

Theory of Mind and Siblings among Preschool Children

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Abstract

This research investigated whether number of siblings in the family facilitates theory of mind (ToM) understanding. A battery of tests was administered to measure ToM and VA (verbal ability) on 163 3.6 to 5.6 years-old children. No significant difference was found between ToM and number of siblings. In contrast, in a hierarchical multiple regression analysis, it was found out that, over and above age and VA, a significant contribution for birth order on ToM development was observed.

Keywords: Child development, False belief, Parental demographic variables, Siblings, Theory of mind, Verbal ability

1. Introduction

The study of children's social cognition has lately been dominated by research investigating children understanding of the mind. For the past 20 years, there has been a rapid growth of ToM study that investigates the development of children ability to understand human activity by ascribing mental states to people. Most normally developing children acquire ToM before six years of age (Flavell, 1999; Wellman, 1993) but important individual differences exist across the acquisition period from 3 to 5 years. The attainment of false belief understanding around 4 years of age is highly robust (Astington & Gopnik, 1991; Perner, Leekam, & Wimmer, 1987; Perner, Ruffman, & Leekam, 1994). The standard false belief tasks, are critical tasks for assessing ToM understanding, this was first used by Wimmer and Perner (1983) to examine children ability to predict the thought or behavior of someone holding a false belief. In this "change of location" task, the child is told that the boy will put a chocolate in box A. In his absence, his mother takes the chocolate from box A and put it into box B. The boy returns and will like to eat some chocolate; the child is then asked "where does the boy look for the chocolate?" A related false belief task was designed by Horefe et al. (1986). In this "unexpected contents" task, children were shown a crayon box and inside the box there were stickers. The children were initially shown the closed box and were asked "what do you think is inside the box" then the box was opened to reveal what was inside. The children found stickers not crayon. Then the box was closed again, and the children were asked again, now "what do you think is inside the box?" then, next false belief question was asked. For this question, children were asked to name a best friend, and then they were also asked, imagine your friend comes in and see this box. "What will your friend think is inside the box".

However, the findings of some of the studies conducted by Dunn (1996) and Hughes and Cutting (1999) on normally developing preschoolers, suggested that variations in family conversational pattern contributes to ToM development. Since Perner et al. (1994), as a pioneering study of ToM and siblings on children 3 to 4 years of age, reported a linear development in performance of ToM with increasing family size, and children with just one sibling scored significantly better than only child but significantly worse than those from larger family. It was concluded that whether the sibling is older or younger made no difference to false belief performance.

Following Perner et al. (1994) research, a number of studies has been carried out on the link between sibling's status and ToM development. Ruffman et al. (1998) challenged the results of Perner's study on ToM and siblings. Ruffman et al. (1998) found that having more siblings, especially older ones had link with higher false belief scores. They found no advantages associated with younger siblings. Jenkins and Astington (1996) examined sixty eight 3- to- 5 years-old Canadian children who confirmed that, it is the number of siblings that the child has, that will have fundamental role for ToM development rather than older or younger siblings. Cutting and Dunn (1999) conducted their study on 128 British preschool children, majority of the sample came from low income and single parents families, they still found no significant correlation with false belief understanding and siblings. Furthermore, Cole and Mitchell (2000) conducted their study on one hundred and ninety 3 to 5 years old children from a low income families. No link was observed between false belief scores and number of siblings. Peterson (2000) carried out a large investigation of ToM with 265 children aged 3 to 5 years old. Findings revealed that children who had at least one sibling in the age range between 12 months and 12 years outperformed those who did not. In a recent study, Hughes and Ensor (2005) did not find any relationship between siblings and ToM among 2 years old children of lower income British families. Another study was carried out by Peterson and McAlister (2006) on one hundred and twenty four 3 to 5 years old children. The results showed that children who had at least 1 child aged siblings scored significantly higher ToM than both only children and those whose only siblings were infants or adults.

The aim of the present study was to determine whether there is a significant difference between ToM, number of siblings, birth order, and parental demographic variables, by investigating ToM understanding using false belief tasks to assess the phenomena in age ranged from 43 to 66 months children. However, some incongruity is observed in the results of the previous studies, and also most of the studies regarding ToM and siblings have been done in western countries. The present study tries to examine whether the presence of siblings influence ToM among Iranian preschool children. Furthermore, the role of parental demographic background on ToM has been reported by few studies, this possibility was tested clearly in the present study. The study attempts to compare whether there is a significant difference between ToM and number of siblings. Therefore, the following hypotheses were tested: (a) There is a significant relationship between ToM, VA, and age. (b) There is a significant difference between ToM and siblings. (c) There is a significant difference between ToM and birth order. (d) There is a significant difference between ToM and parental demographic variables.

