BILINGUALISM AND THEORY OF MIND: VARIATION WITHIN BILINGUAL PRESCHOOLERS

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CERTIFICATION OF APPROVAL

I certify that I have read Bilingualism and Theory of Mind: Variation within Bilingual Preschoolers by Marium Yusufzie, and that in my opinion this work meets the criteria for approving a thesis submitted in partial fulfillment of the requirements for the degree: Master of Arts in Psychology: Developmental Psychology at San Francisco State University.

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BILINGUALISM AND THEORY OF MIND: VARIATION WITHIN BILINGUAL PRESCHOOLERS

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The present study examined the link between preschoolers' bilingualism and their Theory of Mind (ToM) understanding. As exposure to two languages may increase children's ability to understand complex mental states, the impact of bilingualism on the advancement of ToM among bilingual preschool children was investigated. Participants were recruited from preschools in the San Francisco Bay Area that serve predominantly multicultural and multilingual communities. All thirty-seven children (mean age = 47.11 months; SD = 5.39) that participated were reported as being bilingual by their parent. All parents filled out a survey regarding their child's ability to understand and speak in a second language. To measure ToM understanding, participants were given the Wellman and Liu's (2004) Theory of Mind Scale, which included six items varying in level of difficulty. To measure English receptive vocabulary the Peabody Picture Vocabulary Test (PPVT-4) was given. A significant correlation was found between child's English receptive vocabulary and ToM understanding. Hierarchical regression analysis revealed that preschoolers' level of bilingualism accounted for significant variance in overall ToM performance, even after controlling for their level of English receptive vocabulary. The present study supports the positive impact bilingual experience has on preschoolers' ToM understanding.

Keywords: theory of mind, bilingualism, preschool

I certify that the Abstract is a correct representation of the content of this thesis (or dissertation)

Ira H. Pavl 5/21/19

Chair, Thesis Committee Date

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICIES

Appendix Page

Introduction

To navigate in the social world, the ability to engage in a meaningful social interaction is essential. A successful social interaction occurs when a person is able to process and integrate others' perspectives, feelings, and beliefs that may be different from their own. Theory of Mind (ToM) is defined as the ability to interpret and understand that individuals could have different mental and emotional states; and that one's actions are guided by interpretations of the world (Wellman, Cross, & Watson, 2001). It is referred to as ToM since our beliefs about what might be going on in another person's head are just that, they are theories. ToM is something one readily engages on a daily basis while interacting with others. For example, when suggesting a restaurant for dinner with a friend, one might not only consider their own preference but may also consider their friend's preference of cuisines and/or dietary restrictions. The ability to detect sarcasm requires ToM as well. For example, when someone is sarcastic, one must understand that the sarcastic statement being made is not one that the person believes. This requires one to use what they know about the person making the sarcastic statement and understand that the statement is independent of their true beliefs. Such mental state processing is helpful in daily engagements as it enables one to better adjust into social contexts, understand other's perspectives, and empathize with those around them. Needless to say, ToM is at the heart of social cognition and is a core aspect to human relationships.

As children develop, they learn about the world through their own experiences and often attribute their mental states onto others around them. Therefore, it is challenging for young children to grasp the idea that others could have differing beliefs, thoughts, and desires than their own (Rubio-Fernandez, 2017). In fact, it is not until

between ages four and six, children start to reach this important milestone (Devine & Hughes, 2014). A common task researchers use to test for ToM understanding is called the false belief task—an individual holding a belief about the world that may differ with reality, hence having "false belief" (Rubio-Fernández, 2017). One of the most frequently used false belief tasks is called the Sally Anne task. Children are introduced to two characters, Sally and Anne. Children are then told that Sally places an item (i.e., ball) in her basket and then leaves. Then, children are told that while Sally is gone, Anne moves the ball into her box. Children are asked where Sally might look for her ball when she returns. A majority of children under the age of four fail the false-belief task, answering that Sally will look for her ball in the box because they are unable to take on Sally's perspectives. In contrast, many children who are over the age of four answer that Sally will look for her ball in the basket, thus passing the false belief task. Once children have passed the false-belief task, it is marked as reaching a major milestone in the development of ToM. Across cultures, numerous studies have shown consistent findings that children typically pass false-belief tasks between the ages four and six (Liu, Wellman, Tardif, & Sabbagh, 2008; Shahaeian, Peterson, Slaughter, & Wellman, 2011; Wiesmann, Friederici, Disla, Steinbeis, & Singer, 2018). Thus, there appears to be a universal developmental shift in grasping the complex mental states and researchers have begun studying the underlying mechanisms that fosters such shift.

Language Matters

ToM research stems from evolutionary biology; the term was first coined by primate researchers Premack and Woodruff (1978) as they examined chimpanzee's understanding of human goals and found that chimpanzees were unable to understand the

psychological state of others. Why may that be? One factor that separates human social cognition from those of chimpanzees is that humans have evolved sophisticated and complex use of language (Tomasello & Herrmann, 2010). In order for children to understand mental states such as feelings, desires, beliefs, and thoughts it seems necessary to hear language that is used to express such mental states. Language is crucial to developing ToM as it facilitates understanding of oneself and others through conversations which help children label and describe feelings from their own inner thoughts and interpret them into conversations (de Villiers & de Villiers 2014). It seems that language and ToM are closely intertwined as more conversations leads to opportunity for mental state words to emerge, thus allowing children to represent their own mental state and infer about others.

