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Cognitive Biases in Schizophrenia Spectrum Disorders

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Abstract

In the scientific literature, a close relationship between cognitive biases and schizophrenia disorder has been widely demonstrated. Cognitive biases would be a pattern of deviation in judgment, in which the inferences we make about other people and/or situations can be illogical. Throughout this chapter will be analyzed how some cognitive biases are greatly related and are involved in the onset, maintenance, relapse and recovery of this disorder. Specifically, we will discuss five biases [need for closure, overconfidence bias, bias against confirmatory evidence (BACE), bias against disconfirmatory evidence (BADE) and above all jumping to conclusions (JTC)] that have been extensively studied and shown in patients with schizophrenia, especially with delusions. In this chapter the importance of studying in depth these cognitive biases in schizophrenia in order to understand, reduce and avoid them will be seen. The reduction and avoidance of these biases will result in an improvement in symptoms of schizophrenia. Therefore, it will lead to a faster, effective recovery. Moreover, the patient with schizophrenia will have an active role in his recovery. As a result, nowadays we can find several behavioral cognitive therapies, which are working on the reduction and avoidance of these cognitive biases and are demonstrating their effectiveness.

Keywords: cognitive bias, schizophrenia, jumping to conclusions, overconfidence bias, need for closure

1. Introduction

Throughout this chapter we will focus on the great influence of some cognitive biases in the study of schizophrenia disorder. In this chapter we will describe how these cognitive biases are involved in the cognitive processes, which lead to the onset, maintenance and recover of this disorder. Therefore, we will mark the importance of studying these biases to understand, reduce

and avoid them. As a result, this knowledge would produce an improvement of the symptoms of schizophrenia, increasing the quality of life of these patients.

Schizophrenia is a mental disorder characterized by a set of psychotic disorders which usually involve abnormal social behavior and cognitive deficit [1]. Schizophrenia includes environmental and genetic factors. In general, the onset of this disorder would be due to environmental factors such as stress, cannabis, poor nutrition during pregnant and some traumatic episodes or infections, among others [2]. Genetic factors include a variety of common and rare genetic variants [3]. However, the genetic influence must be studied in the context of interaction with environmental, social and cognitive effects [4].

In general, the symptoms of schizophrenia are usually divided into two main groups: positive or negative psychotic symptoms. However, these disorders also have other important aspects, which must be observed such as behavioral, affective and cognitive symptoms [5].

On the one hand, the positive symptoms would be typified by failure to understand what is real. In this category we will find, for example, delusions, hallucinations and disorganized speech. On the other hand, the negative symptoms would be typified by diminished emotional expression or avolition such as apathy or alogia. The emotional symptoms would be affective flattening, dysphoria and depression, among others. The behavioral symptoms would be hostility, impulsivity, aggressive attitudes and antisocial behavior [6, 7]. And finally, cognitive symptoms would include cognitive deficits, for example, in the executive functions [1]. In 2013, the American Psychiatric Association removed all subclassifications of schizophrenia in the new publication of DSM-5 [8].

Focusing in the factors which are involved in the onset and maintenance of schizophrenia disorder, many studies have found multiple implicated psychological mechanisms. However, we will talk about some implied cognitive biases such as jumping to conclusions (JTC) and overconfidence bias, among others.

In 1974, Tervsky and Kahneman defined the term of cognitive bias [9]. In a general definition, we can say that a cognitive bias would be a pattern of deviation in judgment, in which the inferences we make about other people and/or situations can be illogical [10]. Besides, diverse studies have found that these cognitive biases can be influenced by the context, personal motivation, failure in the information processing and social/culture factors [11, 12].

In schizophrenia research, throughout years cognitive behavioral models have established a strong relationship between some cognitive biases and schizophrenia disorders especially in those patients with positive symptomatology [13, 14]. One of the origins and maintenance of delusions are the cognitive biases or deficits in probabilistic reasoning processes of individuals.

However, these biases have been also studied in healthy populations with high scores on schizotypy [13]. Schizotypy would be qualitatively analogous but quantitatively more moderate than schizophrenia. Schizotypy trait could give us a possible explanation about the possible etiological mechanisms underlying schizophrenia spectrum disorders and may permit us to get better strategies for prevention and early detection of this disorder. Diverse studies have found that people with high schizotypy trait have more probability to display these cognitive biases [13].

In addition, several cognitive biases have been identified in those with the diagnosis or those at risk, especially when under stress or in confusing situations [15]. Therefore, it is necessary to know how these cognitive biases work in the onset, maintenance and relapse or recovery from this disorder.

