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Theory of Mind in Major Depressive Disorder

Major Depresif Bozuklukta Zihin Kuramı

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Abstract

Theory of mind refers to the ability to explain the appearing behavior of others with reference to their mental state. Theory of mind ability is thought to be an integral part of maintaining social functioning and interpersonal relationships. One of the important clinical features of major depressive disorder is the deterioration of social and interpersonal functions. Since interpersonal difficulties of people with major depression have become widespread, it is of great importance to have a more detailed understanding of the underlying cognitive mechanisms of these social deficits. The aim of this article is to find out current state of research on theory of mind in depressive disorders. When the findings of the studies are considered, it is thought that the difficulties in the social and interpersonal areas seen in the individuals with major depressive disorder may be due, at least in part, to the distortions in their ability to interpret the emotional stimuli and mental states correctly.

Keywords: Theory of mind, mentalizing, major depressive disorder.

Öz

Zihin kuramı başkalarının görünen davranışlarını zihinsel durumlarına atıfla açıklayabilme yetisine işaret etmektedir. Zihin kuramı, sosyal işlevselliğin ve kişilerarası ilişkilerin sürdürülmesinin ayrılmaz bir parçası olarak düşünülmektedir. Major depresif bozukluğun önemli klinik özelliklerinden biri sosyal ve kişilerarası işlevlerde bozulma olmasıdır. Major depresyon tanısı olan kişilerin kişilerarası zorlukları yaygınlaşmış olduğundan, bu sosyal eksikliklerin altında yatan bilişsel mekanizmaların daha ayrıntılı bir şekilde anlaşılması büyük önem taşımaktadır. Bu kapsamda, bu makalede major depresif bozuklukta zihin kuramı yetisinin incelenmesi amaçlanmıştır. Araştırmaları bulguları ele alındığında sonuçların farklılaşmasına sebep olacak muhtemel açıklamalar ile ele alındığında major depresif bozukluğa sahip bireylerde görülen sosyal ve kişilerarası alanlardaki zorlukların, en azından kısmen, duygusal uyaranları ve zihinsel durumları doğru yorumlama yeteğindeki bozulmalara bağlı olabileceği düşünülmüştür.

Anahtar sözcükler: Zihin kuramı, zihinselleştirme, major depresif bozukluk

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SINCE the theory of mind represents one of the differences in the cognitive structures of the individual, both the existence and the absence of the other's mental functioning in the normal development of the individual become one of the important concepts examined in clinical psychology (Baron-Cohen et al. 1999, Tager-Flusberg and Sullivan 2000, Bora 2009). Numerous studies indicate that cognitive and emotional domains which are required for metacognition tasks, including the theory of mind ability are impaired in major depressive disorder (Donges et al. 2005, Bailey and Henry 2008, Zobel 2010, Csukly et al. 2011, Wolkenstein et al. 2011, Weightman et al. 2014). Therefore, it is thought that examining the theory of mind and its underlying concepts will contribute to the evaluation of major depressive disorder and planning treatment processes. In order to determine the articles covered in this review, the words which correspond to the key words of mind theory / social cognition / mentalization and major depressive disorder / depression were used in the English and Turkish language publications. Article search was conducted on the databases of Web of Science, PsycINFO, Science Direct, and Pubmed, in addition Google Academic, YÖK Thesis. Publications are empirical research and being published after 2000 have created inclusion criteria. Twenty-one studies comparing healthy control group and individuals with major depressive disorder to theory of mind ability were included in the study. Studies involving sampling major depressive disorder as well as other psychopathological disorders such as bipolar mood disorders, psychotic disorders have not been included in this review. In addition, studies involving physical or psychiatric comorbidity in addition to major depressive disorder have been excluded.

Theory of Mind

The theory of mind is defined as the ability to recognize and understand the thoughts, emotions, beliefs, intentions, and desires of others, and others, which enable us to interpret the behaviors of others and to predict what they will do after a step (Howlin et al. 1999, Premack and Woodruff 1978). The theory of mind (Tom) points to the ability to explain the behavior of others by referring to their mental state (Premack and Woodruff 1978). Theory of mind points to the ability to explain the behavior of others by referring to their mental state (Premack and Woodruff 1978). Most people are born with an intuitive skill that allows them to properly read tips about their mental state. Acquiring theory of mind enables people to understand one's own and others' mental states such as will, intention and opinion; to mentally represent them and to realize that others have a different mind (Schneider et al., 2005). Theory of mind includes many positively perceived such as empathy, sympathy and emotional perspective or involves many negative aspects such as deception, betrayal, and lying (Trivers 1971, Drubach 2007).

The concept of mind theory was first described in 1978 by Premack and Woodruff after an experiment in chimpanzees. It is suggested that chimpanzees act to achieve their goals, like humans, that they attach to their mental states and organize their behavior based on them.

Theory of mind first examined the gestures and nonverbal communication of babies after they were examined in animals, and suggested that these communication skills were evidence of what Premack and Woodruff described as 'theory of mind' in 1978 (Perner and Lang 1999).