In the last three decades, abundant research conducted with autistic, deaf, and normal hearing children provided a wealth of knowledge on development of ToM understanding, which further provides evidence for the importance of language exposure (Peterson & Siegal, 1999; Peterson, Slaughter, Moore, & Wellman, 2016; Shield, Pyers, Martin, & Tager-Flusberg, 2016). For example, Peterson and Siegal (1999) found that native signers, oral deaf children, and normal hearing children all scored higher on ToM tasks than compared to signing deaf children from hearing families and autistic children. The researchers argued that the reason deaf children from hearing families were delayed in developing ToM was due to the lack of early conversational input from parents who are also learning sign language themselves. Individuals diagnosed with autism, especially with language deficiency, also face difficulty with ToM tasks as they may not readily understand verbal cues as well as other social cues such as emotions (Baron-Cohen,

2001).Unfortunately, deficits in ToM understanding lead to further difficulties in social interaction and communication. These studies with atypically and typically developing children have provided insights onto understanding factors (e.g., language input from parents) contributing to development of ToM.

Executive Function

Other researchers have found that children's executive function (EF) is related to ToM understanding. For example, Carlson and Moses (2001) examined inhibitory control (i.e., ability to inhibit prepotent responses) and ToM performance in preschool aged children. The study consisted of 107 preschool children ages three to four whom were given the Peabody Picture Vocabulary Test (PPVT)—a test of receptive vocabulary ability, two ToM tasks (i.e., location false-belief and content false-belief), and a mental state control task. The location false-belief task was similar to the classic Sally-Anne task. It consisted of two puppets and two distinct containers where one puppet places a ball under one container and leaves, the other puppet moves the ball into another container, first puppet returns and children are asked where the puppet believes the ball is versus where it actually is. The content false-belief task consisted of children being shown a Band-Aid box and were asked what they thought were inside it. Then, children see that an unexpected item (i.e., crayons) is inside the Band-Aid box. Next, children are told about a puppet that has never seen inside the Band-Aid box before, and are asked what the puppet believes is inside the Band-Aid box. The mental states control task was similar to the false-belief tasks, however did not contain references to mental states. More specifically, children were asked to open a box which contained a toy pig, researchers then suggest that the children remove the pig and replace it with a toy horse. Once

children replaced the toy pig with a toy horse and the box is closed, children are asked what is inside the box now as well as what was inside the box before they first opened it.

Lastly, an inhibitory control battery was given, which consisted of "Day/Night", "Bear/Dragon", and a Pretend-Action tasks. In the "Day/Night" task, children were instructed to say "day" when a card depicting the moon/stars were shown and to say "night" when a card depicting the sun was shown. "Bear/Dragon" task was similar to "Simon Says," in which children were asked to listen to the commands of the "nice Bear" and ignore the commands of the "naughty Dragon." The Pretend-Actions task assessed children's level of pretend play through asking children to demonstrate pretend actions, such as pretending to sleep or pretending to put sunglasses on. After controlling for confounding variables such as age, gender, family size, and verbal ability, Carlson and Moses (2001) found that inhibitory control was strongly correlated to children's ToM skills. In other words, skills that is required for children to inhibit a dominate response and initiate a subdominant response were also seen in children who have higher ToM.

Another component of EF that has been shown to influence ToM development is working memory. Working memory is a cognitive system responsible for holding short term information and is useful when it comes to reasoning, decision making, and behavior (Carlson, Moses, & Breton, 2002; Davis & Pratt, 1996; Keenan, Olson, & Marini, 1998). For example, Carlson, Moses, & Breton (2002) found that working memory along with inhibitory control was found to be strongly related to ToM abilities among preschool aged children. Indeed, the ability to understand others' mental states requires an individual to hold and incorporate multiple perspectives/information simultaneously, while selectively attending only to relevant perspectives/information.

Lastly, mental shifting, which is the ability to adapt ones behaviors or thoughts to a new or unexpected event, is the ability to make appropriate changes to adapt to a new situation. This ability to redirect one's behavior and attention from one fixation to another easily have also been found to contribute to ToM development (Bradford, Gomez, & Jentzsch, 2018). The ability to shift from one's own perspective and take on another person's perspective is crucial when understanding others mental states. All-in-all, abundant studies suggest that EFs—inhibitory control, working memory, mental shifting, or the combination of the three—plays a role in facilitating ToM advancement in preschool age children.

