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THEORY OF MIND IN PRESCHOOL CHILDREN WITH NORMAL DEVELOPMENT, AUTISM AND MENTAL RETARDATION

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ABSTRACT

The present study was designed to evaluate the theory of mind in preschool children with normal development, autism or mental retardation in terms of the teachers' views on the mental ability, school adaptation, social and physical competences. Pre-school teachers (n=27) were requested to evaluate children with normal development (n=426), mental retardation (n=30) or autism (n=39) in their classes in terms of adequacy of mental ability, school adaptation, social competence and physical competence as well as school attendance while the results were compared with the theory of mind. It was found that there was a significant difference between the children who were found to be adequate or highly adequate in mental, physical, social and school adaptation by their teachers and those who were found to be inadequate or quite inadequate in theory of mind story tests in terms of qualitative and quantitative data.
Key words: *theory of mind; teachers' perspective; preschool children*

1. INTRODUCTION

Theory-of-mind (ToM) development is the area of cognitive development research that investigates the nature and development of our understanding of the mental world – the inner world inhabited by beliefs, desires, emotions, thoughts, perceptions, intentions, and other mental states. Since its introduction almost 30 years ago, it has grown to be one of the largest and liveliest areas in the developmental psychology.

Human social interactions are based, among other things, on the ability to detect cognitive and emotional processes in others (Frith & Frith, 2001). The development of theory of mind ability has been extensively studied in humans. Premack and Woodruff (1978) found that chimpanzees even have the ability to impute mental states and make inferences that can be used to make predictions about the behavior of other chimpanzees. The attribution of mental states, such as emotions, beliefs and intentions, to one self and to others has been defined as 'Theory of Mind' (Premack & Woodruff, 1978) or 'Mindreading' (Baron-Cohen, 1995). From an evolutionary perspective, theory of mind has been suggested to represent an essential component of social intelligence that evolved in primates to solve the problems of an increasingly complex social environment (Brothers, 1990; Whiten, 2008). Babies are born with, or acquire early, a number of abilities and propensities that will help them to learn about people. They find human faces, voices, and movements especially interesting. The capacity of children to recognize that other people have thoughts and desires that are not necessarily alike to their own thoughts and desires emerges during the second year of life (Onishi & Baillargeon, 2005).

In everyday life we form ideas about other people and about social situations. We interpret other people's actions and we predict what they will do under certain circumstances. Indeed, part of the intrigue in studying children's theory of mind is that it may constitute their first commonsense theory (Wellman, 1990). This makes ToM an essential skill for competent functioning and communication in everyday social situations (Astington & Jenkins, 1995). In brief, to have a theory of mind is to be able to reflect on the contents of one's own and other's minds. Difficulty in understanding other minds is a core cognitive feature of autism spectrum conditions. The theory of mind difficulties seems to be universal among such individuals (Baron-Cohen, 2001).

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Research on ToM has travelled a long way in the last two and a half decades. Undoubtedly, the most important turning point in its history was the discovery that children with autism have impairments in understanding false beliefs (Baron-Cohen, Leslie, & Frith, 1985; Perner Leekam, 2008), a finding that changed people's thinking about the concept of ToM and had a profoundly positive impact on subsequent scientific progress in the field of autism. In the late 1980s, Uta Frith invited us to join her and Alan Leslie on their initial journey to explore the nature of the difficulty of ToM in children with autism (Perner, Frith, Leslie, & Leekam, 1989; Perner & Leekam, 2008).

The ToM Storybooks are a new instrument measuring basic ToM-functioning and associated aspects. There are 34 tasks, tapping various emotions, beliefs, desires and mental-physical distinctions. Four studies on the validity and reliability of the test are presented, in developing children (n=324, 3-12 years) and children with PDD-NOS (n=30). The ToM Storybooks have good psychometric qualities. A component analysis reveals five components corresponding with the underlying theoretical constructs. The internal consistency, test retest reliability, inter-rater reliability, construct validity and convergent validity are good. The ToM Storybooks can be used in research as well as in clinical settings (Blijd-Hoogewys, Geert, Serra, & Minderaa, 2008).

