DOES BILINGUALISM PREDICT DEVELOPMENT OF THEORY OF MIND
IN 3- TO 4-YEAR-OLD PRESCHOOLERS?

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by

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Department of Graduate and Professional Studies in Education
Abstract

DOES BILINGUALISM PREDICT DEVELOPMENT OF THEORY OF MIND IN 3- TO 4-YEAR-OLD PRESCHOOLERS?

by

Sadat Naziri Zarek

Theory of Mind explains how individuals recognize their own knowledge, intentions, emotions, beliefs, and allows individuals to understand or predict the behavior of other people (Levin, 2004; Meltzoff, 1999). The focus in this area in existing literature has been on false-belief tasks used for young 4- and 5-year-old children using verbal perspective-taking tasks. To measure Theory of Mind in younger children, the present study used visual perspective-taking rather than verbal perspective-taking tasks. Research has shown Theory of Mind and language are related. To address whether knowing two or more languages predicts Theory of Mind development in young children, 48 Head Start 3- to-4-year old preschoolers (26 monolingual and 22 bilingual) were assessed on three different visual Theory of Mind tasks. It was hypothesized that bilinguals would outperform monolinguals on tasks that require taking a perspective different from one’s own. The results did not show support for this hypothesis. Implications for future research and education are discussed.

_______________________, Committee Chair
Dr. Kristen Alexander, Ph.D.

_______________________
Date
DEDICATION

I dedicate my work to all innocent and precious children, including my daughter, with the hope of passing a better world to them for raising their children.
ACKNOWLEDGEMENTS

I sincerely thank Dr. Kristen Alexander and Dr. Albert Lozano for being so patient and understanding with me going through a bumpy road to accomplish this research. I thank Sacramento SETA Head Start staff, especially Kim Duong, and administrative personnel to help me in collecting data and administering this experiment. I also want to mention my appreciation to Dr. Kimberly Biddle as my mentor and friend who always encouraged me with positive thoughts and energy. I definitely appreciate, from bottom of my heart, Sam and Nikki’s support and patience that without them I would not be able to accomplish my work. In addition, I value so much my parents for raising me with a passion for learning.
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Chapter 1
INTRODUCTION

Statement of the Problem

The United States is called a home to more bilingual speakers than any other country in the world (Grosjean, 2011), and research on bilingualism and its effects on cognitive development in children has recently been a focus of interest among developmental psychologists. However, as Grosjean (2011) and Bialystok, Carik, and Luk (2012) point out, many families in the United States might have the misconception that bilingualism will delay language acquisition in young children. In addition, because bilingualism has often been associated with low socioeconomic status in the U.S. (Engel de Abruel, Cruz-Santos, Tourinhol, Martin, & Bialystok, 2012) families might not consider bilingualism as an asset for their children’s cognitive development.

This misconception about the relationship between bilingualism and cognitive development is in contrast to recent research findings indicating bilingual children do better than monolinguals on a number of cognitive tasks (Bialystok, 1999; Goetz, 2003; Kovacs, 2007a; Kovacs, 2007b). One of these cognitive abilities considered by developmental psychologists as a major milestone in children’s development is Theory of Mind. Theory of Mind explains how individuals recognize their own knowledge, intentions, emotions, beliefs, and also understand or predict the behavior of other people (Levin, 2004; Meltzoff, 1999).
Purpose of the Study

The current study addresses whether knowing two or more languages predicts Theory of Mind development in young children. The purpose of the study was to explore whether bilingualism is associated with Theory of Mind in 3- to 4-year-old preschoolers by comparing the perspective-taking skills of bilinguals and monolinguals.

The focus of existing literature in this area has been on false-belief tasks used for young 4- and 5-year-old children who are verbal, using verbal perspective-taking tasks. To measure Theory of Mind in younger children, the present study used a visual rather than verbal perspective-taking task. The rationale for this design was based on previous research indicating that assessing perspective-taking tasks may be confounded with language abilities, or that it might be more reliant on verbal skills rather than children’s perspective-taking skills (Bloom & German, 2000; Levin, 2004; Moll & Meltzoff, 2011). For example, cultural differences, variations in verbal ability and difficulty in choosing the right vocabulary can all influence children’s linguistic responses for perspective-taking tasks. Moreover, Bialystok et al. (2012) discuss that multiple results show weaker verbal skills in bilinguals in comparison to monolinguals about either comprehending the words or producing them. Taking these into mind, in the current study a visual perspective-taking task was used to lessen the impact of verbal skills on children’s responses. It was hypothesized that bilinguals would outperform monolinguals on tasks requiring perspective taking.
Significance of the Study

Learning more about how human minds develop and convey information to each other through language has long been a quest among scholars. This study will add to knowledge to the basic and empirical research on cognitive development in young children by investigating an important social cognitive skill vital in communication and social interactions (Hughes & Leekam, 2004).

The larger community of bilingual families, students, and educators in our communities can benefit from the results of this study, providing new insights into how bilinguals and monolinguals are different (or similar) in developing perception and metalinguistic skills. Patnaik (2008) has offered a comprehensive study of how studying Theory of Mind can have implications for educational sectors including instructional suggestions to inquire better educational tools to address learners’ needs. As Patnaik (2008) suggests, learning more about developmental trends of Theory of Mind can affect teaching and learning practices and help K-12 educators better understand cognitive processes and assist them in facilitating their students’ educational progress and achievement.

Furthermore, misconceptions about bilingualism and worries among some families that bilingualism might cause delay in cognitive development might also be addressed by this study. If the results support the hypothesis or at least lack of a disadvantage, it can be evidence to decrease this misconception motivating families and
educators to focus more on positive aspects of bilingualism, seeing that as a cognitive advantage that enriches development.

**Methods**

This was a quasi-experimental comparative study, with quantitative data analyzed using descriptive and inferential statistics. The level 2 visual perspective-taking tasks used in the current study were modified from Moll and Meltzoff (2011).

**Participants**

Participants were two groups of 3- to 4-year-old children from Northern California recruited from Seta Head Start Preschool. Sixty-seven children responded to the flyer and 48 of them participated in the experiment.

**Procedure**

Parental consent and child assent were obtained prior to data collection. The study took place in a quiet room at a Northern California Head Start preschool and took approximately 10 to 15 minutes per child. Children were screened for color recognition in English as an eligibility test prior to the perspective-taking tasks. Nineteen children did not pass the eligibility test and did not participate further. The researcher videotaped the lab procedure and a teacher assisted the researcher to administer the Theory of Mind tasks and other data. Each preschooler received two age appropriate books and small
play dough pack priced under five dollars as an incentive. After the eligibility pretest, additional measures of Theory of Mind were administered, including color and mix color tasks, followed by a production task.

**Eligibility pretest.** To determine whether a child was eligible to participate in this experiment, s/he demonstrated in English the knowledge of the four colors to be used in these experiments: blue, green, yellow, and white.

**Demonstration phase.** Prior to each task, two transparent plastic screens were placed in the middle of the table, adjacent to one another. Each screen had paper thin slots into which filters could be placed to make objects and pictures appear colored. Each child experienced during the demonstration phases how using color filters in transparent plastic screens changed the color of the object or picture seen through the transparent plastic screens. Each child also experienced how changing visual angles affected the appearance of the objects or pictures, color wise. For example, during the demonstration phase for the mix color task, the participant noticed that blue ball and blue rabbit picture looked green when viewed through the yellow filtered transparent screen.

