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Inductive Reasoning in Patients with Paranoid Type Schizophrenia

Mehmet Emrah KARADERE[1], Yasir ŞAFAK[2], Halime Şeyma ÖZÇELİK[3], Emre DEMİR[4], Mehmet Hakan TÜRKÇAPAR[5]

[1]Department of Psychiatry, Hitit University School of Medicine, Corum, Turkey

[2]Psychiatry Clinic, Dıskapi Yidirim Beyazıt Research and Training Hospital, Ankara, Turkey

[3]29 May State Hospital, Ankara, Turkey

[4]Department of Biostatistics, Hitit University School of Medicine, Corum, Turkey

[5]Department of Psychology, Hasan Kalyoncu University, Istanbul, Turkey

Abstract

Thinking patterns, reasoning and decision making processes of individuals with schizophrenia have been intriguing. The goal of our study is to evaluate the decision making and reasoning of the paranoid type schizophrenic patients, and their confidence in reasoning and perseverance in keeping to their decisions, using Reasoning with Inductive Argument Test (RIAT). Thirty-two delusional patients and 30 healthy volunteers were included in the study. After diagnostic interview conducted by SCID-I, patients were asked to participate in the study, RIAT test was applied by the interviewer in order to detect the inferential thinking patterns. Apart from the 3rd item of RIAT out of 11, the differences of initial scores between the delusional patient group and control group are statistically insignificant. After RIAT items of both delusional patient and control group are read, compared to ANOVA results of the difference between the belief levels in the result of their initial reasoning and after seeing the alternatives (RIAT belief level before and after), no significant differences were detected for both groups in terms of changes between the belief levels to RIAT items before and after ($p>0.05$). According to our study, apart from the area of delusions, it can be declared that the reasoning of the patients is normal. Our study indicates that when the delusional patients are compared to the control group in terms of jumping to conclusion and modifying their initial beliefs, they are not different, given similarly sufficient amount of data.

Keywords: Delusions, reasoning, psychosis, schizophrenia, decision making

Öz

Paranoid Tip Şizofreniye Sahip Hastalarda Tümevarımsal Akıl Yürütme

Şizofreni hastalarının düşünce kalıpları, akıl yürütme ve karar verme süreçleri ilgi çekici ve şaşırtıcıdır. Çalışmamızın amacı, paranoid tip şizofreni olan hastaların karar verme, akıl yürütme, akıl yürütmelerine güven dereceleri ve kararlarını sürdürmedeki sebatlarının Tümevarımsal Kanıtlarla Akıl Yürütme Testi (TKAYT) kullanılarak değerlendirilmesidir. Çalışmaya 32 delüzyonel hasta ve 30 sağlıklı gönüllü dahil edildi. Araştırmaya çağrılan hastalarla SCID-I ile tanı görüşmesi yapıldıktan sonra çıkarımsal (inferansiyel) düşünme biçimlerini tespit etmek için görüşmeci tarafından TKAYT testi uygulandı. Delüzyonel bozukluk grubunun ve kontrol grubunun her bir RIAT maddesi için ilk inanç düzeyleri arasındaki fark, üçüncü madde dışında istatistiksel olarak anlamsızdı. Delüzyonel bozukluğa sahip hasta grubu ile sağlıklı kontrol grubunun RIAT ifadeleri (maddeleri) okunduktan sonra; çıkardıkları ilk sonuca inanma düzeyi ile alternatifleri gördükten sonraki inanma düzeyi (RIAT önceki ve sonraki inanma düzeyi) arasındaki değişimlerle, ANOVA sonuçlarına göre iki grubun önceki ve sonraki RIAT maddelerine inanma düzeyleri açısından oluşan değişimler arasında anlamlı fark saptanmadı ($p>0,05$). Çalışmamıza göre, delüzyonel alan dışında, hastaların karar vermelerinin normal olduğu söylenebilir. Çalışmamız, delüzyonel bozukluğa sahip hastaların, aynı miktarda veri sunulduğunda ulaştıkları sonuçtaki eminlik düzeyinin sağlıklı kontrollerle benzer olduğunu ve yeni veriler sunulduğunda, başlangıç inanç düzeylerinin değişme oranlarının kontrol grubuyla benzer şekilde olduğunu göstermiştir.