ToM is an issue that received much interest in the recent years and is of major importance for developmental psychology. Another interesting point is that, in autistic people, impairments in performance on the classic false-belief tasks have been detected (Leekam & Perner, 1991), but not on a ToM story books test.

Young children often provided psychological explanations considering emotions, thoughts and intentions, but did so appropriately. Specifically, nearly 100% of children's explanations for intended actions were psychological explanations, even for 3-year-olds. Moreover, 88% of 3-year-olds' explanations and 93% of 4-year-olds explanations for mistaken actions were also psychological explanations. In contrast, preschoolers provided physical or biological explanations for physically-caused or biologically-caused human movements (Inagaki & Hatano, 2006; Wellman & Lagattuta, 2004). Besides, preschool children were also shown to provide psychological explanations for voluntary, but not involuntary, behavior (Wellman & Lagattuta, 2004).

Children, on average, develop foundational ToM understanding by 4 years of age, though an understanding of more complex concepts (e.g., consciousness, forgetting, and attention) develops later (Flavell, Green, Flavell, & Lin, 1999).

Defining emotional competence requires acknowledging the intertwinement with social competence. Emotions are often understood as social processes (Salovey, 2003). Emotion is the primary medium of communication in infancy, and children's emotions are directly linked to their relations with others (Begeer, Koot, Rieffe, Meerum, & Stegge, 2008; Dunn, 2003). Throughout the lifespan, most emotional experiences and responses are contextually anchored in social relationships, and emotions become meaningful in interactions with other people (Begeer et al., 2008; Ekman, 1992; Frijda, 1986; Saarni, 1999).

Considering development as a whole, inadequacy in any of the developmental areas is believed to have a negative impact on self-perception and the interpretation of other people by the individual.
The present study was designed to evaluate the theory of mind in preschool children with normal development, autism or mental retardation in terms of the teachers' views on the mental ability, school adaptation, social and physical competences.

2. MATERIALS AND METHODS

2.1. Participants

With the permission of the Ministry of National Education, a total of 27 preschool teachers were included in the present study based on their voluntary participation. Teachers were then requested to evaluate the children in their classes in terms of mental ability, school adaptation, social and physical competences, and the results were compared with ToM. The sampling of the study consisted of total of 426 (45.8% were 6 years old, 51.6% were male) children with normal development enrolled in the preschool educational institutions of the Ministry of National Education in Istanbul. The first sampling group of the study was selected from the Uskudar, Umraniye, Kadikoy, Atasehir, Beyoglu, Fatih and Sisli districts of the Istanbul province.

The second sampling group included children with mental retardation (n=30; 56.7% were 8 years old, 76.7% were male) and autism (n=39; 38.5% were 8 years old, 87.2% were male) who were enrolled in rehabilitation centers located on the Anatolian and European sides of Istanbul. The autistic children enrolled in the study were those that were diagnosed with autism at a general hospital, were referred to a psychological counseling-guidance center, and were identified by their teachers as having "expressive language" and "experience transfer" skills (For example, teachers were asked to identify the children who could give correct answers to questions such as what they just did or what they do during the day, and who could make, even if short-term, meaningful conversations).

2.2. Procedures

Based on development reports prepared with two-month intervals, preschool teachers were asked to fill in a personal information form inquiring about their views on mental ability, school adaptation, the social and physical competence of the children as well as demographic characteristics of children (age and sex) and the school attendance.

2.2.1. A test on Theory of Mind – The ToM Storybooks

The ToM Storybooks is a Dutch psychological test performed to obtain information on the quality of a child's ToM skills, and to assess whether these skills have developed in accordance with the child's age or not (Serra, Loth, van Geert, Hurkens, & Minderaa, 2002). The test consists of six storybooks in which a main protagonist, named Sam, experiences all kinds of feelings, desires and thoughts. The child is asked a variety of questions about the protagonist's experiences. The questions are clustered in tasks. The tasks focus on ToM and associated aspects that children develop between the ages of three to six years old. They cover five components: 1) Recognition of emotion, 2) Distinction between physical and mental entities, 3) Understanding that seeing leads to knowing, 4) Prediction of behaviors and emotions from desires, and 5) Prediction of behaviors and emotions from beliefs (Blijd-Hoogewys, van Geert, Serra, & Minderaa, 2008).

