Collection	67
Study Results	72
Summary	81
Chapter 5: Discussion, Conclusions, and Recommendations	83
Interpretation of the Findings.....	84
Limitations of the Study.....	88
Recommendations.....	89
Implications.....	91
Conclusions.....	94
References.....	95
Appendix A: Study Flyer and Return Email.....	112
Appendix B: Letter of Cooperation From Varna Medical University Official	113
Appendix C: Walden University IRB Approval Email	114

List of Tables

Table 1. Independent Variables	48
Table 2. Dependent Variables.....	49
Table 3. Means: Difference Between Two Independent Means (Two Groups).....	51
Table 4. Child Participant Demographics and LENA Recording Information.....	74
Table 5. Daycare Setting Participants' Characteristics.....	75
Table 6. Homecare Setting Participants' Characteristics.....	75
Table 7. Adult Word Count Simple Linear Regression Model Table	78
Table 8. Child Vocalization Simple Linear Regression Model Table	79
Table 9. MChildVoc Multiple Linear Regression Models Table	80
Table 10. Conversation Turns Simple Linear Regression Model Table.....	81

List of Figures

Figure 1. Zone of proximal development.....25

Chapter 1: Introduction to the Study

Introduction

Children's early language development is strongly associated with their school success, and slow language growth could predict later academic problems (Weisleder & Fernald, 2013). Children's comprehension, correct vocabulary use, and proper use of two- or three-word sentences by 24 months of age have been found to be linked with school performance (Roulstone, Law, Rush, Clegg, & Peters, 2011). Huttenlocher, Waterfall, Vasilyeva, Vevea, and Hedges (2010) demonstrated the importance of positive adult interactions with infants and toddlers through language development, vocabulary use, and intelligence quotient (IQ) test scores.

Several researchers have documented that the language environment can be influenced by various factors, including family socioeconomic status, adult-child interactions, caregivers' education, and childcare characteristics (Belsky et al., 2007; Huttenlocher et al., 2010). A child's social and emotional development have been found to strongly correlate with their language development (Hoff, 2006). This helps to explain why social interaction plays a significant role in language acquisition. To better understand language development, it is necessary to pay close attention not only to the linguistic mechanisms of language acquisition, but also to the social characteristics of the child's environment (Pruden, Hirsh-Pasek, & Golinkoff, 2006). Public health educators' advanced knowledge regarding children's language environment could result in effective efforts to address language development issues early in life. Additionally, this information could be incorporated into early language development interventions to assist

families with children at risk for language delay (Cesaro, Campos, Gurgel, Nunes, & Reppold, 2013).

This study's aim was to evaluate the association of the quality of language that children hear during daily adult interactions and caregivers' educational level in relation to infant/toddler language environment. The important role of children's social and emotional development has been broadly recognized within language development literature (Pruden et al., 2006). In fact, social interactions have been recognized as an important factor that could guide language learning by introducing different scripts and routines to the child's life (Miller & Gros-Louis, 2013; Miller & Lossia, 2013). For example, parents initially communicate with their infants/toddlers by engaging them in common proto-conversation routines, including diapering and feeding. Early language learning could be closely related to how children participate in the social interactions or routines that adults provide to them during the prelinguistic period of their lives (Goldstein, Schwade, Briesch, & Syal, 2010; Gros-Louis, West, & King, 2014).

Positive social change resulting from this research could be associated with improved caregiver practices aimed to advance adult-child daily interactions. Incorporating these practices into children's lives could assist caregivers in improving their communication with infants/toddlers via activities such as book reading, play activities, and other educational practices. Moreover, social changes targeting the quality of speech the child hears at home or in daycare settings could result in advanced cognitive and linguistic development later in life (Roulstone et al., 2011; Soderstrom & Wittebolle, 2013). Therefore, the findings from this study could add to existing

knowledge surrounding the impact of quality of speech (mother vs. childcare caregiver) and childcare environment (nonmaternal vs. maternal care) on infant/toddler language environment. This study was conducted in a country where childcare setting practices have never been compared using the Language Environment Analysis (LENA) Digital Language Processor device.

Background of the Study

People's ability to talk is an important feature of human development (Hoff, 2006). Research examining the process and factors influencing children's language development has been mainly focused on milestone achievements. However, the time process of language acquisition greatly varies, depending on children's environment and their interactions with adults (Barbu et al., 2015; Rowe, Raudenbush, & Goldin-Meadow, 2012). Children's vocabulary development depends on factors associated with family, maternal characteristics, as well as individual differences noticeable at the end of the first year of life (Baydar et al., 2014). Some authors have identified that language development differences in early childhood may predict language skills and academic achievements later in life. Furthermore, exposing children to different maternal and nonmaternal environments could result in better language development outcomes (Hoff, 2006).

In the last few years, results from research studies have shown the importance of the language environment, childcare quality, caregiver practices, and mothers' and childcare providers' education and background in affecting early language development outcomes. Hoff (2003) and Pan, Rowe, Singer, and Snow (2005) discussed that there

could be a significant association between the quality of the language environment and children's language development. For instance, children who live in advantaged household environments have more advanced language skills compared to same-age children who live in less advantaged environments (Hoff, 2003). Li and colleagues (2013) examined nonmaternal childcare quality during infant–toddler and preschool development stages. The authors reported that children who attended high-quality nonmaternal childcare during these two important developmental stages showed more advanced cognitive and language skills than children who attended low-quality nonmaternal childcare. In contrast, children who attended high-quality childcare during only one of these stages showed less advanced cognitive and language skills. Finally, lower skills were reported among children who attended low-quality care during both periods.

During 1995, nonmaternal, center-based childcare settings became preferred childcare settings. For instance, 10% of infants' and 25% of toddlers' parents enrolled their children in nonmaternal daycares (Burchinal et al., 2000). Variation in toddler cognitive and language development have been linked with nonmaternal childcare quality. For instance, the National Institute of Child Health and Human Development Early Child Care Research Network (NICHD/ECCRN, 2000) found that even after accounting for family characteristics, the quality of nonmaternal childcare was a significant predictor of cognitive and language development among 15- to 36-month-old children. Furthermore, Cote and colleagues (2013) suggested that advanced teacher-child

interaction plays a significant role in language development among children aged 2 to 4 years.

The role of nonmaternal caregiver practices on early language development has also been evaluated. For instance, caregivers' education and positive communication with toddlers has a significant role in children's linguistic behavior and speech development (Huttenlocher, Vasilyeva, Waterfall, Vevea, & Hedges, 2007). Honig and Shin (2001) presented significant evidence showing the benefits of daily reading to infants in terms of improved word recognition skills and vocabulary development. The same authors also noted that because parents frequently use nonmaternal childcare services, specific emphasis needed to be given to the need to improve childcare providers' education. Moreover, the authors argued that providers should be made aware of the importance of reading frequently and with expression to toddlers.

Maternal education and a child's language, cognitive, and academic development are strongly correlated (Dollaghan et al., 1999; Magnuson, Sexton, Davis-Kean, & Huston, 2009). According to Magnuson and colleagues (2009), increasing mothers' education could result in simultaneous improvements in toddlers' language skills, school readiness, and the quality of household learning environments (providing children with learning materials). Specifically, children's language improvements were linked to home quality changes. Additionally, it was noted that increased maternal education resulted in home quality changes. Authors Tracey and Young (2002) found that children of college-educated mothers had superior language skills compared to children of less-than-high-school- or high-school-educated mothers. Therefore, the authors suggested that it was

necessary to better examine maternal education along with other socioeconomic factors' influences on child language development.

Rentzou and Sakellariou (2011) discussed the important role of the childcare center environment and caregiver interaction in the language and literacy development of children under the age of 3. For example, the quality of children's interactions with early childhood educators along with structural characteristics of the care provided at daycare centers were found to be important factors influencing children's wellbeing and development. Furthermore, Phillips and Morse (2011) discussed the association between childcare providers' education and background and child language, literacy, and math skill development. The same authors pointed out that home-based providers' education was not significantly related to children's performance. However, childcare providers' years of experience were linked with some providers' practices, including reading to children and free-play activities, but were negatively associated with pedagogical knowledge.

In the United States, childcare quality has been extensively researched and has been found to be linked with children's language and overall development. This association has been much less researched in other countries (Rentzou & Sakellariou, 2011). Additionally, existing studies on the impact of quality of the language environment on children's language development have used only a small sample of speech, generally 1 to 2 hours (Soderstrom & Wittebolle, 2013). According to the Soderstrom and Wittebolle (2013), introducing the Language Environment Analysis (LENA) system into language environment research can provide researchers with a

powerful tool to better evaluate the quality of children's language environment.

Additionally, the LENA device could provide child and adult speech samples for more than 10 hours a day. Whereas considerable attention has been given to the concerns of childcare quality and childcare providers' education in the United States, this problem has not been examined in Bulgaria.

Recently, two studies, conducted by Greenwood, Thiemann-Bourque, Walker, Buzhardt, and Gilkerson (2011) and Soderstrom and Wittebolle (2013), addressed the use of the LENA device to evaluate the child home and daycare language environment. According to Soderstrom and Wittebolle, the two childcare environments could be considered very similar regarding the levels of caregivers' language and child vocalization. However, the researchers reported significant differences in the language measurements depending on the specific activities the child was exposed to as well as the time of day.

This study was the first conducted in Bulgaria to evaluate the effects of the two different childcare settings and caregivers' educational levels on language environment in children 2 years and younger. Bulgaria is described as an Upper Middle Eastern European country. According to the Republic of Bulgaria National Statistical Institute (2015), the total population of the country in 2015 was 7,153,784 people (49% male, 51% female), representing 1.4% of the European Union (EU) population. The Bulgarian population had decreased by 48,414 people compared to 2014. Twenty percent of the country's population was 65 years of age or older, and 14% was 15 years of age or younger. The country's birth rate for 2015 was 66,370 children, of which 99.4% were

live born. The number of live births had decreased by 2.4% compared to 2014. The main ethnicity in the country was Bulgarian, followed by Turkish and Roma ethnicities. The current study was conducted to provide needed information regarding the effects of various factors on the toddler language development. This information may assist caregivers in Bulgaria in changing their approach and their daily communications with children younger than 2 years.

Problem Statement

Language skills are fundamental in child development and are associated with children's social, behavioral, and academic outcomes (Harrison, McLeod Berthelsen, & Walker, 2009; Roulstone et al., 2011). Additionally, language development has important implications for cognitive development, in that children in lower quality language environments are at a disadvantage relative to their peers who are exposed to richer language environments (Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002; Pan, et al., 2005). Hoff (2003) and Pan et al. (2005) have evaluated the significant effect of the primary language environment on toddlers' developmental and language outcomes. The quality of daycare and its influence on child language development have also been extensively researched (Belsky et al., 2007; Montes, Hightower, Brugger, & Moustafa, 2005).

The association between the language quality and amount of speech children hear and their language development has been proven; however, the problem of what influences variability in linguistic input remains less understood (Hoff, 2003; Huttenlocher et al., 2002; Pan et al., 2005; Soderstrom & Wittebolle, 2013). For

example, the role of socioeconomic factors in language development has been clearly identified, but other factors that affect infant/toddler language development specifically, such as individual differences in childcare environment along with caregiver education, could also play a significant role (Dollaghan et al., 1999; Magnuson et al., 2009; Soderstrom & Wittebolle, 2013)

Fewer research trials have investigated the impact of childcare settings on infant and toddler language development compared to studies that investigated the same issue on older than 3 years' children (Soderstrom & Wittebolle, 2013). In addition, existing studies have only measured small samples (1-2 hours) of speech. For example, researchers have examined the influence of book reading, play dough activities, and snack time activities on language development in daycare settings and have concluded that it is important to engage children in specific activities to better stimulate language development (Bouchard et al., 2010; Girolametto, Weitzman, Lieshout, & Duff, 2000).

Soderstorm and Wittebolle's (2013) research was the only study in the literature that used the LENA Digital Language Processor to compare two different childcare settings. The authors contended that it is important to consider that children have different linguistic experiences depending on whether they stay home with their mothers or attend full-time daycare. Therefore, the researchers first categorized the type of activities that the children were engaged in during a typical day in both home-based and childcare settings (Soderstrom & Wittebolle, 2013). The authors pointed out that additional research was needed to better understand the factors that could influence toddlers' language environments.

According to Sylva, Stein, Leach, Barnes, and Malmberg (2011), the quality of the language environment was strongly associated with child-adult one-to-one interactions. Though extensive research on this topic has been conducted in the U.S., the quality of the language environment has never been researched in Bulgaria; thus, a study of this topic in Bulgaria presented a rare opportunity to explore the issue outside the U.S. country. Furthermore, additional studies that explore factors related to language environment characteristics in different childcare settings could provide public health professionals with significant information to inform changes during critical stages of language development (Sylva et al., 2011). Finally, the results of future studies may influence daycare staff and parental approaches and activities during a typical day to enhance the number of words used by 12- to 24-month-old children.

Purpose of the Study

The purpose of this quantitative study was to assess the association between childcare settings and childcare provider educational level and toddlers' language environment. In existing research, the significance of the language environment in affecting language outcomes has been well recognized; however, limited research has concentrated on the relative causes that affect the amount of language heard and vocalizations produced by infants/toddlers in different childcare settings (Soderstrom & Wittebolle, 2013). Specifically, this issue has never previously been researched in Bulgaria; thus, the findings of this study could present important differences that influence toddler language environment.

This research fills a gap in existing literature on the effect of childcare settings on the amount of speech spoken by toddlers who spend more time with parents as compared to daycare personnel. The study was conducted in the Varna region of Bulgaria and examined the similarities and differences of the childcare setting on the amount of child vocalizations, adults' words, and conversational turns. The study was conducted to determine whether the daycare setting and parental care had the same effect on vocalizations produced by toddlers, amount of adult words spoken to them, and conversational turns. The independent variables were childcare setting, childcare provider's and mother's educational level, childcare provider's years of experience, child's sex and age, and whether the mother had more than one child. The dependent variables in this study were adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

Research Question(s) and Hypotheses

RQ1: Is maternal education level associated with an increase in adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns)?

Null hypothesis: There is no association between maternal education and the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

Alternative hypothesis: There is an association between maternal education and the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

RQ2: Is the education level of daycare staff associated with an increase in adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns)?

Null hypothesis: Daycare staff education level is not associated with the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

Alternative hypothesis: Daycare staff education level is associated with the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

RQ3: Is the childcare setting associated with an increase in adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns)?