Many researchers have developed various theories about how individuals understand their own and others' ideas and mind processes. In recent studies, 'Simulation theory', 'Modular theory' and 'Theory theory' are more involved.

The origin of the simulation theory is based on Dilthey's Verstehen method, Hume and Kant's simulations (Kraml and Michlmayr 2002). The basic idea of simulation theory is explained by Kraml and Michlmayr (2002): One uses his or her own 'mind device' to substitute himself and explain and make predictions. According to Goswami (2002), the reasoning of person and the mind is not through conceptualization or concrete representations, but by one's own experiences.

Experiences need not simulate and derive from other people, but simulations. When one considers the minds of other people, he puts himself in the face of the other, thinks how he feels in this situation, and attributes this experience to the opposite person. According to Goswami (2002), the reasoning of the human mind is not through conceptualization or concrete representations, but by one's own experiences. To attribute experiences to other people, simulations are need instead of concepts and inferences. When one considers the minds of other people, he puts himself in the face of the other, thinks how he feels in this situation, and attributes this experience to the opposite person. Similar to theory theory, simulation theory gives an important role to experiences. It is only possible to understand the mental processes of the other person by creating the situation in itself. Simulation theory describes mentalization less cognitively. Unlike theory theory, simulation theory argues that the attribution of mental states to one's self is at the center of understanding their mental states by repetition or imitation of the mental life of others. Unlike the other two theories, simulation theory implies that people can understand the mental states of others by means of introspection. It assumes neural structures that support the general perspective-taking ability rather than a distinct neural structure specific to theory of mind (Gallese and Goldman, 1998).

Modular theory suggests that people use large-scale propositional behaviors in interpreting their mental experiences and the actions of others. For example, a person who sees a person running after a newly-moving train thinks that this person is someone who wants to board this train (Meltzoff 1999). This thinking capacity builds on the cognitive structure of an innate, encapsulated and domain-specific part of the cognitive structure (Scholl and Leslie 1999). When the influence of the modular theory on theory of mind was examined, it was concluded that the theory of the mind is an innate special foundation, every part of this foundation is very important and people perceive according to genetically innate special talents.

The development of theory of mind is based on the fundamental neurological maturation and experience in this brain region, the activity of the theory of mind can only trigger mechanism, but does not determine the hardware of mechanism (Brüne ve Brüne-Cohrs 2006).

Theory theory has emerged in the last 25 years and is the most dominant theory in the field (Gopnik 2003). According to this model, children develop the daily knowledge about the world while they show the same cognitive abilities that adults use in their scientific work, that is children produce theories. These theories provide predictions, interpretations and explanations of the data about the new data. If these predictions are not correct in the direction of their interactions with the outside world, they tend to

create alternative theories (Gopnik 2003). According to theory theory, knowledge about the mind does not cover true scientific theory but forms the limit or framework of the theory (Flavell 1999). In other words, according to this theory, in the development of theory of mind, experience has an important role in shaping behavior. Experience is important not in order to contribute to the theory of mind, but in terms of the knowledge to improve and develop the theory (Flavell 1999). According to theory theory, there is a neural causality that associates certain internal states with external stimuli, other internal states and behaviors. The fundamental difference of the theory theory from the simulation theory is that it suggests that the intention behind the behavior of the other is derived from one's own mental representations, not by imitating its behavior but by mental causation.

Paralanguage (such as body posture or facial expressions) and nonverbal (such as accents, intonations, signs) are among the most valuable sources of information on interpreting other people's mental states. In addition, our awareness of the situation in which communication emerges is also an important source of information. The most commonly used facial expressions of these tips in your daily life, especially around the eyes is the ability to read the tips. Tager-Flusberg and Sullivan (2000) and Sabbagh (2004) have identified two different subtypes of theory of mind. The first of these is described as social-cognitive theory of mind and it can be described as inferring the mental state of others by looking at the underlying behavior. False belief tests can be shown as a classic example of this. The second type of metallization that these researchers have defined is the ability to perceive the mental state of others based on directly observable knowledge (social-perceptual theory of mind). It is thought that social-perceptual theory of mind is related to emotion recognition ability. 'Reading The Mind in The Eyes Task' is one of the most commonly used tools to measure the capacity of social-perceptual theory of mind. Interpersonal relationships also needed in trying to understand the mental state of both theory of mind abilities. For example, in order to understand one's ironic expressions, one should pay attention to the person's tone of voice, gesture and facial expressions (social- perceptual theory of mind), to assess the state in which the words used and consider the thoughts and beliefs that the person expressed in the past (social-cognitive mind theory). Some studies based on the content inference, emotional and cognitive theory of mind distinction can be made (Shamay-Tsoory et al. 2007).

Increasing research on theory of mind, it has expanded the scope of the concept of theory of mind. In this context, the concept is not a single theory of mind abilities, it has been evaluated in terms of the various components. These components include; first-order false belief, second-order false belief and metaphor comprehension, irony comprehension, and faux pas comprehension, which, in some sources, are also referred to as third-order theory of mind. The first-order theory of mind is developmentally first developed theory of mind ability and is defined as the ability to identify others' misconceptions (Bach et al. 2000).