In each story, the child is presented with an illustrated book that makes it easier to follow the stories read by the researcher. During the storytelling, researcher gives breaks to ask the child questions such as "Where will Sam look for grandpa?" and "Why is Sam looking under the table?". Giving the correct answer requires the child to take the perspective of the protagonist. Occasionally the child is also asked to connect the main character's mood to some additional pictures that represent different emotions like happiness, anger, sadness and neutrality. To administer the test, researcher needs six storybooks, an empty score form and emotion cards. Based upon the six books, a total score is calculated. Subsequently a quantitative (max 76) and a quantitative + qualitative score (max 112) are possible. In order to enable the standardized evaluation of the justifications, a category system has been developed, based on the category system used by Rieffe (1998), on different categories from

Wellman (1990), and on an exploration of the empirical data. Two rules of thumb are followed in scoring the justifications. First, a justification can only be scored if the preceding test question is answered correctly. Second, the correctness of categories varies over the different types of questions (Cheung, 2010).

For the Dutch version, a ToM quotient (ToM-Q) and a ToM age equivalent can also be calculated (Blijd-Hoogewys et al. 2008). ToM-Q is a normed quotient score with an average of 100 and a standard deviation of 15. Scoring the qualitative answers requires the researcher to be familiar with 21 different answer categories. In the current research, the ToM Storybook in Serra et al.'s study (2002) was used after it was translated into Turkish and its validation (Sari, 2011) was established.

2.3. Statistical analysis

Statistical analysis was made using SPSS software (Version 13.0, SPSS Inc. Chicago, IL, USA). The theory of mind with respect to mental ability, school adaptation, social and physical competences was analyzed using ANOVA test and complementary Post hoc analysis. The relationship between school attendance and the theory of mind was evaluated via correlation and regression analyses. Data were expressed as "mean (standard deviation; SD)", minimum-maximum and percent (%) where appropriate. $p<0.05$ was considered statistically significant.

3. RESULTS

3.1. Demographic characteristics

Table 1 presents the demographic characteristics of the participants. Of the children with normal development, 201 (45.8%) were 6 years old, 220 (51.3%) were male, 286 (65.3%) had been attending the classes for 0-6 months. Of the children with autism, 15 (38.5%) were 8 years old, 34 (87.2%) were male and 36 (92.3%) had been attending the classes for 0-6 months. Of the children with mental retardation, 17 (56.7%) were 8 years old, 23 (76.7%) were male and 28 (96.6%) had been attending the classes for 0-6 months.

Table 1. Data on demographic characteristics and school attendance in children with normal development, mental retardation or autism

	Normal development		Autism		Mental Retardation	
	N	%	N	%	N	%
Age range						
Age 4	22	5.0	3	7.7	2	6.7
Age 4.5	50	11.4	4	10.3	0	0.0
Age 5	69	15.7	6	15.4	1	3.3
Age 5.5	86	19.6	3	7.7	3	10.0
Age 6	201	45.8	3	7.7	5	16.7
Age 6.5	-	-	5	12.8	2	6.7
Age 8	-	-	15	38.5	17	56.7
Gender						
Male	220	51.3	34	87.2	23	76.7
Female	206	48.7	5	12.8	7	23.3
School attendance						
0-6 months	286	65.3	36	92.3	28	96.6
7-12 months	143	32.6	2	5.1	0	0.0
≥13 months	9	2.1	1	2.6	1	3.4

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3.2. Teachers' view on the adequacy of mental ability, school adaptation, social competence and physical competence in children with normal development, autism or mental retardation

Of the children with normal development, 190 (43.3%) were determined to be adequate while 207 (47.2%) were highly adequate in terms of mental ability according to teachers (Table 2).