Null hypothesis: Childcare setting is not associated with the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

Alternative hypothesis: Childcare setting is associated with the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

Theoretical Foundation

Vygotsky's developmental theory provided the theoretical foundation for this study. This theory presents social interactions with adults or more advanced peers as essential for children's independent cognitive and language development (Vygotsky, 1987). Specifically, Vygotsky (1987) described a child's development and functioning

process as strongly related to the child's social environment. More importantly, children's language development process is described as involving gradual daily interactions with adults or more advanced peers. Eventually, after participation in these daily interactions, children advance their language abilities and start to understand and construct meaning by using different sounds, words, and sentences (Vygotsky, 1987).

Vygotsky (1987) stated that an adult caregiver can structure daily activities so that the role of the child is within the zone of proximal development (ZPD). Vygotsky defined the ZPD as the distance between a child's actual developmental level (problem-solving skills) and the child's potential developmental level. The latter level of development involves problems that the child can solve under adult caregiver guidance or with the assistance of more advanced peers (Vygotsky, 1978). Vygotsky's theory related to this study and the research questions because advanced interactions between children and maternal or nonmaternal caregivers represented a key component of this study. Moreover, child interactions with more advanced adults may result in greater amounts of adult talk and consequently child vocalizations.

Lillard and colleagues (2013) described Vygotsky's theory as fundamental and critical in explaining children's language development. This theory suggests that the cognitive development process contains three main elements: culture, language, and social communication. On one hand, people's cultural background is viewed as most important in relation to cognitive development. However, adult social interactions play a critical role in influencing cognitive and language development (Vygotsky, 1980). Furthermore, according to the theory, child cognitive and linguistic development is

associated with their social environment and could be socially constructed (Bodrova & Leong, 2007; Schneider & Watkins, 1996).

Berk and Winsler (1995) pointed out that Vygotsky's theory describes the child's language development process as a combination of daily interactions that occur throughout life. Specifically, young children's language development occurs through interactions with main caregivers in the course of engaging in different daily routines. Examples of repeated social relations include children's interactions with parents, childcare providers, and family members that assist a toddler's learning process to understand meaning through different sounds, words, and sentences (Berk & Winsler, 1995). Finally, Vygotsky's theory and his ZPD concept focused on the critical role of adult interactions and language development. Thus, this theory could be considered closely related to this study's approach and research questions. The theoretical foundation of the study is further discussed in Chapter 2.

Nature of the Study

The study used a quantitative methods approach. Research studies have been conducted to examine determinants of the language environment that include the parents' socioeconomic status and education, the effect of childcare environments, and different family members' influences (Belsky et al., 2007; Hoff, 2003; Murray, Fees, Crowe, Murphy, & Henriksen, 2006; Pan, et al., 2005). For example, authors have identified significant associations between the quality of daycare and early language development (Belsky et al., 2007; NICHD/ECCRN, 2004). Lastly, a small amount of research has been

conducted to evaluate in detail the distinctiveness of the language environment in daycare (Belsky et al., 2007; Burchinal et al., 2000; NICHD/ECCRN, 2000).

The independent variables were childcare setting (maternal care and nonmaternal care), childcare provider's and mother's educational level (less than high school, high school, some college, college degree, graduate degree), childcare provider's years of experience, child sex and age, and whether the mother had more than one child. The dependent variables were adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns). The covariates that were collected at baseline included child's age, gender, and parents' demographics.

The study used the LENA device to evaluate whether, during a typical day, children talked more or less depending on the two different childcare settings and caregiver educational level. The LENA software generated three main quantitative estimates: adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns). AWC, ChildVoc, and Turns were outcome variables that were expected to change during the study. AWC was the estimation of the total amount of words that an adult spoke in close proximity to the child (approximately six to 10 feet). ChildVoc was an estimation of the number of times a child articulated any type of appropriate verbal vocalization, including talking or babbling and dismissing vegetative noises, during a specific period of time. Lastly, Turn was an estimate of the total amount of times that an adult responded to a child's vocalization within 5 seconds and vice versa. The LENA device was used to collect data on language variation depending on childcare setting and caregiver educational level. Finally, using the full-day LENA recordings, children's

linguistic experiences were tested to assess whether they varied for toddlers who stayed at home with mothers versus those placed in full-time daycare.

Definitions

The independent variables for this study were childcare setting and caregiver's educational level. The potential confounders to control for included childcare personnel's years of experience, child's age, family's annual income, and whether the mother had more than one child. The two childcare settings were nonmaternal setting and maternal care. The dependent variables were the number of words pronounced by each child and adult and the total amount of times when an adult responded to a child's vocalization during two nonconsecutive days of the week. The LENA device generated the three dependent variables: AWC, ChildVoc, and Turns.

Adult word count (AWC): AWC is the estimate of the total number of words that an adult speaks in close proximity to a child (approximately 6 to 10 feet).

Childcare settings: Kindergarten and maternal care.

Child vocalization (ChildVoc): ChildVoc is an estimation of the number of times a child articulates any type of linguistically appropriate vocalization, including speech or babble and excluding vegetative noise, during a specific time period.

Conversational turns (Turns): An estimate of the total amount of times when an adult respond to a child's vocalization within 5 seconds and vice versa.

Educational level: Less than high school, high school diploma, some college, college degree, or graduate degree.

Language Environment Analysis (LENA) system: Digital language processor device (LENA Research Foundation, 2015).

Assumptions

I assumed that some nonmaternal childcare personnel would talk less to children and engage them in less educational activities aimed to advance their language development than maternal caregivers would. This assumption was based on information regarding the kindergarten curriculum in Bulgaria. Children who attend daycare before 3 years of age are not engaged in any educational activities because the personnel's responsibilities are more aimed toward feeding and changing the children (European Commission/EACEA/Eurydice/Eurostat, 2014). I also assumed that mothers would talk to their children more and engage their children in various activities aimed to advance their language development. Additionally, I assumed that the amount of talking that children were exposed to would depend on the education level and years of experience of the kindergarten personnel. The amount of talking would also depend on the mother's educational level and whether she took care of more than one child. Finally, I assumed that, on average, children exposed to more daily conversations and interactions involving mothers and kindergarten personnel would pronounce more words.

Limitations

The study might have been limited by the sample size; however, the proposed study's sample size (29) was larger than that of a similar study conducted in Canada (12 children; Soderstrom & Wittebolle, 2013). The town where the study was conducted was relatively large, with 25 kindergartens. Data collection was limited by the number of

kindergartens that agreed to participate in the study. Additionally, there was the possibility of technical limitations. The study's dependent variable measures relied entirely on the LENA device data and were consequently vulnerable to system errors or weaknesses. Specifically, one of the language measures was determined in noisy conditions, which could have resulted in reduction of the measure's reliability.

Scope and Delimitations

The study used the LENA device to evaluate children's language environment and to measure the amount of words that were pronounced by the children and caregivers. The device has been described as the most advanced technology to accurately measure the language environment (Xu, Yapanel, & Gray, 2009).

Toddlers between 12 and 24 months of age and their caregivers were the focus of this study. In order to accomplish the goal of the study, only children between 12 and 24 months of age and their caregivers (depending on the childcare settings) were included in the study. All mothers and legal guardians who resided in the Varna region had an equal opportunity to participate in the study. Finally, all participating daycares were randomly selected for the study.

Significance of the Study

The findings from this study could provide policy makers and parents with information regarding the influence of language environment quality in two different childcare settings. It could present important results regarding the amount of toddler vocalizations, stratified by childcare setting. This research was unique because the LENA device offered automatic data on the child's expressive verbal communication using an

Automatic Vocalization Assessment (Soderstrom & Wittebolle, 2013). The study findings present data on child caregivers' and mothers' education, which is an important language development factor (McNally & Quigley, 2014; Phyllis & Morse, 2011). For instance, in Bulgaria, caregivers for children 1 to 3 years of age are not required to hold a teaching degree (European Commission/EACEA/Eurydice/Eurostat, 2014). According to Phillips and Morse (2011), caregiver education was identified as a significant factor associated with child language development and language environment quality. The results from this study could drive policy to raise the bar for caregiver credentials to improve the language environment in daycare settings. Findings from this study could assist parents and policy makers in changing their approach regarding activities aimed at advancing toddlers' speech development. In addition, by providing information regarding the association between the quality of the language environment and caregiver education on children's language development, this research could provide information regarding the LENA device's performance for additional non-English-speaking populations. By defining some of the factors associated with a child's language environment and identifying different strategies that could support children's language development in the two different childcare settings, this study may promote advancements in maternal and center childcare practices in Bulgaria. Moreover, childcare providers and mothers may advance their language development knowledge and take additional actions to advance children's language development and better prepare them for overall school achievement.

The LENA device has been used to evaluate the language environment in English, Spanish, French, and Korean households (Oller, 2010; Pae et al., 2016; Soderstrom &

Wittebolle, 2013; Wood, Diehm, & Callender, 2016). The device has never been used in Slavonic-speaking environments. Therefore, this study could be the first step toward extending the device's validation to a Slavonic language. Additionally, the results from the study could provide important information regarding language environment quality in the two different childcare settings and lead to changes that could advance childcare practices and language environment quality in non-English-speaking countries.

Early language promotion programs are based only on the best evidence available; there is a lack of information regarding the association between language growth in the first 2 years of life and whether specific adults contribute to this growth. Moreover, maternal education could be considered an important predictor of children's language development, but the existing information on this factor has not been sufficient to support further development of programs to reduce social inequality. Therefore, the positive social change that could be expected from this study could be linked with advancing home and nonmaternal childcare language environments by promoting improved adult-toddler communication during the first 2 years of life. Finally, improving adult-toddler communication during this important developmental period could result in better language outcomes and could advance children's academic skills later in life (Roulstone et al., 2011).

Summary

The quality of a child's language environment plays an important role in determining the child's vocabulary size and overall language development (Soderstrom, & Wittebolle, 2013). The use of the LENA device in this study provided a better

understanding of child-adult interaction in kindergarten and maternal childcare settings, as well as information about the differences and similarities of these two settings.

In this section, I have addressed issues related to the impact of language environment on children's language development. The research questions have been introduced, along with specific research terms. Assumptions, limitations, scope, and delimitations have also been presented. The section concluded with a discussion regarding the significance of the study. In Section 2, which contains the literature review, I describe existing research on professionals' diverse perceptions regarding language development linked with language environment.

Chapter 2: Literature Review

Introduction

The problem prompting this study was the need to assess the quality of the language environment in two childcare settings that had never been researched in Bulgaria. This research presented a rare opportunity to explore this issue outside the U.S. Authors from different research groups have reported that the spoken language that young children hear is strongly associated with their cognitive, emotional, and social development (Rowe, 2008; Tayler & Sebastian-Galles, 2007). Children who are exposed to fewer words during the toddler period can experience an achievement gap that is linked with their school readiness (Hoff- Ginsberg, 1991). The amount of conversation that adults have with children and other characteristics of adult caregivers' language have been found to be predictive of children's language development metrics (Early et al., 2007; Rowe, 2012). The amount of conversation a child is exposed to between birth and 3 years of age could have a great impact on the child's entire life (LENA Research Foundation, 2016). Key factors affecting the quality of the child language environment have been evaluated, including but not limited to the influences of family members, childcare environment, child caregiver's education, and family socioeconomic status (Soderstrom & Wittebolle, 2013). Different aspects of maternal and nonmaternal language environments have become easier to research through the use of the LENA device (Gilkerson et al., 2015).

This study used the LENA automatic system, which records the number of words pronounced by a child and adult during an entire day. The main objective of the study is

to identify specific factors that affect children's language environment at early ages. The theoretical framework for this research focused on social interaction and experiences of children who attend childcare settings or are cared for primarily by their mothers.

This section includes information regarding previous research on the association that childcare setting quality and mother and childcare provider education have with a child's language environment. Furthermore, discussion of previous studies that used the LENA device specifically in relation to language environment differences for children between 12 and 24 months of age is presented.

Literature Search Strategy

A systematic literature review was performed using Google Scholar, the Walden University Library including Academic Search Complete, and PubMed. In Google Scholar, the following medical terms and free text terms were employed: *social context*, *childcare quality*, *maternal education*, *early speech*, *language environment*, *language and cognitive development*, *childcare settings*, and *LENA device*. The same medical terms and free text were used in the Academic Search Complete multidisciplinary database and PubMed websites. There were no restrictions for publication date. The inclusion criteria for the articles searched were English language, peer reviewed, and content pertaining to children's language environment and language development. The exclusion criteria applied to any non-English articles that did not include information regarding language development among children linked with maternal and nonmaternal childcare settings and caregivers' educational level.

Theoretical Foundation

Vygotsky (1978) explained language acquisition as consisting of not only a child's daily exposure to different words, but also a specific process of development involving thought and language. In Vygotsky's view, child intellectual development is closely associated with language development. Children's interaction with the environment results in the development of their inner speech, which is described as the ability to think in pure meanings. Moreover, as Daniels (2005) stated, according to Vygotsky's theory, language acquisition is associated with children's social interactions with more experienced and educated parents or adult caregivers. The ZPD is one of Vygotsky's theoretical concepts.

The ZPD includes three important elements (Vygotsky, 1978, Figure 1). The first element of the ZPD focuses on the idea that an individual is capable of learning a certain number of tasks independently. The second element addresses the adult's/teacher's approach and interactions with a child. Vygotsky's theory associates the role of a more advanced adult with positive influence on the child's language development. The third element focuses on a child's readiness to learn (Vygotsky, 1978). Adult-child interactions and caregiver education level could be considered important when assessing the role of parent/nonparent involvement during the language development process. The second component of Vygotsky's ZPD theory could be identified as the most appropriate for application to the current study problem. Specifically, the study research questions touch upon the association between the amount of words pronounced by an adult and child depending on the childcare setting and maternal/childcare provider education level. For

example, the specific approach could depend on the childcare setting and the child's experiences with the mother or other caregiver or could depend on the caregiver's educational level. In that the second aspect of ZPD theory involves the adult caregiver's specific approach associated with the child's cognitive and language development, this aspect closely aligns with the research questions. Moreover, adult interactions that occur during maternal or nonmaternal childcare could play a distinctive role in the child's language development and could also be considered important for this study.