**Color task.** Following the demonstration phase, the child was guided back to his/her seat at one end of the table facing the transparent clear screen and transparent blue filtered screen. The Experimenter (the teacher helping the researcher) sat at the middle of the table facing the edge of the transparent screens. The Experimenter placed an identical white rabbit in front of each screen between the child and the screens. The Questioner (the researcher) entered the room through the door in front of the child viewing the rabbits through the screens. The Questioner asked two questions, requiring the child to
place the correct color objects into the bag held by the Experimenter. The Experimenter switched the screens after each pair of trials. Each child had four trials counterbalancing the requests of objects and colors. Both the Experimenter and the Questioner recorded the answers on the Participant Response form (see Appendix B).

Mix task. This procedure was analogous to the color task, except a yellow filter was used instead of blue. Following the demonstration phase, the child was guided back to his/her seat at one end of the table facing the transparent clear screen and transparent yellow filtered screen. The Experimenter sat at the middle of the table facing the edge of the transparent screens. The Experimenter placed one identical blue ball in front of each screen between the child and the screens. The Questioner entered the room through the door in front of the child viewing the blue balls through the screens. The child was asked to put the requested objects in two trials by the Questioner in the bag held by the Experimenter. The task was to see if the child could recognize that the Questioner was seeing the balls differently color wise from another angle.

Each child had four trials counterbalancing the requests of objects and colors. The Experimenter switched the screens after each pair of trials. Both the Experimenter and the Questioner recorded the answers on the Participant Response form (see Appendix B). The Questioner stayed in the room after mix task, pretending she was reading some booklets off the shelves.

Production task. After the demonstration phase, the Questioner changed seats with the child, such that the child sat at the middle of the table facing the edge of the screen and the Experimenter took the child’s seat at the end of the table facing the screen.
For this task, only one screen was used with a yellow filter. The Experimenter handed a blue ball to the child and said, “Can you make this ball look blue/green to me?” The trial ended when the child placed the ball in front or behind the yellow filtered transparent screen. Each child had four trials with request for a blue ball, blue picture of a horse, blue picture of a dog, and blue picture of a rabbit.

An independent rater scored the videotaped trials to ensure inter-observer reliability. Preliminary and inferential analyses were used to compare the bilingual and monolingual groups in Theory of Mind performance.

**Definition of Terms**

One term used in this study is *Theory of Mind*. Theory of Mind is defined as the ability in the younger children to understand that people can have different beliefs and desires than their own beliefs and desires (Astington & Baird, 2005).

Another term used in this study is *bilingualism*, which refers to those born into multi language families and context who learn two or more languages simultaneously. Specifically to the purpose of this study, the bilingual person knows more than one language via context or persons interacting with the child.

In addition, *level 2 visual perspective-taking abilities* being assessed in the current study refers to “… the understanding that, when people look at the same drawing from different angles, they arrive at different and contradictory descriptions” (Aichhorn, Perner, Kronbichler, Staffen, & Ladurner, 2006, p. 1059).
Limitations

One of the main limitations of this study would be the lack of diversity in the sample. The nonrandom and purposive sample was not representative of the total population of preschool-aged children. In addition, many studies have shown that socioeconomic status (SES) affects cognitive and language development in children (Bradley & Corwyn, 2002; Christensen, Schieve, Devine & Drews-Botsch, 2014; Hackman & Farah, 2009; Hoff, 2003; Noble, Houston, Kan, & Sowell, 2012; McLoyd, 1998) and participants for this study were recruited from underserved families with limited financial means. However, two groups of monolingual and bilingual preschoolers for this study were from the families of similar SES in order to avoid SES effects.

Organization of the Study

Chapter 1 serves as an introduction to this study of whether bilingualism is linked to development of Theory of Mind in 3- to 4-year-old preschoolers. Chapter 2 begins with an overview of Bronfenbrenner’s Bioecological theory as the theoretical framework for the study followed by theoretical models of Theory of Mind. Then, research on how Theory of Mind affects development is discussed. Next, relationship between Theory of Mind and language development is reviewed, relating the discussion to how Theory of Mind and bilingualism can be linked, and ending with a rationale for using the level 2 visual perspective-taking versus verbal perspective-taking for the purpose of this study.
Chapter 3 provides a description of the study methodology, including procedures and measures used to collect data. Chapter 4 presents the results of the analyses. In Chapter 5, the results are discussed and conclusions are drawn. This chapter also describes the study limitations and offers suggestions for future research on this topic.
Chapter 2
REVIEW OF LITERATURE

This review begins with an overview of Bronfenbrenner’s Bioecological theory as an overarching theoretical framework that guides the study. Theory-Theory and Simulation-Theory are then discussed as the dominant theoretical frameworks for research on Theory of Mind. How Theory of Mind affects development will be addressed. Next, the relationship between Theory of Mind and language development is scrutinized, linking the discussion to relationship between Theory of Mind and bilingualism. The last section summarizes the rationale for using level 2 visual perspective-taking versus verbal perspective-taking to find out whether bilingualism predicts development of Theory of Mind in 3- to 4-year-old preschoolers.

Theoretical Framework

Human development has been the focus of different disciplines including biology, sociology, and psychology. In the past decade, developmental psychologists have developed theories that consider human growth an accumulation of biological, social, and cultural interactions happening in a process of change through an entire life span (Tudge, Mokrova, Hatfield, & Karnik, 2009). As one such theory, Bronfenbrenner’s Bioecological model of human development serves as a foundation for the current study because learning more about language development, human mind, thought processes, and
perception requires the focus on bidirectional relationships between individuals and the context surrounding them. Tenenberg and Knobelsdorf (2014) believe that culture, biology, and all interactions influence our minds and behaviors and to explain any aspect of development we need a theory that collectively covers all these elements.

Bronfenbrenner’s model of Process-Person-Context-Time considers the complex factors influencing the development of humans together for a more in-depth understanding of how an individual develops. Biological characteristics interact with every factor in the environment via physical and mental processes and mechanisms during time or throughout “episodes of proximal processes”. Bronfenbrenner (2005) explains that interactions between person and context (proximal processes) are systematic; a person develops through these processes that occur in a relational and physical context over time (Lerner, Damon, Bronfenbrenner, & Morris, 2006). Learning a language is a complex process and its relationship to Theory of Mind requires better understanding of the relational context (Stanzione & Schick, 2014). Bronfenbrenner’s model includes this contextual interdisciplinary perspective toward development (Bronfenbrenner, 2005; Bronfenbrenner & Morris, 2007; Tudge, Mokrova, Hatfield, & Karnik, 2009), and is therefore well-suited to the current study.

**Theoretical Models of Theory of Mind**

There are philosophical and psychological roots in defining Theory of Mind. Some scholars like Apperly (2008) consider Theory of Mind as folk psychology or commonsense psychology, which can be traced back to philosophy of mind. According
to Apperly (2008), folk psychology or Theory of Mind is attributing mental states that are not observable such as beliefs and desires to individuals and are able to predict behaviors. This definition is close to what has been defined as mindreading in philosophical approaches as well. However, defining Theory of Mind as folk psychology or mindreading might lead to some ambiguity; and as such has raised many debates. To avoid this terminological ambiguity, Theory of Mind for the scope of this study refers to the cognitive capacity in understanding what other people know, think, or feel. In addition, it is the ability to differentiate mental states in oneself and others in order to predict and explain behaviors as it has been defined in most of related disciplines in developmental studies (Apperly, 2008; Astington, 2008; Astington & Jenkins, 1995; Lockl & Schneider, 2007; Meltzoff, 1999).