2. Methodology

2.1 Participants

A sample of 170 typically developing preschool children using simple random sampling method in diverse kindergartens of the second district of Sanandaj city (Sanandaj is the capital of Kurdistan of Iran) were selected. The children came from various socio-economic classes. Parental consent was obtained for each child in the study. Two of the children were twins and 2 were from single parents. Three of the children could not answer ToM tasks. For the sake of sample homogeneity, they were excluded from the study analysis. In total, 163 preschool children took part in this study with a mean age of 54.39 months (S.D = 5.877) and age ranging from 43 to 66 months. Of these, 96 were male and 67 were female. One hundred and three of the sample was first born and 63 were second born. Therefore, for categorization purposes of the siblings, 3 of the children had 3 siblings and one of them had 4 siblings, they were grouped in the category of children who had 2 and more than 2 siblings in the family. Information regarding the age of the siblings wasn't available for all the children. In terms of sibling constellation, 88 (53.6%) of the children in the sample had no siblings (only child) and 62 (39%) of them had 1 sibling and 13 (8%) had 2 and more than 2 siblings in the family. None of the children had any known or suspected disabilities or developmental delay according to the parent reports. Among the parents, 4% of the mothers and 3% of the fathers had education below diploma level, 58% of the mothers and 38% of the fathers had diploma education level, and finally, 37% of the mothers and 58% of the fathers had university education.

2.2 Procedures

The parents who had preschool children aged 43 to 66 in months were invited for a meeting. Three different questionnaires, such as children background, parental demographic background, and the parental consent questionnaires were distributed to be filled out by the parents. Prior to the administration of the tests on the children, reliability of the measures was assessed. The test-retest coefficient of an interval of two weeks for false belief tasks (Wimmer and Perner 1983) and McCarthy Scale of Children's Ability test (McCarthy 1972) was 7.41 and 8.92 respectively. In order to make sure of the tests with the Iranian children, the false belief tasks and McCarthy Scale of Children's Ability test were initially translated into Persian language and the Persian version

was translated back into English to ensure that the Persian version corresponded with the English one. Therefore, the false belief tasks for assessing ToM and McCarthy Scale of Children's Ability test to tab VA of the preschool children were administered individually in a quiet room free of visual and auditory distractions in each kindergarten, and lasting up to 25 minutes per child, took eleven weeks to complete. During the process of testing, parents were allowed to enter the testing room, and to be with their children. Children's responses were recorded by the test administer. The tests were administered in a fixed sequence designed from easiest to hardest in order to increase motivation. Between the tests and during the assessment session, 10 minutes break occurred for the children who did not have patience to sit for the period of time. Children were allowed to discontinue the testing processes in any time and this happened to 5 of the children. In cases where the tests were not completely administered in one session, a second testing session was scheduled within the week or two, and it happened to 5 of the children. At the end of testing session, all the children were given a toy as an appreciation for participating in the study.

2.3 Materials

2.3.1 In this study four instruments were used

2.3.1.1 ToM tasks- Sally and Anne (Change of Location)

The first instrument used for assessing ToM was from Baron-Cohen et al. (1985) study is the "Sally and Anne task". The instrument was adopted by changing the name Sally and Anne to Ahmad and Fatima. Besides this, in the original instrument, a marble was used for the activity but in this study, the researchers replaced it with a ball. The task was used in story form.

A boy by the name of Ahmad has a ball. He plays with the ball for a while and then he gets tired, he puts the ball away in his box. He goes downstairs (disappears from view). While he has gone, his sister Fatima takes the ball out of the box. She plays with the ball for a while, and then she plays a trick and puts the ball away. She puts it in the basket, and then goes outside. Ahmad comes back. He wants to play with his ball again. Now the children were asked the false belief question "Where will Ahmad look for the ball?" followed by memory questions "Where had he put the ball before he went downstairs?" and "Where is the ball really?" Each correct test question respond earned 1 point. A maximum total of 2 points were scored for this task.