The scope of this skill includes one's ability to look back, ignore his or her own knowledge of reality, and recognize the false belief that other people have. First order theory of mind ability is tested with first-order false belief tasks. The second order theory of mind is defined as "thought about thought" or "belief about belief" (Mazza et al. 2001). The ability of a person to recognize someone else's thoughts about an event

or thought about a third person's thoughts and to understand that they have the false idea (Herold et al. 2002).

Second-order false belief tasks are used to test second-order theory of mind skills (Wimmer and Perner 1983). Second-order false belief tasks are more complex and difficult than first-order false belief tasks. In these tasks, one must be able to correctly identify the false belief in the situation of a third person. Metaphor and irony comprehension, are more complex theory of mind skills, including the abstract interpretation of language. The metaphorical task involves the use of a metaphor for the situation in which one of the two talking people is in; asking what the speaker wants to say with this metaphor; it requires interpretation of this metaphor. Irony tasks involve one of the two people making an ironic metaphor by understanding the uses of words that have the opposite meaning to the situation they are in. In this task, one will be asked whether the speaker's statement is correct and what the speaker wants to say. It is suggested that the metaphor comprehension is related to the first-order theory of mind and the irony comprehension is related to the second-order theory of mind (Harrington et al. 2005). Faux pas is a more complex theory of mind skills from developmental perspective. It is one's ability to understand that s/he said a word that should not be said without knowing that s/he or someone else would not say it in an occasion. One of the two people who are speaking on the faux pas' tasks says something that they should not say without knowing or not knowing that they should not say it, and they are asked a series of questions about it. These questions in turn test the detection of faux pas, the understanding of faux pas, the mental state of the listener, and the perception of the person who hears the faux pas. In this task, it should be understood why the speaker does not notice that he is speaking erroneously, why the speaker should not say what he is saying, and why the listener feels humiliated or hurt.

Theory of Mind and Psychopathology

For the last 20 years, the role of theory of mind in human development and psychopathology has become the focus of attention. After Baron-Cohen et al. (1985) showed that there was a problem in the development of theory of mind in autism, a number of studies have supported that there is a serious disorder in mental capacity in autism spectrum disorders (Hadwin et al. 1999, Perner et al. 1999, Baron-Cohen et al. 2001, Steele et al. 2003, Brüne and Brüne-Cohrs 2006, Colle et al. 2007, Hutchins 2008). After studies on autism, findings have been published suggesting that there may also be a relationship between theory of mind impairment and other psychopathologies. Schizophrenia is one of the leading psychopathologies and after Frith's (1992) theory which stated that the impairment in mental capacity plays a causal role in the development of delusions, a number of studies have examined the relationship between schizophrenia and theory of mind. (Corcoran et al. 1995, Roncone et al. 2002, Jannsen et al. 2003, Pinkham et al. 2003, Brüne 2005, Bora et al. 2006, Inoue et al. 2006, Irani et al. 2006, Marjoram et al. 2006, Shamay-Tsoory et al. 2007, Mizrahi et al. 2007).

Although it is known that theory of mind is a key feature of schizophrenia and autism, bipolar disorder (Keer et al. 2003), anorexia nervosa (Gál et al. 2011), borderline personality disorder (Fonagy et al. 2015), antisocial personality disorder (Fullam 2004) as well as other psychopathologies are also related with theory of mind. These researches reveals that social cognition is impaired in individuals with such psychopathologies.

Difficulties in social cognitions, including emotion recognition and impairment from the theory of mind, play an important deficit in social functioning (Bora et al., 2006, Fett et al., 2011, Irani et al., 2012). Although the effect of depression on social cognitive functioning is not fully understood, it is believed that a similar social cognitive impairment can be seen in major depressive disorder.

Theory of Mind and Major Depressive Disorder

Major depressive disorder, one of the most common mental disorders, has a recurrent course (Baxter et al. 2013). At least 50% of patients with a depressive episode continue to have another episode at least once in their lifetime, and about 80% of patients with two previous depressive episodes continue to have recurrence of the disorder (APA 1994). For this reason, it is very important to investigate the factors contributing to the development and maintenance of depressive disorders.

One of the important clinical features of depression is that deterioration in the social and interpersonal functioning. Individuals diagnosed with major depressive disorder, withdrawn from social relations, they take less pleasure in social interaction and as a result, they have less social contacts than people without a diagnosis of depression. (Hirschfeld et al., 2000). Patients with major depressive disorder were found to be less likely to interact with strangers (Gotlib and Robinson 1982) and with family members (Gotlib and Beach 1995). These findings are not only based on the self-reports of depressed individuals, but are also supported by the reports of individuals that they are in a social interaction. This deterioration in the social and interpersonal field, mutual psychological and social factors (bi-directional) with the interaction constitutes a risk factor for depression (Paykel 1994). It is thought that the cognitive difficulties that occur during depression may also negatively affect the social functions. (Evans et al., 2014). Since the personal difficulties of patients with major depression have become widespread, it gains importance to understand the cognitive mechanisms underlying these social deficits in depth. Research suggests that there is an impairment in cognitive and emotional domains, including theory of mind in major depressive disorder (Bailey and Henry 2008). Theory of mind is considered as an integral part of maintaining interpersonal relations and of social functioning (Tomasello et al. 2005).

