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Theory of Mind Performance Among College Students at Hispanic Serving Institutions

Mauricio Alejandro Yanez
The University of Texas Rio Grande Valley

THEORY OF MIND PERFORMANCE AMONG COLLEGE STUDENTS AT

HISPANIC SERVING INSTITUTIONS

A Thesis

by

MAURICIO ALEJANDRO YANEZ

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MAURICIO ALEJANDRO YANEZ

COMMITTEE MEMBERS

Dr. Jason Popan
Chair of Committee

Dr. Amy A. Weimer
Committee Member

Dr. Ralph Carlson
Committee Member

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ABSTRACT

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Previous research has yielded mixed findings about relations among sociodemographic variables and Theory of Mind (ToM) performance. The current literature lacks robust studies that utilize multiple types of ToM assessments. Additionally, most ToM research has assessed samples of young, white children and adolescents. The present study addresses these limitations by examining the association between sociodemographic variables and ToM performance among Hispanic emerging adults, utilizing three ToM measures across two sites. Participants included 867 college students from two Hispanic serving institutions who completed questionnaires including an embedded false belief task, Strange Stories, and the Constructivist Theory of Mind (cToM) task. All three ToM tasks were positively correlated with one another. The Strange Stories, and embedded false belief task were each negatively correlated with income and embedded false belief scores were positively correlated with number of older siblings. The cToM task was positively correlated with gender. Gender and site differences in ToM performance were found. Implications are discussed.

DEDICATION

A mis padres, Julio Cesar Yáñez y Carmen Yánez, gracias por aguantarme toda mi vida. Desde que era un quiebra huevos cuando apenas caminaba, a ser un teenagrio, y ahora un enano de tamaño familiar. En los tiempos más difíciles siempre recuerdo sus palabras y me sirven como un guía. Gracias por todo, los quiero con todo mi corazón.

To my dearest Deanna, thank you for your unyielding love, and support along this journey. You have been one of my greatest sources of inspiration that continues to drive my ambition. I love you and am eternally grateful to you for having kept me nice and fed while I typed away.

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CHAPTER I

INTRODUCTION

Theory of Mind (ToM) is the ability to understand and perceive other individuals' thought processes, emotions, behaviors, and actions (Wellman et al., 2001). ToM research began over 50 years ago with the term coined in a study on chimpanzees' ability to understand mental states (Premack & Woodruff, 1978). To determine whether or not chimpanzees could infer mental states, chimpanzees were shown scenes involving a human struggling to solve a problem (e.g., obtain inaccessible food, escape from a locked cage). Chimpanzees were offered several photographs, one depicting a solution to the problem (e.g., a stick to reach the inaccessible food). The chimpanzee's consistent choice of the photograph depicting the solution was thought to indicate that the chimpanzee understood the problem depicted in the photographs, that is, the chimpanzee had ToM. Shortly thereafter, researchers began to explore at what age humans could reason in this way and which factors predicted developmental advancements in ToM understanding.

The study of ToM in humans has been ongoing for over 30 years. Over the course of this time, most researchers have come to the consensus that typical- developing children begin to understand basic mental states during early childhood (Wellman et al., 2001) and continue to advance their understanding into later years (Weimer et al., 2020). Starting around age four to five years, children acquire an initial ability to understand that their own mental states might differ from those of others (Horton & Brennan, 2016; Perner, 1991; Wellman et al., 2001).

From this age on, typically developing children are able to comprehend their own and other's mental states, as well as interpret different opinions and intentions. These abilities are often assessed through false belief tasks with varying levels of complexity (Wellman et al., 2001). More advanced ToM tasks involve complex social scenarios requiring children to correctly assess and interpret the mental states and actions of the characters by using their understanding of opinions, utterances, and perceptions (Happé, 1994; White et al., 2009). However, there is a debate among researchers as to the complexity of ToM understanding and factors that affect ToM performance (Apperly et al., 2009; Devine et al., 2016; Keenan, 2003; Lecce et al., 2017). In particular, further research is needed to explore ToM using multiple measures among culturally diverse samples. A useful beginning is to examine ToM across two contexts. Therefore, the present study examines ToM performance using three measures of ToM, and explores associations among sociodemographic and contextual variables on ToM performance across two contexts.

CHAPTER II

REVIEW OF LITERATURE

Assessing ToM

In children, ToM is often assessed via false belief tasks. False belief tasks were among the first developed in the 1980's. They are designed to assess whether a participant can discern between their own feelings or knowledge and that of others. For example, Wimmer and Perner (1983) used a false belief task to measure children ages 3 to 9 years that involved using sketches in which objects are placed by a person and moved when the subject was not there. Children were then asked where they thought the person would look for the item. Additionally, the children were asked to give a story and asked to infer the purpose of a conversation between two people.