2.3.1.2 Red/Blue Box (Change of Location)

The second instrument that was used is change of location task. In this task one red box, one blue box, and a piece of chocolate and two dolls were used. In this false belief task, the previous scenario about Ahmad and Fatima was repeated using a new location. The task was done in story form.

2.3.1.3 Crayon Box/Sticker (Change of Content)

The third instrument was crayon box/sticker task. This task was modeled on the version used by Gopnik and Astington (1988). The task was done in performance action. A child was shown a crayon box and inside the crayon box that actually held stickers. The child was initially shown the closed box and was asked to look at the box "What do you think is inside the box?" Then the box was opened to reveal what was inside, he found stickers not crayon. Then the box was closed again, and the child was asked again, "now what do you think is inside the box?" then the next false belief question was asked. "What did you think is inside the box when you first saw it?" The second false belief question concerned children understanding of another person's false belief. For this question, the child was asked to name a best friend, and then was asked, "Imagine your friend comes in and sees this box. "What will your friend think is inside the box?" Each correct test question response earned 1 point to a maximum total of 2 for the task.

2.3.1.4 Scoring of the false belief tasks

False belief answers will be correct only if memory check answer is also correct. Consequently, if a child gets any memory check question incorrectly, then score of 0 will be given; if a child gets the memory check and false belief question correctly then he will be given a score of 2 for each task. Children have to get false belief questions correctly along with the memory check to be given credit; otherwise they will score 0 on false belief task. Therefore, a score of 2 means they passed both false belief task and memory check questions; a score of 0 meant that either they had the memory check question incorrect, or one of the two false belief questions incorrect. A child's total score could range from 0 to 6.

2.3.1.5 McCarthy Scales of Children's Ability (MSCA)

The fourth instrument was used in this study is McCarthy Scales of Children's Ability (McCarthy, 1972). This instrument was used to tab VA of the children and consist of five sub-scales. The child was asked to respond

with one word answers, phrases, and sentences to a variety of items. Therefore, sum of the scores of the five subscales will be the score of VA. The test in the verbal scale is described below.

- 1- Pictorial memory: The child is shown a card which has 6 colored pictures of familiar object. The examiner names the objects aloud during a 10 second exposure, after which the card is removed and the child tries to recall the objects. One point for each object correctly recalled.
- 2- Word knowledge: Part 1, picture vocabulary, it requires the child to demonstrate his understanding of the spoken language of others by pointing to 5 objects and naming 4 additional objects, all pictures on cards. Therefore, 1 point was given for each card that the child gave an acceptable response. Part 2, oral vocabulary, consists of 10 words given in the usual manner. They are graded in difficulty, and range from concept, familiar words to abstract concepts. Therefore, 2 points were given if the child describes the words in term of use. The child was given 1 point if he describes the word incompletely and zero was given if the child response was similar to 0-point sample.
- 3- Verbal memory: This test is graded series of words and sentences to be repeated by the child. The first two items contain concrete concepts likely to be within the child's understood vocabulary, the next two items contain two syllable words, which are more abstract in meaning, and the last two items are full sentences. Therefore, 1 point was given to each word, which was repeated by the child, and 1 point was deducted if the sequence of the words were changed.
- 4- Verbal frequency: This test measures the child's ability to classify and think categorically. He has to think quickly of words falling into each of four categories (things to eat, animal to name...) and name as many words as he can in 20 seconds. One point was given to each acceptable response, up to maximum of 9 for each item.
- 5- Opposite analogies: The child provides the opposite of the key words in each of the 9 statements spoken by the examiner. Therefore, 1 point was given to each correct response and 0 for each incorrect response.

3. Results

Table 1 shows the mean and standard deviation of the ToM, VA, and age of the children. Skewness and Kurtosis values for all the variables indicated normal distributions of the scores.

In terms of false belief questions, 35 (21%) of the children obtained zero score to the false belief questions, 35(21%) of them correctly answered one of the false belief questions, 37 (22%) correctly answered two of the false belief questions, and finally, 56 (34%) of them correctly answered all false belief questions. In terms of control questions, (e.g. "where is the ball now") 106 (64%) of the children correctly answered all of the control questions, 18 (11%) of the children correctly answered one control question, and 32 (20%) correctly answered two control questions, only 7 (4%) of them obtained zero score to all control questions.