In this context study samples, measurements of theory of mind and findings of the articles examining the theory of mind in major depressive disorder which are included in the current review article are presented in Table 1.

Table 1. Studies included in the review

References	Sample	Theory of Mind Task	Results
Leppänen et al.(2004)	MDD n=18 Healthy Controls n=18	Pictures of Facial Affect	Patients with MDD is worse than healthy controls (HC) in facial affect recognition accuracy.
Donges et al.(2005)	MDD n=22 Healthy Controls n=22	Level of Emotional Awareness Scale	Patients with MDD impaired at recognizing facial expressions compared to HC.

Lee et al.(2005)	MDD n=52 Healthy Controls n=30	Reading the Mind in the Eyes Task	Patients with MDD less accurate than HC on reading the mind in the eyes task.
Gollan et al.(2008)	MDD n=37 Healthy Controls n=29	Pictures of Facial Affect	No difference between MDD group and HC.
Uerkermann et al.(2008)	MDD n=27 Healthy Controls n=27	Mentalistic Humour Stories	Patients with MDD worse than HC in mentalistic humour stories task.
Csukly et al.(2009)	MDD n=23 Healthy Controls n=23	Facial Expression Recognition Task	Patients with MDD impaired at recognizing facial expressions compared to HC.
Suslow et al.(2009)	MDD n=30 Healthy Controls n=26	Pictures of Facial Affect	No difference between MDD group and HC.
Gollan et al.(2010)	MDD n=44 Healthy Controls n=44	Pictures of Facial Affect	No difference between MDD group and HC.
Harkness et al.(2010)	MDD n=41 Healthy Controls n=52	Reading the Mind in the Eyes Task	Patients with MDD performed significantly better than HC on reading the mind in the eyes task.
Seidel et al.(2010)	MDD n=24 Healthy Controls n=24	Vienna Emotion Recognition Tasks	No difference between MDD group and HC.
Wilbertz et al. (2010)	MDD n=16 Healthy Controls n=16	Movie for the Assessment of Social Cognition	No difference between MDD group and HC.
Zobel et al. (2010)	MDD n=30 Healthy Controls n=30	Brüne's Cartoon Picture Story Test	Patients with MDD inferior to HC in the test.
Csukly et al.(2011)	MDD n=107 Healthy Controls n=23	Facial Expression Recognition Task	Patients with MDD impaired at recognizing facial expressions compared to HC.
Harkness et al.(2011)	MDD n=61 Healthy Controls n=30	Reading the Mind in the Eyes Task	Patients with MDD performed significantly worse than HC on reading the mind in the eyes task.
Wolkenstein et al.(2011)	MDD n=20 Healthy Controls n=20	Movie for the Assessment of Social Cognition (MASC) /Reading The Mind in The Eyes Task (RMET)	Patients with MDD inferior to HC in performance on MASC, but both groups equal on RMET.
Nejati et al. (2012)	MDD n=45 Healthy Controls n=50	Reading the Mind in the Eyes Task	Patients with MDD performed significantly worse than HC on reading the mind in the eyes task.
Cusi et al.(2013)	MDD n=20	Theory of Mind Stories	Patients with MDD

	Healthy Controls n=20	(including first-order and second-order false belief tests)	performed significantly worse on second-order false belief test than HC.
Manstead et al.(2013)	MDD n=91 Healthy Controls n=73	Reading the Mind in the Eyes Task	Patients with MDD less accurate than HC on reading the mind in the eyes task.
Ladegard et al.(2014)	MDD n=44 Healthy Controls n=44	Frith-Happé Animations/ Awareness of Social Inference Test	Patients with MDD performed significantly worse on both social cognition task than HC.
Poletti et al.(2014)	MDD n=10 Healthy Controls n=30	Reading the Mind in the Eyes Task	Patients with MDD less accurate than HC on reading the mind in the eyes task.
Mattern et al.(2015)	MDD n=26 Healthy Controls n=26	False-Belief Theory of Mind Cartoon Task	Patients with MDD performed significantly worse on false belief test than HC.

Discussion

Considering 21 studies which were included in the scope of this review, 2 researches measured both social-perceptual (emotional) and social-cognitive (cognitive) theory of mind skills, 14 researches measured only emotional theory of mind skill, 5 researches measured only cognitive theory of mind skills.