False belief tasks were widely used in subsequent studies with some minor alterations (Weimer & Guajardo, 2005). Others, such as Baron-Cohen et al. (1985) used the foundation established by Wimmer and Perner (1983) to develop their own Sally Anne Test in order to measure children's social cognitive ability in discerning the false beliefs of others. Further implementations of False Belief tasks developed alternative assessment formats, as well as accounted for alleged difficulty levels in early tests (Wellman et al., 2001). Another variation of the false belief task was implemented by Kinderman et al. (1998) and Rutherford (2004) in which nested various levels of embedded false belief tasks were presented through statement

pairs after reading a story and required the participant to consider various complex social relationships to choose the correct statement.

Further tasks developed were designed to assess an advanced form of ToM by presenting a child with more complex social situations that required a more complex interpretation of the information presented to ascertain the mental state of the characters presented in the scenarios (Ebert, 2019). A series of strange stories were designed to measure ToM by presenting a child vignettes presenting a social scenario involving a character making certain choices and performing an action (Happé, 1994; White et al., 2009). The child was then required to reason as to why the character made their choice. Other iterations of scenario-based ToM tasks include tasks that present more complex scenarios (Kaland et al., 2002); tasks that required children to identify emotional reactions presented by characters during a social situation (Baron-Cohen et al., 1999; Heavey et al., 2000); and tasks that required children to ascertain forms of social understanding from scenarios of ambiguous interactions (Bosacki, 2000).

Recently, ToM development from middle childhood through adulthood has been examined using measures of Constructivist Theory of Mind (cToM; Weimer et al., 2017). cToM is based on interpretative diversity, the notion that individuals can draw different conclusions from the same information based on how their mental process evaluates the information (Weimer et al., 2017). Weimer et al. developed a direct measure of interpretative diversity that presents information via scenarios of two interpretations being drawn from the same information and requires participants to ascertain the reason for the divergence. Ceiling was not reached by the adult group within the sample the assessment was validated on, implicating this novel measure as an adequate measure to explore the cToM in late adolescence and emerging

adulthood. However, the measure was validated with two samples from the Southwestern United States and can benefit from further validation in cross-cultural samples.

ToM Development

Using these varied tasks, researchers also have examined individual differences in ToM development. For example, Hughes and Devine (2013) argue that individual differences in children's development influence the degree to which they can effectively employ their ToM capabilities. Moderate support for the influence of individual differences can be found in the scarce longitudinal studies carried out on samples of children in early childhood through adolescence (Devine et al., 2016; Ensor et al., 2014; Lecce 2014); however, there remains a need for research examining the association between individual differences and variations in how ToM is employed in adult samples (Weimer et al., 2017).

Sociodemographic Factors that Influence ToM

Researchers have found a variety of sociodemographic factors to influence ToM [e.g., parental education, number of sibling's, socioeconomic status (SES), and gender]. Parental education, mostly in terms of maternal education level, has been shown to influence children's performance on ToM tasks (Pears & Moses, 2003). Weimer and Guajardo (2005) found that children from low SES families whose parents had lower education would score lower on ToM tasks than their middle-class counterparts with more educated parents. In particular, higher maternal education levels have been linked to higher performance on ToM tasks (Adrian et al., 2007; Cutting & Dunn, 1999; Pears & Moses, 2003). One possible reason for this association is that mothers with higher education levels might spend more time with their children and offer them more socioemotional guidance.

Despite these findings, previous research on the relationship between SES and ToM performance remains ambiguous and warrants further research. Several studies on young children have not found a relationship between SES and ToM performance on variations of false belief tasks (Adrian et al., 2007; Lucariello et al., 2007; Pears & Moses, 2005). Conversely studies have found differences such that children of higher SES have performed better on false belief tasks than children of lower SES (Cutting & Dun 1999; Hughes et al., 2005; Weimer & Guajardo, 2005). A critique of ToM research has been the lack of standardization of what constitutes as a measure of SES. For example, some studies have operationalized SES as family income, while others operationalize SES as a combination of income, parental education, and/or parental occupation. Further research into the influence of SES on ToM performance is needed to address issues in assessing SES as well as expanding the findings to older and nonwestern samples (Devine & Hughes, 2013).

Researchers also have found that the number of older siblings a child has (Ruffman et al., 1998) and their relationships with their siblings, in general, could influence ToM development (Pears & Mosess, 2003). Some have described how children who grow up with siblings have greater exposure to more frequent and complex social situations that can influence their performance on ToM tasks than children without siblings (Jenkins & Astingon, 1996; McAlister & Peterson, 2013; Perner et al., 1994). However, many studies have found little to no relationships between the number of siblings and ToM performance, especially in samples from collectivist cultures in which another close relative can counterbalance siblings' roles (Pears & Moses, 2003; Shahaeian et al., 2011), and a few studies found a negative relationship between the number of siblings' and ToM performance (Tompkins, 2013). Prime et al. (2016) and Tompkins et al. (2013) argue that the negative relationship between having more siblings and

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ToM performance could be due to parental resource dilution in terms of reduction in attention and resources being given to each child as the size of the family grows. However, this negative relationship mostly applies when children are close in age and live together (Prime et al., 2016).