What has shifted the importance of Theory of Mind as a mere philosophical subject into a vital developmental milestone in many disciplines like developmental science, cognitive science, or social cognitive neuroscience, is its influence on cognition and social skills, which are crucial for human development. Therefore, finding a theoretical frame for Theory of Mind has divided scholars into several groups. Meltzoff (1999) mentions three major post-Piagetian era accounts in addressing Theory of Mind: Modularity-nativism, Connectionism, and Theory-Theory. In Nativism, there are inborn abilities and skills, which explain development; and modern nativism has added cognitive modules to this view. However, Meltzoff (1999) believes that Modularity-nativism has a noticeable drawback in explaining qualitative changes in development due to its emphasis on innate abilities. On the other hand, he points out that Connectionism is
strong to explain behavioral changes; however, it lacks explanations in innate competences since Connectionism does not accept innate representations. He argues for a Theory-Theory model that views Theory of Mind as similar to how we build and change theories in science as we collect more information. In Theory-Theory, children have theories of the world and they modify those theories as they grow up and receive more input from the outside world. In other words, children receive raw information and interpret the data they receive in order to predict events and behaviors. They are like little scientists who hypothesize, collect data, interpret data, and predict outcome. Meanwhile they change their theories as they develop new skills and abilities (Apperly, 2008; Meltzoff, 1999; Michlmayr, 2002). Nevertheless, it is not only Theory-Theory as a dominant framework in explaining Theory of Mind. Many developmental psychologists and scholars have been utilizing Simulation-Theory to shed more light on mysteries of Theory of Mind development as well.

Simulation-Theory is not a new theory in philosophy of mind and developmental psychology; however, it has not been that popular until recent years in the search to find better ways to understand how Theory of Mind develops in humans (Michlmayr, 2002). Simulationists discuss that it is not just the knowledge coming from forming theories that leads to predictions as it is in Theory-Theory. In Simulation-Theory, one can predict others’ behavior because one tries to be in another person’s shoes. That is why Michlmayr (2002) notes that “… simulation is an ability rather than knowledge” (p. 32). Since this approach is closer to behaviorism and more applicable than Theory-Theory explanations, Simulation-Theory has gained more favor over Theory-Theory in the past
decade, and empirical investigations continue to test these two dominant interpretive frameworks.

Results of recent studies in this field have brought up the emergence of a new theory to explain Theory of Mind development. Apperly (2008) argues that the complexity of human behavior and Theory of Mind judgments need a broader lens to understand Theory of Mind processes. He sees a theoretical shift in recent years from Simulation-Theory and Theory-Theory debate toward a more hybrid account rather than two exclusive accounts of Theory of Mind. Apperly (2008) goes further and believes that new tools and concepts like social cognitive neuroscience can provide stronger evidence for understanding Theory of Mind processes as a major cognitive milestone.

What has inspired scholars to explore Theory of Mind development for such a long time in such a vast body of research is not only for seeking answers about origins of thought and for understanding mental state processes, but also it is for its relation with different aspects of development and primary cognitive domains, specifically like language. Although some researchers have argued that other social cognitions are not implicated in language development and language carries independent origins, scholars such as Vygotsky suggests that language has its roots in non-verbal social and cognitive development (Meltzoff, 1999).
Theory of Mind and Development

Theory of Mind as a cognitive capacity to understand mental states of self and others plays an important role in development. It is related to vital aspects of development like understanding of representations and metarepresentations (Walker & Murachver, 2012), prospective memory (Altgassen, Vetter, Phillips, Akguen, & Kliegel, 2014), and it is linked to executive functioning (Ahmed & Miller, 2011). Nevertheless, the role of Theory of Mind development in social cognition is the most important one as it affects individuals’ social life in a wide range such as emotion recognition skills (Loukusa, Mäkinen, Kuusikko-Gauffin, Ebeling, & Moilanen, 2014) or empathy enhancement (Goldstein & Winner, 2012). Learning more about how Theory of Mind develops can expand our knowledge on how to enhance social responsiveness, social judgment, and relational reasoning. In addition, it can help to find explanations for disturbances of interpersonal behaviors or social-cognitive deficits like Autism Spectrum disorder, which is related to development of Theory of Mind (Loukusa et al., 2014).

Mikulincer, Shaver, Borgida, Bargh, and Guinote (2015) take it further and discuss how social cognition and Theory of Mind play a practical role in real-life situations by relating that to social power. Individuals who have better understanding of others’ thoughts and predict their behavior become power holders. Fernyhough (2008) shows how this social understanding relates to Vygotsky’s ideas about dialogue and language. In fact, Theory of Mind as a social cognition aspect promotes intention understanding, predicts behavior of others, and intertwines with language processing (Gallese, 2007).
Theory of Mind and Language Development

Humans as social beings need the cognitive ability to communicate with others. Language is the primary tool that makes this communication possible. However, simply learning a language does not adequately fulfill this need. Individuals must recognize their own knowledge, intentions, emotions and beliefs in addition to having the ability to understand and predict the intentions, emotions, and beliefs of other people in order to communicate and socialize effectively. In studying how this social communication takes place through language, research has shown links between language and Theory of Mind development (Astington & Baird, 2005; Astington & Dack, 2008; De Villiers, 2007; De Villiers & Pyers, 2002; Farrar, Ashwell, & Maag, 2005; Ebert, 2014; Hale & Tager-Flusberg, 2003; Lohmann & Tomasello, 2003; Meristo, Falkman, Hjelmquist, Tedoldi, Surian, & Siegal, 2007; Miller, 2006; Milligan, Astington, & Dack, 2007; Mulder, 2011; Perner & Aichhorn, 2008; Stevenson, 1993).

For some time, the major question addressed in research has been the causal direction of the relationship between Theory of Mind and language. Many researchers have surveyed the crucial role of language in Theory of Mind development; whereas some have attempted to provide evidence that Theory of Mind is fundamental for language development. Hypotheses about this association range from the general to the specific. It means that some claim there is not one particular aspect of language that is relevant for the development of Theory of Mind or vice versa. In fact, debate on the causal relationship is not necessary because a certain level of general linguistic ability or Theory of Mind skills are needed in order to be able to deal with the representational
complexities or linguistic processes (Mudler, 2011). For example, in understanding false belief tasks, the individual should be able to conceptualize the different levels of representation like verbal understanding. In contrast to this general view on the relationship between language and Theory of Mind, other researchers claim that there are specific aspects of language or Theory of Mind that promote development of either one (Mudler, 2011).

As an example, in a set of five correlational studies, Mudler (2011) investigated the relationship between language/mental language and Theory of Mind. Each study was set to detect direction of this relationship. For instance, the second study assessed children’s understanding of epistemic modality. Epistemic modal auxiliaries are like ‘must’ and ‘might’. Epistemic modal adverbs are like ‘definitely’ and ‘maybe’. The results of this single study showed that Theory of Mind was significant predictor in how 110 Dutch speaking participants (Mean=4; 6 years) performed in epistemic modality tests. However, the rest of four studies reported mixed results, showing differing direction of influence from one to the other. Similarly, De Villiers (2007) conducted a study to detect whether Theory of Mind is implicated in language acquisition or language is implicated in Theory of Mind development and if so, when that happens. De Villiers’s work (2007) was organized in a way that different concepts like “intention”, “desire”, “knowledge”, “false belief” were discussed and explained in two different cognitive categories of Theory of Mind and language. For example, how intentions can be explained as mental states of others from infancy through preschool years. This example
was done the same way for intentions explained via language lens. Like Mudler’s results (2011), De Villiers (2007) found an interrelation which was bidirectional.

In addition, in a meta-analysis Milligan et al. (2007) included a total of 103 studies limited to studies of the relation between false belief and language in typically developing, English-speaking children under 7 years of age. False belief tasks were used to assess the perspective-taking aspect of Theory of Mind development. The results indicated a positive and significant relation between the two variables. However, the most remarkable finding was that both directions of relation - language influencing Theory of Mind and Theory of Mind influencing language - carried a significant effect size.

Reviewing all studies of the language-Theory of Mind link and exploring assumptions and theoretical approaches on the nature of the relationship is beyond the scope of this paper. However, it is clear that these two cognitive concepts are strongly interrelated. The current study considered whether Theory of Mind is related to bilingualism, a topic addressed in the next section.