Table 2. Distribution of teachers' views on adequacy of mental ability, school adaptation, social competence and physical competence according to groups

Teachers' views	Normal development		Autism		Mental Retardation	
	N	%	N	%	N	%
Mental ability						
Quite Inadequate	1	0.2	6	15.4	7	23.3
Slightly Adequate	41	9.3	14	35.9	19	63.3
Adequate	190	43.3	14	35.9	1	3.3
Highly Adequate	207	47.2	5	12.8	3	10.0
Quite Inadequate	6	1.4	9	23.1	3	10.0
School adaptation						
Slightly Adequate	31	7.1	11	28.2	10	33.3
Adequate	204	46.5	17	43.6	15	50.0
Highly Adequate	198	45.1	2	5.1	2	6.7
Quite Inadequate	6	1.4	11	28.2	6	20.0
Social competence						
Slightly Adequate	56	12.8	19	48.7	15	50.0
Adequate	203	46.2	9	23.1	7	23.3
Highly Adequate	174	39.6	0	0.0	2	6.7
Quite Inadequate	1	0.2	6	15.4	3	10.0
Physical Competence						
Slightly Adequate	22	5.0	12	30.8	6	20.0
Adequate	189	43.1	16	41.0	16	53.3
Highly Adequate	227	51.7	5	12.8	5	16.7

Of the children with autism, 14 (35.9%) were slightly adequate while 14 (35.9%) were adequate in terms of mental ability according to teachers. Of the children with mental retardation, 19 (63.3%) were slightly adequate while 7 (23.3%) were quite inadequate in terms of mental ability according to teachers (Table 2).

Of the children with normal development 204 (46.5%) were adequate and 198 (45.1%) were highly adequate in terms of school adaptation. Of the children with autism 11 (28.2%) were slightly adequate; 17 (43.6%) were adequate in terms of school adaptation. Of the children with mental retardation, 15 (50.0%) were adequate and 10 (33.3%) were slightly adequate in terms of school adaptation (Table 2). Of the children with normal development 203 (46.2%) were adequate and 174 (39.6%) were highly adequate in terms of social competence. Of the children with autism 19 (48.7%) were slightly adequate; 9 (23.1%) were adequate in terms of social competence. Of the children with mental retardation, 15 (50.0%) were slightly adequate; 7 (23.3%) were adequate in terms of social competence (Table 2).

Of the children with normal development 227 (51.7%) were highly adequate and 189 (43.1%) were adequate and in terms of physical competence. Of the children with autism 16 (41.0%) were adequate and 12 (30.8%) were slightly adequate in terms of physical competence. Of the children with mental retardation, 6 (20.0%) were slightly adequate; 16 (53.3%) were adequate in terms of physical

competence. Quite inadequate and slightly adequate groups were combined and termed as inadequate since the number of children observed was low (Table 2).

3.3. Book scores in relation to mental ability

The general (F=28.433;p=0.000<0.05), quantitative (F=28.241; p=0.000<0.05) and qualitative book scores (F=28.433; p=0.000<0.05) were determined to be significantly associated with the adequacy of mental ability as evaluated by teachers. General, quantitative and qualitative scores of the children with inadequate mental ability were determined to be significantly lower than the scores of the children with adequate and highly adequate mental ability. Besides, qualitative book scores in children with adequate mental ability were significantly lower than scores in children with highly adequate mental ability (Table 3).

Table 3. The theory of mind book scores in terms of the teachers' views on the mental ability, school adaptation, social and physical competences