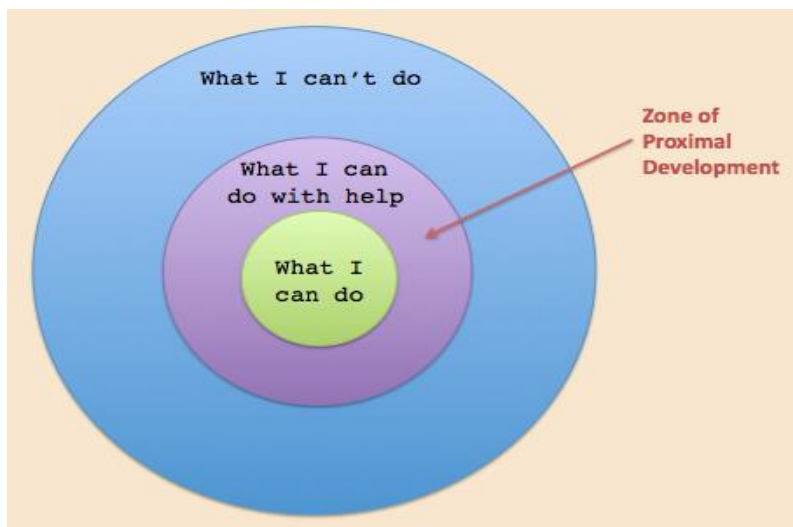


Figure 1. Zone of proximal development.

Various researchers have applied Vygotsky's theory to the study of child language development. This theory explains how children gain their language skills and can be applied to various aspects of language development (Bodrova & Leong, 1996; Hoff, 2013). For instance, Vygotsky (1978) contended that the main function of language could be linked with social communication, and that the act of play facilitates a child's learning process (Astington, 1999). When children are engaged in play, they consider this

action to be free of risk of doing something wrong. During social play, children learn from each other and mediate each other's learning. In fact, children learn the meaning of different words during play with their representations of the world (Astington, 1999). Theorists following Vygotsky maintain that children build their concepts of language during play and interactions. Further, all social interactions with adult caregivers and peers provide children with better opportunities to learn language through positive social experiences (Goodman & Goodman, 1990).

Gridley, Hutchings, and Baker-Henningham (2015) conducted a study that examined parents' behavior, focusing in particular on parents' typical conversations with children. In that study, Gridley et al. identified the importance of language development promotion via positive communication in the home environment. A negative parenting style, they argued, greatly affects language development. On the other hand, positive parenting was found to contribute close to 50% of language variation among children 17 months old. Socio-cognitive theorists including Vygotsky (1978) emphasized that child development, particularly in early years, involves multifaceted social interactions with supportive and sensitive adults (parent or nonmaternal caregiver), and these interactions could be the key to child language and cognitive development (Rogoff, Paradise, Arauz, Correa-Chávez, & Angelillo, 2003).

Nonmaternal care has become a significant part of infants' and toddlers' lives (Landry, Smith, & Swank, 2006). Landry and colleagues (2006) reported that parents and professionals raised various concerns regarding children's experiences attending regular nonmaternal childcare. The main issues were linked with lack of one-to-one interactions

in the nonmaternal setting compared to the home care setting. This was found to be a significant factor related to child language and cognitive development. Specifically, positive interactions with kind, sensitive, and responsible adults were reported as an important factor during a child's development process, as supported by socio-cognitive theories (Landry et al., 2006; Tamis-LeMonda, Bornstein, & Baumwell, 2001). I sought to use Vygotsky's theory in the current research to better understand differences in social interactions that were linked to child caregiver settings and educational background influence on the child language environment. Moreover, in terms of the main study goals associated with the effects of language environment interactions on language development in children between 12 and 24 months of age, this theory provided the study with the required foundation to explain the effects of different childcare settings and caregivers' education on children's language environment.

Literature Review

Childcare Quality and Language Development Outcomes

Evidence has shown that adult interactions have a critical role during the language development process. Head and Darcy Mahoney (2015) reported that the frequency of adult caregivers' language, among other characteristics, could predict children's language development. For instance, a child's vocabulary size was found to be strongly associated with the rate at which parents or other caregivers talked to the child. Moreover, vocabulary growth has been found to be linked with parents' responsiveness to their children's conversations (Tamis-LeMonda et al., 2001; Topping, Dekhinet, & Zeedyk, 2013). In addition to adult interaction factors, children's language delay could be

associated with the quality or quantity of language input, which could result in lowering children's intelligence quotient (IQ) scores and academic achievement. Therefore, environmental factors within caregiver control should be considered when evaluating aspects of children's language acquisition (Huttenlocher et al., 2002; Landry, Smith, Swank, & Miller-Loncar, 2000; Topping et al., 2011).

The prevalence of nonmaternal childcare has increased gradually during the last 50 years, and extensive research has been conducted regarding the role of nonmaternal childcare in children's early language development (Vandell, Belsky, Burchinal, Steinberg, Vandergrift, & NICHD Early Child Care Research Network, 2010). Scarr (1998) reported that in the U.S., economic changes along with changes in women's social roles have both resulted in fundamental daycare agreement changes for infants and toddlers. Infant childcare starting when a baby is 6 weeks' old has become a typical experience for U.S. children (Bachu, 1995). In fact, during 1997, close to 80% of children aged 3 years and younger regularly attended nonmaternal daycare, and 40% of these children spent more than 35 hours per week there (Adams & Capizzano, 2000). Childcare arrangements in the U.S. differ from those in other countries (NICHD/ECCRN, 2002).

Rentozou and Sakellariou (2011) stated that there are different definitions of childcare quality that are linked with caregivers' and childcare's characteristics. For example, childcare quality may be assessed by examining teacher-child interactions, group size, availability of educational materials, and types of daily activities in which children are involved (Cote et al., 2013). Cote and colleagues (2013) pointed out that a large number of studies had examined and compared intensities of care delivered to

children through different childcare services. Further, Cote et al. contended that even though the quality of childcare could positively or negatively impact children's cognitive development, few studies had evaluated differences in childcare quality. Therefore, Cote et al. suggested that increasing teacher-child interactions, especially to enhance children's language development, could greatly impact children's cognitive development.

Li and colleagues (2013) stated that both developmental theories and empirical research support the concept that high-quality childcare can positively influence cognitive and language development for infants and toddlers. High-quality childcare during these periods was found to be associated with advanced cognitive and early language development among children. Children's language skills improved dramatically when they experienced warm and positive interactions with parents and other child caregivers. Children 3 years and older who were exposed to high-quality childcare and positive caregiver-toddler interactions were shown to have high cognitive and preschool scores (Shonkoff & Phillips, 2000). The results from those experimental and observational studies were consistent with findings that high-quality childcare (for low-birthweight children and low-socioeconomic-status families) was linked with improved cognitive and language outcomes (Campbell, Pungello, Miller-Johnson, Burchinal, & Ramey, 2001).

Two different research groups' findings specified that one of the most significant indicators of early childhood education quality is associated with caregivers' sensitivity and responsiveness (LoCasale-Crouch et al., 2007; Rudasill & Rimm-Kaufman, 2009). Scarr (1998) reported that quality childcare could be defined as childcare in which children experience daily warm and supportive interaction with their caregivers in a

protected, healthy, and stimulating environment. Therefore, caregivers' characteristics including educational level and attitude toward children could be considered equally important when assessing childcare quality and its connection with language development (NICHD/ECCRN, 2000).

In a Greek observational study, Rentouzu and Sakellariou (2011) examined caregivers' characteristics and interactions with toddlers and preschool-aged children. The researchers stated that Greek caregivers' interaction with children was primarily aimed toward caring for the children rather than engaging them in educational activities. The authors also noted that in Greek center-based childcares, no attention was given to educational activities. In general, the educational quality of these centers was relatively low compared to centers in other countries. Rentouzu and Sakellariou suggested that policy and practice changes were necessary in the country and that there was a need for additional education for caregivers to increase their sensitivity toward and responsiveness to children. Such change could result in advancing higher quality care for children that would support their cognitive development (Rentouzu & Sakellariou, 2011).

High-quality care that involves one-on-one interaction between children and caregivers in a nonmaternal childcare environment has been found to affect infants' and toddlers' development (Dettling, Parker, Lane, Sebanc, & Gunnar, 2000; Watamura, Donzella, Alwin, & Gunnar, 2003). NICHD/ECCRN (2003) reported that the number of hours spent in nonmaternal care centers was not a predictive factor in relation to children's cognitive and language development. The numbers of hours spent in daycare settings during the infancy and toddler period was pointed out significant factor affecting

children's cognitive and language development. For instance, when infants (0-17 months) spent more hours in center care, their preacademic test scores were low at 54 months of age (NICHD/ECCRN (2003). In contrast, the scores of children who spent more hours in nonmaternal child care centers as toddlers (18-35 months of age) indicated better language skills at 54 months (NICHD/ECCRN, 2003).

Many of the studies that have examined the effects of early childcare have not taken into account childcare quality, which has been identified as critical factor when assessing children's development (Belsky et al., 2007). However, studies that have addressed this issue have shown that quality of childcare greatly affects children's outcomes (Burchinal & Cryer, 2003; Loeb, Fuller, Kagan, & Carrol, 2004; NICHD/ECCRN, 2003). The main problem has been the lack of studies examining the quality of childcare for infants/toddlers, as opposed to the extensive research that has been conducted on the quality of childcare for children older than 3 years.

Researchers who have conducted studies on nonmaternal care provided in the home or center environment have suggested that cognitive and linguistic outcomes vary based on the age of the child. A positive association was reported for children's cognitive and language development when attending group childcare. Mothers reported better language skills for children attending group care when they were 15 months and younger. However, when children 4 years and older attended group care, that setting was found to influence only memory enhancement; it did not affect academic achievement (Loeb et al., 2004; NICHD/ECCRN, 2004). The authors of another study reported higher cognitive and language measures associated with concurrent home-based childcare only for

children 2 years of age, not for 3-year-olds. Children who attended home-based childcare by age 2 were performing better and displayed superior extensive language and verbal conversations at age of 3 compared to children who attended any other childcare setting (NICHD/ECCRN, 2000).

Sylva and colleagues (2011) evaluated the impact of individual and group care quality along with various childcare characteristics on 18-month-old children's cognitive, language, and behavior outcomes. The authors discussed that positive effects were reported on cognitive development but not language outcomes among children who attended nursery care. Additionally, nonmaternal care quality was positively associated with cognitive development but not language development. The researchers who concluded the current study provided initial support of the multidimensional concept of parental caregiving. Also, caregivers' language skills including responding to vocalization, praising, and positive conversations could greatly affect language development and it was an overall predictor of childcare quality (Sylva et al., 2011).

Nonmaternal Providers' Education and Practices

Research and census data suggested that close to 60% of US children from birth to 5 years attend some sort of regular nonmaternal care (Davis & Connelly, 2005). Frequently regulated non-maternal centers' characteristics of care included the group size, the child-caregivers' ratio, and caregivers' educational levels and experiences. The regulation practices regarding these characteristics were associated with better quality of nonmaternal care. For instance, the study results from two research groups suggested that positive experiences for children and better practices to enhance language and overall

development were linked to daycares with smaller group sizes, better child-caregiver to child ratios, and caregiver education (Lamb, 1997; NICHD/ECCRN, 1999).

Chazan- Cohen and colleagues (2009) reported that research groups and policy makers were giving similar attention to the learning opportunities and language development practices that children experienced at home and outside of home environment. In general, childcare quality evaluation was focused on the childcare centers structural characteristics, caregivers' interactions with children, and activities that affect the overall quality of care (NICHD/ECCRN, 2002). However, the caregiver's educational level was discussed as an additional factor that needs additional attention when evaluating the childcare quality (Early et al., 2007; Vu, Jeon, & Howes, 2008). Caregiver qualification and educational level were linked with classroom quality and educational activities, which could affect the child's language environment (Burchinal, Cryer, Clifford, & Howes, 2002; NICHD/ECCRN, 2002). Moreover, policy makers often prioritize caregiver qualifications as a primary strategy for ensuring that provided educational activities positively affect children's language skills (Early et al., 2007).

Vu and colleagues (2008) examined the classroom quality connection with caregivers' level of education and other credentials. The study participants were employed in different types of preschool practices including private and sponsored by school districts. The authors found a significant association between classroom quality and caregivers' education level, qualifications, and type of daycare management. Also, having a bachelor's degree was associated with classroom quality but only in private and nonprofit practices. However, having a bachelor's degree was not found to be

significantly associated with state and school district sponsored daycares. The authors recommended that to better determine the factors that could influence classroom quality, daycare management should be included in study modeling.

Clarke-Stewart, Vandell, Burchinal, O'Brien, and McCartney (2002) noted that children who attended daycare with more educated, trained, and experienced caregivers showed better scores on cognitive and language development tests. Home-based daycare caregiver's education and positive interactions with children was also found to be significantly associated with language and cognitive outcomes. Also, children were found to be more cooperative in home-based daycare environments. The authors concluded that regulating caregivers' educational level and training was a significant and necessary practice for children's cognitive and language development (Clarke-Stewart et al., 2002).

Maternal Education and Responsiveness: Effect on Children's Language Development

A child's cognitive and language development is strongly associated with maternal educational level (Magnuson, et al., 2009). Different socio-demographic factors that have been found to affect children's language and overall development included family income, educational level, and race (Huston, McLoyd, & Garcia Call, 1994). Maternal educational level was found as the most significant and also greatly influencing the child's language development compared to mother's race or ethnicity. In fact, maternal education was described as independent and primary factor that impacts children's spontaneous speech and overall language development (Brooks-Gunn, Klebanov, & Duncan, 1996).

Dollaghan and colleagues (1999) evaluated the relationship of maternal educational level and four different measures (mean length of utterance in morphemes (MLUm), number of different words (NDW), total number of words (TNW), and percentage of consonants correct (PCC) of toddler's spontaneous speech and language. The researchers reported that there was a positive relationship between maternal education and the four measures of a child's spontaneous communication and language. The same results were found after adjusting for ethnicity in the U.S. general population. The same authors also specified that it was necessary to assess the maternal education level influence on all measurements of children's language development. Further evaluation of children's language environment could be beneficial to support efforts identifying early language impairments for preschool children.

Parents' direct speech to their children was found out as the most important language environmental factor. For instance, children with large vocabularies tend to experience more direct speech from their parents, which leads to a significantly greater amount of words over time for this population (World Health Organization, 2004). In contrast, less educated parents talked less and used fewer words with their children, which resulted in exposing children to disadvantaged environments and consequently at risk for later in life academic difficulties (Hoff- Ginsberg, 1991). Snow, Burns, and Griffit (1998) stated that difficulties in vocabulary growth during early ages could have longer negative effects on children's reading skills throughout elementary school years. Additionally, for middle-class families' maternal education along with maternal

vocabulary and literacy proficiencies were associated directly and indirectly with their children's vocabulary growth (NICHD/ECCRN, 2000).