Anahtar Kelimeler: Delüzyon, akıl yürütme, psikoz, şizofreni, karar verme

Correspondence / *Yazışma:*
Mehmet Emrah KARADERE
Department of Psychiatry, Hitit University, School of Medicine, Corum, Turkey
E-mail: karadere26@yahoo.com

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INTRODUCTION

Delusional belief may result in distress or disability and generally occur in the context of psychotic disorders such as schizophrenia and delusional disorder (Freeman, 2007). Delusions are defined as false personal beliefs that are fixed, resistant against change and even against the given evidence on the contrary (American Psychiatric Association, 1994). It is thought that beliefs of people who actually suffer from delusions are formed as a result of fault reasoning. This perspective on delusions has eventually been revised for it is not uncommon to find beliefs that are similar to delusions in the non-clinical population (Freeman et al., 2005). Thus, it is essential that the abnormal thinking structures of the delusional people be better understood and analyzed.

Thinking patterns, reasoning and decision making processes of individuals with schizophrenia and other psychotic disorders have been intriguing for the psychologists and psychiatrists since the schizophrenia has been defined for the first time. Many tests have been used in these studies to better understand abnormal thoughts such as Syllogistic Reasoning Tasks (Kemp, Chua, McKenna, & David, 1997) and Beads Task (Phillips & Edwards, 1966). Among these, Beads Task is the most commonly used one. This test is developed on guessing from which jar a bead was picked where there are 100 beads of 2 different colors given in two different jars. The task has two level types, 85/15 easy task and 60/40 hard task (Phillips & Edwards, 1966). There are studies showing that patients with psychotic disorders tend to pick fewer beads without being certain of the source when compared to the control group (Fine, Gardner, Craigie, & Gold, 2007). Garety et al. (2005) defined deciding with two or fewer beads as "Jumping to Conclusions (JTC)" and indicated JTC in 53% of the 100 psychotic patients (Garety et al., 2008). Freeman et al. (2006) detected 51% JTC in 149 patients in the easy task and 39% in the difficult task. Similarly, Moritz and Woodward (2007) reported 65% JTC in delusional patients. All studies taken into consideration, it seems JTC occurs in 40–70% of delusional patients (Freeman, 2007). Additionally, the study by Freeman, Pugh and Garety (2008) on general population with 200 samples indicated JTC in 20%, and more importantly pointed to its relation with paranoid ideas.

A majority of the studies were about reasoning and indicated that the delusional patients decided with less evidence compared to the not delusional ones. Also, it is stated that the typically delusional patients decide faster than control group (R. E. J. Dudley, John, Young, & Over, 1997a, 1997b). The relationship between reasoning and "draws to decision behavior (DTD)" by delusional ideas has significant support in literature (Fine et al., 2007).

As a result, draws to decision behaviors seems to be a common feature of the psychotic patients, however; draws to decision style alone do not answer for the reason why psychotic patients hold so tight on their delusions. Almost half of the delusional patients do not have JTC. Moreover, JTC was reported in the non-clinical group and was found related to paranoid ideas (R. Dudley et al., 2013) meaning delusional ideas seem not to be a prerequisite.

Up until this day, delusional psychosis and non-psychotic group have been compared in many studies (R. E. J. Dudley, Cavanagh, K., Daley, K., Smith, S., 2015). Thus it can be said that this is related not only to delusions but also to other psychotic symptoms (i. e. hallucinations or negative symptoms). To be able to define this, studies have taken place in which patients diagnosed as schizophrenic, but are not delusional were used as control groups (Menon, Pomarol-Clotet, McKenna, & McCarthy, 2006; Moritz & Woodward, 2005) and no significant differences between delusional and non-delusional were found.

