

The Development of Theory of Mind According to False Belief Performance of Children Ages 3 to 5

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Abstract

This study has examined the role of age in the false belief understanding in typically developing children and to determine if the different type of false belief tasks affects performance on false belief. The survey research design was used. False belief understanding was measured in 72 children between the ages of 3.00 to 5.11 year old. The sample consisted of 12 children in each age group and age groups were divided into six month period. Four false belief tasks were conducted. The findings of this study indicated that the false belief understanding of Turkish speaking children between the ages of 3.0 to 5.11 year old had some similarities as well as some differences to children speaking other than Turkish. 3 year old children seemed to have developed an understanding of the own false belief before they developed a clear understanding of others' false belief. It was clear that the rapid change of understanding false belief seemed to have appeared at 4.6 year old.

Key Words

Theory of Mind, False Belief, Mind Reading.

Theory of mind refers to an understanding of mental states such as belief, desire and knowledge that enables us to explain and predict others' behavior (Wellman & Estes, 1986). In brief, theory of mind is to be able to reflect on the contents of one's own and other minds (Baron-Cohen, 2000). Developmental evidence suggests that such thinking is not automatic for young children, who must develop a number of skills in order to reach the adult level of competence in understanding of mental states. Precursors of theory of mind include joint attention, appreciation of intentionality, recognition that different people have different perspectives,

use of mental state words and pretend play (Miller, 2006). Between 3 and 5 years of age, important developmental changes in theory of mind take place (de Villiers & Pyers, 2002; Flavell, Everett, Croft, & Flavell, 1981; Wellman, Cross, & Watson, 2001; Youngblade & Dunn, 1995). Two year old children might understand desires, perception, and emotions (Bartsch & Wellman, 1995; Wellman, Philips, & Rodriguez, 2000). Children at three years can distinguish between the mental and physical worlds and from three years of age children can grasp the subjectivity of thoughts (Flavell, Flavell, Green, & Moses, 1990; Watson, Gelman, & Wellman, 1998; Wellman & Estes, 1986). Three and four year olds also distinguish thinking from doing (Flavell, Green & Flavell, 1995). Mental states are not only non-physical; they also provide the causes and explanations for persons' actions and experiences (Wellman & Lagattuta, 2000). Most subsequent research on the development of theory of mind has concerned false beliefs between 3 and 5 years of age, and their role in the prediction or explanation of behavior, and in attempts to manipulate behavior. Wimmer and Perner (1983) showed

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that a full-fledged TOM doesn't develop before the age of 3/4. They set up a series of experimental tests in order to check whether children between 3 and 5 years of age were able to attribute a false belief to someone else. Comprehending false belief is the clearest sign of understanding a critical aspect of the mind: its subjectivity and its susceptibility to manipulation by information (Dennett, 1978; Wimmer & Perner, 1983).

Widely used versions of first order false belief tasks are the appearance reality distinction, the unexpected contents false belief and change in location tasks. They are called first-order tests because they only involve inferring one person's mental state. According to Wellman et al. (2001) study allowed an estimate of the probability of passing the false belief task at various ages: At 2.5 years, children were less than likely to pass false belief tasks; at 3 years 8 months, children were 50% correct; and at 4 years 8 months children were about 75% correct. Younger children (3 years and 5 months or younger) either fail or perform at chance levels, whereas older children pass the task, giving an adult like answer at better than chance levels (Flavell, 1999; Moses & Flavell, 1990; Wimmer & Perner, 1983). Individual differences in children's theory of mind have been proposed by Bartsch and Estes (1996). These are individual differences in antecedent causes, individual differences in the consequences of arriving early or late to a theory of mind, the possibility of qualitative differences in theory of mind across individuals (family variables, other cognitive and language abilities and various social outcome measures). Children in different countries performed differently in the false belief tasks: At 44 months, American children were 50% correct, Australians were 69% correct and Japanese were 40% correct (Wellman et al., 2001). Nevertheless, within each country the age profile had a similar shape, with poor performance in younger children and better performance in older children. The research literature suggests that there are measurable individual differences in the mind reading abilities of young children (Lewis & Osborne, 1990; Slaughter & Gopnik, 1996), and that these individual differences are correlated with variables like family variables, other cognitive constructs like language and various social outcome measures (Hughes, 1998; Jenkins & Astington, 2000; Ruffman, Perner, & Parkin, 1999; Slaughter & Repacholi, 2003; Yağmurlu, Kazak-Berument, & Çelimli, 2005).