Gender also has been found to influence ToM performance among populations ranging in age from young children to adolescents. For example, among children and adolescents, females have been found to perform higher on ToM tasks including false belief tasks (Charman et al., 2002), the Strange Stories task (Devine & Huges, 2013), and the cToM task (Weimer et al., 2017). It must be noted, however, that past research has also yielded no gender differences in ToM (Hughes et al., 2011; Ronald, 2006). A possible explanation for these early advantages by females can be attributed to early parental influence in which parents socialize daughters differently and spend more time discussing emotional affects (Bosacki, 2000). Further research is warranted to expand the scant literature on ToM performance in emerging adults to determine whether or not these gender differences continue to be present.

Culture and ToM

ToM development across cultures has been thought to follow similar trajectories across cultures while differing in the ages in which children reach ToM milestones (Liu et al., 2008). However, despite the growing body of knowledge on sociocultural and contextual factors influencing ToM development, much ambiguity remains about variability in ToM performance among specific cultures (Wellman, 2011). Most research questions within cognitive psychology have been investigated using samples drawn from WEIRD (Wester, Educated, Industrialized, Rich, and Democratic; Henrich, Heine & Norenzayan, 2010) cultures. There is a strong need to effectively test the generalizability of ToM measures in populations that are underrepresented in

the literature (Kuntoro et al., 2017). This extends to culturally underrepresented groups residing in Western countries. One such group are Hispanics.

ToM and Bilingualism

Previous research on bilingualism has given rise to the idea that a "bilingual advantage" exists, which gives bilinguals an advantage on executive functioning (Bialystok, 2015). These findings suggest that bilinguals outperform their monolingual counterparts on various ToM tasks, including false belief tasks (Diaz & Farrar, 2018; Goetz, 2003; Kovács, 2009). Furthermore, a meta-analysis by Schroeder (2018) demonstrated that bilinguals outperform monolinguals on ToM task across 16 studies, though the effect size was small. Others have not found distinct advantages among bilinguals on executive functioning tasks and have noted several methodological problems of past studies finding differences (e.g., Paap et al., 2015). In a recent meta-analysis by Gunnerus et al. (2020), based on a large number of studies (143 comparisons and 583 effect sizes), it was found that there was large variability across study findings and the authors noted that most studies only included middle-class children. These authors conclude that there might be bilingual advantages under some conditions, but further research is needed to identify moderators. This is in line with research by Weimer and Gasquoine (2016) who compared groups of bilingual children of varying linguistic proficiency and reported that while language dominant and balanced bilingual children performed similarly on ToM tasks, these findings were likely to shift over time, especially in U.S. school systems in which curriculum and instruction focuses on enhancing English. There is a need for further understanding of the developmental and sociocontextual factors underlying bilingual advantages on ToM and other executive functioning skills. Given that the majority of the studies have been conducted on children, the effect of bilingualism on ToM performance among emerging adults is unknown and

warrants study. In particular, research is needed to identify relations among sociodemographic variables (especially bilingualism) and ToM across sociocultural contexts among older samples.

ToM among Hispanics

The umbrella term "Hispanic" refers to individuals with ancestry from Mexico, Spain, some islands in the Caribbean, Central America, and South. Consequently, the literature on ToM performance across Hispanic populations is both scant and encompasses populations from multiple countries with their own diverse cultures. Most ToM studies available in English on Hispanic populations have focused primarily on establishing the psychometric properties of ToM measures for Hispanic samples. For example, Souza et al. (2021) developed a Portuguese version of Wellman and Liu's (2004) ToM scale, and other studies validated the Reading the Mind in the Eyes Test (RMET) for use in Mexican samples (Giordano et al., 2019) and a version of the ToMas-child Scale for Spanish samples (Rivas-Garcia et al., 2020). One of the few studies conducted on a Hispanic American sample looked at the relationship between belief reasoning and bilingualism among a sample of four- to seven-year-old Mexican American (Spanish/English) bilingual children and found no differences between language dominant (having greater proficiency in Spanish or English) and balanced bilingual children (i.e., those with a balanced proficiency in Spanish and English) on overall ToM performance (Weimer & Gasquoine, 2016). Additionally, in contrast to results obtained in studies conducted on predominantly White samples, Weimer et al. (2020) did not find gender differences in ToM performance when examining this association in a sample of predominantly Mexican American 6- to 12-year-old children.