**Theory of Mind and Bilingualism**

In exploring how language exposure might affect Theory of Mind, Miller (2006) notes that experience related to others’ thoughts and feelings, for example in interaction with siblings, can contribute to children’s Theory of Mind. Because these interactions provide opportunities to listen more and be engaged in more conversations about mental states, they promote Theory of Mind development. Kovacs (2007a; 2007b; 2009) takes
this idea to another special circumstance like bilingualism. He (2009) suggests that a bilingual environment provides more opportunities and experiences for discourse and ‘conflicting mental representations’. Kovacs (2009) points out the fact that speaking and being aware of two languages are already like having a knowledge of two different mental contents as part of bilingual children’s cognitive awareness.

In one study of the association between bilingualism and Theory of Mind, Goetz (2003) examined whether linguistic knowledge predicted Theory of Mind development. In his study, 3- and 4-year-old English monolinguals, Mandarin Chinese monolinguals, and Mandarin-English bilinguals were given appearance-reality tasks, level 2 perspective-taking, and false belief tasks. All children were tested twice, a week apart; the bilinguals were tested in each of their languages. The 4-year-olds in each group performed significantly better than the corresponding 3-year-olds. Both monolingual groups performed similarly on the tasks, and the bilinguals performed significantly better than the monolingual groups; although when the two testing times were examined separately, they had only a near-significant tendency to perform better at the second testing time.

Possible explanations for this evidence of a bilingual advantage are greater inhibitory control, greater metalinguistic understanding, and a greater sensitivity to sociolinguistic interactions with interlocutors that bilinguals experience (Goetz, 2003). The idea that knowing another language improves executive control abilities has also been reported by Bialystok et al. (2012). Bialystok et al. (2012) found functions like inhibition, switching attention, and working memory as factors of executive control that
promote skills in cognitive development related to Theory of Mind (see also Kovacs, 2009; Miller, 2006; Siegal & Surian, 2012; Siegal, Tallandini, Pellizzoni, & Michelin, 2012).

Similarly, Tare and Gelman (2010) investigated cognitive factors in bilingual children’s pragmatic language skills. They used Theory of Mind tasks to assess social cognition, and a language check task to assess children’s explicit knowledge of the experimenters’ language knowledge. They found a positive relation between these two variables, reporting a relationship between bilinguals’ metacognitive understanding and their pragmatic language understanding. This suggests that language access promotes sociolinguistic awareness, metalinguistic knowledge, and inhibitory control that are closely related to Theory of Mind development (Tare & Gelman, 2010).

Similar to this but with another group of children, Meristo et al. (2007) provide evidence in two experiments from deaf children in bilingual and oralist environments (Italy, Estonia, and Sweden) that the amount of exposure to differing opportunities about mental states enabled bilingual native signers to outperform in both experiments those instructed in oralist schools. Although Meristo et al. (2007) noted that their experiments were mainly focused on false belief understanding of Theory of Mind and only some measures of mental states, it shows how bilingual environments can enhance mentalizing skills and promote typical development of Theory of Mind in deaf children. Rubio-Fernandez and Glucksberg (2012) reported similar results about bilinguals’ early sociolinguistic sensitivity and enhanced executive control with an adult population.
Taken together, the positive relationship between bilingualism and Theory of Mind indicated in the above-discussed studies raise new questions. A good deal of developmental research in this area has focused on false belief tasks in measuring Theory of Mind development aspect of this relationship. However, the question posed in the current study - whether bilingualism predicts Theory of Mind in 3- to 4-year-old preschoolers - has been explored utilizing level 2 visual perspective-taking tasks rather than classic false belief tasks. The next section discusses the reasons behind this methodological choice.

Level 2 Visual Perspective-Taking vs. Verbal Perspective-Taking Tasks

Perspective-taking is the ability to understand how another person interprets a situation. In fact, it is the skill to recognize that people can have differing perception of ours (Epley, Morewedge, & Keysar, 2004). This differing perspective can be abstract because mentally we understand another person’s mental state like a belief, a desire, or a judgment (Frye & Moore, 2014; Hughes & Leekam, 2004; Lock & Schneider, 2007). Alternatively, perspective-taking can be visual in nature because we look at things or we see events from different physical locations and angles (Aichhorn et al., 2006; Astington & Dack, 2008; Levin, 2004; Malcolm, 2004; Nicholas, 1974).

Other precursors to Theory of Mind development discussed under visual perspective-taking abilities include joint attention in early years (Akhtar & Gernsbacher, 2007), and understanding intentionality (Miller, 2006) as well as representational abilities
which allow individuals to conceptualize abstract mental states develop at a later time (Sabbagh, Benson, & Kuhlmeier, 2013). For example, Walker and Murachver (2012) believed that representational skills involved in symbolic understanding are the basic ability children need to explain their own and others’ behavior in terms of beliefs and desires. These abilities help children to understand that the referent of a representation can be different than the way it is represented (Walker & Murachver, 2012). Walker and Murachver (2012) conducted a study to find the possible link between false belief understanding and DeLoache’s scale, which measures children’s representational abilities. They hypothesized that language and executive function could be mediators in this relation. The results overall supported the idea that early representational skills can predict later Theory of Mind if Theory of Mind is considered a kind of metarepresentational ability. Results of a scale model task also showed a close relation to participants’ language and executive function skills from 36 months. In addition, results showed the relation between scale model performance at 42 months and false belief understanding was mediated by language. Each executive function was measured at 42 months, scale model at 42 months, and false-belief understanding at 48 months and were significantly correlated indicating that executive function mediates scale model false belief relation.

To assess these representational abilities, researchers have developed several kinds of tests called false belief tasks (Sabbagh et al., 2013). First order tasks which involve only ‘inferring one person’s mental state’ like appearance reality distinction or change in location are the most common first order version of these tasks for younger
children (Kaysili & Acarlar, 2011). However, as Sabbagh et al. (2013) discuss, it is
difficult to assign young preschoolers Theory of Mind understanding by representational
abilities since preschoolers fail at a remarkable number of these false belief tasks. From
their meta-analysis in comparing different mental states, like desires vs. beliefs, Wellman
This trend shows that children first perceive other’s desires, next beliefs, and last false
beliefs. Like Wellman and Liu (2004), Sabbagh et al. (2013) discuss that false belief
tasks for preschoolers are too complicated and require a variety of cognitive capacities to
succeed. Bloom and German (2000) go further and suggest abandoning false belief tasks
to assess Theory of Mind in preschoolers. First, Bloom and German (2000) argue that in
order to pass false belief tasks, preschoolers must be competent in many other cognitive
skills. Second, they discuss the fact that passing false belief tasks cannot be the sole
indicator of ability in children to attribute mental states.

Considering these findings, it was more preferable to use other variations of
perspective taking tasks to address links between bilingualism and Theory of Mind. For
example, Flavell, Flavell, Green, and Moses (2008), who believed that research has
shown preschoolers make mistakes in understanding a false belief about a ‘verifiable
fact’, used value belief tasks versus fact beliefs. Value belief tasks were about smell or
taste of substances, which referred to other’s like/dislikes. However, fact beliefs referred
to false belief facts and children make more mistakes on later tasks. Therefore, in
exploring perspective taking abilities in young children, visual perspective taking has
been extensively studied in literature as well (Frick, Mohring, & Newcombe, 2014).
Diana and Reder (2004) proposed that brain processes the information that is conceptually represented in memory analog to information that is perceptually received. Also, in questioning whether visual perspective tasks need Theory of Mind, Aichhorn et al. (2006) reported that neural imaging results showed activation in the pSTS/TPJ (superior temporal sulcus/temporo-parietal junction) region of the brain responsible for a specific part of Theory of Mind, not behavioral predictions. Furthermore, Bigelow and Dugas (2008) reported from their study that visual perspective taking and false belief independently predicted each other. The three mountain task was one of the pioneer and the most popular visual perspective tasks created by Piaget (Farrant, Fletcher, & Maybery, 2006; Frick et al., 2014). Putting all these together promotes the idea of evaluating perspective-taking skills in the visual realm. However, in recent years, visual perspective taking was divided into two levels.