Parental Input and Sibling Interactions

Other studies have examined the relationship between family size and children's ToM understanding (Cole & Mitchell, 2000; Cutting, & Dunn, 2006; McAlister & Peterson, 2013; Perner, Ruffman, & Leekman, 1994). Perner, Ruffman, and Leekman (1994) investigated whether the number of siblings one has affected preschool aged children's understanding of false-beliefs. Participants consisted of 76 preschool aged children from the middle-class families. Of the 76 children, 22 were only children, 42 came from a family of two children, and 11 were from a family of three children. Researchers measured children's false-belief understanding through telling a story, one story was about unexpected change and the other about misinformation. Half of the children were told story pertaining to an unexpected change. In the unexpected change story, a child named Max is helping his mother put away groceries; Max put a box of chocolate in the cupboard and then leaves to play. While Max is gone, his mother then moves the chocolate into a different cupboard. After playing, Max was hungry and

returned to retrieve some chocolate. After being told the story, children were then asked about Max's knowledge about the location of the chocolate, as well as, where Max will look for the chocolate. The other half of the children were told the misinformation story where Max is joined by his brother Sam who asks Max where the chocolate is. Max then tells Sam where he mistakenly thinks the chocolate is, providing misinformation. The experimenter then asks the children the same question but this time about Sam's knowledge about the location of the chocolate and where Sam will look for the chocolate.

Perner, Ruffman, and Leekman (1994) found that children from larger families (two or more) performed significantly higher on the false-belief tasks than children from smaller families (none or one sibling). They argued that abundant daily sibling interactions and conversations between siblings may facilitate children's development of ToM understanding. Similarly, another study conducted by Candida Peterson (2000) found that children who had siblings outperformed only children when examining ToM understanding. These findings suggest that sibling social interactions and experiences influence ToM development. Perner et al. (1994) also highlighted the important role parents play in facilitating the conversation between siblings which may further promote ToM understanding.

Others have found that in general, parental input is instrumental in ToM development (Adrian, Clemente, Villanueva, & Rieffe, 2005; Ebert, Peterson, Slaughter, & Weinert, 2017; Moeller & Schick 2006). Peterson and Slaughter (2003) examined whether the amount of mental states concepts discussed by mothers in their conversations with their children was related to their children's ToM understanding. 47 preschool aged children and their mothers participated in the study. The mothers were given the Maternal

Mental State Input Inventory (MSII) which measured the mother's preference for talking about mental states with their children. This was measured through having the mothers read 12 vignettes which depicted everyday family interactions. The vignettes depicted episodes of everyday family interactions (e.g. mother and child baking a cake in the kitchen). There were then four options for responses to the vignettes where mothers had to rank their probability of using with their children, the four choices involved different speeches or actions varying from short responses without any discussion of mental state talk's verses longer response with mental state talks. Children were given the PPVT to measure receptive vocabulary and measures of mental state understanding including gaze reading and desire perspective taking test. In the gaze reading test, children were presented with a picture which displayed a person's face looking at one of the four objects. Children were asked to name the object the person is looking at. Children were also asked which of the four objects they preferred so that the children were not basing their answer off of what they like.

In the desire perspective taking test, children were asked if they preferred candy or vegetables, once children had given their answer, the experimenter would then put a picture of "Susan" in front of the children and claim that Susan liked the opposite of whatever the child claimed. The experimenter then asked children which snack Susan would eat; children then must be able to put their own desire aside and think of what Susan would like to eat. Peterson and Slaughter (2003) found that the more mothers spoke about mental states with their children, the higher their children scored on ToM tasks. Similarly, Racine, Carpendale, and Turnbull (2007) found that parents who discussed mental states while describing pictures to their preschool aged children

predicted children's false belief understanding. An example of mental state conversation would be when a parent is using emotion words with their child while also supporting the child to acknowledge the underlying motivation of those emotions. Considering these findings, parental input through discussing mental states with their children is an important factor in ToM development.

Bilingualism

Although EF, siblings, and parental input have been focused in the research on ToM development, there are other factors that may foster ToM understanding and provide additional insights on the underlying mechanisms responsible for the development. In particular, there is reason to believe that bilingualism influences ToM understanding as children exposed to more than one language must consider other's linguistic/cultural background and switch from one language to another accordingly on a daily bases (Goetz, 2003; Javor, 2016; Wellman, Cross, & Watson, 2001). For example, an English-Spanish bilingual child growing up speaking Spanish at home with his/her parents is aware that their English monolingual classmate will not understand when the child speaks in Spanish with their parent, and thus the child may switch from Spanish to English that is if the child's parents also understand English. However, the child would keep speaking in Spanish to parents and speak English to the classmate if his/her parents do not understand English. As such, bilingual children must assess linguistic background and knowledge of others to make decision regarding which language to speak accordingly in any given social situation. Thus, bilingual children may have opportunity

to reflect and recognize the importance of considering other people's knowledge and perspectives more so than monolingual children.