Many studies have been conducted regarding the Beads task; nevertheless, the criticisms about the test were concerned that people mostly decide in social occasions and that the reasoning in deciding between two jars of beads yields to different result than the reasoning in a social environment. Hence some researchers were of the opinion that there were some findings, in the studies conducted utilizing this method, which increase number of error in gathering data and/or cause more reasoning errors (Lincoln, Salzmann, Ziegler, & Westermann, 2011; Young & Bentall, 1997). Because of the reasons given above, these processes are needed to be examined with other tests in the field. Reasoning with inductive argument test (RIAT) has been developed by Pelissier and O'Connor (2002) to measure reasoning with inductive arguments in the patients with Obsessive Compulsive Disorder (OCD). This test, also adapted in Turkish and reliability and validity ensured (Karadere, 2013), is applicable in this context.

The goal of our study is to evaluate the decision making and reasoning of the paranoid type schizophrenic patients, and their confidence in reasoning and perseverance in keeping to their decisions via using RIAT with a healthy

control group. The hypothesis of the study is that the paranoid type schizophrenic patients will be more confident in their initial decisions in comparison to the control group and will not change their decision after the alternatives are set and the new data is revealed.

METHOD

Sample

This study was approved by the local ethics committee with no: 4/8-9.36 participants whose level of education is at least primary school and who are between ages 18–65 and who applied to Ankara Diskapi Yildirim Beyazit Training and Research Hospital Psychiatry outpatient clinic between November 2011 and February 2012, and are diagnosed with paranoid schizophrenia have taken part in the research. All patients were offered to take part in the research and Structured Clinical Interview for DSM-4-TR (SCID-I) was conducted with the ones who agreed to participate, and a written consent was taken from every patient stating their agreement to take part in the research. Four of the delusional patients whose participation in the test was insufficient were excluded. As a result a group of 32 delusional patients and 30 healthy volunteers were included in the study. In order to gather the healthy volunteers, the janitors, secretaries, nurses, interns and assistant doctors who work in the psychiatry clinic of the hospital were invited to take part in the study. Among the ones who agreed to participate, the ones who had no record of psychiatric treatment or tracking were included in the study. The RIAT was implemented by 2 interviewers with all participants and it applied without interruption at one time. Interviewers were not blind to the participants. The socio-demographic data of the participants were similar. The demographical features of the participants such as gender, level of education, marital status and occupational status are presented in Table 1 in accordance with the groups.

The standards to be included in the study were defined as: having been diagnosed with paranoid schizophrenia in remission, being between the ages 18 and 65, having an educational degree of at least primary school, and the criteria to be excluded were defined as: having a comorbid mental disease, having had in the past or still suffering from a neurological disease or defect disabling cognitive functions. As the criteria for remission, the symptomatic remission criteria in schizophrenia published in 2005 by Symptomatic Remission In Schizophrenia Study Group with the supervision of Nancy Andreasen were used (Andreasen et al., 2005). According to this, the criteria of Symptomatic Remission (SR) are defined as having scored 3 (mild) or less for a period of 6 months on all subscales of Positive and Negative Syndrome Scale (PANSS) as explained below.

Data Collection Tools

After the diagnostic interview was conducted by SCID-I to the patients who were asked to participate in the study, RIAT test was applied by the interviewer in order to detect the inferential thinking patterns.

Structured Clinical Interview for the DSM-IV-TR Axis I Disorders (SCID-I): Clinical interview form structured by First, Gibbon, Spitzer ve Williams (1996) for DSM-IV Axis I disorders. It ensures that the diagnostic evaluation is conducted in a standardized manner increasing the validity of the diagnoses.

Table 1: Comparison of the demographic features of the groups.

		Delusional group (n=32)	*Control group (n=30)*	X^2	*df*	*Sig.*
		N (%)	**N (%)**			
Gender	Woman Man	12 (37.5) 20 (62.5)	16 (53.4) 14 (46.6)	1.57	1	0.21
Marital Status	Married Single Separate	8 (25) 12 (37.5) 12 (37.5)	7 (23.3) 18 (60) 5 (16.7)	4.06	2	0.13
		***M* (SD)**	***M* (SD)**	***p***		
Age		37.91 (±9.32)	34.63 (±8.45)	0.291		
Education		12.40 (±2.84)	13.43 (±4.59)	0.154		

Note: *p<0.05 for between-group comparison

Table 2: The comparison of the average differences between initial belief level and the second belief level of the subjects for every RIAT item.