Statement of Purpose

The present study aims to expand the scant literature on ToM among Hispanic populations by examining two Hispanic samples' performance on three ToM tasks. First, the cToM task (Weimer et al., 2017) will be explored in a Hispanic population and further confirm whether the gender differences found by Weimer et al. (2017), in which females performed higher than males, remain consistent in older and culturally diverse populations. Second, given the recent development of the measure and its focus on interpretive diversity rather than traditional false belief ToM measures, it is important to examine individuals' performance on the cToM task in relation to other commonly used measures to confirm that the cToM task is measuring different aspects of ToM. The embedded false belief task (Rutherford, 2004) and the Strange Stories (Happé, 1994) were chosen as reference measures due their prevalence in ToM research. The third is to further the generalizability for use on culturally diverse populations. To this end, cToM performance among college students attending two Hispanic Serving institutions (South Texas site and Central Texas site) will be compared. This study will add to the limited body of knowledge regarding cToM by examining samples of emerging adults from ethnically diverse populations. Three research questions are addressed:

Research Question 1

What are the interrelations among sociodemographic characteristics (including cultural and linguistic variables, age, income, number of siblings) and ToM performance among emerging adults in Hispanic serving institutions?

Hypothesis 1a: It is expected that age, income, and number of older siblings will be positively related to ToM.

Hypothesis 1b: It is expected that all three ToM measures will be positively related.

Research Question 2

Are there gender differences in ToM performance among emerging adults from two Hispanic serving institutions?

Hypothesis 2: Based on past research (e.g.,Weimer et al., 2017), it was expected that females would perform higher overall than males on the ToM task.

Research Question 3

Are there differences in ToM performance across the two Hispanic serving institution recruitment sites?

Hypothesis 3: ToM performance will differ across the South Texas and Central Texas sample sites as the two locations are unique sociocultural contexts.

CHAPTER III

METHODOLOGY

Participants

Undergraduate psychology students (*N*=978) were recruited via the SONA research participation pool at two Hispanic Serving universities located in Central and South Texas. They all received SONA credit for their participation. All cases with missing data were excluded, leaving a final sample size of 867. Of these, 58.5% (*n* = 505) were from South Texas, and 41.5% (*n* = 358) were from Central Texas, with 30.9% (*n* = 267) of them being male and 69.1% (*n* = 597) female. The age range was 18-25 years (*M* =19.86, *SD* =1.65). The institutional profile of the student body for the South Texas site is 3.4% White, 90.5% Hispanic, .8% African American, 5.3% other, and for Central Texas is 43.3% White, 38.7% Hispanic, 11.1% African American, and 6.9% other. Participants' classification was: 36% (*n* = 280) freshman, 32% (*n* = 249) sophomores, 19.9% (*n* = 155) juniors, and 12% (*n* = 93) seniors. 90.6% (*n* = 700) of the participants reported income under $20,000. 0.6% (*n* = 5) of participants reported a GPA under 1.0, 7.1% (*n* = 55) were between 1.01-2.0, 39.9% (*n* = 310) were between 2.01-3.0, and 52.4% (*n* = 407) were between 3.01-4.0. Maternal education levels were high school 54.2% (*n* = 417), vocational 12.7% (*n* = 98), bachelors 21.9% (*n* = 169), masters 10.3% (*n* = 79) and PhD .9% (*n* = 7). Paternal education levels were high school 58.6% (*n* = 447), Vocational 9% (*n* = 59), bachelors 22.7% (*n* = 173), masters 8.4% (*n* = 64) and PhD 1.3% (n = 7). Number of older siblings reported were: 40.4% (n = 350) with no older siblings, 33.5% (*n* = 278) with one older

sibling, 15.4% ($n = 128$) with two older siblings, 5.4% ($n = 45$) with three older siblings, and 3.5% ($n = 30$) with four or more older siblings. 6.1% ($n = 53$) of participants reported a siblingship size of zero, 63% ($n = 543$) reported having one to two siblings, and 30.7% ($n = 266$) reported having three or more siblings. 56.6% ($n = 440$) reported not being first generation students while 43.4% ($n = 338$) reported being first generation. 51.9% ($n = 403$) reported being bilingual in English and Spanish. Among bilingual participants, 56.6% ($n = 323$) acquired their second language between the ages of 1-5 years, 27% ($n = 155$) acquired their second language between ages 6-12 years, 13.6% ($n = 78$) acquired their second language between ages 13-17 years, and 3.1% ($n = 18$) acquired their second language when they were at least 18 years of age.

Design and Procedures

Survey administration took place entirely online. Students signed up to participate in this study via the undergraduate student online research participation pool (SONA) at their respective universities' psychology departments and received a survey link through which they could participate in the study. Once consent was obtained, participants were administered the demographic questions, the cToM Task, Happé Strange Stories, the Acculturation Rating Scale for Mexican Americans-II (ARSMA-II), the Embedded False Belief Task, and lastly, the academic demographic questions. Upon completion of the online survey, the survey webpage was redirected to SONA, and credit was granted automatically by the built-in automatic credit granting system.

Demographic survey

A demographic survey included questions on gender; date of birth; paternal education level; maternal education level; languages spoken; age of second language acquisition; income; parental income; parental support; GPA; and classification.