Researches measuring social-perceptual theory of mind skill tested with various emotion recognition measures including Reading the Mind in The Eyes Task, Pictures of Facial Affect, Facial Expression Recognition Task, Levels of Emotional Awareness Scale, Frith-Happé Animations and Vienna Emotion Recognition Tasks. When the reviewed measure the emotional component of the research findings, controversial results has been found. 9 studies concluded that patients with major depressive disorder had statistically low scores on measures compared to healthy controls, and that there was a deterioration in theory of mind ability in connection with this. A recent meta-analysis study supports this finding. A meta-analysis of 22 studies (Dalili et al., 2015) revealed that emotional recognition capacity (with a small effect size) affects depression. On the other hand, 5 of the researches included in this review compared the healthy control group of individuals with major depressive disorder in terms of emotional theory of mind skill and did not find a significant difference between the groups. When these studies were examined, it was found that the difference between the groups with major depressive disorder and the healthy control group differed in terms of emotional recognition measures, although there was no significant difference in terms of social perceptual theory of mind. Patients with major depressive disorder were found to recognize negative emotions better and faster than healthy control group when emotional stimuli measuring emotional theory of mind skills were separated as neutral, negative and positive (Gollan et al. 2008, Suslow et al. 2009, Gollan et al. 2010, Seidel 2010, Wolkenstein 2011). Two studies concluded that patients with major depressive disorder

were more successful when compared to the control group in emotional theory of mind. The authors discussed these findings by examining social perceptual mental skill with the severity of depression (Harkness et al. 2010, Poletti et al. 2014). Patients with mild depression may be overly sensitive to having control over their social circles. Conversely, patients with severe depression have been thought to leave social attention unnoticed by describing their social relations as hopeless. This finding suggests that individuals with a predisposition to depression may have a trait which increases their motivation to read others' mind, and that this feature may eventually be lifted with an increase in over-sensitive social cognition.

Researches measuring social cognitive theory of mind abilities tested them with measures related with a variety of beliefs and intentions including False-Belief Theory of Mind Cartoon Task, Awareness of Social Inference Test, Mentalistic Humour Stories, Movie for the Assessment of Social Cognition and Brüne's Cartoon Picture Story Test. When these findings that measure the cognitive component are examined 6 out of the 7 studies found that patients with major depressive disorder had statistically significantly lower scores than healthy controls. However, in one study, no significant differences were found between groups in cognitive theory of mind ability (Wilbertz et al. 2010). In addition to this finding, the authors asked participants to rate their empathy abilities in everyday life, and they found that patients with major depressive disorder significantly rated their empathy skills lower than the control group.

Two studies that met the inclusion criteria of this review jointly measured both emotional theory of mind and cognitive theory of mind. One of these studies has resulted in the conclusion that there was a deterioration of both components of theory of mind in major depressive disorder. In the other study, no group difference was found between the measures of emotional component; on the other hand, when cognitive components were evaluated it was found that patients with major depressive disorder were less successful in these measurements. In addition, both components were included in the theory of mind, and in the meta-analysis study of 18 studies, it was concluded that impairments in theory of mind affect depression with moderate effect (Bora and Berk 2016).

Conclusion

Findings indicated that the majority of studies demonstrated the relationship between theory of the mind and major depressive disorder. On the other hand, there are studies showing that the theory of mind is not related to major depressive disorder. A possible explanation for the differentiation of results is that the diversity of the measuring tasks used, the difficulty levels of the tasks and the differences in psychometric properties. It is striking that there are so many measurement tools measuring theory of mind skill, and the differentiation of the measurements makes it difficult to compare the results. Some of the theory of mind measures may require the use of higher information-processing processes, in which cognitive abilities, such as executive functions, working memory, may have had a confusing effect. Another confounding factor may be the medications taken by the patients included in these studies. This may change the heterogeneity of the sample involved in the study, resulting in inconsistent results.

Differentiation in emotional theory of mind, the social stimuli of individuals with major depressive disorder can be negatively interpreted. While this bias increases per-

formance for negative stimuli, it has a detrimental effect on performance for positive or neutral stimuli. This bias may cause actual differences to be masked in the task of recognizing emotions because it will degrade overall performance. Emotional theory of mind measurements measuring emotion recognition skills and analysis should be carried out taking into account these biases.

Challenges in the social and interpersonal domains of individuals with major depressive disorder may be due, at least in part, to deterioration in the ability to correctly interpret emotional stimuli and mental states. In addition, social cognitive performance in depression affects the development of impairment through deterioration of social functioning.

Misrecognition of feedback from interpersonal interactions has further aggravated the process of irrational thought. This can reduce motivation to engage in social interaction, which will reduce reward and intensify social isolation. The effects of social cognitive ability and the awareness of this loop may be a useful component in cognitive-based psychotherapies.

Further research on the theory of mind in major depressive disorder will shed light on these findings. In a large major depressive disorder sample, there is a need for research that comprehensively measures the theory of mind ability. When measuring theory of mind, the inclusion of first-order false beliefs, second-order false beliefs, metaphor comprehension, irony comprehension, and faux pas comprehension will provide both a more valid and reliable measure, in addition to much more comprehensive findings.