The second aim was to determine the significant difference between ToM and number of siblings in the family. Although, the mean ToM score ($M=4.50$) of the children who had one sibling was higher than the mean ToM score ($M=4.11$) of only child and the mean ToM score ($M=4.30$) of the children who had two and more than two siblings in the family, Tukey's test revealed no significant difference between ToM and number of siblings, $F(2, 160) = 1.044$, $p = .354$.

A non-significant difference was found between the performance of the ToM score of the children with having older siblings to younger siblings, $t = -1.237$, $p = .181$. In contrast, a significant difference was found between ToM and birth order, $t(161) = -.2104$, $p < .05$. To examine the difference between the siblings with having the same sex versus opposite sex, the sample was divided into two groups, namely, the children who had older brother and the children who had older sister. ToM performance of the children who had older brother sibling versus older sister sibling did show an advantage over those with older brother siblings, $t = 3.23$, $p < .05$.

Furthermore, t test revealed that the children who had older siblings are advantageous in ToM as compared to only child, $t = -1.85$, $p < .05$. In addition, housewife mothers had significantly higher mean scores in ToM as compared to working mothers, $t = -2.23$, $p < .05$. Analysis of variance (ANOVA) using Tukey's test showed there were no significant difference between ToM and father's educational levels, mother's educational levels, and Family income.

4. Discussions

One of the most important aspects of this study is the nature of the sample. This study assessed relatively large number of children. Generally, the reliability of the measures in the new population demonstrates that it is

possible to apply the tasks in different cultures. In the present study, the ToM mean scores was $M=4.27$ that is a little bit higher than the ToM mean scores ($M=3.47$) in the second experiment of Cole and Mitchell (2000). Majority (64%) of the children correctly answered all the control questions, it is lower in comparing with Jenkins and Astington's (1996) study, that ninety-seven of the control questions were correctly answered by the children. It might be indicated that greater part of the children could follow the story and understand it well in the same way that adults would understand it.

Although, the ToM mean scores for only child was the lowest and the ToM mean scores of the children having one sibling was the highest, no significant difference was found between the mean of ToM and number of siblings (only child, children who had one sibling, and the children who had two and more than two siblings), which is in line with Cole and Mitchell, 2000; Cutting and Dunn, 1999; Peterson and Slaughter, 2003; Wright-Cassidy, 2005). The small sample size (13) for the two and more than two siblings in the family might be one of the reasons for non-significant results. Therefore, the finding that only children were delayed in mastering ToM is consistent with the finding of the Peterson's (2000) study.

In a different analysis, a significant difference was found between older siblings and only children, when younger children were not considered, therefore, it is in line with Ruffman et al. (1998) who found the benefit of ToM in older siblings. One view that can justify the advantages of the children with having older siblings in terms of ToM is due to the information processing capacity (Foder, 1992). Some studies have indicated the link between working memory and ToM development in children (Davis & Pratt, 1995; Keenan, Olson, & Marini, 1998).

No significant difference was found between older and younger siblings in ToM. The possible explanation might be that, no information was available about the age of the older and younger siblings than the target child, therefore, the older siblings than the target child might be teenagers, adult like or younger siblings might be a very young infant. If it is so, adult like and very infant siblings may limit their capacities to interact in ways that stimulates ToM in children (Peterson, 2000). Additionally, small sample size for younger sibling (10) might be one of the reasons for non-significant results. Replication with large sample size consists of number of older and younger siblings than the target child is necessary. The evidence of a contribution by birth order in ToM controlling for age and VA is in inconsistent with Jenkins and Astington (1996). They found that family size, but not birth order, significantly predicted false belief understanding in younger children over and above age and VA.

Advantages of older brother sibling over older sister sibling is consistent with the trend found by Ruffman et al. (1998) toward association between mismatched sibling gender and improved false belief understanding. However, the amount of time that the parents, especially mothers spend with the children may have been considered as one of the important factors in ToM development among siblings. Some other factors such as parental attitudes and parental behaviors (Wright-Cassidy et al. 2005) and the quality of relationship between the children and parents should possibly be underlying factors for ToM development. According to McAlister and Peterson (2007), highly minded parents, who attribute beliefs and cognitive states to their siblings from an early age, may promote ToM growth in their children. And also, minded parents focus more on interaction and may elucidate the profit of social interaction for children. Some other factors such as executive functioning (Cole & Mitchel, 2000; Hughes & Ensor, 2005; McAlister & Peterson, 2006) and language (Jenkins and Astington, 1996) are also believable. Ruffman et al. (2002) found that maternal mental state utterance was significantly correlated with children's succeeding ToM ability at different time in points. That is, when mothers used more mental state terms with their preschool children, the children subsequently developed more sophisticated ToM understanding.