Davis-Kean (2005) suggested that different theories and research reported significant positive relationship between maternal education and cognitive and language outcomes for children younger than 3 years. For example, mothers' additional schooling was found to be positively associated with children's language outcomes and home learning environments (Davis-Kean, 2005). Parents with higher levels of education have been found to utilize advanced approaches with children including involving them in more educational activities (Taylor, Clayton, & Rowley, 2004). Taylor and colleagues (2004) identified that involvement in both superior educational activities and positive adult-child interactions were linked with advance cognitive development among children.

Richman, Miller, and Le Vine (1992) presented significant evidence that mothers with higher levels of education were more likely to use teaching strategies with their children that include asking questions and offering feedback, opposed to using orders. Hoff-Ginsberg (1998) reported that when comparing high school educated with college – educated mothers of 2 years old children, the more educated mothers talked more, asked more questions, and used less directives. Since maternal education was described as an important factor influencing the quality of parent and child verbal interactions and house learning environment, improvement in mothers' educational level could result in positive language and cognitive development changes for children (Raviv, Kessenich, & Morrison, 2004).

Magnuson et al. (2009) examined the link between increasing mother's education and simultaneous improvements in children's language development and learning home environment quality. The authors reported that children's language development and home environment improvements appeared only for high-school educated mothers with 2 years old children. High school graduated women educational level improvements resulted in advanced toddlers' vocabulary knowledge and language expression compared with toddlers that mothers did not improve their education. The same author continued that children with more educated mothers improved their language skills since the language development was linked with daily experiences and the amount of speech that they hear. Educated mothers were found to be more responsive to their children's needs. These mothers tend to talk and listen to what the children had to say and also provided them with advanced learning materials. The researcher finished that toddlers' language development was strongly associated with maternal education level and mother's education improvements could improve child language development (Magnuson et al., 2009).

Language acquisition has been found to be one of the most important childhood fundamental achievements. Unfortunately, language delay prior to school entry was reported for 7% to 20% of children (Levickis, Reilly, Girolametto, Ukoumunne, & Wake, 2014). Children at risk for language delay should be identified not only by language screening tools but also by considering the maternal responsiveness factor. This factor was explained as parent-child interactions and maternal responsive behaviors to child vocalizations and gesture (Levickis et al., 2014). Also, the same authors continued that

the maternal responsive behavior was discussed as important predictors affecting language outcomes in slow-to-talk toddlers. Levickis and colleagues (2014) study results showed that some specific maternal behaviors could predict better language outcomes for 24 to 36 month old toddlers. The researchers discussed that daily positive maternal interactions could affect language outcomes for toddler diagnosed with language delays. Future studies should determine if maternal responsive behaviors at age of 2 could continue to affect language outcomes for children 4 years and older (Levickis et al., 2014).

Language Environment Assessment with LENA

Language assessment practices normally involved a combination of both standard tests and informal evaluation procedures (Caesar & Kohler, 2009). In the past, language assessment could only be done by language sampling technics and the mean length of utterance measurements (MLU). More recently, the Language Environment Analysis (LENA) system was used to collect data on children and adults' language assessments. Ceaser and Kohler (2009) discussed that the practice of language sampling could provide important information regarding a child's grammar skills, vocabulary use, and practical skills. For years this language assessment method was the most widely used informal language evaluation procedure (Wilson, Blackmon, Hall, & Elcholtz, 1991). MLU was recognized as the gold standard in the clinical field of English language based sample examination (Nippold, Hesketh, Duthie, & Mansfield, 2005; Rice, Redmond, & Hoffman, 2006). The MLU language assessment method was also found to strongly correlate with children's age (Miller & Chapman, 1981). MLU was recognized as one of

the most well established child development language maturity indices, significant indicator of vocabulary growth, and lastly as best predictor of pediatrics' syntactic development (Nippold et al., 2005; Rice et al., 2006).

Language assessment practices could present different challenges and inconsistencies (Soderstrom, & Wittebolle, 2013). The recent new technology device called the LENA was the preferred method to assess the children language environment (Xu et al., 2009). The LENA system was designed to specifically measure and evaluate toddler and infant language environments. This small device uses two main software programs, one that recognizes voices and an Advanced Data Extractor (ADEX). The first one is responsible for segmenting speech vs. nonspeech sounds including TV, radio, and silence. The same software then filters out the sounds that were not attributable to an individual in the child's language environment. The LENA speech recognition software has been found to work best in a quiet environment with single speaker. The device eliminates the overlapping conversations from other children or adults and does not include them in the language analysis (Soderstrom, & Wittebolle, 2013). The LENA ADEX software provides an automated analysis of different sounds in the environment that include adult and child vocalization. The software separates the vocalizations between the measured child and other children that are present. Oller (2010) stated that the use of the LENA device and the technology behind it presented a better opportunity to assess young children's language environment variations.

Different research groups have used the LENA device to evaluate the language environment in diverse childcare settings including home and nonmaternal care. Also, in

addition to English speaking populations, the LENA device was used in nonEnglish speaking families including French, Chinese, and Spanish languages. Wood and colleagues (2016) conducted a study to evaluate LENA data from 3 to 5 years old Spanish-English and typical English speaking children. The researchers compared the LENA samples and the MLU from 50-utterance consecutive excerpts of audio files (CEAF) between 42 bilinguals and 39 monolingual children. Wood et al. study results showed that bilingual children had lower typical performance on the LENA samples, MLUw, and total number of words compared with the English-speaking children. The authors noted that the LENA device could be considered a promising tool to examine the language environment for bilingual children. More research is necessary to determine norms for better MLUw and total number of words from CEAF selected samples (Wood et al., 2016).

Canault, Le Normand, Foudil, Loundon, and Thi-Van (2015) evaluated the accuracy of the LENA device in French-speaking children. The LENA validation was important since spoken French (syllable-timed language) has many phonetic and acoustic features compared to English language. The authors collected 10 to 16 hours of recoding from 18 to 48 months old French-speaking children. In order to determine what extend the human and automatic language measurement agreed, the authors used simple and mixed linear models between the LENA data and the adult AWC and CVC estimates. According to the researchers both human and automatic estimates were very reliable for the 324 samples (six 10-min portions of recordings). The authors noted that when controlling the random factors of study subjects and recordings, 1 hour was adequate to

obtain a reliable language sample. It was reported that two age groups including 7 to 12 months old and 3 to 18 months old showed a significant effect on the AWC system data. The subsequent day of recording also showed a significant effect on the CVC system data. When the authors added the noise related factors into the model the only significant effect of signal to noise ratio on the AWC data were reported. Canault and colleagues concluded that the study results provided strong evidences regarding the reliability of the LENA device in French language and could be used to track French children language development.

Gilkerson and colleagues (2015) examined the LENA system's performance for Chinese Shanghai dialect and Mandarin (SDM) languages. The researchers enrolled 22 young children between 3 to 23 months of age and the families provided in-home LENA recording data. The researchers reported that the LENA device demonstrated sufficient sensitivity in recognizing adult talk and child vocalizations, which was equivalent to the American English validation samples. The LENA precision data were stronger for adults compared to child recordings and the adult count was found strongly correlated with both tested languages. The authors also noted that to some extent the LENA data depended to the enrolled child age. The researchers concluded that the LENA adults' word count and conversational turns provided reasonably precise estimations for SDM depending on the different child ages tested.

In addition to research studies done to evaluate the LENA accuracy and reliability in different languages, the device has also been used to test the language environment at home and nonmaternal caregiving settings. Soderstrom and Wittebolle (2013) used the

LENA device to compare the two different settings that include home and kindergarten environments. The authors suggested that more research was necessary to further evaluate the differences between maternal and nonmaternal childcare settings. It was found that even though there has been a large amount of research conducted regarding the importance of the quality of the language environment on the language outcomes, there have been few studies that actually addressed specific factors that could influence the amount of child and adult vocalization within different childcare settings (Soderstrom & Wittebolle, 2013).

Recently additional study groups conducted studies using the LENA device. The authors presented similar results regarding the influence of the language environment and social interactions on a child's language development (Kuhl, 2011; Rowe, 2012; Zimmerman et al., 2009). Different characteristics of language input have been reported to predict language environment quantity, word frequency use, and language diversity (Braine, 1994; Kuhl, 2011; Pan et al., 2005; Rowe, 2012; Weizman & Snow, 2001). For instance, Hart and Risley (1995) conducted a longitudinal study examining the link between language development in early ages and academic achievement. The same study results were reported in a different study that enrolled 30 English-speaking children using the LENA device (Greenwood, et al., 2011). Greenwood and colleagues (2011) stated that, the LENA device could provide valuable and reliable data regarding toddler language environment in different childcare settings. The device has been identified as a preferable language measurement method in English and some nonEnglish speaking populations.

Summary and Conclusions

Data from the last 3 decades has shown that infant and toddler language development is strongly associated with the different factors related to family, maternal, and daycare characteristics (Baydar et al., 2014; Burchinal et al., 2000). Additionally, early childhood identification of children's language development differences could be associated with enhanced language development outcomes later in life (Hoff, 2006). Advanced caregiver education, positive child-caregiver interaction, and classroom quality (group size and child/caregiver ratios) could greatly affect language development (Rentzou & Sakellariou, 2011). According to the Vygotsky (1987) children's cognitive and linguistic development was closely related with daily social interactions and could be socially constructed (Bodrova & Leong, 2007; Schneider & Watkins, 1996). The philosopher suggested that advanced adult interactions could contribute to a child's language skills and overall development (Vygotsky, 1978). The LENA device could present a better opportunity for researchers to identify quantitative differences between maternal and nonmaternal environment in children's linguistic experiences (Soderstrom & Wittebolle, 2013).

The link between children's language development, the language quality, and amount of speech a child hears is well known (Hoff, 2003; Huttenlocher et al., 2002). However, the main issue regarding what influences variability in linguistic input is still less understood and researched (Pan et al., 2005; Soderstrom & Wittebolle, 2013). For example, the family socio-economic status influence on language development has been clearly recognized, though, other factors that affect infant/toddler language development

including childcare environment differences and the caregiver educational level could also be important (Dollaghan et al., 1999; Magnuson et al., 2009; Soderstrom & Wittebolle, 2013). Fewer research groups have examined the influence of childcare settings on infant and toddler language development. The current studies have only evaluated small samples (1 to 2 hours) of speech (Soderstrom & Wittebolle, 2013). Since the LENA device could record up to 16 hours of child/adult speech in their natural environment, the device could offer a better opportunity for researchers to identify quantitative differences between maternal and nonmaternal environment in children's linguistic experiences (Soderstrom & Wittebolle, 2013).

The problem regarding relative factors that influence the amount of speech heard and vocalizations produced by infants/toddlers in different childcare settings and the caregiver education has never been researched in Bulgaria. Quantitative data from different study groups have shown that LENA device could offer advanced options to assess English and nonEnglish speaking language environments (Oller, 2010; Wood et al., 2016). The study findings could present significant differences that could impact toddler language environment and development. This research study could fill the existing gap of understanding the effect of childcare settings and caregiver educational level on the amount of speech spoken by toddlers who spend more time with parents as compared to daycare personnel.

Section 3 includes information regarding study methodology, purpose for the study, research questions and hypothesis, method design, study population, sampling procedures, enrollment procedure, and data collection and analysis.

Chapter 3: Methods

Introduction

The purpose of this quantitative study was to assess the association between childcare settings and childcare provider education level and toddlers' language environment. The study results may promote changes in caregivers' social interactions with children, which could affect the quality of children's language environments. This section includes specific information regarding research design, study rationale, study population, sampling procedures, data collection, and ethical procedures.

Research Design and Rationale

This study had a prospective cross-sectional quantitative study design. This study design was chosen because it was more appropriate than other models. Specifically, I did not use a placebo device; therefore, there was no need to randomize subjects into control and experimental groups (Suresh, 2011). Additionally, the study design and rationale did not require randomization techniques to assess the association between the two different childcare settings and caregiver educational level and the amount of talk that children produced. Frankfort-Nachmias and Nachmias (2008) explained that this design should be used when the data on the study variables are only collected at one time and the study samples are designed with fixed age ranges to assure that the study outcomes difference will not be affected by age-related change. The same authors reported that cross-sectional studies are quick, relatively easy to conduct, and appropriate when multiple study outcomes and exposures are being considered. This methodology has been deemed appropriate when research is being conducted using a convenience sample from a

population at one point in time (Feldman & McKinlay, 1994). Frankfort-Nachmias and Nachmias further stated that researchers should use cross-sectional design because it can offer a good opportunity to answer research questions and receive scientific results.

A quantitative design was appropriate for this study because the LENA device software generated three basic quantitative estimates: AWC, ChildVoc, and Turns. All study indicators were analyzed using quantitative methods. Additionally, the research design was closely linked with the research questions. For instance, all research questions required quantitative data collection and analysis, which were provided by the LENA system and standard study questionnaires. A number of existing studies had used the quantitative research methodology to evaluate children's language environment through the LENA device. For instance, study groups from China, France, Canada, and the U.S. presented quantitative language analysis using the LENA device. The study results showed that the system could provide a representative sample of the child vocalization and vocal environment in ways that were previously not feasible (Soderstrom & Wittebolle, 2013). Moreover, the LENA device's performance and reliability in relation to non-English languages were potentially good, and the device could be used in broader cross-linguistic applications (Greenwood et al., 2011).

This design was also deemed the most appropriate because the study would not experience loss to follow up and would be conducted in natural, real-life settings (Frankfort-Nachmias & Nachmias, 2008). For instance, the research was conducted and study variables were measured during two different days of the week in the children's home or daycare settings, which could be considered their natural settings. Furthermore,

the study design had the potential to provide evidence regarding the association between daycare arrangements for 12- to 24-month-old children and provider education on their language environment at a single point in time. The design could also offer significant evidence regarding child/adult interaction frequencies in the research population at a given point in time. Specifically, this could yield additional information indicating whether the child interacted more frequently with the caregiver depending on the daycare setting and caregiver's level of education. This knowledge could assist childcare providers in planning and allocating language development resources more effectively. Finally, because the study goal was to analyze the association between the toddler language environment and childcare settings and childcare providers' and mothers' education, the cross-sectional design was used to estimate this association.