References

APA (1994) Diagnostic and Statistical Manual for Mental Disorders, 4th edition (DSM-IV). Washington DC, American Psychiatric Association.

Bailey PE, Henry JD (2008) Growing less empathic with age: Disinhibition of the self-perspective. J Gerontol B Psychol Sci Soc Sci, 63:P219-P226.

Bach L, Happé F, Fleminger S, Powell J (2000) Theory of mind: Independence of executive function and the role of the frontal cortex in acquired brain injury. Cogn Neuropsychiatry, 25:175-192.

Baron-Cohen S, Leslie AM, Frith U (1985) Does the autistic child have a "theory of mind"? Cognition, 21:37-46.

Baron-Cohen S, O'Riordan M, Jones R, Stone V, Plaisted K (1999) A new test of social sensitivity: Detection of faux pas in normal children and children with Asperger syndrome. J Autism Dev Disord, 29:407-418.

Baron-Cohen S, Wheelwright S, Skinner R, Martin J, Clubley E (2001) The Autism-spectrum quotient (AQ): Evidence from Asperger syndrome/high-functioning autism, malesand females, scientists and mathematicians. J Autism Dev Disord, 31:5-17.

Baxter AJ, Patton G, Scott KM, Degenhardt L, Whiteford HA (2013) Global epidemiology of mental disorders: what are we missing? PLoS One, 8:e65514.

Bora E, Eryavuz A, Kayahan B, Sungu G, Veznedaroglu B (2006) Social functioning, theory of mind and neurocognition in outpatients with schizophrenia; mental state decoding may be a better predictor of social functioning than mental state reasoning. Psychiatry Res, 145:95-103.

Bora E (2009) Şizofreni spektrum bozukluklarında zihin kuramı. Turk Psikiyatri Derg, 20:269-281.

Brüne M (2005) "Theory of mind" in schizophrenia: a review of the literature. Schizophr Bull, 31:21-42.

Brüne M, Brüne-Cohrs U (2006) Theory of mind-evolution, ontogeny, brain mechanisms and psychopathology. Neurosci Biobehav Rev 2006; 30:437–455.

Colle L, Baron-Cohen S, Hill J (2007) Do children with autism have a theory of mind? A non-verbal test of autism vs. specific language impairment. J Autism Dev Disord, 37:716-723.

Corcoran R, Mercer G, Frith CD (1995) Schizophrenia, symptomatology and social inference: investigating theory of mind in people with schizophrenia. Schizophr Res, 17:5–13.

Cusi AM, Nazarov A, MacQueen GM, McKinnon MC (2013) Theory of mind deficits in patients with mild symptoms of major depressive disorder. Psychiatry Res, 210:672-674.