Ágnes Kovács (2009) examined whether early bilingualism enhances mechanisms of false-belief reasoning. The study compared 32 Romanian-Hungarian bilingual and 32 Romanian monolingual preschool aged children. All bilingual children had been exposed to two languages from birth (a.k.a., crib bilingualism). A standard false-belief task, a modified false-belief task, and a control task were used. The standard false-belief task was a colored illustration of a short story similar to those in the Sally-Anne task. In the modified false-belief task, children were told a story consisted of two characters, one of the characters is a Romanian monolingual while the other character is a Romanian-Hungarian bilingual: there are two stands, one that sells sandwiches and another that sells ice cream; when the characters are approaching the ice cream vendor, the Ice cream vendor says in Hungarian (a language the monolingual puppet does not speak) that there is not any ice cream left, but that the sandwich vendor has ice cream and to go to the sandwich vendor. The experimenter then translates the phrase and pointed out that the monolingual character did not understand what the ice cream vendor had said. Then, children were asked, "Where will the monolingual character go to buy ice cream?" The modified false-belief task consisted of was meant to mimic language-switching situations that bilinguals experience on an everyday basis.

The control task involving physical reasoning was used in order to control for general information processing differences. In this task, a mechanical cardboard device called "gizmo" and small toys were used where children were able to push and pull a rod to free or block passage through the tube. Experimenters would drop toys into gizmo and

depending on whether the rod was pushed in or pulled out, children had to predict the final location of the toys. This task was structurally similar to ToM tasks in that children had to predict two different outcomes, however gizmo does not require reasoning about mental state concepts.

Researchers found that twice as many bilingual children passed the standard false-belief and modified false-belief task, but they scored similarly to monolingual children in the control task. Ágnes Kovács (2009) suggested that such advantage in ToM understanding among bilingual children may be due to better ability to mentally switch from one language to another, allowing bilingual children to have more of an opportunity than monolingual children to consider another individuals' linguistic background. These daily opportunities allow bilingual children to strengthen their perspective taking abilities which may be the reason for the bilingual advantage on ToM tasks.

In another study, Greenberg, Bellana and Bialystok (2013) examined whether bilingual children would perform perspective-taking task more accurately than monolingual children. The participants consisted of 45 monolinguals and 37 bilingual children who were 8-years-old. There were 15 languages represented in the bilingual group, the most common languages being Spanish, Italian, and Portuguese. Three tasks were used to compare the monolingual and bilingual groups: the Peabody Picture Vocabulary Test–III (PPVT), The Kaufman Brief Intelligence Test-Matrices, and a computerized perspective taking task. During the computerized perspective taking task, children saw an image of an owl appear in one of three positions around the array (90°, 180°, or 270°) counter-clockwise from the children. Children then had to pick one image out of the four options that represented the owls' view of the blocks. The four responses

represented either the correct view (owls' view of the blocks), egocentric (child's view of the blocks), structured (correct internal structure of blocks but incorrect orientation in relation to owl's position), and oriented (correct front-back relationship of blocks except the side blocks were reversed). It was found that both monolingual and bilingual children scored the same on the 90° observer position, however there was a significant difference between the two groups for the more complex observer positions of 180°and 270° where bilingual children performed exceedingly better on the more complex spatial tasks than their monolingual peers. The study echoed the results of the previous study observed by Kovács (2009) and demonstrated there is a bilingual advantage in children's perspective taking ability.

Fan, Liberman, Keysar and Kinzler (2015) also argued that the multilingual environment provides bilingual children with important tools for effective communication. Their study compared 72 four- to six-year-old monolingual and bilingual children. Of the 72 children, 24 children were placed into one of the three groups: monolingual, exposure (children not considered bilingual but are regularly exposed to a second language besides English), and the bilingual group (children who spoke both English and a second language). Some of the languages the children spoke or were exposed to included Spanish, Arabic, Polish, French, Japanese, Cantonese, Hebrew, and Greek. Children sat across the table from the experimenter and in between them was a 4 X 4 shelf grid with some of the compartments containing objects (e.g. toys, spoon, brush, cars). From the child's point of view, the child can see everything, however from the experimenter's point of view, certain compartments were blocked off and were not visible to the experimenter. The experimenter wore black matte sunglasses throughout the

task and was instructed to maintain eye gaze toward the center of the grid to avoid unintentionally leading children toward the target object.

The experimenters asked children to move toy cars out from the experimenter's point of view. From the children's point of view, they saw three cars, a small, medium, and large car. But, because certain compartments were blocked off from their view, the experimenter only saw the medium and the large car. When experiments asked the children to move the small car, bilinguals moved the medium car (the smallest one for the experimenter's point of view) 75% of the time whereas monolingual children only moved it 50% of the time. The result demonstrated that bilingual children are better at understanding another individual's perspectives. Fan et al. (2015) argued that being exposed to more than one language, as well as culture, allows bilingual children to reflect and recognize the importance of considering other people's perspectives. Thus, a multilingual environment affords bilingual children with the valuable opportunity to practice such skills.

Previous studies with bilingual and monolingual children contribute to the growing literature on ToM development, and are important, as they highlight the impact of multilingual and multicultural experience. However, previous studies have almost exclusively compared bilingual children's performance to those of monolinguals. Studies have yet to examine the possible variation in perspective-taking abilities among the bilingual children. Language exposure, experience and abilities vary greatly from child to child. By lumping all bilingual children into one category and not taking their level of bilingualism into account, we may miss insights onto understanding the underlying mechanisms at play.