Book Scores	Teachers' views						F	p value
	Inadequate		Adequate		Highly Adequate			
	Mean	SD	Mean	SD	Mean	SD		
Mental ability								
Total quantitative score	43.835	10.110	51.424	10.171	53.447	9.872	28.241	**0.000**
Total qualitative score	3.153	3.096	6.093	3.914	7.153	4.678	28.433	**0.000**
General score	47.224	11.989	57.478	13.182	60.419	13.635	30.714	**0.000**
School adaptation								
Total quantitative score	45.443	10.807	50.764	10.397	53.218	9.956	14.986	**0.000**
Total qualitative score	3.821	3.846	5.891	4.118	7.005	4.513	14.916	**0.000**
General score	49.257	13.762	56.706	13.434	60.032	13.564	16.586	**0.000**
Social competence								
Total quantitative score	45.468	10.664	51.372	10.244	54.051	9.528	24.846	**0.000**
Total qualitative score	3.707	3.354	5.995	4.170	7.594	4.503	30.188	**0.000**
General score	49.437	12.981	57.273	13.383	61.443	13.256	28.018	**0.000**
Physical competence								
Total quantitative score	43.896	11.216	50.505	9.926	52.916	10.374	15.881	**0.000**
Total qualitative score	2.802	3.335	5.852	4.086	6.890	4.475	19.230	**0.000**
General score	46.719	13.812	56.393	12.933	59.654	13.896	18.788	**0.000**

3.4. Book scores in relation to school adaptation

The general (F=16.586; p=0.000<0.05), quantitative (F=14.986; p=0.000<0.05) and qualitative book scores (F=14.916; p=0.000<0.05) were determined to be significantly associated with the adequacy of school adaptation as evaluated by teachers. General, quantitative and qualitative scores of the children with inadequate school adaptation were determined to be significantly lower than the scores of the children with adequate and highly adequate school adaptation. Besides, general, quantitative and qualitative book scores in children with adequate school adaptation were significantly lower than scores in children with highly adequate school adaptation (Table 3).

3.5. Book scores in relation to social competence

The general (F=28.018; p=0.000<0.05), quantitative (F=24.846; p=0.000<0.05) and qualitative book scores (F=30.188; p=0.000<0.05) were determined to be significantly associated with the adequacy of social competence as evaluated by teachers. General, quantitative and qualitative scores of the children with inadequate social competence were determined to be significantly lower than the scores of the

children with adequate and highly adequate social competence. Besides, general, quantitative and qualitative book scores in children with adequate social competence were significantly lower than scores in children with highly adequate social competence (Table 3).

3.6. Book scores in relation to physical competence

The general (F=18.788; p=0.000<0.05), quantitative (F=15.881; p=0.000<0.05 and qualitative book scores (F=19.230; p=0.000<0.05) were determined to be significantly associated with the adequacy of physical competence as evaluated by teachers. General, quantitative and qualitative scores of the children with inadequate social competence were determined to be significantly lower than the scores of the children with adequate and highly adequate social competence. Besides, general, quantitative and qualitative book scores in children with adequate physical competence were significantly lower than scores in children with highly adequate physical competence (Table 3).

3.7. Book scores in relation to school attendance

Correlational analysis revealed no significant relation between school attendance and general (r=0.027; p=0.546>0.05), quantitative (r=0.014; p=0.756>0.05) and qualitative (r=0.033; p=0.456>0.05) book scores (Table 4).

Table 4. Correlation analysis for the relationship between school attendance and the theory of mind

		Theory of Mind Book Scores		
		Total quantitative score	**Total qualitative score**	**General score**
School Attendance	r	0.014	0.033	0.027
	p	0.756	0.456	0.546
	N	503	503	503

Children's school attendance explain all book total quantitative score at a ratio of 0.019 (R^2=0.019). Regression analysis performed to test whether children's time of attending the classes were affected was found to be statistically significant (F=3.466; p=0.008<0.05). Children's time of attending the classes did not statistically affect all book total quantitative scores (t=0.308; p=0.758>0.05). Children's time of attending the classes explained all book total qualitative at a ratio of 0.020 (R^2=0.020) indicating that there is no correlation between time of class attendance and ToM (Table 5).