Csukly G, Czobor P, Szily E, Takács B, Simon L (2009) Facial expression recognition in depressed subjects: the impact of intensity level and arousal dimension. J Nerv Ment Dis, 197:98-103.
Csukly G, Telek R, Filipovits D, Takács B, Unoka Z, Simon L (2011) What is the relationship between the recognition of emotions and core beliefs: associations between the recognition of emotions in facial expressions and the maladaptive schemas in depressed patients. J Behav Ther Exp Psychiatry, 42:129-137.
Dalili MN, Penton-Voak IS, Harmer CJ, Munafò MR (2015) Meta-analysis of emotion recognition deficits in major depressive disorder. Psychol Med, 45:1135-1144.
Dolan M, Fullam R (2004) Theory of mind and mentalizing ability in antisocial personality disorders with and without psychopathy. Psychol Med, 34:1093-1102.
Donges US, Kersting A, Dannlowski U, Lalee-Mentzel J, Arolt, V, Suslow T (2005) Reduced awareness of others' emotions in unipolar depressed patients. J Nerv Ment Dis, 193:331-337.
Drubach, DA (2008) The purpose and neurobiology of theory of mind functions. Relig Health, 47:354-365.
Evans VC, Iverson GL, Yatham LN, Lam RW (2014) The relationship between neurocognitive and psychosocial functioning in major depressive disorder: a systematic review. J Clin Psychiatry, 75:1359-1370.
Fett AKJ, Viechtbauer W, Penn DL, van Os J, Krabbendam L (2011) The relationship between neurocognition and social cognition with functional outcomes in schizophrenia: a meta-analysis. Neurosci Biobehav Rev, 35:573-588.
Frith CD (1992) The Cognitive Neuropsychology of Schizophrenia. Hillsdale, NJ, Lawrence Erbaum Associates.
Flavell JH (1999) Children's knowledge about the mind: cognitive development. Annu Rev Psychol, 50:21-45.
Fonagy P, Leigh T, Steele M, Steele H, Kennedy R, Mattoon G et al. (1996) The relation of attachment status, psychiatric classification, and response to psychotherapy. J Consult Clin Psychol, 64:22-31.
Gál Z, Egyed K, Pászthy B, Németh D (2010) Impaired theory of mind in anorexia nervosa. Psychiatr Hung, 26:12-25.
Gallese V, Goldman A (1998) Mirror neurons and the simulation theory of mindreading. Trends Cogn Sci , 2:493-501.
Gollan JK, Pane HT, McCloskey MS, Coccaro EF (2008) Identifying differences in biased affective information processing in major depression. Psychiatry Res, 159:18-24.
Gollan JK, McCloskey M, Hoxha D, Coccaro EF (2010) How do depressed and healthy adults interpret nuanced facial expressions? J Abnorm Psychol, 119:804-810.
Gopnik, A (2003) The theory theory as an alternative to the innateness hypothesis. In Chomsky and His Critics (Eds LM Antony, N Hornstein): 238-254. New York, Basil Blackwell.
Gotlib, IH, Beach, SR (1995) A marital/family discord model of depression: implications for therapeutic intervention. In Clinical Handbook of Couple Therapy (Eds NS Jacobson, AS Gurman):411-436. New York, Guilford Press.
Gotlib, IH, Robinson, LA (1982) Responses to depressed individuals: discrepancies between self-report and observer-rated behavior. J Abnorm Psychol, 91:231-240.
Goswami, U (2002) Blackwell Handbook of Childhood Cognitive Development. Oxford, Blackwell.
Hadwin J, Baron-Cohen S, Howlin P, Hill K (1997) Does teaching theory of mind have an effect on the ability to develop conversation in children with autism? J Autism Dev Disord, 27:519-537.
Harkness KL, Jacobson JA, Duong D, Sabbagh MA (2010) Mental state decoding in past major depression: effect of sad versus happy mood induction. Cogn Emot, 24:497-513.
Harkness KL, Washburn D, Theriault JE, Lee L, Sabbagh MA (2011) Maternal history of depression is associated with enhanced theory of mind in depressed and nondepressed adult women. Psychiatry Res, 189:91-96.
Harrington L, Siegert RJ, McClure J (2005) Theory of mind in schizophrenia: a critical review. Cogn Neuropsychiatry, 10:249-286.
Herold R, Tényi T, Lénárd K, Trixler M (2002) Theory of mind deficit in people with schizophrenia during remission. Psychol Med, 32:1125–1129
Hirschfeld R, Montgomery SA, Keller MB, Kasper S, Schatzberg AF, Möller HJ et al. (2000) Social functioning in depression: a review. J Clin Psychiatry, 61:268-275.
Howlin P, Baron-Cohen S, Hadwin J (1999) Teaching Children with Autism to MindRead: a Practical Guide. New York, Wiley.
Hutchins TL, Prelock PA, Chace W (2008) Test-retest reliability of a theory of mind task battery for children with autism spectrum disorders. Focus Autism Other Dev Disabl, 23:195-206.
Inoue Y, Yamada K, Hirano M, Shinohara M, Tamaoki T, Iguchi H et al. (2006) Impairment of theory of mind in patients in remission following first episode of schizophrenia. Eur Arch Psychiatry Clin Neurosci, 256:326-328.
Irani F, Platek SM., Panyavin IS., Calkins ME., Kohler C, Siege, SJ. (2006) Self-face recognition and theory of mind in patients with schizophrenia and first-degree relatives. Schizophr Res, 88:151–160.
Irani F, Seligman S, Kamath, V, Kohler C, Gur, RC (2012) A meta-analysis of emotion perception and functional outcomes in schizophrenia. Schizophr Res, 137:203-211.

Jannsen I, Krabbendam L, Jolles J, Van Os J (2003) Alterations of theory of mind in patients with schizophrenia and nonpsychotic relatives. Acta Psychiatr Scand, 108:110-117.

Kerr N, Dunbar RI, Bentall RP (2003) Theory of mind deficits in bipolar affective disorder. J Affect Disord, 73:253-259.

Kraml H, Michlmayr M (2002) Simulation versus theory theory. theories concerning the ability to read minds (Masters thesis). Innsbruck, Austria, Leopold-Franzens University,

Ladegaard N, Larsen ER, Videbech P, Lysaker PH (2014) Higher-order social cognition in first-episode major depression. Psychiatry Res, 216:37-43.

Lee L, Harkness KL, Sabbagh MA, Jacobson JA (2005) Mental state decoding abilities in clinical depression. J Affect Disord, 86:247-258.

Leppänen JM, Milders M, Bell JS, Terriere E, Hietanen JK (2004) Depression biases the recognition of emotionally neutral faces. Psychiatry Res, 128:123-133.

Manstead AS, Dosmukhambetova D, Shearn J, Clifton A (2013) The influence of dysphoria and depression on mental state decoding. J Soc Clin Psychol, 32:116-133.

Marjoram D, Miller P, McIntosh AM, Owens DGC, Johnstone EC, Lawrie S (2006) A neuropsychological investigation into 'Theory of Mind' and enhanced risk of schizophrenia. Psychiatry Res, 144:29–37.

Mattern M, Walter H, Hentze C, Schramm E, Drost S, Schoepf D et al. (2015) Behavioral evidence for an impairment of affective theory of mind capabilities in chronic depression. Psychopathology, 48:240-250.