Study Independent Variables

Two groups of 12 to 15 children and their mothers were included in the study. Children from daycare centers located in Varna region of Bulgaria were considered to participate in this study. Additionally, children who did not attend daycares and their mothers were approached and invited to participate. The independent variables were childcare settings (maternal care and nonmaternal care), childcare providers' and mothers' educational level (less than high school, high school, some college, college degree, graduate degree), childcare providers' years of experience, child sex and age, and whether the mother had more than one child.

Table 1

Independent Variables

Variable	Level of measurement	Values
Childcare setting	Nominal (dichotomous)	1 = home, 2 = daycare
Sex	Nominal (dichotomous)	1 = male, 2 = female
Age	Scale (continuous)	Range: 12 to 24 months
Educational level	Nominal (categorical)	1 = less than high school, 2 = high school graduate, 3 = some college, 4 = college degree, 5 = some graduate work, 6 = master's degree or PhD
Years of experience	Nominal (dichotomous)	1 = 5 years or less 2 = more than 5 years
Number of children	Nominal (dichotomous)	1 = one child 2 = more than one child

Study Dependent Variables

The dependent variables in this study were adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns). AWC provides a raw number of adult words spoken near the research child. ChildVoc provides an estimate of the number of times the research child provided any linguistic vocalization, including speech or babble and excluding vegetative noises. Turns provides information regarding the number of times an adult responded within 5 seconds of the child's vocalization or vice versa. The above-described dependent variables were continuous and generated by the LENA software.

Table 2

Dependent Variables

Variable	Level of measurement	Values
Adult word count (AWC)	Continuous	0 to 999
Child vocalization (ChildVoc)	Continuous	0 to 999
Conversational turns (Turns)	Continuous	0 to 999

Population

The target study population consisted of Bulgarian-speaking male and female children between 12 and 24 months of age. The study subjects were recruited from the Varna region of Bulgaria. The target population size was between 24 and 30 children who either attended full-time nonmaternal daycare centers or were cared for exclusively by their mothers. The participants' mothers were 18 years of age and older and represented various educational and socioeconomic backgrounds. Additionally, mothers could have more than one child. The two study groups included an equal number of children (15).

This research project involved children; this population is considered vulnerable and presents potential ethical concerns. According to Harriss and Atkinson (2013), research studies using human subjects must be conducted ethically by following the principles of the Declaration of Helsinki. Some of the principles expressed in the Declaration are respecting the rights and welfare of study participants, securing appropriate ethics committee approval before conducting a study, providing a clear

description of the research protocol and design, and conducting all study procedures according to the study protocol. For this research, because the children could not give assent to study participation, the mothers provided consent on their behalf.

Sampling and Sampling Procedures

The study participants were selected from different daycares located in the Varna region of Bulgaria. In addition, mothers with children aged 12 to 24 months who took care of their children at home and lived in the same region were invited to participate in the study. For this study, convenience-sampling techniques were used. The sample size was 14 toddlers from different daycares and 15 toddlers from different families who took care of their children at homes located in the Varna region. G*Power analysis was used to determine and compute the effect size and power level chosen for this study (Faul, Erdfelder, Lang, & Buchner, 2007). According to the G*Power 3 computer platform for sample size 30 (15 per group) and with an assumption of 1.1 standard deviation (*SD*), there is 0.84 chance of correctly detecting a statistically significant differences of .05 level between the two groups (Table 3).

Table 3

Means: Difference Between Two Independent Means (Two Groups)

Analysis:	Post hoc: Compute achieved power	
Input:	Tail(s)	= Two
	Effect size d	= 1.1111111
	α err prob	= .05
	Sample size Group 1	= 15
	Sample size Group 2	= 15
Output:	Noncentrality parameter δ	= 3.0429031
	Critical t	= 2.0484071
	df	= 28
	Power ($1-\beta$ err prob)	= 0.8357395

Because the main disadvantage of the convenience sampling is selection bias, the daycare locations were randomly selected by assigning a number (1 to 14) to each of the daycares located in Varna region. Then, six daycare locations were selected for inclusion in the study. The daycare locations were distributed across different locations throughout the Varna region and therefore represented a fairly broad spectrum of the population. All toddlers from the randomly selected daycare locations were eligible to participate in the study. The inclusion criteria specified that participants needed to be 12- to 24-month-old Bulgarian-speaking children and their mothers aged 18 years or older.

Exclusion criteria pertained to non-Bulgarian-speaking children and their mothers. Additionally, children younger than 12 months and older than 24 months were excluded from the study. Study participants lived in the Varna region and were not planning to relocate during the study. The statistical power or the level of significance was $\alpha < .05$. The randomization plan enhanced the validity of the nonprobability

sampling procedure to eliminate possible sources of bias (Frankfort-Nachmias & Nachmias, 2008).

Procedures

Recruitment, Participation, and Data Collection

The study included two recruitment procedures. The first procedure was to enroll children who attended full-time daycare, and the second procedure was to enroll children who were taken care of by their mothers or legal guardians in the home. Therefore, two different recruitment strategies were used to enroll eligible participants. The enrollment procedure for children who were cared for by their mothers or legal guardians at home was as follows.

Mothers or legal guardians of children 12 to 24 months of age were recruited to participate in the study via flyers, emails, and word of mouth from two sources: medical personnel from Varna University medical centers and personnel from local women's organizations. Interested mothers or legal guardians used the phone number provided in the flyers or emails to call to request additional information regarding study participation. During the call, I explained the study; if the mother or legal guardian was interested, I screened him or her over the phone to determine study eligibility. If the mother or legal guardian was eligible to participate, I invited him or her to meet with me at the Varna University office or another location convenient for the participant. During the first study visit, I explained the study procedures, and if the mother or the legal guardian was interested in participating, I asked him or her to sign the informed consent form (ICF), of which participants received a copy.

The second group was enrolled from different daycare centers located in the Varna region. The regional director of daycare centers was contacted for approval. All of the participating daycare centers were randomly selected. A total of six daycares were used to enroll the study participants. At every daycare, there were two to three different groups led by separate daycare personnel. Therefore, the different groups were considered different daycare settings. Only one child per daycare group could be enrolled and wear a LENA device. I approached the children's mothers or legal guardians to ask if they were interested in their children participating in the study. During this meeting, I explained the study. If a mother or legal guardian was interested, I screened him or her to determine study eligibility. All interested mothers or legal guardians followed the same consent procedure described above. In addition to mothers or legal guardians, daycare personnel who took care of enrolled children provided consent. The daycare staff completed a brief questionnaire regarding their educational level and years of experience.

Study Participation

All mothers or legal guardians who signed the consent form completed a brief demographic questionnaire and received a packet containing two LENA digital language processors (DLP), instructional materials on how to use LENA, a recording session questionnaire, and one piece of clothing to use with the LENA device. The LENA clothing was designed to maximize comfort and optimal recording. Parents followed instructions to record the spontaneous speech that occurred within the child's natural environment for one continuous 16-hour day. For instance, the mother or legal guardian was instructed on how to turn on the device in the morning and how to turn it off at the

end of the recording day. The mothers or legal guardians had to place the LENA device on the children in the morning. The device should not be used during bath time or in the pool. Additionally, the mother or legal guardian needed to remove the device during naptime. The home-cared children followed the daycare schedule for consistency.

For the study participants who attended daycare, the mothers or legal guardians had to place the device on the children when they arrived at the daycare. The daycare personnel needed to remove the device during naptime. The device needed to be placed on the children until the end of the daycare day. The same procedure was followed for the second day of LENA recording. I collected the LENA devices from the mother, the legal guardian, or the daycare personnel at the end of the day. The mothers or legal guardians and the participating daycares were compensated for their study participation. Individuals who did not qualify for the study due to the inclusion/exclusion criteria or who did not complete 2 days of LENA recordings were excluded from the study.

No names or personal information were required for this study. In order to download the LENA recordings, I obtained the date of birth (DOB) and sex of the enrolled children. Audio files were transferred to a computer where the LENA system software automatically analyzed them. Once the computer automatically processed the audio file, the audio recording data file was deleted. This practice ensured that the privacy of study participants was preserved.

Data Analysis

SPSS will be used to calculate descriptive statistics, percentage agreement, analysis of covariance (ANCOVA), simple and multiple linear regressions. The study

participants were screened to determine eligibility. The goal was to estimate the correlation between the LENA variables and three independent variables of interest: maternal education, daycare staff education, and childcare setting. The screening form included questions regarding mother and child age and if she was planning to relocate before study participation. The study research questions and hypothesis are described as following:

Research Question(s) and Hypotheses

RQ1: Is maternal education level associated with an increase in adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns)?

Null hypothesis: There is no association between maternal education and the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

Alternative hypothesis: There is an association between maternal education and the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

RQ2: Is the education level of daycare staff associated with an increase in adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns)?

Null hypothesis: Daycare staff education level is not associated with the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

Alternative hypothesis: Daycare staff education level is associated with the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

RQ3: Is the childcare setting associated with increases in adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns)?

Null hypothesis: The childcare setting is not associated with the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

Alternative hypothesis: The childcare setting is associated with the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

The LENA device collected between 12 to 16 hours of recordings from 2 nonconsecutive days. The three study measurements included AWC, ChildVoc, and Turns and all of these measurements were outputted in one-hour block. For instance, data generated by the LENA device indicated the number of child vocalizations and adult words spoken within 6 to 10 feet of the child between 8:00 AM – 9:00 AM, 9:00 AM - 10:00 AM, etc. These word counts per 1-hour block were used by the LENA device to generate the three dependent variables. The recordings from each participant were used to compute the daily averages of AWC, ChildVoc, and Turns. Then those data were used to compare the AWC, ChildVoc, and Turns between two groups (home and daycare settings) and the caregivers' educational level. Study results were interpreted depending on the difference in the mean number of AWC, ChildVoc, and Turns collected in the

home compared to daycare childcare settings. Also, the mean differences of the same variables were compared depending on the caregivers' educational level childcare providers' years of experience, the child sex and age, and if the mother is having more than one child.

The segments that were shorter than 1 hour were excluded from the analysis. Most likely these were the beginning and end of the LENA recordings or at any time when the device was paused. The potential confounders to control for included the childcare personnel years of experience, child age, family annual income, and whether the mother has more than one child. The covariates that were collected at baseline include child's age, gender, and parents' demographics. The confounders and covariates were included in the study analysis because of evidence found in different research studies that they could possibly affect the child language environment. Specifically, authors from different study reported that language development process could be affected by children being exposed to more parents' communications, cared by well-educated and experienced daycare personnel, and also depending on the socioeconomic (SES) status, and the sex of the child (Thomas, Forrester, & Ronald, 2013).

Gilkerson, and Richards (2009) and Hart and Risley (1995) found that distinguished academic advantages exist for children when they are exposed to parents who talk to them more. Gilkerson, and Richards also reported that they were significant evidence that mothers talk to daughters more than to their sons. For instance, the same authors noted that up to 30 months, mothers talk to their female child close to 9% more compared to their male child. Parents talk more or less to their child depending upon if

the child is the first or latter born. On average, parents talk more to the first-born. For instance, first-born baby is exposed to 1,338 more words a day than the latter born child (Gilkerson & Richards, 2009). Moreover, Gilkerson and Richards reported that mothers and fathers talk more to their first-born son than their latter-born sons, however they spoke equally to their daughter regardless of birth order.

Clarke-Stewart and colleagues (2002) noted that children that attended daycare with more educated, trained, and experienced caregivers showed better scores on cognitive and language development tests. Language development variations were also linked with the family SES status and child sex (Barbu et al., 2015). For instance, low SES and language outcomes were extensively examined; however, the low SES influence on language development comparing boys with girls has not been thoroughly investigated (Baydar et al., 2014). Even though it is broadly believed that girl's language develops faster than boys, research findings have been mixed (Barbu et al., 2015).

Thomas et al. (2013) pointed out that SES was well-recognized environmental factor that could predict important differences in children's cognitive and language development. In general, assessing parents educational and income level could be a sufficient predictor regarding parental SES; however, these measurements could not be relevant to accurately evaluation the cognitive development. The same authors stated that since different environmental factors interact with SES, it has been challenging to assess the fundamental pathways by which SES affects child development. Low SES has been found to be associated with poor parental care. This could impact child verbal communication development and discipline. Lastly, low SES was linked with poor home

environment including accessibility of books, electronics, spending time outside, and parental communication (Thomas et al., 2013).

LENA Device Validation

The dependent variables would be provided by the LENA device and would include AWC, ChildVoc, and Turns. Xu, and colleagues (2009) presented significant evidence that the LENA DLP system could produce valid and reliable assessments of the language environment of English speaking toddlers and infants. The authors stated that the LENA Automated Vocalization Assessment (AVA™) software was designed to provide parents and health professionals with data regarding toddler and infants' expressive language development of 2 to 48 months old children. Additionally, the language assessment information was based on the LENA automatic estimates of audio recordings that were conducted in the child the natural environment. The device estimates were reported reliable and valid predictors of potential language delay (Xu et al., 2009).

The LENA quantitative acoustic data were summarized to basic components that were used as input for age related multiple linear regression models. Furthermore, the AVA software could utilize these regression models to produce valuable data regarding children's expressive language development as average scores, developmental age assessments, and estimated mean length of utterance (EMLU). Therefore, Xu, and colleagues (2009) concluded that AVA expressive language estimates were described as statistically reliable and validity comparable to standard expressive language evaluations usually performed by speech language pathologists. According to the same researchers the LENA validity and utility measures were not limited only to English speaking

population.

Recently, different research groups conducted studies to evaluate the LENA device reliability and validity in nonEnglish speaking populations. For example, Weisleder and Fernald (2013) reported that the LENA device could reliably evaluate the adult word use frequency of Spanish language environments. Gilkerson and colleagues (2014) stated that the LENA device could provide reasonably accurate estimates regarding AWC and Turns for Chinese speaking population. The same authors also stated that regardless of the study limitations the results were encouraging for broader cross-linguistic applications. Canault et al. (2015) evaluated the LENA reliability in French. The authors reported that the simple correlational analyses showed a significant reliability on the AWCs and ChildVocs data. The authors also discussed that in French language the reliability between LENA and human count was consistent with the Spanish language reliably study. Therefore, all study findings suggested and supported LENA reliability assessments in French language environment.