	Delusional (n=32)			*Control (n=30)*		
Items	**Pre**	**Post**		**Pre**	**Post**	
	***M* (SD)**	***M* (SD)**	***p****	***M* (SD)**	***M* (SD)**	***p****
Given	300.94 (78.91)	267.28 (69.66)	**0.00**	326.67 (46.49)	278.13 (64.26)	**0.00**
1	71.5 (26.9)	63.9 (27.0)	0.07	74.8 (17.5)	59.7 (21.6)	**0.00**
3	42.5 (28.1)	41.3 (24.5)	0.81	68.7 (23.3)	65.5 (23.0)	0.41
5	64.3 (25.1)	48.6 (23.1)	**0.00**	65.2 (20.1)	51.2 (19.7)	**0.00**
10	62.3 (24.0)	60.5 (22.7)	0.63	63.0 (22.7)	51.5 (22.5)	**0.00**
11	60.4 (30.7)	53.1 (24.5)	0.16	55.0 (23.0)	50.3 (24.1)	0.30
Self-Generated	418.47 (82.54)	378.72 (84.35)	**0.00**	425.17 (65.01)	373.17 (73.69)	**0.00**
2	82.5 (15.8)	71.9 (18.4)	**0.02**	83.8 (16.3)	73.0 (22.0)	**0.01**
4	62.2 (20.4)	54.1 (19.8)	**0.02**	59.5 (20.9)	50.5 (19.2)	**0.02**
6	68.3 (25.1)	57.4 (22.8)	**0.00**	70.5 (19.7)	59.5 (19.7)	**0.01**
7	63.7 (22.7)	61.9 (22.7)	0.38	62.0 (22.1)	57.7 (18.5)	0.13
8	63.7 (24.1)	59.9 (25.0)	0.21	71.8 (15.1)	63.3 (16.6)	**0.00**
9	78.0 (22.3)	73.6 (23.0)	0.19	77.5 (23.7)	69.2 (24.1)	**0.00**
Total	719.41 (139.97)	646.00 (143.39)	**0.00**	751.83 (91.81)	651.30 (112.05)	**0.00**

Note: * Results of Paired Sample T-Test.

Reasoning with Inductive Argument Test (RIAT): The test developed by Pelissier and O'Connor (2002) and revised (Pélissier, O'Connor, & Dupuis, 2009) in order to create doubt and indecision in the subjects, and adapted to Turkish by us (Karadere, 2013), is composed of 11 short scenarios relevant and irrelevant with Obsessive Compulsive Disorder Symptoms. After each and every scenario is read the patient is asked to reason about what the character in the story might have done and then rate the confidence level of the result of their reasoning, this level is recorded in percentage and then the patients are asked to rate the confidence level of their first reasoning again in the light of new reasoning; their "strength of inference" is evaluated by measuring the difference between the initial confidence level and the final confidence level. The RIAT items are composed of items the alternatives of which are self-created (RIAT items 2-4-6-7-8-9), and items alternatives of which are given (RIAT items 1-3-5-10-11).

Statistical Analysis

Data were analyzed with SPSS Statistics for Windows, Version 22.0. Descriptive statistics with a normal distribution are presented as mean ± standard deviation and nominal variables are presented as number of cases and percentage (%). Normality distributions of the groups were evaluated with Kolmogorov-Smirnov tests. To evaluate the homogeneity of variance, we used Levene's test. The significances of the difference between groups were evaluated with ANOVA (Analysis of Variance) test. P value less than 0.05 was considered statistically significant.