Present Study

Previously, it has been argued that bilingual children's environment enables them to have more opportunity to switch between languages to accommodate people's linguistic backgrounds. This exposure to two cultural perspectives may help children recognize the importance of attending to other people's perspectives. Thus, the level of bilingual exposure children receive should also impact their level of ToM skills. Specifically, children who are more balanced speakers of two languages, the better their ToM skills should be. It is important to compare the degree of bilingualism to ToM development in order to better understand the underlying mechanisms that impact ToM skills.

The present study will fill this gap through examining the link between preschoolers' level of bilingual experience and their ToM understanding. Specifically, I investigated whether the extent or degree of bilingualism was associated with the advancement of ToM among preschoolers. I hypothesized that the degree of bilingualism would be positively associated with ToM development among preschool aged children. Thus, I hypothesized that children's level of bilingualism will predict their performance on ToM tasks. The goal of this study was to offer further insight into how the bilingual experience, specifically the variation within it, which may impact ToM development in preschool aged children.

Method

Participants

Participants were recruited from preschools in the Bay Area that serve predominantly a multicultural/multilingual community. All preschools served middle to

upper-middle class populations. A total of 37 children (M_{age} = 47.11 months; SD = 5.39) participated. Parents reported that their children were exposed to at least one other language at home. For these children, another language other than English was spoken to them at home (e.g., Malayalam, Korean, Pashto, Russian, Bengali, Hindi, Italian, Tamil, Tagalog, Romanian, Spanish, Mandarin Chinese, and Dutch). One of the preschools was an immersion school where Italian and English were both spoken to the children.

Measures

Bilingualism. Parents were given a parental survey which examined children's language experience. An example of the questions included, "Does your child *understand* any language other than English?" Then, the parent was asked to rate their child's *understanding* ability as well as *speaking* ability from a scale of 1-5 (1 = poor and 5 = excellent). The parental survey also included set of questions that detailed the amount of exposure and use of English and second languages at home (e.g., watching TV in another language or grandparents speaking to child in second language). Lastly, parents rated their child's overall level of bilingualism through the Global Bilingual Assessment (GBA), assessing their child's overall level of bilingualism factoring both comprehension and production that included 1 (*being predominately one language speaker*), 2 (*being weak bilingual*), 3 (*being unbalanced bilingual*), 4 (*being practical bilingual*), and 5 (*being fluent bilingual*, see Appendix A).

Theory of Mind (ToM). Wellman and Liu's (2004) Theory of Mind Scale was used to measure the children's ToM understanding. The ToM Scale consisted of six tasks presented in order of least to most difficult for the preschool children. The tasks were diverse-desire, knowledge-access, contents false belief, diverse belief, explicit false

belief, and real-apparent emotion (See Table 1). The experimenters followed the protocol and incorporated pictures and small figurines as instructed in the original study (Wellman and Liu, 2004). Each ToM task received a score of 1 if children answered both the control and target question correctly. Children received a score of 0 if they got one or both wrong. Children were all tested individually.

English receptive vocabulary. Children were also given Peabody Picture Vocabulary Test (PPVT) version 4. The PPVT-4 is used to measure of receptive vocabulary for standard American English. Using the PPVT-4 book, and asked the participant, for example, "point to dog" and they would point to one out of the four pictures. The order in which children received ToM tasks and PPVT-4 was counterbalanced.

Results

Parental reporting of GBA found that roughly 40% of parents reported their children as unbalanced bilinguals ($N = 14$), followed by 24 % of weak bilinguals ($N = 9$), 16% of predominately one language ($N = 6$), 13% of practical bilinguals ($N = 5$), and lastly 8% fluent bilinguals ($N = 3$). In our sample, it was observed that there is a pattern of gradual decrease in number of children from unbalanced bilingual to fluent bilingual.

Figure 1 shows children's percentage correct on the six ToM tasks. Consistent with the previous studies (Peterson, Slaughter, & Wellman, 2011; Wiesmann, Friederici, Disla, Steinbeis, & Singer, 2018), bilingual preschoolers in the present study also found diverse-desire to be the easiest and hidden emotion to be the most challenging.

~~Previous studies have consistently shown positive relationship between language and ToM skills (e.g., Shield, Pyers, Martin, & Tager□Flusberg, 2016).~~ Table 2 shows

bivariate correlations (Pearson's r) among age, receptive vocabulary, ToM score, and overall level of bilingualism (GBA). I hypothesized that children's level of bilingualism is positively associated to ToM development in preschool aged children; specifically children who are more fluent bilinguals will show higher ToM understanding. In our sample, I also found that children's receptive vocabulary, measured by PPVT-4 , was significantly correlated in the direction as expected with ToM ($r = 0.41, p = .01$). Thus, PPVT-4 was controlled for in the subsequent hierarchical regression analysis. To our surprise, children's age was not significantly correlated with children's ToM scores. However, this may be due to the fact that within our sample there was a lack of variation between children's ages where all children's ages were between 32 months and 57 months.