Constructivist Theory of Mind Task

The constructivist Theory of Mind task developed by Weimer et al. (2017) is a measure of how individuals interpret diversity of thought. It was used to gauge cToM. It is comprised of 10 questions with six subscales: comprehension A and B; attention A and B; memory A, B, and C; comparison; planning; and inference. The task was administered via an online survey in which participants were presented with each question and responded with as much detail as possible. Each answer was then independently coded following procedures described by Weimer et al. (2017) by two research assistants working independently to attribute scores based on the following criteria: 0 for any answer stating "no" or having a non-active/non-mental process: 1 for an answer stating a difference without having a mental process: and 2 for an answer stating a difference with a mental process. The interrater reliability (kappa) for each item were as follows: comprehension A (.61); comprehension B (.39); attention A (.37); attention B (.39); attention C (.41); memory A (36); memory B (.40); comparison (.41); planning (.56); and inference (.63).

Embedded False Belief Task

The embedded false belief task was used by Rutherford (2004) and is tailored after traditional false belief tasks, particularly, one developed by Kinderman et al. (1998). The task consists of four stories that are each one paragraph in length and contain eight to nine statement

pairs. After reading each paragraph, participants are presented with statement pairs and instructed to select the correct one based on the paragraph they read. The statement pairs consist of control questions stating a fact about what they just read and ToM questions which requires an interpretation of a false belief statement. Below is an example of one.

ToM 1 (a) Bobby thinks the chocolate is in the freezer

ToM 2 (a) Susie thinks Father will look for the chocolate in the cupboard

ToM 2 (a) Father thinks that the children think the chocolate is on the counter

(b) Father thinks that the children think the chocolate is in the cupboard

ToM 3 (a) Susie believes that Mother thinks Father believes that the chocolate is in the freezer

(b) Susie believes that Mother thinks Father believes that the chocolate is in the cupboard

The score attributed to ToM performance was the participant's error score on the ToM questions, with lower error scores indicating greater ToM.

Happé Strange Stories

The Strange Stories are a vignette-based measure of advanced ToM consisting of 18 stories (Happé, 1994). Participants were asked to read the story in which a complex social situation occurred. After that, the participant was asked to reason as to why characters made certain choices. Two research assistants coded the participants' responses and assigned them values ranging from zero to three. The average of both scores was then obtained. Interrater reliability (Kappa) for each story was: story 1 (.45); story 2 (.87); story 2_2 (.41); story 3 (.71); story 4 (.46); story 5 (.21); story 6 (.48); story 7 (.58); story 8 (.42); story 9 (.43); story 10 (.61); story 11 (.58); story 12 (.74); story 13 (.69); story 14 (.61); story 15 (.44); story 16 (.25)

Cultural values

The Acculturation Rating Scale for Mexican Americans-II (ARSMA-II) was used to measure acculturation. It consisted of 30 questions broken down into two subscales (Cuellar et al., 1995). The Mexican orientation subscale (MOS) consisted of 17 items (items 1, 3, 5, 6, 8, 11, 12, 14, 17, 18, 20, 21, 22, 24, 26, 28, 29). Cronbach's alpha was high: .95.Similarly for the American Orientation subscale (AOS),comprised of 13 items (items 2, 4, 7, 9, 10, 13, 15, 16, 19, 23, 25, 27, 30), Cronbach's alpha was adequate:.71.

CHAPTER IV

RESULTS

Table 1 in Appendix A shows the means, standard deviations, and range for all continuous variables and Table 2 in Appendix A shows the sample size and percentages for all categorical variables.

Research Question 1

To examine Research Question 1 ("What are the interrelations among sociodemographic characteristics and ToM in Hispanic adults?"), correlational analyses (Table 3 of Appendix A) and linear regressions were conducted. Table 2 shows the interrelations among all variables. Scores on the Happé task were correlated with income ($r = -.21$, $p < .01$), GPA ($r = .11$, $p < .01$), Embedded False Belief Scores ($r = .42$, $p < .05$), and cToM scores ($r = .09$, $p < .05$). Embedded False Belief Scores were correlated with income ($r = -.12$, $p < .05$), GPA ($r = .10$, $p < .05$), and cToM scores ($r = .08$, $p < .05$). cToM scores were correlated with gender ($r = .09$, $p < .01$).

Research Question 2

To address Research Question 2 ("Are the gender differences in ToM development among Hispanic adults?"), a multivariate analysis of variance (MANOVA) was conducted with gender as the independent variable and the three ToM measures as the dependent variables. The results revealed that there was a main effect of gender, $F(3,671) = 5.29$, $p = .00$, Wilks' $\Lambda = .98$, partial $\eta^2 = .02$. Follow-up univariate analyses indicated that females performed higher than

males on the embedded false belief task ($F(1, 712) = 6.22$, $p < .01$, partial $\eta2 = .01$, $M_{\text{female}} =$ 0.20, $SD = 0.01$, $M_{\text{male}} = 0.23$, $SD = 0.01$) and on the cToM task ($F(1, 712) = 6.83$, $p < .01$, partial $\eta2 = .01$, $M_{\text{female}} = 15.24$, $SD = 2.22$, $M_{\text{male}} = 14.78$, $SD = 2.22$) than males, but not on the strange stories task ($F(1, 712) = .26$, $p > .05$, $M_{female} = 2.87$, $SD = 0.55$, $M_{\text{male}} = 2.85$, $SD = 0.54$).