Level 1 tasks in visual perspective-taking measure what people can and cannot see. In fact, level 1 refers to different mental depictions (what they are looking at) not understanding differing perspectives (Farrant et al., 2006; see also Moll & Meltzoff, 2011). Level 2 tasks according to Moll and Meltzoff (2011) refer to the understanding of the fact that people can have different perspective if they look at something from different angles (the way in which they look at something). Aichhorn et al. (2006) found out that the level 1 tasks did not activate the Theory of Mind area in the brain because these tasks are not involved in taking perspectives. Nevertheless, their result showed activation in one of the areas related to Theory of Mind, in particular, the anterior paracingulate region and the pSTS (posterior superior temporal sulcus)/TPJ (temporo-
parietal junction). Given the results of these studies, in the current study level 2 visual perspective taking tasks were used to address the question whether bilingualism predicts development of Theory of Mind in 3- to 4-year-old preschoolers.
Chapter 3

METHODS

Research Question and Design

To address whether knowing two or more languages predicts Theory of Mind development in young children, the current study explored associations between bilingualism and Theory of Mind in preschoolers by comparing the level 2 visual perspective-taking skills in bilinguals and monolinguals.

Data were collected on bilingual experience and Theory of Mind and evaluated through statistical analysis. The assessment of level 2 visual perspective-taking experiment used in the current study was a modified version used by Moll and Meltzoff’s (2011) test of perspective-taking in 3-year-olds.

Participants

Participants included two groups of monolingual and bilingual 3- to 4-year-old preschoolers recruited from a Head Start preschool located in Northern California among 4 classes in the center. All participants were from families below the income figures published annually by the federal government as the Poverty Guidelines (see Head Start, 2009). Participants’ bilingualism was determined by the information collected in the
Head Start agency’s files and matched with parent’s input. No further data were collected about the nature of the bilingual experience.

In total, 67 children were invited to participate and 48 of them (25 boys and 23 girls) participated in the study. The mean age was = 4.23 years, SD = .495. Twelve participants were 3-year-olds and 36 were 4-year-olds.

**Materials**

Two identical solid blue color balls, green color balls, yellow color balls, and white color balls plus four identical solid color rabbit pictures in blue, green, yellow, and white were used in the pretest.

Two identical solid white color plush rabbits, two identical solid white color balls, and two identical solid blue color balls were used as objects. One solid blue color picture of a horse, a dog, and a rabbit were used. One acrylic yellow filter and one acrylic blue filter, three transparent plastic screens with paper-thin slots into which filters could be slid, and a fabric bag were used for demonstrations and tasks.

**Procedure**

Data collection took place in a quiet room at a Head Start preschool and lasted approximately 10 to 15 minutes per child. Each child took a pretest for color recognition
in English language as an eligibility measure prior to beginning of the experiment and the participant’s responses were recorded on Participant Screening form (see Appendix A).

A teacher (referred to as Experimenter in this paper) assisted the researcher (referred to as Questioner) to administer the Theory of mind tasks and code the data. The Experimenter and the Questioner recorded the scores on separate Participant Response forms (see Appendix B). After the eligibility pretest, children completed three Theory of Mind tasks: a color task, a mix task, and a production task. A demonstration phase preceded each task. The entire procedure was videotaped for coding purposes.

**Eligibility Pretest**

To determine whether a child was eligible to participate in this study, s/he was required to demonstrate knowledge of the four colors to be used in these tasks. The child sat at the table next to the Experimenter. Eight identical, same size balls - two solid blue color, two solid green color, two solid yellow color, and two solid white color - were placed on the table. The Experimenter said aloud the color of the balls while placing them on the table. The Experimenter asked for one ball of each color and the child placed it in a bag. Next, the Experimenter did the same with four identical rabbit pictures in four solid blue, green, yellow, and white colors and the child was asked to put each requested picture in the bag. In order to maintain the fairness of administering the same procedure with each participant and counterbalancing the color requests, the Experimenter read the same written instructions on the Participant Screening form (see Appendix A) to each child during the test. Preschoolers who correctly picked all four
balls and four pictures were eligible to participate in the study. After two weeks children not passing the pretest a first time were offered it again.

**Demonstration Phase for Color Task**

The Experimenter placed two transparent plastic screens with paper-thin slots, into which filters could be slid, adjacent to one another in the middle of the table. One screen had a blue acrylic filter, making the screen appear transparent blue. The Questioner accompanied the child to the room and asked the child to sit at one end of the table facing the screens with the Experimenter. The Questioner turned on the camcorder and left the room through the door, which was facing the child and plastic screens. The Experimenter was sitting at the middle of the table facing the edge of the screens.

The Experimenter placed one of the identical white plush rabbits in front of the clear screen and the other in front of the blue filtered screen between the child and the screens making both rabbits appear white to the child (see Figure 1). First, the Experimenter pointed to the rabbit in front of transparent screen and said, “This is a white rabbit”. Second, the Experimenter pointed to the rabbit in front of blue filtered screen and said, “This is a white rabbit”. Then, the Experimenter guided the child to walk around the table toward the door (180 degrees) and look at the screens from the other angle (see Figure 2). The Experimenter pointed to the rabbit behind the clear screen and said, “The rabbit looks white”. Next, the Experimenter pointed to the rabbit behind the blue filtered screen and said, “The rabbit looks blue”.

Figure 1. Demonstration for Color Task showing the effect of blue filter on white object from the participant’s perspective.

Figure 2. Demonstration for Color Task showing the effect of blue filter on white object from the Questioner’s perspective.
Then, the Experimenter guided the child back to her/his seat and the Experimenter repeated the same demonstration with two identical white balls for the child.

**Color Task**

Following the demonstration phase, the child was guided back to his/her seat at the end of the table facing the screens. The Experimenter sat at the middle of the table facing the edge of the screens. The Experimenter switched the screens so that the blue and the clear screens were on opposite sides. The Experimenter placed one white rabbit in front of each screen between the child and the screens. At that time, the Questioner entered the room facing the child and the screens viewing the white rabbits through the clear and blue filtered screens and said, “Look at those rabbits, they are cute. Can you put the blue rabbit in the bag for me?” The Experimenter held up a bag next to the child. When the child was selecting the rabbit, the Experimenter gazed at the edge of the screens to avoid eye contact with the child for confirmation. Also, the Questioner avoided eye contact with the child or looking at the rabbits. If the child picked both rabbits, the Experimenter put the rabbits back and the Questioner repeated the same request. After the child picked the rabbit, the Questioner turned away from the table and pretended she was busy writing. The Experimenter removed the other rabbit and placed white balls between the child and the screens the same way she did with white rabbits. The Questioner turned to the table and requested the white ball. The child picked the ball and dropped it in the bag. Each child had four trials counterbalancing the requests of objects and colors. The Experimenter switched the screens after each pair of trials. The
Questioner left the room after all four trials and told the child she would be back to play more of that game.

**Demonstration Phase for Mix Task.**

The demonstration was similar to the Color Task demonstration. There were two transparent plastic screens in the middle of the table: clear and yellow. The Questioner accompanied the child to the room and asked the child to sit at one end of the table facing the screens with the Experimenter.