Without doubt, there is a relation between language and false belief understanding. There are three possibilities about this relation: theory of mind depends on language; or language depends on theory of mind; or both depend on a third factor (Astington & Jenkins, 1999). Granti (2004) suggested that Turkish speaking children start to establish some understanding about other minds starting around 3 years of age. Children's performance revealed highest level of understanding for the verb *sanmak* "think with implication of false belief" as compared to other mental verbs, but understanding of mental verbs did not precede false belief understanding. Aksu-Koç, Aydın, Avcı, Sefer and Yaşa (2005), suggested that a significant interaction effect between age and type of task showing that 4 year-olds scored higher than 3 year-olds on false belief tasks but no age effect found on appearance-reality tasks. Shatz, Diesendruck, Martinez-Beck and Akar, (2003), investigated whether differences in the lexical explicitness with which languages express false belief influence children's performance on standard false belief tasks. Bayramoğlu and Hohenberger (2007) investigated the theory of mind development of 4 and 5 year old Turkish preschoolers. The results indicated that a main effect of age was found. Researchers suggest that 4 year old children can predict the actions of someone with a false belief and there are measurable individual differences in the mind reading abilities of young children (Wellman et al., 2001). Therefore, it is important to conduct studies in languages other than English. It would certainly add weight to findings about mind reading abilities of young children if they are replicated. Also it is important to determine the relationship between false belief understanding and other areas like language, cognitive constructs and social outcomes. In Turkey there are several studies investigated theory of mind performances of children between 3 to 5 years old (Aksu-Koç et al., 2005; Granti, 2004). In these studies standard false belief tasks were administered. Also in this study standard false belief tasks (appearance-reality and unexpected content and three versions of change in location) were administered.

The aim of the present study was to examine the role of age in the false belief understanding in Turkish speaking children and to determine if the different type of false belief tasks affects performance on false belief.

Method

Model

While conducting the research, which was aimed to determine the role of age in the false belief understanding in Turkish speaking children and to determine if the different type of false belief tasks affects performance on false belief, the survey research design was used (Büyüköztürk, Kılıç-Çakmak, Akgün, Karadeniz, & Demirel, 2008).

Participants

Participants were selected from five preschools children. Because of maternal education level was associated with a number of aspects of theory of mind (Pears & Moses, 2003), children whose parents' education level was at least high school was selected. Seventy two typically developing children between the ages of 3.00 to 5.11 year old were included in the sample. The sample consisted of 12 children in each age group and age groups were divided into six month period.

Instruments

Five false belief tasks were conducted.

Appearance-reality task modeled on the work of Flavell, Flavell and Green, (1983), examined children's ability to distinguish between what an object appears to be and what really is. In order to probe the child's understanding of her own and others' thoughts, questions regarding the child's initial mistaken belief about the object and what another's belief about the object were also included in this task. Sugars that look like pebbles were used as deceptive object. But 16 children were familiar with the deceptive object so this task was omitted from the analyses.