Following this line, multiple studies have found bidirectional effects in these cognitive biases, that is, one bias or its results could influence another bias or the effects of that second bias and vice versa [16]. For example, Buchy et al. [17] investigated the relationship between jumping to conclusions (JTC) bias and bias against disconfirmatory evidence (BADE) based on the dimensional model of schizophrenia which bodes unifying cognitive biases or that these cognitive biases may combine to contribute to the formation of the delusional aspects of psychosis. Having said that, it is easy supposing there will have combinations of cognitive biases that together would be involved in the onset, maintenance, relapse and/or recovery from this disorder.

Another enriching way of studying cognitive biases in schizophrenia is through the comparison between the involved cognitive biases in other mental disorders. This study may give us important clues. For example, we could know how these operate in different mental disorders and its symptoms. In fact, we could find specific cognitive biases, which are implicated in a mental disorder but not in other disorders. An example of this type of studio, which tried to compare some psychiatric disorders and its relationship with the cognitive biases, was carried out by Wittorf et al. [18]. These authors did a cross-sectional study about jumping to conclusion (JTC) and attributional biases (AB) with 20 patients with paranoid schizophrenia, 20 patients with depression, 15 patients with anorexia nervosa and 55 nonclinical controls. Participants completed a modified version of the beads task, a revised German version of the Internal, Personal and Situational Attributions Questionnaire (AB) and several symptoms and neuro-cognitive measures. The findings showed that patients with schizophrenia evidenced that they are more likely to exhibit a jumping to conclusions bias than the other groups (patients with depression or anorexia nervosa and healthy controls). With respect to attentional bias, there were no significant differences between the clinical groups in personalizing bias, but patients with schizophrenia exhibited greater externalizing than the other clinical groups. The innovation of this studio is that it compared two cognitive biases in different psychiatric disorders and this can help us in understanding them better. Therefore, the ultimate purpose of the study of cognitive biases and their influence on schizophrenia is to better understand how these biases are involved in cognitive processes of patients with schizophrenia and how we can get to avoid, know and reduce them. This will result in a recovery of this disorder more effective and faster. In addition, we will achieve an active role of the patient with schizophrenia in his recovery and prevention of a possible relapse. Due to this multiple cognitive behavioral therapies work on the avoidance and reduction of cognitive biases in their programs. For instance, we can name the metacognitive training/therapy [19] or the famous cognitive bias modification therapy [20]. The objective of these therapies is to detect, reduce and avoid the cognitive bias implicated in the onset and maintenance of schizophrenia in order to get an effective recovery and preventing a relapse. For that, different modules are used to work in

different biases where the patient knows the bias, becomes aware of it and works on its reduction and avoidance.

2. Schizophrenia and cognitive biases

As mentioned above, some cognitive biases have been widely related to schizophrenia such as need for closure [21], overconfidence bias [14], bias against confirmatory evidence (BACE), bias against disconfirmatory evidence (BADE) and above all jumping to conclusions [13, 17]. Then we will explain these four cognitive biases and their relationship with this disorder.

2.1. Jumping to conclusions, against disconfirmatory evidence bias (BADE) and bias against confirmatory evidence (BACE)

The jumping to conclusions is a cognitive bias where there is a data-gathering bias and a contrast of hypothesis testing bias. This cognitive bias occurs when there is a tendency to make decisions very quickly even when there may not be a lot of evidence [22]. This bias is usually tested using probabilistic reasoning tasks based on a Bayesian model of probabilistic inference [13, 23]. As it is stated above, jumping to conclusions bias is a bias which has been largely related to patients with schizophrenia, especially, in patients with delusions [13, 17].

Numerous researches said that jumping to conclusions would be an endophenotype of psychosis [24]. In support of this, Menon et al. [25] found that antipsychotic treatment in patients with schizophrenia did not reduce the bias which may suggest that jumping to conclusions bias could be a trait maker for schizophrenia. This bias has also been observed in first-degree relatives of patients with schizophrenia above all patients with delusions [26]. Similarly, these cognitive biases have been observed in patients with psychosis.

The jumping to conclusions bias is closely related to the origin and maintenance of delusions. In fact, most studies have found this bias in patients with schizophrenia who have positive symptoms and not in patients with schizophrenia who have a negative symptomatology. Therefore, this bias is more associated with the delusions rather than with schizophrenia disorder [26]. The JTC is found in people with delusions with a schizophrenia diagnosis or delusional disorder. The subjects with delusions show a bias in the collection of information. They need fewer data than the normal population to reach to a final decision. In delirium process, there is a development constant by which ideas confirm and disconfirm through approaches to hypothesis, information gathering and contrast of the results with the previous hypothesis. Probably some of these steps are inadequate in delusional patients, both cognitive and emotional processes.