Mazza M, De Risio A, Surian L, Roncone R, Casacchia M (2001) Selective impairments of theory of mind in people with schizophrenia. Schizophr Res, 47:299-308.

Meltzoff AN (1999) Origins of theory of mind, cognition and communication. J Commun Disord, 32:251-269.

Mizrahi R, Korostil M, Starkstein ES, Zipursky RB, Kapur S (2007) The effect of antipsychotic treatment on theory of mind. Psychol Med, 37:595-601.

Nejati V, Zabihzadeh A, Maleki G, Tehranchi A (2012) Mind reading and mindfulness deficits in patients with major depression disorder. Procedia Soc Behav Sci, 32:431-437.

Paykel ES (1994) Life events, social support and depression. Acta Psychiatr Scand, 89:50-58.

Perner J, Frith U, Leslie AM, Leekam SR (1989) Exploration of the autistic child's theory of mind: Knowledge, belief, and communication. Child Dev, 60:689-700.

Perner J, Lang B (1999) Development of theory of mind and executive control. Trends Cogn Sci, 3:337-344.

Pinkham AE, Penn DL, Perkins DO, Liberman J (2003) Implications for the neural basis of social cognition for the study of schizophrenia. Am J Psychiatry, 160: 815-824.

Poletti M, Sonnoli A, Bonuccelli U (2014) Mild depressive symptoms are associated with enhanced affective theory of mind in nonclinical adult women. J Neuropsychiatry Clin Neurosci, 26:E63-E64.

Premack D, Woodruff G (1978) Does the chimpanzee have a theory of mind? Behav Brain Sci, 1:515-526.

Roncone R, Falloon IR, Mazza M, De Risio A, Pollice R, Necozine S et al. (2002) Is theory of mind in schizophrenia more strongly associated with clinical and social functioning than with neurocognitive deficits? Psychopathology, 35:280-288.

Sabbagh MA (2004) Understanding the orbitofrontal contributions to theory of mind reasoning: implications for autism. Brain Cog, 55:209-219.

Schneider W, Schumann-Hengsteler R, Sodian B (2014) Young Children's Cognitive Development: Interrelationships among Executive Functioning, Working Memory, Verbal Ability and Theory of Mind. New York, Psychology Press.

Scholl BJ, Leslie AM (1999) Modularity, development and 'theory of mind'. Mind Lang, 14:131-153.

Seidel EM, Habel U, Finkelmeyer A, Schneider F, Gur RC, Derntl B (2010). Implicit and explicit behavioral tendencies in male and female depression. Psychiatry Res, 177:124-130.

Shamay-Tsoory SG, Aharon-Peretz J (2007) Dissociable prefrontal networks for cognitive and affective theory of mind: a lesion study. Neuropsychologia, 45:3054-3067.

Shamay-Tsoory, SG, Shur S, Barcai-Goodman L, Medlovich S, Harari H, Levkovitz Y (2007) Dissociation of cognitive from affective components of theory of mind in schizophrenia. Psychiatry Res, 149:11-23.

Steele S, Joseph RM, Tager-Flusberg H (2003) Brief report: Developmental change in theory of mind abilities in children with autism. J Autism Dev Disord, 33:461-467.

Suslow T, Konrad C, Kugel H, Rumstadt D, Zwitserlood P, Schöning S et al. (2010) Automatic mood-congruent amygdala responses to masked facial expressions in major depression. Biol Psychiatry, 67:155-160.

Tager-Flusberg H, Sullivan K (2000) A componential view of theory of mind: Evidence from syndrome. Cognition, 76:59-90.

Tomasello M, Carpenter M, Call J, Behne T, Moll H (2005). Understanding and sharing intentions: The origins of cultural cognition. Behav Brain Sci, 28:675-691.

Trivers, RL (1971) The evolution of reciprocal altruism. Q Rev Biol. 46:35-57.
Uekermann J, Channon S, Lehmkämper C, Abdel-Hamid M, Vollmoeller W, Daum I (2008) Executive function, mentalizing and humor in major depression. J Int Neuropsychol Soc, 14:55-62.
Weightman MJ, Air TM, Baune BT (2014) A review of the role of social cognition in major depressive disorder. Front Psychiatry, 5:179-192.
Wilbertz G, Brakemeier EL, Zobel, Härter M, Schramm E (2010) Exploring preoperational features in chronic depression. J Affect Disord, 124:262-269.
Wimmer H, Perner J (1983) Beliefs about beliefs: representation and constraining function of wrong beliefs in young children˝s understanding of deception. Cognition, 13:103-128.
Wolkenstein L, Schönenberg M, Schirm E, Hautzinger M (2011) I can see what you feel, but I can't deal with it: Impaired theory of mind in depression. J Affect Disord, 132:104-111.
Zobel I, Werden D, Linster H, Dykierek P, Drieling T, Berger M et al. (2010) Theory of mind deficits in chronically depressed patients. Depress Anxiety, 27:821-828.

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