The Experimenter placed one of the identical blue balls in front of the clear screen and the other in front of the yellow filtered screen between the child and the screens making both balls appear blue to the child (see Figure 3). First, the Experimenter pointed to the ball in front of transparent screen and said, “This is a blue ball”. Second, the Experimenter pointed to the ball in front of yellow filtered screen and said, “This is a blue ball”.

Then, the Experimenter guided the child to walk around the table toward the door (180 degrees) and look at the screens from the other angle (see Figure 4). The Experimenter pointed to the ball behind the clear screen and said, “The ball looks white”. Next, the Experimenter pointed to the ball behind the yellow filtered screen and said, “The ball looks green”.


Figure 3. Demonstration for Mix Task showing the effect of yellow filter on blue object from the participant’s perspective.

Figure 4. Demonstration for Mix Task showing the effect of yellow filter on blue object from the Questioner’s perspective.
The Experimenter repeated the exact same demonstration with two identical blue rabbit pictures for the child (see Figure 5).

**Figure 5.** Demonstration for Mix Task showing the effect of yellow filter on blue picture from the participant’s perspective.

**Mix Task**

The procedure for the Mix Task was analogous to the previously described Color Task. Following the demonstration phase, the child was guided back to his/her seat at the end of the table facing the screens. The Experimenter sat at the middle of the table facing the edge of the screens. The Experimenter switched the screens so that the yellow and the clear screens were on opposite sides. The Experimenter placed one blue ball in front of each screen between the child and the screens. At that time, the Questioner entered the room facing the child and the screens viewing the blue balls through the clear and
yellow filtered screens and said, “Look at those balls, I like those. Can you put the blue ball in the bag for me?” The Experimenter held up a bag next to the child. When the child was selecting the ball, the Experimenter gazed at the edge of the screens to avoid eye contact with the child for confirmation. In addition, the Questioner avoided eye contact with the child or looking at the balls. If the child picked both balls, the Experimenter put the balls back and the Questioner repeated the same request. After the child picked the ball, the Questioner turned away from the table and pretended she was busy writing. The Experimenter removed the other ball and placed blue rabbit pictures between the child and the screens flat on the table. The Questioner requested the green rabbit picture. The child picked the picture and put it in the bag. Each child had four trials counterbalancing the requests of objects and colors. The Experimenter switched the screens after each pair of trials. Both the Experimenter and the Questioner recorded the answers on the Participant Response form (see Appendix B) at the time of receiving the response. The Questioner stayed in the room after all four trials pretending she was reading some booklets off the shelves.

**Demonstration Phase for Production Task**

The Experimenter left the transparent plastic screen with yellow filter in the middle of the table and removed the clear screen. The Experimenter placed the blue ball in front of the screen and said, “This is a blue ball”. Next, the Experimenter placed it behind the screen with a yellow filter and said, “The ball looks green”. The Experimenter repeated this with the blue rabbit picture. Then, the Experimenter told the
child that they were going to switch roles; meaning that the child was going to sit at the Experimenter’s seat and act like a teacher and the Experimenter sit at child’s seat.

**Production Task**

The child was sitting at the middle of the table facing the edge of the screen with yellow filter. The Experimenter handed the blue ball to the child and asked, “Can you make this ball look green to me?” If the child could place the ball behind the screen and make it look green to the Experimenter, the answer was counted as correct. The child had three more trials with blue horse, rabbit, and dog pictures and requests were counterbalanced.

Each trial ended after the child placed the ball/the picture in front or behind the screen and the Experimenter confirmed the response, “Does the ball look green to me now?” The Questioner was present during the Production Task.

**Coding**

Each response was coded as correct (1) or incorrect (0). Both the Experimenter and the Questioner recorded children’s responses. Additionally, based on video data, a third scorer recorded responses. Pairs were examined for inter-rater reliability, which was high (Kappa ranged from 0.850 to 0.912). Discrepancies were resolved via review and discussion of the video.
Chapter 4

RESULTS

Descriptive Analyses

All three perspective-taking tasks (Color, Mix, Production) referred to filtered screen tasks requiring children to take the perspective of the Questioner when different from the perspective of the child. Control items in all three tasks referred to unfiltered screen tasks requiring children to choose the perspective matching their own. Table 1 shows means and standard deviations for scores on these items.

Table 1. Descriptive Statistics

<table>
<thead>
<tr>
<th>Items</th>
<th>n</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color Perspective</td>
<td>48</td>
<td>0.88</td>
<td>0.23</td>
</tr>
<tr>
<td>Color Control</td>
<td>48</td>
<td>0.82</td>
<td>0.30</td>
</tr>
<tr>
<td>Mix Perspective</td>
<td>48</td>
<td>0.85</td>
<td>0.29</td>
</tr>
<tr>
<td>Mix Control</td>
<td>48</td>
<td>0.72</td>
<td>0.38</td>
</tr>
<tr>
<td>Production Perspective</td>
<td>48</td>
<td>0.90</td>
<td>0.26</td>
</tr>
<tr>
<td>Production Control</td>
<td>48</td>
<td>0.34</td>
<td>0.47</td>
</tr>
</tbody>
</table>

*Note.* Perspective = filtered screen tasks; Control = unfiltered screen tasks; Correct response = 1, incorrect = 0.
Based on examination of means in Table 1, participants performed well for filtered tasks, but more poorly for unfiltered tasks. Inferential analyses were used to further explore this trend.

Preliminary analyses examining age and gender effects were also conducted. T-tests showed a trend for boys to outperform girls in the Color Task (in both perspective and control items), as shown in Figure 6. Table 2 shows the results of gender effect and because of these differences, gender was included in hypothesis tests.

Figure 6. Gender Differences in all Items
Table 2.

*Gender T-Test Results*

<table>
<thead>
<tr>
<th>Items</th>
<th>Boy, n=25</th>
<th></th>
<th>Girl, n=23</th>
<th></th>
<th>Sig.(2-tailed)</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color Perspective</td>
<td>0.98</td>
<td>0.10</td>
<td>0.78</td>
<td>0.29</td>
<td>0.003</td>
<td>3.15</td>
</tr>
<tr>
<td>Color Control</td>
<td>0.92</td>
<td>0.23</td>
<td>0.71</td>
<td>0.33</td>
<td>0.018</td>
<td>2.45</td>
</tr>
<tr>
<td>Mix Perspective</td>
<td>0.86</td>
<td>0.30</td>
<td>0.84</td>
<td>0.27</td>
<td>0.887</td>
<td>0.14</td>
</tr>
<tr>
<td>Mix Control</td>
<td>0.80</td>
<td>0.35</td>
<td>0.65</td>
<td>0.41</td>
<td>0.187</td>
<td>1.33</td>
</tr>
<tr>
<td>Production Perspective</td>
<td>0.88</td>
<td>0.92</td>
<td>0.93</td>
<td>0.22</td>
<td>0.482</td>
<td>0.70</td>
</tr>
<tr>
<td>Production Control</td>
<td>0.50</td>
<td>0.50</td>
<td>0.17</td>
<td>0.38</td>
<td>0.16</td>
<td>2.50</td>
</tr>
</tbody>
</table>

*Note.* Perspective = filtered screen tasks; Control = unfiltered screen tasks; Confidence Interval=95%.