I posited that the extent of bilingualism in preschoolers would predict their ToM performance. In order to test this hypothesis, a two-step hierarchical regression was performing on the total score of ToM with the children's overall level of bilingualism as the predictor while controlling for the children's receptive vocabulary which was significantly correlated with ToM. Hierarchical regression analysis revealed that child's level of bilingualism uniquely accounted for 22% of the variance in children's overall ToM performance ($B = .35$, $t = 2.16$, $p = .03$, adjusted $R^2 = .22$, $F(2,33) = 5.82$, $p = .04$), even after controlling for their level of English receptive vocabulary. Based on these findings, our hypothesis that the extent of bilingualism in preschoolers would predict ToM abilities was supported.

Discussion

Preschoolers are egocentric in nature, they learn about the world through their own experiences and perspective (Piaget, 1952). As a result of being egocentric, preschoolers commonly make mistakes attributing their mental states onto others around them. Although preschoolers' limited understanding and the pattern of ToM development have been heavily researched within the last few decades, the type of daily experiences that might drive ToM advancement is relatively unknown. Therefore, it is important to explore the type of daily experiences that may be driving ToM understanding within preschoolers. When considering what type of daily experience may be influencing ToM understanding, one can assume that children who receive more exposure to daily situations where they witness and must consider others' mental states differing from their own will lead to ToM advancement. Through exposure to situations and/or experiences that allow children to consider others thoughts, feelings, beliefs, and desires it allows children to understand that such complex mental states exist. A bilingual environment enables for such an environment, as children are surrounded by a different language and culture. Such daily experience may lead children away from the egocentric mindset as they gain awareness that one holds their own, unique mental states which guide their behaviors.

The present study examined the relationship between preschooler's level of bilingualism and their ToM understanding. The bilingual experience allows children not only to be exposed to two languages but also provides natural settings for children to consider others' linguistic and cultural backgrounds. Therefore, young children who are more fluent in two languages may have more opportunities to practice such perspective-

taking skills, which in turn, may lead to an advanced ToM understanding. As such, I hypothesized that the level of preschooler's bilingualism would predict their ToM understanding. This study was unique in that it went beyond the current literature, which exclusively compared bilingual children to monolingual children's performances on ToM tasks. Examining variations within the bilingual sample may provide additional insights on factors that lead to growth and changes in ToM understanding. Indeed, even after controlling for the children's level of English Receptive Vocabulary, we have found that preschoolers' overall level of bilingualism significantly predicted their total score on ToM tasks. The present results support the notion that children who are fluent bilinguals, the better their ToM skills are likely to be. This is crucial, as it alludes that it is not merely the exposure to two languages that are helpful, but the active practice of conversing back and forth between two languages that may lead to growth and changes in ToM understanding.

The present study provides important implications for studies that involve bilingual children. As exposure to a bilingual environment alone is not driving ToM understanding, it is crucial to consider what underlying factors within the bilingual environment may lead to ToM advancement. This is why the present study examined the extent of bilingualism and how it may be influencing ToM understanding. Children who are fluent bilinguals must consider the linguistic background of others that they encounter. These children must hold two vastly different lexicons and linguistic structures in their mind and must have the ability to switch back and forth between the languages rather quickly in order to carry on a meaningful conversation. Hence, referencing an example stated earlier in the paper, a bilingual child who fluently speaks

both English and Spanish, is carrying a conversation with their parent who speaks only Spanish, as well as, with their classmate who speaks only English; The bilingual child must hold two languages simultaneously in their working memory, inhibit one language while speaking to the other language, and has to flexibly switch from on language to the other. The bilingual child is relying on their EF skills, which further emphasizes the crucial role EF plays when it comes to ToM understanding. Thus, the extent of bilingualism may provide children with more opportunity to practice and strengthen their EF skills, which may lead to further ToM advancement.

It is important to highlight that the level of bilingualism may matter, as it is indicative of how much children have to engage EF in their daily lives. For example, children who are considered weak bilinguals are less likely to inhibit, hold two languages in their working memory, or even flexibly switch between languages as easily as children who are fluent in their second language. As mentioned earlier, many studies have shown the role EF abilities, such as working memory, inhibitory control, and mental shifting, have on ToM understanding (Bradford, Gomez, & Jentzsch, 2018; Carlson, Moses, & Breton, 2002; Davis & Pratt, 1996). In order to pass a false belief task, such as the Sally-Anne task mentioned earlier, it requires multiple EF skills. For example, children must suppress their knowledge that Anne moved the ball out of Sally's basket while Sally was away (inhibition) and take on Sally's perspective (mental shifting). Both EF and ToM develop rapidly during the preschool years and both share the prefrontal cortex (Carlson and Moses, 2001). The relationship between EF and ToM has been well established and it is clear that EF plays a crucial role in ToM understanding.