Unexpected content task modeled on the work of Hogrefe, Wimmer and Perner, (1986). Experimenter asked children what they believe to be the contents of a box that looks as though it holds a candy called "Bonibon". After the children's answer, each was shown that the box in fact contained pencils. After these unexpected contents were replaced in the box, the children were asked what they had thought was inside it before it was opened and what their friend would think was inside it before it was opened. After these false belief questions justification of the prediction question (why?) were also asked and scored separately. Lewis and Osborne (1990) found that test questions that are tempo-

rally specific and syntactically straightforward enable most 3 year olds to attribute false beliefs of others. Therefore questions were posed with temporal markers and with specific false belief verb form "san" (What will X think (san) is inside the box before I opened it?). A score of 0 to 3 was given for the unexpected content task.

Three "change in location" false belief tasks (Baron-Cohen, Leslie, & Frith, 1985; Wimmer & Perner, 1983) were conducted. In the first one the task acted out with dolls, and in the second one child and experimenter acted the scene together and in the last one illustrated short story were used. In all the false belief tasks control questions were asked. After these control questions "Look for" false belief questions also posed with temporal markers (Where does Ayşe going to look for the ball first when she returns?). Furthermore after false belief questions justification of the prediction question (why?) were also asked and scored in each task. A score of 0 to 6 was given for the change in location false belief tasks.

A score of 0 to 9 was given for the total theory of mind score.

Procedures

All of the children cooperated with the first researcher. Data collection procedure was carried out individually in a quiet room in their preschools. The tasks were counterbalanced against the order effect. It takes about 20 minutes to conduct all the false belief tasks.

Data Analysis

The Kruskal-Wallis Analysis of Variance was used to test differences among age groups in each of the tasks. The Mann Whitney U-tests was used to test for differences between the age groups on the false belief task performances.

Results

The percentiles of total theory of mind scores showed that the 25th percentile mostly involved 3.0 to 4.5 year old children while 50th percentile involved 4 year old and older children (between 4.0 to 5.11 year old) and finally 75th percentile mostly involved 4.6 to 5.11 year old children.

In the own belief task (unexpected content false belief task) the analysis indicated that no significant

differences was found between age groups [$\chi^2(5) = 8.27, p > .05$].

Significant differences [$\chi^2(5) = 23.92, p < .05$] were found between the age groups in the attributing a false belief to someone else according to “unexpected content false belief task”. Mann-Whitney U test results indicated that the 5 year old has the highest score in the “unexpected content false belief task” and this is followed by the order of; 4 years 6 months and 3 years 6 months. When comparing consecutive age groups in 6 months period no significant differences were found between these age groups. But when comparing age groups between one year periods, significant differences were found. In the first period of 3 year old although some children passed the tasks which were attributing a false belief to someone else the competence of these children improve at 4 years 6 months.

According to “change in location false belief task” significant differences [$\chi^2(5) = 43.20, p < .05$] were found between the age groups. Mann-Whitney U test results indicated that 4 year and 6 months and bigger children have the highest score on these tasks and significant differences found between these age groups and smaller age groups (3.0-3.5, 3.6-3.11 and 4.0-4.5).

No significant differences found between change in location task performance [$\chi^2(5) = 8.27, p > .05$].

According to total theory of mind score, the results indicate that 5.6 to 5.11 year old children have a higher total theory of mind score and significant differences found between age groups [$\chi^2(5) = 40.30, p < .05$].

Discussion

In summary the findings of this study indicated that the false belief understanding of Turkish speaking children between the ages of 3.0 to 5.11 year old had some similarities as well as some differences to children speaking other than Turkish (Gopnik & Astington, 1988; Perner, Frith, Leslie, & Leekam, 1989; Perner, Leekam, & Wimmer, 1987). Three year old children seemed to develop an understanding of the own false belief before they develop a clear understanding of others’ false belief. It is clear that the rapid change of understanding false belief seems to appear at 4.6 year old. This finding shows similarities with the results of the meta-analysis provided by Wellman et al. (2001) and Aksu-Koç et al. (2005). The result shows that younger children either fail or perform at chance levels. This

also shows the individual differences in theory of mind performance. A number of studies have suggested that children’s theory of mind development is influenced by their exposure to talk about mental states. It was found that mother’s talk about mental states predicted children’s later theory of mind performance (Ruffman, Slade, & Crowe, 2002). The performance of younger children can be related to these variables but this issue is out of this research.