In sum, the LENA device AVA software estimates could be considered reliable and valid to measure infants and toddlers' language environment not only in English but also in nonEnglish speaking population. Moreover, the AVA primary advantage was pointed out as reliable development-screening tool to perform standard expressive language evaluations, which generally were administered by speech language pathologists. The LENA device provided the current study with reliable and valid data since it allowed an effectively unobstructed assessment of the child natural language environment depending on the childcare settings and provider education. Finally, the

AVA scores provided a diverse and possibly more accurate determination of the research child's actual ability than the usual clinical setting (Xu et al., 2009).

Threats to Validity

According to Wludyka (2011), the internal validity concern is causality or the strength of associating causes to an outcome. The same author reported that this issue is not relevant for most observational studies. For instance, some common threats to internal validity include: history, maturation, statistical regression, selection, experimental mortality, testing, instrumentation, design contamination, and selection-maturation interaction. To examine the internal validity for this study, the following threats to internal validity were evaluated: experimental mortality and instrumentation. The experimental mortality is regarding dropouts and loss to follow-up. The main issue was parents and children dropping out of the study since the study participants were not followed-up. The study results were not impacted from dropouts since the study was short (study participation was two days) and the mothers were aware about the study participation and procedures and they volunteer to participate in the study. Missing data was another problem. This had a limited impact, since I explained to the mothers in great details how the LENA should be place on the child. The mother had a phone number to call if she experienced any issues. The LENA device is easy to use and is made especially for children therefore; missing data were relatively small. For instance, I missed the LENA recordings for one study participant. For the cross-sectional study, one major threat of internal validity could be the difference in participants' ages in the two groups. For the current study, the age of the two groups of children was relatively close between

12 and 24 months and the two groups included an equal number of children (Miller, 2007).

The external validity is linked with study result generalizability. The possible threats of external validity could be effect of settings/situations and reactive effect of experimental arrangement (Miller, 2007; Wludyka, 2011). The current study sample size was small (29 children) and that was a possible error of generalization. However, a similar study was conducted in Canada to evaluate the effect of two different childcare settings on the child language environment and the researchers reported significant initial results using smaller study population (12 children or six per group). Wludyka (2011) also noted that if there is a potential threat to external validity this could be considered as inspiration for additional research with more and different study participants. Therefore, this study could lead the way to more language environment research in Bulgaria and help to assist parents and caregivers to better interact with toddlers. Additionally, a problem could be related to parent and caregiver awareness that they are participating in study. For instance, some parents, legal guardians, or daycare caregivers might change their behaviors during the study including talking more to the enrolled children or engaging in more conversations with them. This was not a threat because mothers, legal guardians, and caregivers that reside in the Varna region had an equal chance to be selected to participate in the study.

Ethical Procedures

The Walden University Institutional Review Board (IRB) reviewed and approved all study materials before study conduction. Along with the Walden University IRB

approval the Varna Medical University Research Ethics Board also approved this research project. Participating parents, childcare caregivers, and daycare directors provided written informed consent. The parents or legal guardians provided the informed consent for both themselves and on behalf of their children. The recruitment materials included flyers and return emails that were submitted and approved by both Walden University and Varna University IRBs (Appendix A contains the drafts of the study flyer and return email). Also, researchers from Bulgaria were involved with translating and approving the correct language used in the enrolment materials (Appendix B contains the email and signed letter of cooperation from Varna University official). No ethical concerns were considered in relation of the enrollment materials.

The use of the LENA device presented minor ethical concerns related to data collection. The LENA device created an audio record of the child environment. Therefore, there was a risk of recording information that the participants may not wish to share. However, it was emphasized that (1) the audio file were encrypted and could only be read with software in my office; (2) I did not listen to the LENA audio file; and (3) once the data and four variables were obtained, the recordings were deleted from the LENA device. Even with those safeguards in place, the participant could pause the recording for any reason if they want to, they were instructed how to do this and the recording was stopped. The study participants were instructed how to restart recording and place the LENA device back in the child's clothing. All these procedures were explained in the Informed Consent Form and the LENA demo was used to show the participant how to use the device.

No names, addresses, or phone numbers were used during data analysis. The study participants received a unique maternal identification number (ID) and all data were collected and saved under this number. In the LENA database the children were identified by their unique maternal ID number, thus there was no identifying information in the LENA database. In order to download the LENA recordings, the I collected the date of birth (DOB) and sex of the child. Once the reports were produced, I deleted the audio recording file to ensure that no one will ever be able to listen to the content of the file. The LENA device has the digital memory capacity to record a child's language environment continuously for 16 hours. The audio file was transferred to a computer where the LENA System software automatically analyzed it (that is, I could not listen to the audio recording to produce the reports).

The research data were stored in a password-protected database. The study laptop had PGP Whole Disk Encryption. While the LENA system digitally records voices, the LENA system only analyzed data and there was no access to the recorded voices by me. This feature of the LENA system means that only the data were available and the recorded voices were digitally erased when the data is automatically analyzed. The LENA recording system analyzed digitally recorded voices, but the system was set on analyze data only, which did not allow for transcription of the vocal recordings.

In summary, the cross-sectional quantitative study design was chosen for this research because it was more suitable compared to other models. For instance, this design was considered the most appropriate for this dissertation proposal for various reasons. Conducting the study was relatively inexpensive and did not take a long time to

complete. This design was discussed as reasonable to be used when the researcher was not using placebo and no randomization techniques were required to accomplish study purpose (Frankfort-Nachmias & Nachmias, 2008; Suresh, 2011). Additionally, this methodology was recommended for studies that were using convenient sample from the population at one point in time (Feldman, & McKinlay, 1994). The quantitative methodology was also appropriate since I collected quantitative data that and thus, all study variables were analyzed by this method. Also, no follow up were required, making this an additional reason to consider the proposed design for research studies of this methodology (Mann, 2003).

Other research groups that used the LENA device to assess the child's language development preferred the same design. The authors were able to report significant results regarding factors affecting language development in English and non-English population in ways that were previously not possible (Soderstrom & Wittebolle, 2013). Consequently, the study design and methodology offered a good opportunity to access the child language environment for children that were exposed to different childcare settings and caregivers' education level in Bulgaria. This study results provided the Bulgarian caregivers with additional knowledge to better communicate with young children and enhance their language development during important period their growth.

Chapter 4 includes information regarding data collection, the LENA device use and challenges with the data collection, and the study results.

Chapter 4: Results

The purpose of this quantitative study was to assess the association between childcare settings and childcare provider educational level and toddlers' language environment. The research questions and hypotheses were as follows:

RQ1: Is maternal education level associated with an increased amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns)?

Null Hypothesis₁: There is no association between maternal education and the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

Alternative Hypothesis₁: There is an association between maternal education and the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

RQ2: Is the education level of daycare staff associated with an increased amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns)?

Null Hypothesis₂: Daycare staff education level is not associated with the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

Alternative Hypothesis₂: Daycare staff education level is associated with the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

RQ3: Is the childcare setting associated with an increased amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns)?

Null Hypothesis₃: Childcare setting is not associated with the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

Alternative Hypothesis₃: Childcare setting is associated with the amount of adult word count (AWC), child vocalization (ChildVoc), and conversational turns (Turns).

This chapter includes information regarding the data collection, main study results, and final conclusions.

Data Collection

I completed data collection for this study in the Varna region of Bulgaria. Participant enrollment and data collection were accomplished within a month. Enrollment started on April 3 and continued until April 22, 2017. The initial plan was to use two different recruitment strategies to assess the two different language environments. The first strategy would involve assessing children who were cared for fully by their mothers in their home environment, and the second strategy would involve assessing the language environment of children who were attending full-time daycare.

To assess the first language environment, mothers or the legal guardians of children 12 to 24 months of age were recruited via flyers and word of mouth from a local community center and a medical center. Specifically, mothers and their children who had

never attended daycare services were enrolled from one medical center. I met with the medical staff to explain the study procedures. Additionally, flyers were distributed in the waiting room for mothers to review. The clinic staff contacted eligible mothers and invited them to meet with me. Additionally, mothers who heard about the study by word of mouth contacted me by phone and requested additional information. All interested mothers met with me at a convenient location. A total of 17 mothers met with me, out of which 16 consented and agreed to complete the 2 days LENA recordings. However, one mother was excluded from the study because her child did not want to wear the LENA vest, and one mother was not eligible to participate due to her child attending part-time day care. The response rate was high. For instance, a total of 10 mothers contacted me during the first week of April, and seven additional mothers contacted me during the second week of the same month. Between April 4 and April 25, I enrolled 15 mothers, all of whom completed the 2-day LENA recording sessions.

To assess the second language environment, mothers and their children who attended full-time day care were enrolled following the procedure explained in Chapter 3. Specifically, on April 10, 2017, I met with the Varna daycare regional director. During the initial meeting, I randomly selected six daycares located in the Varna region. The regional director contacted the six daycares and invited them to participate in the study. All six daycare directors received the study information via email and contacted me with a meeting request. I met with the six directors and explained the study to their daycare personnel. Throughout the week of April 10, the daycare personnel contacted all eligible children's mothers and obtained consent for the children to participate in the study. A

total of 17 mothers agreed to participate in the study. However, three children from two different daycares were withdrawn. Two mothers from the first daycare refused to complete the second LENA recording, which rendered them subject to the study exclusion criteria. Further, in the second daycare, I received the LENA device without recordings due to the nurse not turning the device on during both days. Therefore, a total of 14 children were included in the study and completed both days of the LENA recordings.

The only discrepancy from the initial enrolment plan was increasing the number of study participants from 30 to 34. This change to study participant numbers was submitted to the Varna University ethical committee. After receiving approval, I enrolled three additional subjects (two from the daycare settings and one from the home setting group). This change enhanced my effort to enroll the anticipated number of study participants.

The target study population consisted of Bulgarian-speaking male and female children between 12 and 24 months of age. All study subjects were enrolled from the Varna region of Bulgaria. The target population consisted of 14 children who attended full-time nonmaternal daycare centers and 15 children who were for cared exclusively by their mothers at home. The participants' mothers were 18 years of age or older and represented various educational and socioeconomic backgrounds. Specifically, a total of eight females (28%) and 21 males (72%) children were enrolled in the study. The mothers were between 27 and 39 years of age; eight had a high school diploma, two had a college degree, and five had a graduate degree. Additionally, six of the mothers had more

than one child. The daycare personnel consisted of 14 nurses, out of which eight (57%) had an associate's degree and six (43%) had a bachelor's degree. Finally, two of the nurses had less than 5 years of experience.

I used G*Power analysis to determine and compute the effect size and power level chosen for this study (Faul, Erdfelder, Lang, & Buchner, 2007). According to the G*Power 3 computer platform for sample size 30 (15 per group) and with assumption of 1.1 standard deviation (*SD*), there is 0.84 chance of correctly detecting statistically significant differences of .05 level between the two settings. I enrolled 29 study participants; therefore, the sample size provided good evidence for correctly detecting statistically significant differences of .05 level between the two language environments. Because the main disadvantage of convenience sampling is selection bias, daycare locations were randomly selected by assigning a number (1 to 14) to each of the daycares located in the Varna region. Then, six daycares were selected for inclusion in the study. The daycares were distributed in different locations throughout the Varna region and therefore represented a fairly broad spectrum of the population. The statistical power or level of significance was $\alpha < .05$. The randomization plan enhanced the validity of the nonprobability sampling procedure to eliminate possible sources of bias (Frankfort-Nachmias & Nachmias, 2008).

External validity is linked with study result generalizability. Possible threats to external validity were linked with the effect of settings/situations and the reactive effect of experimental arrangement (Miller, 2007; Wludyka, 2011). The current study sample size was small (29 children), and that may have led to error of generalization. A similar

study was conducted in Canada to evaluate the effect of two different childcare settings on the child language environment, in which the researchers reported significant initial results using a smaller study population (12 children, or six per group). The current study is the first to present significant data regarding the language environment of toddlers living in Bulgaria using the LENA device. Additionally, Wludyka (2011) noted that if there is a potential threat to external validity this could be considered as inspiration for additional research with more and different study participants. Thus, the current study findings could lead the way to more language environment research in Bulgaria and assist mothers and caregivers in interacting more effectively with toddlers. Furthermore, external validity problems could be related to parents' and caregivers' awareness that they were participating in study. Specifically, some mothers, legal guardians, or daycare caregivers might have changed their behaviors during the study, such as by talking more to the enrolled children or engaging in more conversations with them. This was not considered a threat because mothers, legal guardians, and caregivers who resided in the Varna region had an equal chance to be selected to participate in the study.

The potential confounders to control for included the childcare personnel's years of experience, child age, and whether the mother had more than one child. The covariates that were collected at baseline included child's age, gender, and mother's demographics. The confounders and covariates were included in the study analysis because of evidence found in different research studies that they could might affect the child language environment. Specifically, authors from a different study reported that the language development process could be affected by children being exposed to more

communication from their mothers, by children being cared for by well-educated and experienced daycare personnel, and by the sex of the child (Thomas, Forrester, & Ronald, 2013). One-way ANCOVA in SPSS was performed to justify inclusion of covariates in the model. The covariates used in the model included child age and gender. The results showed that the covariate gender of the child was not significantly related to the mean number of AWC, Turns, and ChildVoc in both settings. The second model included child age. In this model, child age was not significantly associated to the mean number of AWC and Turns in both settings. However, child age was found to be significantly related to ChildVoc with $p = .007$.

The research children wore the LENA device during two nonconsecutive days. The recording started at approximately 8:00 a.m. for all children. The recordings from the two childcare settings varied, and in order to adopt a standard of measurement, I included in the analysis 7 hours of recordings for all children. All recordings started at approximately 8:00 a.m. and ended at approximately 4:00 p.m. The recordings for the childcare group were between 7 and 9 hours and for the home setting group were between 9 and 13 hours. The 2-day LENA recordings were completed as planned. No challenges were experienced during data collection, and no adverse events were reported during the conduct of the study.

Study Results

The study participants were 29 children between 12 and 24 months of age in Varna, Bulgaria. The LENA recordings were completed in daycare centers ($n = 14$) and home environment ($n = 15$; see Table 4). In the daycare setting, there were 11 males and

three females, with a mean age of 21.3 months (range 15 to 24 months) and *SD* of 2.34. There were 14 separate daycare recordings in the study, and four of the centers contributed data from 13 separate rooms. Taking into account that the separate rooms were taught by different sets of nurses and were attended by different groups of children, they were treated as separate in the analysis. The daycares in Bulgaria are highly regulated and government sponsored. The daycare staff consisted of 14 nurses aged between 24 and 70 years, with a mean age of 49 years and *SD* of 13.2. Two of the nurses reported less than 5 years of experience, and 12 of the nurses reported more than 5 years of experience. Further information on the characteristics of the daycare setting participants is presented in Table 5.