Research Question 3

Before addressing Research Question 3 ("Are there differences in ToM across the two sample sites?"), differences in sociodemographic factors between sample sites were first examined. To examine whether there were significant differences in age and acculturation between the two sample sites, two one-way between-subjects analysis of variance (ANOVA) with test site as the independent variable and age and acculturation scores as the dependent variables were conducted. Results for the ANOVA examining age differences revealed that there was a main effect of age, $F(1, 858) = 5.21$, $p < .05$, indicating that the South Texas site was older ($M = 19.97$, $SD = 1.73$) than the Central Texas site, $M = 19.71$, $SD = 1.52$. However, this difference was small, partial $\eta^2 = .02$. Results for the ANOVA examining acculturation differences revealed that there was also a main effect of acculturation, $F(1, 862) = 298.43$, $p < .001$, partial $\eta^2 = .26$, indicating that participants from the Central Texas site ($M = 1.78$, $SD = 1.01$) were more acculturated than participants from the South Texas site, $M = 0.58$, $SD = 1.00$.

To examine whether there were differences in gender, maternal education level, paternal education level, first generation status, age of second language acquisition, classification, income, GPA, and siblingship size between the two sample sites, chi-square tests of independence were conducted. Chi-square results (Table 4 of Appendix A) revealed significant associations between school site and gender ($\chi^2[4, N = 769] = 26.05$, $p = .00$.), maternal education level ($\chi^2[4, N = 769] = 26.06$, $p = .00$), paternal education level ($\chi^2 (4, N = 762) =$

24.42, $p = .00$), first generation status (χ^2 [1, $N = 777$] $= 7.97$, $p = .01$), and age of second language acquisition (χ^2 [3, $N = 573$] $= 26.79$ $p = .00$). However, results revealed no association between sample site and classification (χ^2 [3, $N = 776$] $= 6.31$, p $= .09$), income (χ^2 [4, $N = 772$] $= 4.57$, $p = .33$), GPA (χ^2 [3, $N = 776$] $= 1.72$, $p = .63$), and siblingship size (χ^2 [2, $N = 861$] $= 5.66$, $p = .06$).

To address Research Question 3, a multivariate analysis of covariance (MANCOVA) was conducted with sample site as the independent variable, all three ToM measures as dependent variables, and age, acculturation, gender, maternal education, paternal education, and first-generation status as control variables. Results revealed differences between testing site and ToM scores (cToM score, embedded false belief score, and Happé mean) variables beyond the influence of age, acculturation, gender, maternal education, paternal education, and first-generation status, $F(3, 684)= 3.08$, $p = .03$, Wilks' $\Lambda = .99$, partial $\eta^2 = .01$. Pairwise comparisons with Bonferroni correction indicated that students from South Texas performed higher than students from Central Texas on strange stories task ($F(1, 686) = 7.20$, $p < .01$, partial $\eta^2 = .01$), but there were no differences in ToM performance between sample sites on the cToM task ($F(1, 686) = 1.71$, $p > .05$) and the embedded false belief task($F(1, 686) = 1.52$, $p > .05$).

CHAPTER V

DISCUSSION

The present study aimed to address the limitations of current ToM research, namely the lack of studies examining samples beyond early childhood years (Weimer et al., 2017). The present study expands the limited ToM research that has focused on culturally underrepresented samples (Kuntoro et al., 2017) using a multi-measure approach. To this end, the present study addressed three goals. First, the study examined the interrelations among sociodemographic variables and the three ToM tasks (Strange Stories, embedded false belief task, and cToM task). Second, the study explored gender differences in ToM performance, with a focus on identifying if these would be present in a sample of older culturally diverse individuals. Third, the study examined if there were any differences in ToM performance across two culturally unique regions, but each with large percentages of Hispanic individuals: South and Central Texas.

The present study revealed several significant intercorrelations among sociodemographic variables and three ToM tasks. Income was negatively correlated with performance on the Strange Stories task and the embedded false belief task. Thus, individuals who reported higher income performed less well on the two ToM tasks than those who reported less income.

However, it must be noted that 90.6% of the sample reported earning less than $20,000, indicating a low variability in income and calling into question the generalizability of this finding. Future research should examine populations with greater variability in income. Interestingly, only the embedded belief task was correlated with the number of older siblings,

and the cToM task was the only variable correlated with gender. All other sociodemographic variables (age, classification, siblingship size, parental education, acculturation score, age of second language acquisition, bilingual in English/Spanish, and age of second language acquisition) were not significantly correlated with the three ToM measures. This lack of relationships can potentially be attributed to individual differences related to family and cultural influences being diluted as age increases.