RESULTS

The average of the difference between the participants'initial belief level and the second belief level to every RIAT item is given in Table 2. Our first analysis is the comparison of the initial belief level and the second belief level of the subjects for every RIAT item. According to this, statistically significant change was detected in the individuals of the delusional group towards the RIAT items 1-2-4-5-6. Moreover, in the delusional group, both the difference between the sum of initial level of belief to the statements and the sum of second level of belief to the statements of the RIAT items for which they have created alternatives, and the difference between the sum of initial level of belief to the statements and the sum of second level of belief to the statements of RIAT items for which the alternatives are given were detected to be statistically significant (p<0.001).

Table 3: The comparison of difference between their level of belief to the initial result of their reasoning and their level of belief after seeing the alternatives (RIAT belief level before and after) by ANOVA, after both delusional patient group and control groups'RIAT items are read.

Groups	*Groups*	*N*	*Mean of the differences*	*Std. Deviation*	*p*
Riat1	Delusional	32	-12.12	27.18	0.591
	Control	30	-16.05	30.07	
Riat2	Delusional	32	-8.84	31.62	0.929
	Control	30	-9.45	20.84	
Riat3	Delusional	32	-2.62	56.66	0.486
	Control	30	15.73	131.74	
Riat4	Delusional	32	-6.99	26.15	0.899
	Control	30	-6.13	27.59	
Riat5	Delusional	32	-18.31	31.32	0.632
	Control	30	-21.68	23.16	
Riat6	Delusional	32	-13.28	22.77	0.632
	Control	30	-10.53	22.49	
Riat7	Delusional	32	-4.71	25.16	0.268
	Control	30	11.11	76.92	
Riat8	Delusional	32	-2.34	26.51	0.089
	Control	30	-12.82	20.61	
Riat9	Delusional	32	0.58	33.70	0.166
	Control	30	-8.85	15.74	
Riat10	Delusional	32	13.01	89.37	0.105
	Control	30	-15.06	22.41	
Riat11	Delusional	32	23.08	124.95	0.237
	Control	30	-5.13	35.33	

Note: mean difference is significant p<0.05

In the examination of the control group results, the change in RIAT items 1-2-4-5-6-8-9-10 was statistically significant. Moreover, in the delusional group, both the difference between the sum of initial level of belief to the statements and the sum of second level of belief to the statements of the RIAT items for which they have created alternatives (RIAT items 2-4-6-7-8-9), and the difference between the sum of initial level of belief to the statements and the sum of second level of belief to the statements of RIAT items for which the alternatives are given were detected to be statistically significant ($p<0.001$).

Analyzing the initial belief level of control group and the delusional group with ANOVA no statistically significant differences were detected. This points out that the initial confidence levels of both groups are similar; in other words, any given differences in belief do not result from the initial belief levels. Apart for the 3rd item out of 11 RIAT items the difference of initial scores are not statistically significant. While the initial belief level of the delusional group to RIAT item 3 is on average 42.4 (±28.1), the initial belief level of the control group to RIAT item 3 in on average 68.7 (±23.3). With regards to this the difference between initial belief scores to the RIAT item 3 is statistically significant. Additionally, the difference between the sums of initial RIAT scores of both groups is not statistically significant.

After both delusional patient group and control groups'RIAT items are read, according to ANOVA results of the difference between the belief levels in the result of their initial reasoning and belief level after seeing the alternatives (RIAT belief level before and after), no significant differences were detected for both groups in terms of changes between the belief levels to the RIAT items before and after ($p>0.05$) (Table 3). Additionally, the difference between given RIAT items and self-created RIAT items was not statistically significant ($p>0.05$).

DISCUSSION

The nature of the cognitive process of decision making and maintaining of the decision by delusional patients is a question being researched by cognitive theorists. In the studies conducted with patients in order to find an answer to this question, the themes such as jumping to conclusions, draws to decision behavior, inflexibility of beliefs, having lower acceptance threshold came to the fore in delusional group compared to the non-delusional (Averbeck, Evans, Chouhan, Bristow, & Shergill, 2011; Freeman, Pugh, & Garety, 2008; Garety & Freeman, 2013; Garety, Hemsley, & Wessely, 1991; Huq, Garety, & Hemsley, 1988; Lunt et al., 2012; Menon et al., 2013; So et al., 2012).