In addition, results indicated a significant difference between 3-year-old and 4-year-old groups in Color Task performance. As shown in Table 3, older children outperformed young children in the control task; yet no other significant age differences were detected, so age was not considered in further analyses.
Table 3.
Age (3-year-olds and 4-year-olds) T-Test Results

<table>
<thead>
<tr>
<th>Items</th>
<th>3-year-olds, n=12</th>
<th>4-year-olds, n=36</th>
<th>Mean</th>
<th>SD</th>
<th>Mean</th>
<th>SD</th>
<th>Sig.(2-tailed)</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color Perspective</td>
<td>0.79</td>
<td>0.25</td>
<td>0.91</td>
<td>0.22</td>
<td>0.113</td>
<td>-1.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Color Control</td>
<td>0.66</td>
<td>0.32</td>
<td>0.87</td>
<td>0.27</td>
<td>0.036</td>
<td>-2.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mix Perspective</td>
<td>0.95</td>
<td>0.14</td>
<td>0.81</td>
<td>0.31</td>
<td>0.154</td>
<td>1.44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mix Control</td>
<td>0.70</td>
<td>0.39</td>
<td>0.73</td>
<td>0.38</td>
<td>0.831</td>
<td>-0.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production Perspective</td>
<td>0.83</td>
<td>0.38</td>
<td>0.93</td>
<td>0.21</td>
<td>0.278</td>
<td>-1.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production Control</td>
<td>0.41</td>
<td>0.51</td>
<td>0.31</td>
<td>0.46</td>
<td>0.544</td>
<td>0.61</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. Perspective = filtered screen tasks; Control = unfiltered screen tasks; Confidence Interval=95%.

Hypothesis Testing

A series of 2 (language: bilingual vs. monolingual) x 2 (gender: boy vs. girl) x 2 (filter: perspective-taking vs. control) Analyses of Variance (ANOVAs), with language and gender as between subjects variables and filter (perspective-taking) varying within subjects, were used to test the hypothesis that bilinguals would outperform monolinguals on perspective-taking (filtered screen) tasks.
Color Task

The ANOVA revealed no significant effect of filter or language and no significant interaction as reported in Table 4. Consistent with preliminary t-tests, there was a main effect of gender, such that boys outperformed girls in both filtered and control tasks (Figure 7).

Table 4.

<table>
<thead>
<tr>
<th>Effects</th>
<th>F</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>filtered</td>
<td>1.75</td>
<td>0.19</td>
</tr>
<tr>
<td>language</td>
<td>0.35</td>
<td>0.55</td>
</tr>
<tr>
<td>gender</td>
<td>12.3</td>
<td>.001</td>
</tr>
<tr>
<td>filtered*language</td>
<td>0.26</td>
<td>0.60</td>
</tr>
<tr>
<td>filtered*gender</td>
<td>0.00</td>
<td>0.99</td>
</tr>
<tr>
<td>language *gender</td>
<td>0.03</td>
<td>0.86</td>
</tr>
<tr>
<td>filtered*language *gender</td>
<td>0.63</td>
<td>0.42</td>
</tr>
</tbody>
</table>

Note. Confidence Interval=95%.
Mix Task

The ANOVA revealed a significant effect of filter, such that children were better when perspective-taking, $M = 0.85$, than when in the control condition, $M = 0.72$. The main effect of language approached significance such that monolinguals were more successful overall, $M = 0.92$ than were bilinguals, $M = 0.77$, in perspective-taking tasks. There were no other main effects or interactions (Table 5).
### Table 5.

*Mix Task Main Effects and Interactions*

<table>
<thead>
<tr>
<th>Effects</th>
<th>F Value</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>filtered</td>
<td>3.77</td>
<td>0.05</td>
</tr>
<tr>
<td>language</td>
<td>3.70</td>
<td>0.06</td>
</tr>
<tr>
<td>gender</td>
<td>1.24</td>
<td>0.27</td>
</tr>
<tr>
<td>filtered*language</td>
<td>0.01</td>
<td>0.91</td>
</tr>
<tr>
<td>language *gender</td>
<td>0.51</td>
<td>0.47</td>
</tr>
<tr>
<td>filtered*gender</td>
<td>1.08</td>
<td>0.30</td>
</tr>
<tr>
<td>filtered*language *gender</td>
<td>0.02</td>
<td>0.87</td>
</tr>
</tbody>
</table>

*Note.* Confidence Interval=95%

### Production Task

As with the other tasks, there was a main effect of gender with boys again outperforming girls (Figure 8). This is qualified by an interaction between filter and gender (Table 8). For filtered tasks requiring sophisticated perspective-taking, boys and girls performed similarly, yet for control tasks boys outperformed girls, who performed quite poorly. No other main effects or interactions were significant.
Table 6.
Production Task Main Effects and Interactions

<table>
<thead>
<tr>
<th>Effects</th>
<th>F</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>filtered</td>
<td>46.3</td>
<td>0.00</td>
</tr>
<tr>
<td>language</td>
<td>1.86</td>
<td>0.17</td>
</tr>
<tr>
<td>gender</td>
<td>4.49</td>
<td>0.04</td>
</tr>
<tr>
<td>language * gender</td>
<td>0.49</td>
<td>0.48</td>
</tr>
<tr>
<td>filtered*language</td>
<td>0.39</td>
<td>0.53</td>
</tr>
<tr>
<td>filtered*gender</td>
<td>4.98</td>
<td>0.03</td>
</tr>
<tr>
<td>filtered*language * gender</td>
<td>0.55</td>
<td>0.46</td>
</tr>
</tbody>
</table>

Note. Confidence Interval=95%.
Chapter 5
DISCUSSION

Hypothesis and Results

A growing body of literature shows an integrated relationship between language and Theory of Mind (Astington & Baird, 2005; Astington & Dack, 2008; De Villiers, 2007; Farrar et al., 2005; Ebert, 2014; Hale & Tager-Flusberg, 2003; Lohmann & Tomasello, 2003; Meristo et al., 2007; Miller, 2006; Milligan et al., 2007; Mulder, 2011; Perner & Aichhorn, 2008). Moreover, some studies reported a positive influence of bilingualism on different aspects of Theory of Mind development in young children (Bialystok et al., 2012; Goetz, 2003; Kovacs, 2009; Meristo et al., 2007; Miller, 2006; Rubio-Fernandez & Glucksberg, 2012; Siegal & Surian, 2012; Tare & Gelman, 2010). Yet whether or how these results apply to younger children is still a primary concern for developmental psychologists. Therefore, the purpose of this study was to investigate whether bilingualism predicts development of Theory of Mind in 3- to 4-year-old preschoolers. The results did not support the hypothesis that bilinguals would outperform monolinguals on perspective-taking (filtered screen) tasks.

Language

Color Task compared bilinguals and monolinguals performance in a one-color task, which was seeing a white object blue through a blue filtered screen. Results showed
no significant effect of language in these filtered screen tasks, which required awareness of differing visual perspective between the Questioner and the participant. The Mix Task was similar to the Color Task, which was seeing a blue object/picture green through a yellow filtered screen. In contrast to expectation, there was a language main effect such that monolinguals did better than bilinguals did. In the Production Task, participants moved a blue object/picture in front or behind the yellow filtered screen to change the color of the object/picture for the Experimenter. No main language effects or interactions were significant for Production Task.

Although the results for two of the Theory of Mind tasks did not support the expectation that bilinguals would outperform monolinguals, it did not indicate a disadvantage for bilinguals either. This result confirms that many families in the United States might have the misconception that bilingualism will delay language acquisition or other milestones in young children (Grosjean, 2011; see also Bialystok et al., 2012). Meanwhile, results for the Mix Task showed an advantage for monolinguals over bilinguals and may be an indication that bilingualism may or may not facilitate or influence this type of visual perspective-taking that correlates with Theory of Mind. However, such results call for further investigation to see what would be the reason that the same children responded similarly to Color Task and then one group outperformed the other in Mix Task; and in Production Task. This happened despite the fact that all three experiments had similar procedures and analogue to one another in many ways. In addition, the experiments took place in a quiet and familiar room with teachers that children had met before to reduce the environment effect influencing the child’s comfort.
level; also, a child could participate in the experiment when s/he passed color recognition test. Moreover, demonstration phases were administered before each task to reduce the possibility that the correct responses were due to chance. However, such criteria might not have guaranteed that children’s performance was not affected by other factors. In fact, these mixed results require a review of methods to see whether methodological limitations affected the results. For example, it could be a lengthy procedure for a preschool age child; or having demonstrations and afterwards performing the tasks would be confusing.