The study's second aim was to examine if previously reported gender differences on ToM performance in which females performed higher than males were present in an older population sample (Baron-Cohen, 1999; Bosacki, 2000; Charman et al., 2002; Devine & Huges, 2013; Weimer et al., 2017). Similar to past research, females performed higher than males on the embedded false belief task and the cToM task; however, there were no significant gender differences on scores of the strange stories task. One possible explanation for higher female performance on these two tasks is that both require higher levels of executive function as compared to the strange stories task.

The third aim of the study was to examine differences in ToM performance across both recruitment sites. Results revealed a difference in performance, with the South Texas participants performing higher than the Central Texas participants on the strange stories task, though it was a small effect size . The difference in performance on the strange stories task can potentially be attributed to the specific cultural context present in each recruitment site. The cultural context in South Texas might be more conducive to a specific aspect of ToM assessed by the strange stories. These site differences should be taken as tentative as the different demographic characteristics of the student body might account for the difference. Future research is warranted looking at differences among ethnicities in these different cultural contexts.

Study Limitations

The cross-sectional study design of the study cannot establish causality and the use of a college sample limits the generalizability of the findings. Furthermore, this current study is gender skewed and did not include focused questions on ethnicity that would grant insight into specific differences in ToM performance across different ethnicities. Lastly, several variables were set as categorical variables and resulted in the loss of variability that could have been captured through employing continuous variables.

Future Directions

Future studies should further examine relations among parental sociodemographic predictors of ToM development across diverse samples. The present study suggests a need to examine Hispanic community samples, mainly because these would likely allow for a greater amount of variance in income than college student populations. Future work also should include longitudinal designs to explore relations among predictors and ToM over time. The present study also suggests that continued use of various ToM measures will help ascertain whether widely used ToM measures are valid for use in non-WEIRD populations. Likewise, future studies should continue to look into parental influence, gender, SES, and cultural differences, which remain ambiguous across ToM studies.

Conclusion

This study adds to the growing body of knowledge regarding the development of ToM in older and more culturally diverse samples. The relationship between individual differences and ToM performance across three measures sheds light on the often-ambiguous findings from studies using younger samples and serves as a reference for future studies on similar ages and populations. Additionally, the study further examined the usefulness of the Constructivist ToM

task for use in an older population. Further research is required to build a consensus on the relationship between individuals in ToM performance and both older and more culturally underrepresented populations.

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APPENDIX

APPENDIX A

Tables

Table 1

Means, Standard Deviations, and Range for Continuous Variables

Variables	*M* (*SD*)	Min	Max
1. Age	19.86 (1.65)	18.00	25.00
2. Number of Older Siblings	0.96 (1.01)	0.00	7.00
3. Acculturation Score	-1.08 (1.16)	-3.73	2.54
4. Happé Mean	2.85 (0.56)	0.00	4.38
5. Embedded False Belief Score	0.21 (0.16)	0.00	0.80
6. cToM Mean	14.94 (2.55)	1.00	25.00

Note. Min = minimum score. Max = maximum score.

Table 2

Percentages and Frequencies for Categorical Variables

Variables	*N* (%)	Variables	*N* (%)
1. Gender		6. Maternal Education	
Male	267 (30.9%)	Highschool/GED	417 (58.6%)
Female	597 (69.1 %)	Vocational/A.A.	98 (12.7%)
2. Income		Bachelors	169 (21.9%)
$ 0-20,000	700 (90.6%)	Masters	79 (10.3%)
$ 20,001-40,000	48 (6.2%)	Doctorate	7 (0.9%)
$ 40,001-60,000	15 (1.9%)	7. Paternal Education	
$60,001-80,000	4 (0.5%)	Highschool/GED	447 (58.6%)
$80,000+	6 (0.8%)	Vocational/A.A.	69 (9.0%)
3.Classification		Bachelors	173 (22.7%)
Freshman	280 (36%)	Masters	64 (8.4%)
Sophomore	249 (32%)	Doctorate	10 (1.3%)
Junior	155 (19%)	8. First Gen Status	
Senior	93 (12%)	Yes	338 (43.4%)
4. GPA		No	440 (56.6%)
0-1	5 (0.6%)	9. Sec. Lang. Acquisition	
1.01-2	55 (7.1%)	Age 0-5	323 (56.3%)
2.01-3	310 (39.9%)	Age 6-12	155 (27%)
3.01-4	407 (52.4%)	Age 13-17	78 (13.6%)
5. Siblingship size		Age 18+	18 (3.1%)
0	53 (6.1%)	10. Bilingual	
1-2	543 (63%)	Yes	403 (51.9%)
3+	266 (30.9%)	No	374 (48.1%)