Table 5. Regression analysis for the relationship between school attendance and the theory of mind

Dependent Variable	**Independent Variable**	**ß**	**t**	**p**	**F**	**Model (p)**	**R^2**
General score	Constant	45.795	13.46	**0.000**	3.98	**0.003**	0.024
	School attendance	0.035	0.18	0.860			
Total quantitative score	Constant	43.647	16.91	**0.000**	3.42	**0.009**	0.019
	School attendance	-0.009	-0.06	0.951			
Total qualitative score	Constant	2.682	2.51	**0.012**	3.47	**0.008**	0.020
	School attendance	0.019	0.31	0.758			

4. DISCUSSION

Our findings revealed high levels of ToM in children who were determined by teachers to be adequate or highly adequate in terms of mental ability, school adaptation, social competence and physical competence with no significant influence of school attendance on ToM level.

Higher scores in theory of mind storybook test in the children with adequate or highly adequate mental ability in our study population support the significant relationship between ToM and intelligence reported in a past study by Buitelaar, Wees, Swaab-Barbeveld and Gaag (1999) on the verbal intelligence, IQ and status of being aware of emotions in children with autism.

Unlike our findings, Rajkumar, Yovan, Raveendran and Russel (2008) reported that there was no significant relationship between general intelligence and theory of mind, while Happe (1994) reported that intelligence test and sub-tests gave varying results in individuals with autism in terms of theory of mind and that they could not obtain similar results. The inconsistency of available data on the relation between intelligence and ToM can be explained by individual differences. In our study, based on teachers' views and thus observable abilities of individuals, it can be stated that children with autism in the study showed similar characteristics in certain points. Berns and Assouline (2012) carried out a study on highly functional young individuals with autism and found a positive significant relationship between intelligence and ToM. Muris, Steerneman, Meesters, Merckelbach, Horselenberg and van den Hogen (1999) analyzed the relationship between WISC-R and theory of mind and found a significant relationship. These results are consistent with the findings of Blijd-Hoogewys and van Geert (2008). The studies of Ozonoff, Rogers, and Pennington (1991), Happe (1994), Buitelaar et al. (1999), Muris et al. (1999) and Brüne (2003) also support the results of our study.

ToM first develops by social awareness and communication with others (Hale & Tager-Flusberg, 2005). Communicative situations such as social communication, cognitive emotional capacities, gestures, and emotional body posture and speech tone in harmony with the environment should be used for social adaptation (Tanguay, Robertson, & Derrick, 1998). Walker (2005) designed a study to analyze the relationship between friendship relationships, social capacity and theory of mind by administering three—five-year-old children a theory of mind test consisting of two wrong belief tests. In addition, the teachers were asked to fill in scales to evaluate the social behaviors of children (aggressive, destructive, and shy). The results of the study showed that when age was taken in account, ToM could predict social behaviors in males and females. Peterson, Garnett, Kelly and Attwood (2009) reported that complexity of social life had an adverse effect on the development of ToM in children with autism. Researchers developed a two-stage study to support the development of daily communication and social skills in the development of ToM in children with autism (399 children, of which 85 were with autism, 230 showed Asperger's syndrome and 24 were with normal development). This scale consisted of questions to determine mental reading difficulties in children with autism found hard in daily life through psychometric measurements. On the other hand, in the second study, teachers were asked to fill in scales to determine teachers' views on ToM in the experimental set up and in the daily life. Then 25 participants at the age of twelve were analyzed (15 with autism, 10 with normal development). Although children with autism passed ToM tests, they received much lower scores than their peers in mental reading in daily life. This indicates the importance of communication with friends in addition to familial communication. In another study which analyzed the scales filled in by teachers, it was found that there was a positive relationship between ToM and social components. In the same study, the ToM abilities of children with inadequate possibilities were found to be lower than those having a better school with better conditions (Liddle & Nettle, 2006). A review of the literature revealed no data on the type of physical competence analyzed in our study. However, considering the physical modeling stage in the use of modeling abilities, it can be stated that active usage of one's physical abilities is important in terms understanding other people's beliefs and desires.

5. CONCLUSION

In conclusion, based on our findings indicating the significant impact of mental ability, school adaptation, social competence and physical competence on ToM, approaching child development as a whole by the specialists who work on children with different developmental characteristics and designing studies for this aim in a multifaceted fashion seems to have a positive impact on development of theory of mind and social cognition processes of children.

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