Adding to this, the major limitation of this study was the sample composition, which was from a specific, low SES group of children. A handful of studies have reported a correlation between socioeconomic status and children’s development and performance on many cognitive tasks (Bradley & Corwyn, 2002; Christensen et al., 2014; Hackman, & Farah, 2009; Hoff, 2003; Johnston, Low, de Baessa, & MacVean, 1987; McLoyd, 1998; Noble et al., 2012). Because detailed information were not gathered about children, family structure, and home environment, it is possible the monolingual and bilingual groups differed on more than language. Future research can answer these questions with targeting other populations with differing characteristics such as culture, SES, or language and comparing the results.

**Gender**

Although gender was not a variable of interest initially, several main effects revealed gender may be an important consideration in this body of research. A handful of
studies have explored gender differences in different domains of cognitive and social emotional development leaving the question of how gender affects children’s development controversial. For example, Lowe, Mayfield and Reynolds (2003) conducted a research on memory performance of 1,279 children and adolescents and reported some strengths for females on verbal tasks and some for males on spatial tasks. However, Ardila, Rosselli, Matute, and Inozemtseva (2011) believe that gender differences are minimal during cognitive development. They reported non-significant differences between 788 monolingual children (350 boys, 438 girls) ages 5 to 16 years from Mexico and Colombia assessing language and spatial abilities in series of neuropsychological tests. Small percentage of variance (1%-3%) they reported was such that boys outperformed girls in oral language, spatial abilities and visual tasks. In fact, Reilly and Neumann (2013) believe that the similar gender differences they found in their meta- analysis of 12 studies refers more to gender roles than biological gender differences. In studies of individual differences in cognition, we can add other factors to gender role variable affecting boys and girls performances in various tasks. For example, Ginsburg and Pappas (2004) researched how SES affects children’s informal math knowledge. They reported that in a sample of 102, 4-5-year-olds, children from upper SES group showed higher rates of success on many problems than did the children from lower and middle SES groups. It is interesting that they found out the differences were more in how they performed the tasks rather than their knowledge about the task. Therefore, it might be possible that significant effect of gender showing that boys in both monolingual and bilingual groups scored better than girls did in this study has been
influenced by variables such as SES. Future research can shed more light on the question of whether SES or gender roles affected children’s performance in this study.

**Other Findings**

It should be mentioned that across tasks, participants performed quite well for experimental filtered screen tasks that required perspective-taking skills in all three tasks (Color Task = 88.5%, Mix Task = 85.45%, and Production = 90.65%). This finding confirms previous studies indicating that preschoolers develop remarkable skills in perspective-taking tasks as early as three years of age (Chandler, Fritz, & Hala, 1989; Epley et al., 2004; Flavell et al., 2008; Frick et al., 2014; Frye, & Moore, 2014; Kaysili, & Acarlar, 2011; Moll, & Meltzoff, 2011; Sabbagh, Moses, & Shiverick, 2006). However, the results for control tasks without using filter showed a different trend of doing well at the beginning but giving more incorrect responses toward the end (Color = 82.05%, Mix = 74.65%, and Production = 34.7%). This might be the result of the procedure being too lengthy or being confusing toward the end. But, if these two factors would affect the responses, the responses for perspective-taking tasks should have shown the similar trend. It is possible that children were more interested, focused on challenging tasks, and were not attentive enough to easy control tasks. Unfortunately, the sample size was too small to be able to draw stronger conclusions.

In addition, dividing participants into distinct age groups of 3-year-olds and 4-year-olds showed significance in Color Task supporting the idea that younger preschoolers need to develop more cognitive awareness of differing visual perspectives
as compared to 4-year-olds. Some studies have reported similar findings that older preschoolers do better in perspective-taking tasks than younger ones (Flavell et al., 2008; Frye, & Moore, 2014; Kaysili, & Acarlar, 2011). There were not enough children in each age x language group to permit detailed analysis of age group differences.

**Limitations and Future Research**

As discussed earlier, some mixed results in participants’ performances called attention to possible methodological limitations. For example, one of the factors could be duration of the experiment or the confusion caused by demonstration phases and experiments. However, the major limitation was the characteristics of the sample in that it consisted of only low SES children. In addition, specific data related to bilingualism were not collected. For instance, there are no data in regard to language dominance or the type of the bilingualism (sequential or simultaneous) which would have affected the results. Moreover, the sample was not large and it was not possible to increase the sample size for greater power to detect significant effects. Therefore, future research that makes modifications to methodology and sample characteristics may determine whether these null findings hold or whether this study did not have the power to detect differences.
Implications

Taken together, there is no doubt that considering bilingualism as a problem or an asset does not change the fact that bilingualism widely exists, along with its attendant linguistic and cognitive consequences. Davis-Unger & Carlson (2008) suggest how learning about Theory of Mind in preschoolers can help in developing teaching skills (see also Macrory, 2006). All developmental milestones are complex and interrelated with one another. Therefore, learning more about how bilingualism affects our typically or atypically developing children and how it can be advantageous or not to them will provide us tools and resources in language planning for a growing population of English language learners and their educators (Westby, 2014; Weyant, 2007). The results from research in this area also can educate monolingual and bilingual parents to better understand their children’s needs in communication and social settings. As discussed in literature review, bilingualism has shown positive effects on development; although, De Bruin, Treccani, and Salal (2015) believe that vast body of research in favor of bilingualism in literature might have been resulted from a media bias. This means that most of the research results in favor of positive effect of bilingualism have been surfaced to the media. Future research will shed more light on many questions in this field and pave the path for debates supported by empirical research.
Appendix A

Participant Screening Form

Color recognition pretest, in English language, to participate in the study:
Child’s participant Number: Age: Gender:
Language/s spoken other than English:
Researcher’s Name:
Researcher’s Signature: Date:

Test 1

| SOLID BLUE BALL | O Yes | O No |
| SOLID YELLOW BALL | O Yes | O No |

| SOLID GREEN BALL | O Yes | O No |
| SOLID WHITE BALL | O Yes | O No |

Procedure for test 1: The researcher places two solid blue color balls, two solid green color balls, two solid yellow color balls, and two solid white color balls on the table. The researcher shows a bag and asks the child, “Can you put the blue ball in this bag?” The researcher repeats the same question for each three remaining colors. Researcher only marks the first answer.

Test 2

| SOLID BLUE RABBIT PICTURE | O Yes | O No |
| SOLID YELLOW RABBIT PICTURE | O Yes | O No |

| SOLID GREEN RABBIT PICTURE | O Yes | O No |
| SOLID WHITE RABBIT PICTURE | O Yes | O No |

Procedure for test 2: The researcher places two solid blue color rabbit pictures, two solid green color rabbit pictures, two solid yellow color rabbit pictures, and two solid white color rabbit pictures on the table. The researcher shows a bag and asks the child, “Can you put the blue rabbit in this bag?” The researcher repeats the same question for each three remaining colors. Researcher only marks the first answer.

To pass the pretest, participant should recognize all four colors in both pretest 1 and 2.
O PASS O NOT PASS
Appendix B

Participant Response Form

Participant’s ID No. :

Experiment 1a requests:  Blue Plush Rabbit
                          White Ball
                          White Plush Rabbit
                          Blue Ball

Experiment 1b requests:  White Ball
                          Green Rabbit Picture
                          Green Ball
                          White Rabbit Picture

Experiment 2 requests:  Make Ball Look Green
                        Make Horse Look Blue
                        Make Rabbit Look Blue
                        Make Dog Look Green