In the homecare group, there were 10 males and five females, with a mean age of 17.7 months (range 12 to 24 months) and *SD* of 4.07. The mothers' demographic characteristics were as follows: Eight mothers had completed high school, three had a bachelor's degree, and four had a graduate degree. The mothers were between 27 and 39 years of age, with a mean age of 29 years and *SD* of 3.2, and for nine mothers, the participating child was their first child. Specific information regarding the homecare setting participants is presented in Table 6.

Table 4

Child Participant Demographics and LENA Recording Information

Child ID	Setting	Sex	Age (months)	Recording Day 1 (D/M/Y)	Recording length (hours)	Recording Day 2 (D/M/Y)	Recording length (hours)
H01	Home	M	22	4/5/2017	11	4/7/2017	11
H02	Home	M	24	4/7/2017	9	4/9/2017	9
H03	Home	M	21	4/6/2017	11	4/8/2017	12
H04	Home	M	21	4/10/2017	13	4/12/2017	12
H05	Home	M	19	4/10/2017	12	4/12/2017	11
H06	Home	M	14	4/8/2017	9	4/10/2017	10
H07	Home	M	14	4/9/2017	10	4/11/2017	10
H09	Home	F	18	4/9/2017	11	4/11/2017	12
H10	Home	M	12	4/11/2017	9	4/13/2017	11
H11	Home	F	16	4/12/2017	13	4/14/2017	11
H12	Home	F	14	4/18/2017	10	4/20/2017	10
H13	Home	M	19	4/19/2017	9	4/21/2017	12
H14	Home	F	19	4/29/2017	11	4/21/2017	11
H15	Home	M	12	4/23/2017	13	4/25/2017	13
H16	Home	F	24	4/19/2017	11	4/21/2017	11
Y01	Daycare	M	15	4/12/2017	7	4/18/2017	9
Y02	Daycare	M	23	4/12/2017	7	4/18/2017	7
Y03	Daycare	F	24	4/12/2017	7	4/18/2017	7
Y04	Daycare	M	22	4/12/2017	7	4/18/2017	6
Y05	Daycare	M	20	4/12/2017	8	4/18/2017	6
Y06	Daycare	F	20	4/12/2017	7	4/18/2017	8
Y07	Daycare	M	22	4/12/2017	7	4/18/2017	6
Y08	Daycare	M	22	4/12/2017	7	4/21/2017	6
Y09	Daycare	M	21	4/12/2017	7	4/18/2017	7
Y10	Daycare	M	20	4/12/2017	7	4/24/2017	7
Y11	Daycare	M	20	4/12/2017	9	4/18/2017	8
Y12	Daycare	M	23	4/12/2017	8	4/18/2017	8
Y13	Daycare	M	23	4/12/2017	7	4/18/2017	7
Y14	Daycare	F	24	4/13/2017	7	4/18/2017	7

Table 5

Daycare Setting Participants' Characteristics

Characteristics	n (%)
Child sex	
Male	11(79)
Female	3(21)
Child age	
15 to 20 months	5(36)
21 to 24 months	9(64)
Daycare personnel's education	
Associate's degree	6(43)
Bachelor's degree	8(57)
Daycare personnel's experience	
Less than 5 years	2(7)
More than 5 years	12(93)

Table 6

Homecare Setting Participants' Characteristics

Characteristics	n (%)
Child sex	
Male	10 (67)
Female	5(33)
Child age	
12 to 19 months	8 (67)
21 to 24 months	7(33)
Mother's education	
High school	8(53)
Bachelor's degree	3(20)
Graduate degree	4(27)
Number of children	
1 child	9(60)
More than 1 child	6 (40)

I used the LENA software suite (version 3.5.0) to generate the dependent variables, Adult Word Count (AWC), Child Vocalization (ChildVoc), and Conversational Turns (Turns). The AWC provided a raw number of adult words spoken near the research child. The ChildVoc provided an estimate of the number of times the research child provides any linguistic vocalization that included speech or babble and excluded the vegetative noise. Finally, the Turns provided information regarding the number of times an adult responded within 5 seconds of child vocalization or vice versa. For all three dependent measures, the adult and child speech that occurred under noisy, silent, and distance conditions or shorter than 1 hour recordings were excluded from the analysis.

During the study, the LENA device collected a total of 58 the LENA 2-day recordings between 7 to 13 hours. The AWC, ChildVoc, and Turns were outputted in one-hour blocks. The recordings from each participant were used to compute the daily averages of the AWC, ChildVoc, and Turns. Then those data were used to compare the AWC, ChildVoc, and Turns between the home and daycare settings groups and the caregivers' educational level. Study results were interpreted depending on the difference in the mean number of the AWC, ChildVoc, and Turns collected in the home compared to daycare childcare settings. Also, the mean differences of the same variables were compared depending on the caregivers' educational level childcare providers' years of experience, the child sex and age, and if the mother is having more than one child.

The study independent measures included the childcare settings (maternal care and nonmaternal care), childcare providers', and mothers' educational level (less than high school, high school, some college, college degree, a graduate degree), childcare

providers' years of experience, the child sex and age, and if the mother had more than one child. Specifically, the data study analysis was used to estimate the correlation between the dependent variables AWC, ChildVoc, and Turns and the independent variables of interest that included maternal education, daycare staff education, and childcare settings.

The simple linear regression was performed using the independent variable mothers' education level (less than high school, high school, some college, college degree, and a graduate degree) and the AWC, ChildVoc, and Turns as dependent variables. The simple linear regression model showed that there was nonsignificant association between of mean number of the AWC, ChildVoc, and Turns (dependent variables) and the independent variable mothers' educational level. Both mother's education and number of children were included in the multiple linear regression models to test whether there was interaction between the two variables. The model suggested that both of these variables showed nonsignificant association with the dependent variables AWC, ChildVoc, and Turns. Therefore, the null hypothesis associated with the first Research Question could not be rejected.

The second simple linear regression was performed using the independent variable childcare personnel' educational level (less than high school, high school, some college, college degree, a graduate degree) and the AWC, ChildVoc, and Turns as dependent variables. The simple linear regression model showed that there was nonsignificant association between the mean number of the AWC, ChildVoc, and Turns and the independent variable daycare personnel' educational level. When both daycare

education and daycare personnel experience were included in the multiple linear regression models to test whether there was interaction between the two variables. The model suggested that both of these variables showed nonsignificant association with the dependent variables AWC, ChildVoc, and Turns. Therefore, the null hypothesis associated with the second Research Question could not be rejected.

Additional simple linear regressions were performed by using the two independent variables childcare setting (1 = home; 2 = daycare) and the AWC, ChildVoc, and Turns as dependent variables. The simple regression model showed that there was a significant association between the mean number of the AWC (dependable variable) and the independent variables (childcare setting) and the significant regression equation was $F(1, 27) = 4.3635, p = .046$ with R^2 of .139. Specifically, the mean number of the AWC was negatively associated with the childcare setting. The children who attended full time daycare heard 342 less words per hour than the children who were cared by their mothers (Table 7).

Table 7

Adult Word Count Simple Linear Regression Model Table

Independent variable	B	SE B	β
Childcare setting	-341.529	163.513	-0.373

Note. Dependent variable: MAWC
 $p < .05$

Additionally, the linear regression model showed that there was a moderate relationship between the AWC and childcare setting with $R = .373$ while $R^2 = .139$ suggested that 14% of the variance in the AWC could be explained by the child daycare setting. The confidence interval (CI) ranged from -677.030 to -6.028, which means that 1-unit increase of the childcare setting would result in AWC decrease by 342. In other words, there was significant association between the AWC and the childcare setting with $p = .046$.

The next simple linear regression model showed that there was a significant association between the mean number of the ChildVoc (dependable variable) and the childcare setting (home vs. daycare) with the following significant regression equation: $F(1, 27) = .6.098$, $p = .020$ with an R^2 of .154. Specifically, the ChildVoc was also negatively associated with the childcare setting or the children who attended full time daycare vocalized 56 less vocalizations per hour than the children who were cared by their mothers (Table 8).

Table 8

Child Vocalization Simple Linear Regression Model Table

Independent variable	B	SE B	β
Childcare setting	-55.867	22.623	-0.429

Note. Dependent variable: MChildVoc
 $p < .05$

Also, the model summary suggested there was a moderate relationship between the ChildVoc and childcare setting with $R = .429$ while $R^2 = .184$ suggested that 18.4% of the variance in the ChildVoc could be explained by the child daycare setting. The CI

ranged from -102,288 to -9.448, which means that 1-unit increase of the childcare setting would result in ChildVoc decrease by 56 child vocalizations. In other words, there was significant association between the ChildVoc and the childcare setting with $p = .020$.

Since, the child age covariate was found significantly related to the ChildVoc, an additional multiple linear regression models were performed that included both the child age and the childcare setting. This model showed that both variables were significantly associated with the dependent variable ChildVoc. For instance, when including the child age in the model the ChildVoc was still negatively associated with the childcare setting. However, vocalization increased from 56 to 89, or the children who attended full time daycare pronounced 89 less vocalizations per hour than the children who were cared by their mother $F(2,26) = 8.264, p = .002$ (Table 9).

Table 9

MChildVoc Multiple Linear Regression Models Table

Independent variable	B	SE B	β
Childcare setting	-88.769	53.509	-0.682
Child age	9.079	3.08	0.518

Note. Dependent variable: MChildVoc.

$p < .05$

The last simple linear regression model showed that there was a significant association between the mean number of the Turns (dependable variable) and the independent variable childcare setting and the significant regression equation was $F(1, 27) = 12.752, p = .001$ with R^2 of .321. Moreover, the Turns variable was also negatively associated with the childcare setting or the children who attended full time daycare were

engaged in 22 less conversations per hour with the daycare personnel compared with the children who were cared by their mothers (Table 10).

Table 10

Conversation Turns Simple Linear Regression Model Table

Independent variable	B	SE B	β
Childcare setting	-22.314	6.249	-0.566

Note. Dependent variable: MTurns
 $p < .05$

According to the same linear model there was a strong relationship between the mean numbers of Turns and childcare setting with $R = .666$ while $R^2 = .321$ suggested that 32 % of the variance in the Turns per hour could be explained by the child daycare setting. The *CI* ranged from -35.136 to -9.493, which means that 1-unit increase of the childcare setting would result in Turns decreased by 22 less conversation per hour. In other words, there was significant association between the Turns and the childcare setting with $p = .001$. Therefore, the multiple linear regression models suggested that the null hypothesis associated with the third Research Question could be rejected and the alternative hypothesis could be approved.

Summary

The sample size for this study was close to the original planed (29 children) and therefore, the data were considered a representative sample of these specific settings and supported some significant study results. After conducting linear regression models, the null hypotheses associated with the research questions one and two could not be rejected. The study results suggested that the educational level of the childcare providers did not

have significant effect on the adult words pronounced by the childcare providers, number of child vocalization, and the conversational turns. However, the study analysis showed a significant correlation between the childcare setting and the mean number of the adult words spoken around the child, child vocalizations, and conversation turns. More importantly, the study findings suggested the children in the daycare settings heard an average of 342 less adult words per hour, vocalized 56 less vocalizations per hour, and were engaged in 22 less conversations per hour with daycare personnel. These results provided good evidence regarding the differences in the language environment in the two different settings. Consequently, better childcare practices in the Bulgarian childcare centers especially for children between one and 2 years of age were necessary to provide the toddler with needed support and attention to enhance their development, which ultimately could affect their cognitive, emotional, and social development academic achievement later in life (Rowe, 2008; Tayler & Sebastian-Galles, 2007).

Chapter 5 provides an explanation of the results of the study. The chapter also presents information regarding implications for social change and recommendations based upon study findings, and suggestions for future research into how the caregivers should change their approach to better communicate with children younger than three years.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this quantitative study was to assess the association between childcare settings and childcare provider education level and toddlers' language environment. This research fills a gap in existing literature by contributing greater understanding of the effect of childcare setting on the amount of speech produced by toddlers who spend more time with their mothers as compared to daycare personnel. The study, which was conducted in the Varna region of Bulgaria, examined the relationship of childcare setting and childcare educational level to the amount of words that adults pronounced in close proximity to children, children's vocalizations, and conversational turns. The study used the LENA device to evaluate children's language environment, to measure the amount of words that were pronounced by children and caregivers, and to determine the amount of conversation that took place between children and caregivers. The device is currently considered to be the most advanced technology available to accurately measure the language environment (Xu et al., 2009). The study results suggested that the educational level of the childcare providers did not have a significant effect on the words pronounced by the childcare providers, the number of child vocalizations, and the conversational turns. On the other hand, the study results showed a significant association between the childcare setting and the mean number of adult words spoken around the child, child vocalizations, and conversation turns. The study findings suggested that children in the daycare settings were exposed to less adult words and conversation with the daycare staff and therefore, produced fewer vocalizations compared with the children who that were cared for exclusively by their mothers.

Interpretation of the Findings

The study results presented additional evidence regarding the language environment differences between the two childcare settings. Two independent studies were conducted to examine the use of the LENA device in the home and childcare settings. Specifically, Greenwood et al. (2011) and Soderstrom and Wittebolle (2013) discussed the use of the LENA device to evaluate children's home and daycare language environments. According to Soderstrom and Wittebolle, the two childcare environments could be considered very similar regarding the levels of caregivers' language and child vocalization, but the researchers reported significant differences regarding the language measurements depending on the specific activities the child was exposed to and the time of day. The authors suggested that more research was needed with a larger population to better evaluate the language environment differences between the two settings.

Interaction with caregivers and one-to-one time involving children and caregivers in the nonmaternal childcare environment were found to be important factors that affect infants' and toddlers' development (Dettling, Parker, Lane, Sebanc, & Gunnar, 2000; Watamura, Donzella, Alwin, & Gunnar, 2003). Many of the studies that have examined the effect of the childcare setting on language environment have not taken into account childcare quality, which has been pointed out as a critical factor to consider when assessing children's development (Belsky et al., 2007). However, studies that have actually evaluated this issue have shown that the quality of childcare greatly affects children's outcomes (Burchinal & Cryer, 2004; Loeb, et al., 2004; NICHD/ECCRN, 2003). More importantly, the main problem has been a lack of studies examining the

quality of childcare for infants/toddlers, as opposed to the extensive research that has been conducted regarding the quality of childcare for children older than 3 years. The current study results showed some significant differences regarding the mean number per hour of AWC, ChildVoc, and Turns depending on the toddlers' childcare setting.