Equally well-established is the link between bilingualism and EF (Goetz, 2003; Javor, 2016; Greenberg, Bellana and Bialystok, 2013;Wellman, Cross, & Watson, 2001). Although complex relations among EF, ToM, and bilingualism have yet to be fully explored, studies have already shown (1) the impact EF has on ToM and (2) the impact bilingualism has on EF. In fact, a study by Bialystok and Barac (2012) explored how the bilingual experience, specifically emerging bilingualism, influenced performance on metalinguistic and EF tasks. Bialystok and Barac (2012) conducted two studies; the first study examined 100 children and the second study examined 80 children, both groups were in the process of becoming bilingual in an immersion program. The children in the first study attended a Hebrew school and were mostly second and third graders. Parents were given a questionnaire to complete where they rated the use of English and Hebrew in 23 situations. PPVT and Hebrew vocabulary were used to measure vocabulary. A non-verbal intelligence test called the KBIT-2 was also used as an assessment test. For the metalinguistic task children were shown cartoon-like images and then given a sentence containing a nonsense word which must then be manipulated to conform to morphological rules of English. For the nonverbal executive control task the Flanker task was used for the first task and in the second task a test of task switching was used where a blue horse and red cow appeared and the child had to indicate whether it was matching the color or animal.

As a result, Bialystok and Barac (2012) found that the English PPVT-3 was a good predictor for metalinguistic tasks. However, performance on the flanker test, which measures nonverbal executive control tasks, was determined by the degree of bilingualism. This shows that more time spent in a bilingual educational environment and

gaining proficiency in the second language, contributed to performance on the flanker test. These results show that there is dissociation between the factors that predict metalinguistic and executive control tasks for children who are becoming bilingual. Just as in study 1, the results for study 2 showed that the English PPVT was a good predictor for metalinguistic awareness. The metalinguistic task differed for study 2, children were given a sentence judgement task incorporating manipulations that assessed metalinguistic awareness. Overall Bialystok and Barac (2012) found that metalinguistic awareness increased with knowledge of the language of testing (i.e., English) and that executive control performance improved with increased experience in a bilingual education environment (i.e., amount of exposure to second language). This study further shows the link between EF and bilingualism, specifically considering the level of bilingualism.

With the mounting evidence indicating a strong link between EF and ToM as well as EF and bilingualism, future studies that examine the relations between all three constructs would be of importance. As the present study has shown varied ToM skills with respect to their level of bilingualism, it may be of importance for researchers to consider such language skills in future studies. This is especially crucial as the majority of previous studies have grouped all bilingual children in a single group. A limitation of the present study is the lack of comparison group. Future studies should consider the variation of bilingualism but also have a monolingual group for comparison.

Although the present study focused on the impact daily bilingual experience has on children's ToM understanding, we acknowledge that ToM skills can be fostered through other daily activities and experiences. For one, siblings have been found to help develop ToM skills due to sibling's interaction which creates opportunity to discuss

mental states (Cole & Mitchell, 2000; Cutting, & Dunn, 2006; McAlister & Peterson, 2013; Perner, Ruffman, & Leekman, 1994). Another experience is through parental interaction. For example, parents who are resolving a sibling conflict may offer the viewpoints for both children, thus helping each child take on their sibling's perspectives and resolve the conflict. Children whose caregivers elicit conversation regarding mental states (e.g., talking about emotions when watching a movie or reading a book) have been found to have higher ToM skills (Adrian, Clemente, Villanueva, & Rieffe, 2005; Ebert, Peterson, Slaughter, & Weinert, 2017; Moeller & Schick 2006). The common thread between these differing experiences is that each one had a linguistic component. Through discussing different mental states, via sibling or parental interactions, it seems that language is essential to helping children gain these crucial ToM skills. A limitation of the present study is we do not investigate sibling interactions, parental input, and EF abilities'.

Continuing the investigation into the type of daily experiences that are influencing ToM understanding is crucial. Increased research on ToM is beneficial as it informs future training studies and intervention programs that support children with delays in ToM understanding. Autistic children who are on the spectrum have been found to have difficulty developing ToM, thus leading to problems in social interaction with others (Kimbi, 2014). Gaining understanding about the type of daily interactions that may be influencing ToM advancement may aide in such therapies as applied behavior analysis (ABA).

Overall the present study is important as it contributes to the literature examining factors and underlying mechanisms that may be driving ToM advancement. ToM is at the

heart of social cognition and is a building block of other complex social and emotional skills such as empathy. Empathy is the ability to understand, be aware of, and sensitive to what others may be experiencing (Dvash, & Shamay-Tsoory, 2014). Since humans are innately social beings, interacting with one another is something that is integral to life. As one can imagine, responding to others in an empathetic and supportive ways are all complex social skills that require ToM abilities. In today's political climate and rapid advancement in technology that is drastically shaping the way we interact and communicate with other, it is hard even as adults to be empathetic to those around us. It seems as though it is easier to see people as the "other" and hard to take on people's perspectives. The more we understand about topics such as ToM the more we can foster these skills within children and hopefully raise a generation that is able to possess these crucial social skills that enhance how humans interact with one another for the better.

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Appendix A.

Global self-assessment:

Overall, how would you describe your child's level of bilingualism?