Table 3

Correlations Among Sociodemographic Characteristics and ToM

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Age	-	-.04	.13**	.69**	-.02	-.08*	-.02	-.06	-.05	.04	.06	.01	-.01	-.04	.01	-.02
2. Gender		-	.02	.03	.06	.03	.09*	.03	-.03	.03	.02	-.09*	.01	.02	-.07	.09**
3. Income			-	.09*	-.07*	-.04	-.02	.03	.05	-.01	.00	.00	.00	-.21**	-.12*	.04
4. Classification				-	.07	-.09*	.00	-.03	-.04	.04	.04	.06	-.06	-.02	.02	.02
5. GPA					-	.02	-.09*	.11**	.09*	-.08*	.05	-.03	.07	.11**	.10*	-.02
6. Number of Older Siblings						-	.47**	-.10**	.00	-.03	-.02	-.01	.01	-.01	.08*	.00
7. Siblingship size							-	-.14**	-.16**	.09	-.02	.10**	-.13**	-.05	-.06	.00
8. Maternal Education								-	.51**	-.50**	.18**	-.27**	.30**	.06	.06	.02
9. Paternal Education									-	-.45**	.12**	-.20**	.24**	-.01	.03	.02
10. First Gen Status										-	-.06	.19**	-.26**	-.05	.00	.00
11. Age Second Lang. Acquisition											-	-.15**	.21**	-.01	.04	-.01
12. Bilingual												-	-.64**	.00	-.03	.00
13. Acculturation													-	.07	.00	-.02
14. Happé Mean														-	.42*	.09*
15. Embedded False Belief Score															-	.08*
16. cToM																-

* $p < .05$. ** $p < .01$.

Table 4

Chi-Square Results Examining Differences in ToM correlates Across Sample Sites

	South TX	Central TX	χ^2
	% (*n*)	% (*n*)	
Gender			26.05***
Male	35.4% (179)	24.6% (88)	
Female	64.6% (326)	75.4% (270)	
Maternal education level			26.06***
High School/GED	60.5% (273)	45.3% (144)	
Voc/Tech/A.A. Degree	13.5% (61)	11.6% (37)	
B.A. /B.S. Degree	18% (81)	27.4% (87)	
Masters/Professional Degree	7.3% (33)	14.5% (46)	
Ph.D. /M.D. /J.D.	0.7% (3)	1.3% (4)	
Paternal education level			24.42***
High School/GED	64.4% (286)	50.6% (161)	
Voc/Tech/A.A. Degree	9.5% (42)	8.2% (26)	
B.A. /B.S. Degree	18.2% (81)	28.9% (92)	
Masters/Professional Degree	6.1% (27)	11.6% (37)	
Ph.D. /M.D. /J.D.	1.8% (8)	0.6% (2)	
First generation status			7.97**
No	52.3% (239)	62.5% (200)	
Yes	47.7% (218)	37.5% (120)	
Age of second lang. acquisition			26.79***

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0-5 years	57.9% (241)	52.2% (82)	
6-12 years	30% (125)	18.5% (154)	
13-17 years	9.6% (40)	24.2% (78)	
18 years+	2.4% (10)	5.1% (18)	
Classification			6.31
Freshman	33.6% (153)	39.4% (126)	
Sophomore	31.6% (144)	32.8% (105)	
Junior	22.8% (104)	15.9% (51)	
Senior	12.1% (55)	11.9% (38)	
Income			4.57
$0-$20,000	89.4% (405)	92.2% (699)	
$20,001-$40,000	7.5% (34)	4.4% (48)	
$40,001-$60,000	1.5% (7)	2.5% (15)	
$60,001-$80,000	0.7% (3)	0.3% (4)	
$80,001+	0.9% (4)	0.6% (6)	
Siblingship size	5.6% (28)	7.0% (25)	5.66
No siblings	60.4% (304)	66.5% (238)	
1-2 siblings	34% (171)	26.5% (95)	
3+ siblings			

$**p < .01.$ $***p < .001.$

BIOGRAPHICAL SKETCH

Mauricio Alejandro Yanez was born in Mexico and immigrated to the United States at a young age. He spent his early childhood in Emporia, Kansas, and moved to the Rio Grande Valley at age eight. Mauricio began his education at the University of Texas at Brownsville-Texas Southmost College and proceeded to be enrolled at the University of Texas at Brownsvillepost-separation and then the University of Texas Rio Grande Valley post-merger with the University of Texas-Pan American. In response to the scarce of opportunities for psychology students on the Brownsville campus, Mauricio moved from the Brownsville campus to the Edinburg campus to pursue research endeavors. He completed his Bachelor of Science in psychology in May of 2018 and pursued a Master of Arts in Experimental Psychology, where he graduated in May 2021. He plans to continue his doctoral studies in a yet undetermined area of psychology.

During his tenure as a graduate student, Mauricio founded the student organization Psychology Student Alliance for Research (PSAR), serving as its president and graduate student advisor until his graduation. From his undergraduate career to his graduate career, Mauricio became involved in a research lab during which he worked on a variety of projects and presentedat several conferences.

Mauricio can be contacted by email at mauricioyanez18@gmail.com.