Therefore, the study results present new knowledge regarding the language environment of toddlers who that were cared by daycare personnel or by their mothers. For example, the study suggested that nonmaternal daycare settings could negatively affect children's language environment, which could consequently affect their school readiness.

Vygotsky's developmental theory provided the theoretical foundation for this study. Proponents of this theory view social interactions with adults or more advanced peers as essential for children's independent cognitive and language development (Vygotsky, 1987). More importantly, Vygotsky described a child's development and functioning process as strongly associated with the child's social environment. For instance, children's language development process is described as involving gradual daily interactions with adults or more advanced peers. Ultimately, after participation in these daily interactions, children advance their language abilities and start to understand and construct meaning by using different sounds, words, and sentences (Vygotsky, 1987). The current study results are consistent with Vygotsky's theory, in that the findings indicate that children who that were cared for by adults who that talked more to them and involved them in more conversational turns per hour had more child vocalizations and better language environment exposure. In this study, a mother's personal attention resulted in significantly more words heard and vocalized by the child, which ultimately is

consistent with the theory. In other words, better social interaction resulted in a better language environment in the home setting.

The study results are also consistent with the work of Richter (2015) and Gridley et al. (2015). Richter reported that parents' direct speech to their children is the most important language environmental factor. For example, children with large vocabularies tend to experience more direct speech from their parents, which leads to a significantly greater amount of words over time for this population. Similarly, Gridley and colleagues (2015) described the impact of parents' behavior—in particular, their typical conversations with their children—and identified the importance of language development promotion via positive communication in the home environment.

According to Landry et al. (2006), nonmaternal care has become a significant part of infants' and toddlers' lives. The authors stated that many parents and professionals have raised various concerns regarding children's experiences when attending regular nonmaternal childcare. The main issues have been linked to lack of one-to-one interactions in the nonmaternal childcare setting compared to the home care setting, which was one of the issues reported in the current study. For instance, the children in the daycare were exposed to 22 fewer conversations with adults per hour compared to children in the home setting. Landry et al. further indicated that fewer adult interactions with children were found to constitute a significant factor related to child language and cognitive development. Additionally, positive interactions with kind, sensitive, and responsible adults were reported to be an important factor during a child's development process, a finding supported by socio-cognitive theories (Landry et al., 2006; Tamis-

LeMonda et al., 2001). This statement was also supported by the study finding that less adult interaction with children at daycares led to fewer child vocalizations. Furthermore, the current study results showed a nonsignificant association between daycare personnel's education level and the language environment of the toddlers, especially when the daycares were highly government-regulated and sponsored. The study results were similar to those of Vu and colleagues (2008), who reported that childcare providers having a bachelor's degree was not significantly associated with children's language environment at state- and school-district-sponsored daycares.

Finally, by using Vygotsky's theory, I was able to better understand differences in social interactions depending on child caregiver settings and educational background and their influence on the child language environment. Moreover, given the main study goals, this theory provided the study with the required foundation to explain the influence of different childcare settings on children's language environment. Specifically, the study research questions touched upon the association between the amount of words pronounced by an adult and child depending on the childcare setting and maternal/childcare provider educational level. The study results indicated that the specific adult caregiver approach to children depended on the childcare setting and the child's experiences with the mother or other caregiver. Lastly, adult interactions that occurred during maternal or nonmaternal childcare definitely played a distinctive role in the child's language development and therefore were considered an important aspect of this study.

Limitations of the Study

Even though this research study provided significant insight concerning the impact of the childcare setting and caregivers' educational level on the toddler language environment, there were some important limitations that need to be considered. First, the study may have been limited by the sample size; however, the study's sample of 29 children was larger than the sample of a similar study conducted in Canada (12 children; Soderstrom & Wittebolle, 2013). The town where the study was conducted is relatively large, with 14 daycares. Additionally, data collection was limited to the number of kindergartens that agreed to participate in the study, making the study sample fairly constricted regarding both the type and quality of daycares and study subjects. Thus, the applicability of the study findings could be restricted to the set of comparatively high-quality daycares like those in the city of Varna, Bulgaria, and the relatively homogeneous study participant group (with respect to ethnicity and socioeconomic status) that was the home group. Second, there was the possibility of technical limitations. The study dependent variable measures relied entirely on the LENA device data and were consequently vulnerable to system errors or weaknesses. Specifically, three of the language measures were conducted in noisy conditions at the daycares, which could have resulted in reduction of the measure's reliability. These conditions at the daycares were more pronounced than in the home environment. Therefore, there were systematic differences in reliability between the daycare and home group LENA recordings. However, the reduction in reliability could have been associated with decreasing of the quantitative values of the study dependable measures collected under the noisy

conditions. The question of the process by which children comprehend vocalizations under noisy conditions remains open; thus, the LENA recordings might have resulted in miscalculation of the amount of adult speech heard under these conditions, which could have skewed the study results.

Recommendations

The goal of this research was to assess the language environment in two different childcare settings and in relation to caregivers' education. This type of research has never been conducted in Bulgaria. This study provided unique data regarding the language environment differences of toddlers who were exposed to daycare or home settings, which could be considered important for child language development (Rowe, 2008; Tayler & Sebastian-Galles, 2007). For instance, Tayler and colleagues (2007) reported that the spoken language that young children hear is strongly associated with their cognitive, emotional, and social development. Children who are exposed to fewer words during the toddler period may experience an achievement gap that is linked with their school readiness. Moreover, the amount of conversations adults have with children and other characteristics of adult caregivers' language and educational level have been found to be predictive of children's language development metrics (Early et al., 2007; Rowe, 2012). The LENA Research Foundation (2016) research presented good evidence that the amount of conversation a child is exposed to between birth and 3 years could have a great impact on the child's entire life.

Data from this study provide some promising evidence regarding language environment differences across the childcare settings. On one hand, the study results

showed nonsignificant differences associated with adult words, child vocalizations, and conversation turns depending on caregivers' educational level. However, in the home setting, the children heard more adult words, vocalized more, and were engaged in more conversations, which suggested that mothers had a more personal approach to their children. This approach resulted in significantly more communication and collaborative language in the home versus the daycare setting. Additionally, the study findings raised a number of important questions. For instance, how might the educational level of daycare caregivers affect toddlers' language environment? Should the Bulgarian government change the education-level standards for caregivers of children younger than 3 years? Is it important for children to be involved in educational and interactive activities with nurses instead of only being changed, fed, and put to sleep?

This research presented a rare opportunity to explore the problem of the quality of language environment in two different childcare settings and in relation to caregiver education level outside the U.S. The study findings constitute an initial systematic attempt to examine these two factors together in a single study under natural conditions, and they demonstrate that childcare settings have significant influence on Bulgarian children between 12 and 24 months of age. The study limitations included a small study population and the use of only quantitative measures provided by the LENA device. Therefore, additional research will be required in order to generalize these results. Future studies should include a larger study population and some qualitative measures of language input. For instance, Yont and colleagues (2003) stated that the amount of child language is reduced during book reading compared to free play. The authors used

semistructured mother-child interviews conducted in the home environment. In order to suggest potential best childcare practices that could greatly affect the toddler language environment depending on the childcare setting, future studies should include some qualitative measures of language input. For instance, some authors have suggested that the quality of the language environment depends on structured versus unstructured playtime (Soderstrom & Wittebolle, 2013; Zimmerman et al., 2009). However, to connect this suggestion with best practices linked to childcare settings, one should evaluate qualitative and quantitative measures of language input in the different settings. Finally, future studies could provide important information to policy makers to improve childcare practices to enhance childcare givers' information regarding factors that could greatly influence language and overall child development in countries outside the United States.

Implications

The study findings present data about mothers' and other child caregivers' education, which is an important language development factor (McNally & Quigley, 2014; Phillips & Morse, 2011). In Bulgaria, caregivers in daycares for children 1 to 3 years old are not required to hold a teaching degree (European Commission/EACEA/Eurydice/Eurostat, 2014). Therefore, Bulgarian daycare personnel are nurses with associate's or bachelor's degrees. Phillips and Morse (2011) discussed caregiver education as a significant factor associated with child language development and language environment quality. In the current study, caregivers' educational level was found to be nonsignificant; however, this could have been due to the small sample size of the two language environment groups (15 for the home setting and 14 for the daycare

setting). Given that the children at the daycare setting were exposed to less talking and conversations, the question of what additional factors might affect the language environment in the childcare setting remains. Additional study with a larger sample could add knowledge regarding the effect of caregivers' education level on the language environment of children between 1 and 3 years of age who attend full-time daycare in Bulgaria.

The findings from this study could provide policy makers and parents with information regarding the influence of language environment quality in two different childcare settings. The study presented important results concerning the amount of adult words, toddler vocalizations, and conversational turns, stratified by childcare setting. This research is unique because the LENA device offered automatic data on children's expressive verbal communication and adult conversation with their children using an Automatic Vocalization Assessment (Soderstrom & Wittebolle, 2013). Therefore, the study results could drive policy makers to raise the bar for caregiver credentials to improve the language environment in daycare settings. Findings from this study could also assist parents and policy makers in changing their approach regarding activities aimed at advancing toddlers' speech development.

By providing information regarding the association between the quality of the language environment and caregiver education and its effect on children's language development, this research could provide significant information regarding the LENA device's performance for additional nonEnglish-speaking populations. The study results indicate that one factor associated with a child's language environment is the personal

attention that children should get in the daycare setting. Therefore, further exploring the personal attention to children factor could result in identifying different strategies that could support children's language development in the daycare setting for children between 1 and 2 years of age. For instance, although mothers' educational level was not a significant language environment factor in this study, mothers who had high school diplomas talked less (949 words per hour) than mothers with bachelor's degrees (1,004 words per hour) and graduate degrees (1,042 words per hour). In light of the findings of this study, mothers and daycare caregivers should advance their language development knowledge and take additional actions to advance children's language development and better prepare them for overall school achievement.

The LENA device has been used to evaluate the language environment in English, Spanish, French, and Korean households (Oller, 2010; Pae et al., 2016; Soderstrom, & Wittebolle, 2013; Wood et al., 2016). Until now, the device had never been used in Slavonic household-speaking environments. Therefore, this study was the first step to extend the devices validation to a Slavonic language. Additionally, the results from the study provided important information regarding language environment quality in the two different childcare settings and lead to changes that could advance childcare practices and language environment quality in nonEnglish speaking countries.

Early language promotion programs are based only on the best evidence available; however, there is a lack of information regarding the association between language growth in the first 2 years of life and if specific adults impute. Moreover, maternal education could be considered as an important predictor but the existing

information has not been enough to further develop programs to reduce social inequality. Therefore, the positive social change that could be expected from this study could be linked with advancing the home and nonmaternal childcare language environments by promoting improved adult-toddler communication during the first 2 years of life. Finally, improving adult-toddler communication during this important developmental period could result in better language outcomes and also advance academic skills later in life (Roulstone et al., 2011).

Conclusions

This study examined the effect of the childcare settings (home and daycare center) on the amount of caregiver words, child vocalization, and conversational turns. Childcare setting had a significant effect on the language environment in the toddlers' daytime experience. Specifically, the children in the home setting experienced increased interactions with their mothers and therefore, had more frequent vocalizations than the children in the daycare setting. Even though I did not find significant evidence that the caregivers' educational level influenced the linguistic input measures, the overall message is that there are significant differences in the children's' language environment that depends not only on the childcare setting. These differences could be due to critical factors that cause the dissimilarities between the home and daycare activities that children are engaged to. Thus, future consideration should be to further examine these factors, which could advance the children linguistic outcomes that could result in young children better language development.

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Appendix A: Study Flyer and Return Email

Study Flyer



The Varna Medical University is conducting a research study on the language environment of toddlers living in Bulgarian-speaking households. You and your child may qualify for this research study that explores the child language environment depending on the childcare setting and caregivers' educational level.

- **If you are 18 years or older, and**
- **Speak Bulgarian language and**
- **Mothers or legal guardian of child between 12 and 24 months**
- **Do not plan on moving from Varna region within two months after the study starts**

Eligible participants will complete one study visit. During the visit the adult caregiver will complete a short survey and the child will wear a device called the Language Environment Analysis (LENA) digital language processor for two non-consecutive days.

Participants will be compensated for their time.

For more information, please call or email: Snejana Nihtianova at xxx-xxx-xxx

Return Email

Dear (name of potential participant)

Thank you for expressing an interest to participate in the proposed study. Please send me a return email or call at (xxx-xxx-xxx) regarding your availability and I can meet with you and explain the study in great details. I will also be happy to answer any questions you may have.

Thank you,

Snejana Nihtianova

Appendix B: Letter of Cooperation From Varna Medical University Official

Date: Thursday, December 29, 2016 2:16 PM

To: Snejana Nihtianova <nihtianova@email.chop.edu>

Subject: Re: Approved Letter of Cooperation from Varna Medical University official

Dear Snejana,

Congratulations for progressing so fast with your research preparations!

I fully approve your research to start after Walden University and Varna University IRB approvals. Also I will assist you with translation of all study materials. Attached with this email is the signed approval letter.

Please let me know if you have any additional questions, with best regards,
Dr. Violeta Iotova

Prof. Dr. Violeta Iotova, PhD
Paediatric Endocrinologist
Clinic of Paeditric Endocrinology - Head
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Appendix C: Walden University IRB Approval Email

From: IRB <irb@mail.waldenu.edu>
Sent: Wednesday, April 12, 2017 10:39:09 AM
To: Snejana Nihtianova
Cc: IRB; Katie Callahan-Myrick
Subject: Notification of Approval to Conduct Research

Dear Ms. Nihtianova,

This email confirms receipt of the translated approval letter for the community research partner and also serves as your notification that Walden University has approved BOTH your doctoral study proposal and your application to the Institutional Review Board. As such, you are approved by Walden University to conduct research.

Congratulations!

Bryn Saunders

Research Ethics Support Specialist

Office of Research Ethics and Compliance

Email: irb@mail.waldenu.edu

Phone: [\(612-312-1336\)](tel:612-312-1336)

[tps://outlook.office.com/owa/?realm=waldenu.edu&exsvurl=1&ll-cc=1033&modurl=0](https://outlook.office.com/owa/?realm=waldenu.edu&exsvurl=1&ll-cc=1033&modurl=0)