In our study, after every one of the 11 RIAT statements were read and the difference between the levels of belief in an idea/probability are reviewed, there was not a statistically significant difference detected between the control group and the delusional group. Only in a single item (RIAT item 3) the confidence level of the control group showed a statistically significant higher value than the confidence level of the delusional group. RIAT item 3 is one of the given items of the RIAT and contextually represents the theme of being harmed. The participant is asked "Ayşe was in a hurry today in the morning and she forgot to lock the door to her house" and the probability was given as "may be no one will notice". In this item, the delusional patients gave a lower probability to "may be no one will notice". However in all other items, the change in the delusional group and the control group after the alternatives were read was of a similar level.

The lack of difference between the initial confidence levels in our study is discordant with the other studies in literature which report schizophrenic patients give a higher certainty level to their beliefs (Lunt et al., 2012; So et al., 2012). Nonetheless it supports and is compatible with a more recent thesis coming to the fore in literature, "draws to decision" behavior (Moritz, Woodward, & Lambert, 2007). In this study 37 schizophrenic patients were matched with 37 healthy people as the control group and were analyzed through computerized beads test. According to this study, delusional patients although with a lower level of confidence can come to a decision. This is more relevant in situations involving more than one possibility. Jumping to conclusions occurs more often in dualities (Moritz et al., 2007). It is observed that developing more than two possibilities as the result of the scenarios in RIAT items is more probable.

Our study showed that the difference between the initial and final RIAT items for both delusional and control group is not statistically significant. Similar to the control group, delusional patients adjust their confidence level in their beliefs after seeing the alternatives just like the control group. This is incompatible with the literature that states delusional patients lack flexibility on are less flexible in their beliefs (So et al., 2012). Nevertheless the studies in literature stating the belief inflexibility are mostly conducted on the patients'beliefs about their delusions. Almost none of the 11 items of RIAT, on the other hand, is about the delusions of the patients making it difficult for us to compare the findings of our study with the literature. Additionally, apart from the area of delusions, it is compatible with the literature that the reasoning of the patients is normal (Freeman et al., 2008; Menon et al., 2013).

With these in mind, in spite of the fact that delusional patients collect less evidence before deciding, it was observed that when given similar amount of evidence with the control group, patients with delusional disorder reason similarly with the control group (Freeman et al., 2005; Lincoln et al., 2011; Young & Bentall, 1997). This finding is compatible with our study. When RIAT items are reviewed, after the patients read every item, a possibility is given in the given items and in the others the patients are asked to produce a possibility. Then they are asked the level of their agreement with the possibility. Following that, the alternatives in the given are read and they are asked to produce alternatives for their own productions. In other words, both the delusional group and the control group are given similar amount of data. As the result, the group with the delusional disorder modify their belief in a similar way to that of the control group.

In conclusion, our study indicates that when the delusional patients are compared to the control group in terms of jumping to conclusion and modifying their initial beliefs, they are not different when given similarly sufficient amount of data. However, this does not suggest that the delusional patients use exactly the same reasoning patterns when compared to the healthy control group. In order to understand this, there is need for both new contextually neutral tests and new studies designed with tests that are contextually compatible with the patients'delusions.

This study had some limitations. The lack of validity and reliability of RIAT in patients with schizophrenia is a limitation of study. However, the available data suggests that RIAT is applicable to schizophrenic patients. The second

is, in the items for which the alternatives were produced by the subjects, whether there was a difference in the number of alternatives produced by the delusional group and the control group was not evaluated. This evaluation could have given an idea about whether they have regarded different possibilities or not. That the time taken to answer the items was not measured and the stress the items might have caused in the patients was not measured is another limitation. As a result, although the rate of modification of the delusional group was found similar to the control group, whether they have taken more or less time could not be compared.

In addition to taking these issues in consideration, in the studies to take place, the test should be improved by items (Pelissier & O'Connor, 2002) contextually compatible with delusions that will cause stress in the delusional patients. Also whether the result stays the same in acute delusional conditions might be subject of new studies in the future.

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