Different tasks were used to assess false belief understanding (Astington & Jenkins, 1999; Gopnik & Astington, 1988; Miller, 2001; Wimmer & Perner, 1983). With regard to the tasks, the difficulties which have been come across were discussed in detail. Performance on different types of tasks may differ by language ability because of the different linguistic demands of false belief tasks. However Wellman et al. (2001) argued that conceptual change, independent of task factors, underlies children’s false belief task performance. Although variations in children’s performance on these tasks were typically masked when we looked at group means, there were some 3 year old children who performed successfully on the false belief tasks. Individual differences in children’s theory of mind thought to be important in terms of other areas (family variables, other cognitive and language abilities and various social outcome measures) that seem to be related to theory of mind. Different type of tasks was used to assess theory of mind (Astington & Jenkins, 1999; Gopnik & Astington, 1988; Miller, 2001; Wimmer & Perner, 1983). In this research “unexpected content” and “change in location” false-belief tasks were used. In “change in location” false-belief tasks the performance of 3.6-4.5 and 4.6-4.11 year old children was significantly different whereas same difference couldn’t found in the “unexpected content” task. In “change in location” task the children had a chance to think about own experience and this experience may be facilitated the performance (First the children were asked what they had thought was inside the box before it was opened and then what their friend would think was inside it before it was opened).

In the “change in location” task the false belief questions and justification of the prediction question (why?) were also asked for the choice of where the character would look. Some researchers only asked false belief questions without asking justification of the prediction question (McGregor & Benett, 2008) and some used a SEE control, which the character sees the object moved and thus has a true belief (Leslie, 1994). In this research a SEE

control wasn't chosen, but rather justification of the prediction question was asked. It was considered whether the child gave a suitable explanation for the character looking in the wrong location. Thus we scored false belief and justification of the prediction questions separately. When justification of the prediction question has omitted no significant difference was found between the second group of 3 year old children and second group of 4 year old children. Whereas when justification of the prediction question was asked significant differences were found between these two age groups. This result shows that the chance is 50/50 for identifying the right location. So the problem lies in interpreting the answer of justification question.

Three "change in location" false belief tasks were conducted. In the first one the task acted out with dolls, and in the second one child and experimenter acted the scene together and in the last one illustrated short story were used. Manipulations in the "change in location task" have no impact on age. Wellman et al. (2001) argued that conceptual change, independent of task factors, underlies children's false belief task performance.

Significant relations between language measures and children's performance on false belief tasks have been demonstrated in both typically developing children (e.g., Astington & Jenkins, 1999) and in clinical samples (e.g., Miller, 2001). Aksu-Koç et al. (2005) found that when the false belief questions asked with "san-think false belief" the performance on these tasks was facilitated and when compared to English-speaking children the Turkish-speaking children's performance was higher. Results also indicated the fact that control of epistemic markers and of complement constructions were found to be significant predictors of false belief performance suggests that these two factors are also important contributors to theory of mind development. Thus it appears that a number of linguistic factors need to be considered for theory of mind development. Based on the fact that language plays an important role in the development of false belief understanding (Astington & Jenkins, 1999; de Villiers & Pyers, 2002; Hale & Tager-Flusberg, 2003; Lohmann & Tomasello, 2003), researches that will be conducted to address areas related to false belief understanding would give support to the implications for both typically developing children and children with special needs.

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Teşekkürler

Makaleyi okuyarak makalenin son halini almasını katkıda bulunan saygın Prof. Dr. Ayhan Aksu Koç'a teşekkürlerimizi sunarız. Ayrıca araştırmaya katılan Şan, Yıldız, Çekirdek, Karayolları ve Kalkınma anaokullarının yöneticileri ile sevgili çocuklara, ailelerine ve öğretmenlerine teşekkür ederiz.