At present, two different hypotheses have been advanced to explain this cognitive bias [27]. On the one hand, several authors support the hypothesis that people with jumping to conclusions bias overestimate the conviction in their choices at the beginning of the decision process [28]. In line with this viewpoint, patients with schizophrenia tend to accept choices early that wrong inferences may.

On the other hand, other authors argue that the bias could be due to a low information threshold for acceptance of a decision [29]. “The hypothesis of liberal acceptance” was proposed by Moritz and Woodward [30]. These authors based on their hypothesis in the decrement of confidence gap in patients with schizophrenia who made final decisions with little evidence collected for them. Moreover, liberal acceptance is thought as core deficit because it is exhibited in delusion-relevant scenarios and neutral settings. Different experimental tasks have been used to support their hypothesis. For example, Moritz et al. [31] carried out an experiment called “Who wants to be a millionaire?,” a TV game, in patients with schizophrenia and healthy control where they were asked to rate the probability of each of four response alternatives to general knowledge questions. The results showed that patients reached to final decisions at 54 % subjective probability ratings and healthy controls at 70 %.

In addition, several studies have explored the possible relationship between jumping to conclusion bias and the bias against disconfirmatory evidence (BADE) and bias against confirmatory evidence (BACE) [13, 17].

Bias against disconfirmatory evidence (BADE) is a cognitive bias where, regardless of the inconsistent information, the hypothesis holds despite evidence to the contrary. Conversely, in the bias against confirmatory evidence (BACE) individuals, regardless of inconsistent information, they maintain their belief or hypothesis because of the evidence in favor of it [32]. The dimensional model of schizophrenia predicts unifying cognitive biases or combined cognitive biases to contribute toward the formation of the delusional aspects of psychosis [17]. For example, according to Munz [33], jumping to conclusions would play a facilitating role in the formation of new delusional systems and BADE. This dimensional model emphasizes quantitative gradations of psychopathology, both within and between subjects, rather than qualitative, discrete, all-or-none class distinctions. However, nowadays the relationship between these remains unclear because the studies are controversial and there is no consensus. At present, it is unclear whether these reasoning biases share common underpinnings or are independent [33].

Based on the previous results of several studies about schizophrenia research [17, 32, 34], our team decided to study the jumping to conclusion bias, bias against disconfirmatory evidence (BADE) and bias against confirmatory evidence (BACE) in patients with schizophrenia and healthy population with high and low score in schizotypy [13] using the Pictures Decision Task [13, 23]. Following the dimensional theory of schizophrenia, we thought that it was interesting to study the population with high schizotypy since it would be useful to understand the etiological mechanisms that there are under schizophrenia spectrum disorders. This understanding could do progress to the own prevention or the early detection of these disorders [35]. The schizotypy is found within the normal variation of population general. Individuals with high schizotypy have a similar psychopathology and cognitive styles than patients with schizophrenia, that is, they are similar qualitatively but they are not similar quantitatively to patients with schizophrenia [13]. For that, we recruited a total of 45 participants divided in three groups: 15 patients with schizophrenia and 30 healthy participants (15 high schizotypy and 15 low schizotypy). To measure schizotypy, we used the Community Assessment of Psychic Experiences (CAPE) [36]. Moreover, there are no significant differences

between them in age, education, gender, or premorbid intelligence. Once participants were tested, they performed the Pictures Decision Task.

The results of the experiment demonstrated that the patients with schizophrenia displayed jumping to conclusions more easily than control groups (high and low schizotypy). Also, patients with schizophrenia showed confirmatory bias, so that, they were more reticent to change their hypothesis even though it would have new disconfirmatory evidence. Moreover, patients with schizophrenia were less sensitive to the feedback, so they did less use of feedback. For example, in the cue condition, they did not profit in possible solutions when the other two control groups (high and low schizotypy) did it. Therefore, we suggested that jumping to conclusions bias may be related to propensity to hold strong beliefs (high plausibility rating at first stages) and/or to low feedback sensitivity (FS), above all, when the task or context is more ambiguous and difficult (uncued trials). This is corroborated by the fact that all groups reproduced jumping to conclusions in the cued condition, but not in the uncued condition (difficult task), where the patients with schizophrenia and high schizotypy group reproduced the bias more early than low schizotypy group.