Not bilingual	Weak bilingual	Unbalanced bilingual bilingual	Practical bilingual	Fluent
1	2	3	4	5

1 – speak predominantly one language
- only know a few vocabulary in the other language.

2 – weak bilingual
- know enough to carry out some conversation to a very limited extent (use keywords with not much grammar)
- need to listen to sentences more than once before understanding.

3 – unbalanced bilingual
- able to carry out basic conversation with minor grammatical errors - without the other speaker repeating the sentence
- has difficulty producing a fluent conversation.

4 – practical bilingual
- can carry out conversation fluently
- does not use the second language everyday

5 – fluent bilingual
- able to converse fluently and actively use two languages everyday

Table 1

Six Theory-of-Mind (ToM) Tasks in Wellman and Liu (2004)

ToM task	Description
Diverse-desires	Two persons can have different desires: Given the choice of two snacks (carrot, cookie), child predicts the choice of another person who has the opposite preference.
Diverse-beliefs	Two persons can have different beliefs (the child does not know which belief is true): Given the choice of two possible locations (in bushes or garage), child predicts the choice of another person who has the opposite belief
Knowledge-ignorance Child	Knowledge is not shared (the child holds the knowledge): whether another person, who has not seen the inside of a drawer, knows about its contents (a toy dog).
Contents false-belief	Beliefs can be mistaken (the child knows the truth): Child sees a toy dog inside a Band-Aid box and predicts the belief of another person who has not seen its inside.
Explicit false-belief	Mistaken beliefs can lead to incorrect efforts (the child knows the truth): Child knows the mittens are in the backpack and predicts the search behavior of another person who believes the mittens are in the closet.
Hidden-emotion	A person can feel one emotion but display another: A boy receives an undesirable gift from his uncle and wants to hide his disappointment. The child predicts what the boy will display outwardly and feel inwardly.

Table 2

Correlation Matrix

	1	2	3	4
1. Age	-	0.16	-0.07	-0.06
2. PPVT		-	0.40*	-0.17
3.ToM			-	0.24
4.GBA				-
M	47.11	82.50	3.35	2.76
SD	5.39	20.84	1.60	1.16

Note. * $p < .05$
Correlation matrix between children's age, language profecieny (PPVT), total ToM score, and overall level of bilingualism (GBA).

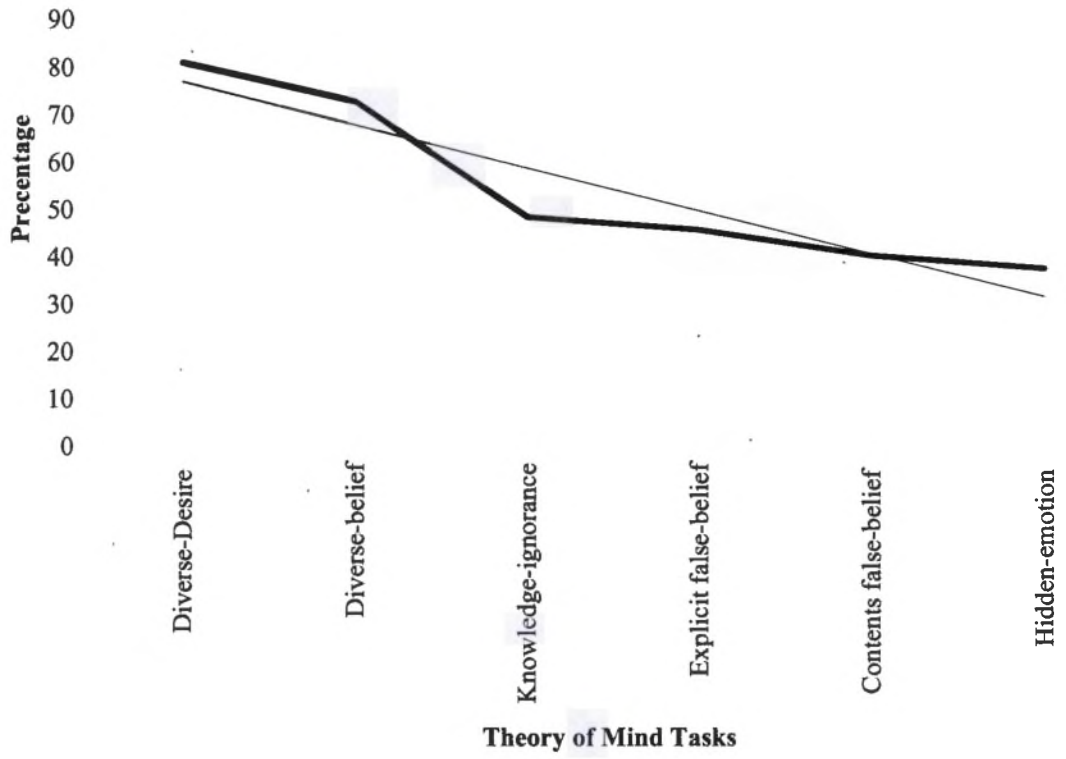

Figure 1. The solid line shows the percentage correct for each Theory of Mind task. The dashed line is the line of best fit.