The housewife mothers in comparison with the employed mothers had a significant contribution to ToM. Several reasons might produce this. The housewife mothers may spend more time with their children, and may play, talk, and have more interaction with their children than employed mothers. It would be useful in future research to consider the amount of time that mother spend with their children and also take into account the relationship between parental style and ToM understanding. The evidence of a contribution by birth order in ToM controlling for age and VA is in inconsistent with Jenkins and Astington (1996). They found that family size, but not birth order, significantly predicted false belief understanding in younger children over and above age and VA.

5. Conclusion

The link between ToM understanding and siblings in the family has received much attention in recent literature. From the present study, birth order had a significant contribution toward ToM. Generally, the only children had the lower performance in ToM, in compared to the children who had one sibling and with the children who had

two and more than two siblings in the family. It is consistent with several studies (Peterson, 2000; Peterson, McAlister, 2007).

6. Limitations

Some limitations of our study should be recognized. The present study has a number of methodological limitations that suggest areas for future research. Firstly, our sample was not comprehensive enough to cover all the male and female siblings older or younger than the target child, or number of siblings younger than the target child. Secondly, the study was cross-sectional and the generalization of the findings might be restricted. Apart from VA, no measures of cognitive development were included in the study.

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Table 1. Mean and SD of ToM, VA, and age

Variables	Mean (SD) N =166
ToM	4.27 (1.6)
VA	59.88 (12.9)
Age in month	54.46 (5.7)

Table 2. ToM, FB, and CO performance of the children based on number of siblings

Number of siblings in the family						
	Only child		One sibling in the family		Two and more than two	
Sample	88		62		13	
Variables	Frequency (%)		Frequency (%)		Frequency (%)	
	Null	Perfect	Null	Perfect	Null	Perfect
ToM*	3(3%)	24(27%)	8(13%)	24(38%)	1(8%)	5(38%)
FB*	25(28%)	26(29.2)	7(11%)	24(38%)	3(23%)	6(46%)
Co*	6(7%)	58(65%)	6(9%)	40(63%)	1(8%)	2(15%)

Note*: ToM= Total score of ToM. FB= False belief score. Co= Control questions.

Table 2 shows the performance of the children who obtained perfect score (6) and null score (0) on ToM tasks according to the number of siblings in the family. The children with one sibling (38%) and the children with having two and more than two siblings (38%) in the family obtained the highest perfect score in ToM in compared to only child (27%).

Table 3. Correlation between ToM, VA, and age

Variables	ToM	VA	Age
ToM	1.00	.502*	.290*
VA	-	-	.155*
Age	-	-	-
Partial correlation after effect of age is partial out			
ToM		.482*	

The first aim of the study was to determine the relationship between ToM, VA, and age of the children. A significant correlation was found between ToM and both age, $r = .292$, $p < .05$, and VA, $r = .502$, $p < .05$, indicated that older children and those with advanced VA were likely to answer the false belief questions correctly. It was important to identify whether the relationship between ToM and VA remained significant after controlling the effect of age. To achieve this objective partial correlation was carried out (Table 3).

Table 4. Summary of hierarchical regression analysis predicting ToM understanding

Variables	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	R	R ²	Change in R ²	P
Age and VA	.060	.020	.207	.541	.293	.293	.001
Birth order	.060	.009	.463	.568	.322	.030	.011
Mother's occupational status	-.541	.335	-.163	.587	.345	.022	.024

To examine the extent, whether birth order and parental demographic variables contributed to children's level of ToM, independent of age and VA, a hierarchical regression analysis was carried out for the purpose. Therefore, ToM was entered as dependent variable at step 1, age and VA were entered as predicted variables. The regression model differed significantly from zero at the end of this step, $R = .541$, $R^2 = .293$, $F(2, 153) = 31.674$, $p < .001$. Next, with the entry of birth order at step 2, there was a significant increment in the amount of ToM variance. $R = .568$, $R^2 = .322$, $F(1, 152) = 6.64$, $p < .05$. At the third step, mother's occupational status was entered in the equation, a significant increment was found in the amount of ToM variance, $R = .587$, $R^2 = .022$, $F(1, 151) = 5.172$, $p < .05$ (Table 4).