Based on these results, we could conclude that jumping to conclusions bias was a general bias because this bias is not only presented in schizophrenia but also in nonclinical population (high- and low-schizotypy healthy populations). However, patients with schizophrenia would show it earlier and stronger than healthy population. It could say that jumping to conclusions bias would be found in a straight line where the patients with schizophrenia would have a greater tendency to show it, followed by populations with high schizotypy and low schizotypy. Furthermore, this line would be influenced by context (more or less ambiguity). Hence, using a controlled or heuristic processing would depend on context and type of participant. Also, we observed that feedback sensitivity could be a factor that affects this bias. However, there is no relationship between jumping to conclusions bias and the two other biases [bias against disconfirmatory evidence (BADE) and bias against confirmatory evidence (BACE)].

To conclude, these results can have an important implication since they could help in the treatment, prevention, or recovery from schizophrenia. For example, the therapy X could try to teach how does more effective hypothesis testing through making a better use of feedback. The jumping to conclusions bias and the other two biases could represent an important therapeutic target. Individual differences in JTC performance could be useful in determining the best course of treatment. Training programs that aim to ameliorate the jumping to conclusions response style might prove to be an important adjunct to established therapies [37]. An example of this, we can find it with the metacognitive training/therapy [19]. This therapy works on different aspects between the cognitive biases like jumping to conclusions or confirmatory bias. In this therapy there are sixteen modules, which must be done by the patient with schizophrenia. For example, to work the confirmation bias, module 3 is used where patients are informed and explained about this bias and then performed different tasks. A typical task to work this bias would consist in a task with a series of three pictures which are shown in reversed order. The sequences of pictures gradually reveal an ambiguous plot. For each picture, participants are asked to rate the plausibility of four different interpretations. The goal of this

task is that patients learn to look for more information before making a judgment and therefore avoiding the confirmation or disconfirmation bias [17, 37].

2.2. Need for closure bias

Another cognitive bias that has been linked to schizophrenia disorder is the need for closure bias [21, 38]. However, as discussed below this bias has not been studied so deeply as the other biases (jumping to conclusions, BACE and BADE). Therefore, its influence in schizophrenia disorder is not well known yet. Moreover, there are not many studies on its bidirectional relationship with the other implicated cognitive biases in the schizophrenia.

According to Kruglanski [39], the cognitive bias called need for closure is:

“the need to reach a fast decision to have an answer and to escape the feeling of doubt and uncertainty and “freeze” by failing to update”.

In addition, this author later adds that this bias could be displayed through the desire for predictability and preference for order and structure and discomfort with ambiguity (need for closure [40]). In general, different studies have evidenced that people who show the need for closure bias have a great need for cognitive closure. They dislike uncertainty and prefer to reach conclusions quickly and with certainty [39–42].

According to Federico et al. [41]:

“They seek to accomplish this goal by “seizing” quickly on any available information to reach conclusions and by “freezing” on these conclusions once they are reached”.

Focusing in the study of this bias in schizophrenia, Colbert and Peters [38] demonstrated that members of the general population that are delusion prone had a higher score on the need for closure scale (NCS). Moreover, these individuals displayed jumping to conclusions bias. So they concluded that as the data-gathering reasoning bias was found in delusion-prone individuals, this suggests that it may be involved in the formation, rather than merely the maintenance, of delusional beliefs.

In other study, McKay et al. [21] found this bias in patients with schizophrenia. On the other hand, the results of this investigation showed that need for closure and jumping to conclusions biases would not seem related with each other. The intolerance of ambiguity correlated positively with delusion proneness and decisiveness correlated negatively. According to these authors, the delusion-prone individuals would be more indecisive in everyday life. In addition, the need for closure has been associated with jumping to conclusions since the intolerance to ambiguity contexts would lead to jumping to conclusions [21]. The following year, in 2007, these authors realized other experiments studying the relationship between need for closure and schizophrenia [43]. They wanted to replicate the study of Bentall and Swarbrick [44].

Bentall and Swarbrick thought that patients with delusions may be highly intolerant of ambiguity, that is, they show need for closure and in point the fact that the results of their study confirmed their hypothesis. They found that patients with delusions were highly intolerant of

ambiguity and had a higher score in the need for closure scale (NCS). Based on this studio, McKay et al. [43] hypothesized that 22 patients with a history of persecutory delusions would exhibit higher need for closure and a more extreme jumping to conclusions bias than 19 healthy control participants. For that, the participants must realize a probabilistic task and fill out depression and need for closure scale. The results demonstrated that patients with persecutory delusions had a higher score than healthy control group. Therefore, the results support an association between persecutory delusions and need for closure. In addition, they did not find relationship between jumping to conclusions and need for closure.

Within the relationships between cognitive biases (e.g., jumping to conclusions, bias against disconfirmatory evidence, need for closure), we can find the interesting study of Moritz et al. [45]. These authors studied a total of 56 patients with schizophrenia through four independent components: jumping to conclusions, personalizing attributional style, inflexibility and low self-esteem. The study lends tentative support for the claim that candidate cognitive mechanisms for delusions only partially overlap, so these mechanisms must be more widely studied in order to have a higher knowledge. Meantime, these authors propose that these biases should be treated independently via behavioral cognitive therapies, which work these biases.

Analyzing all these studies, we see clearly that it is necessary to study more deeply the need for closure and its implication in schizophrenia. Nowadays, it is not known how this bias works in schizophrenia, that is, it is not clear what is its real involvement in the onset, maintenance and relapse of schizophrenia disorder. In fact, if we try to find studies, we will encounter that there are few or almost no one study which attempts to discern what is its influence on schizophrenia. In addition, there are few studies that have tried to investigate the relationship of the implicated cognitive biases in schizophrenia. If the relationship between them is independent, dependent or partially dependent is unclear. In general, it seems that these biases are independent but it is necessary to study better. What is clear is that these cognitive biases play an important role in schizophrenia because they have been found in the same population. In conclusion, the study of need for closure bias and its influence on schizophrenia is needed. In addition, the relationship between these biases in order to obtain better effective therapies should be also examined. While this is not achieved as it is said by Moritz et al. [45], these cognitive biases should be treated independently in the therapies.

2.3. Overconfidence bias

Finally, another cognitive bias that has been related to schizophrenia disorder is overconfidence bias [46] because the patients with schizophrenia displayed overconfidence in their choices or interpretations [13, 46, 47]. The overconfidence bias is the tendency to overestimate or exaggerate our own ability [48]. The response confidence is usually enhanced for erroneous judgments in patients with schizophrenia in comparison with healthy controls [13, 14]. In general, the overconfidence bias has been obtained across memory tasks [46, 47]. For example, Peters et al. [49] did an investigation with 27 patients with schizophrenia and 24 healthy controls where they were administrated a developed emotional video paradigm with 5 videos differing in emotionality (positive, 2 negative, neutral and delusional related). After each video, the participants had to do a recognition task. Also, they are asked to say the confidence

response, that is, participants must make old-new discriminations along with confidence ratings. The objective was to see the memory accuracy and meta-memory deficits. The results demonstrated that in the positive video the patients recognized fewer correct items than healthy controls. The patients with schizophrenia exhibited more high-confident responses for misses and false memories. So the overconfidence bias displayed by them would be related to higher probability of committing error judgments.

Also, this cognitive bias has been observed in social cognition tasks [50]. Köther et al. [50] carried out a study with 76 patients with schizophrenia or schizoaffective disorder and 30 healthy control participants. In this study, the participants must fill out the Reading the Mind in the Eyes test (Eyes test). Moreover, they had to complement a rating scale requesting response confidence. The results showed that patients with schizophrenia had more high-confidence error and fewer high-confidence correct responses. Besides, this was most clear in patients with formal thought disorder. Therefore, this study supports the implication of this cognitive bias in schizophrenia and its spectrum disorders.

Other interesting study was realized by Moritz et al. [14]. In this study, the authors analyzed the perceptual judgments in patients with schizophrenia. For that, a total of 55 patients with schizophrenia, 58 patients with obsessive-compulsive and 45 healthy controls participated. These participants had to judge whether the pictures depicted an object or not and how confident they were in this judgment. The results showed that patients with schizophrenia had more overconfidence in their error response and enhanced knowledge corruption index in comparison with healthy controls. However, accuracy score did not differ between patients with schizophrenia and obsessive-compulsive.

In the study discussed in the previous section [13] also, it was found that patients with schizophrenia showed greater confidence in the early stages of the Pictures to Decision task. In addition, they obtained more errors than healthy controls but the difference was not statistically significant. However, the overconfidence bias is a possible explanation of higher production of errors in patients with schizophrenia.

With respect to the relationship between this bias and the other implicated cognitive biases in schizophrenia, there is not a strong conclusion. In fact, as we saw in the previous cases, it is not clear if the relationship is dependent, independent, or partially dependent. Therefore, its study is necessary for higher understanding, if it is clear that this bias would be involved in the maintenance of schizophrenia disorders. Taking together the exposed results, we could intuit the important implications of these cognitive biases in the onset, maintenance and relapse or recovery in schizophrenia disorders. For that, several new therapies have been created to work in avoiding and recognizing them.

3. Conclusions

Cognitive biases have been extensively studied in patients with schizophrenia especially those with delusion-prone individuals [13, 14]. The results of experiments have shown that it is

difficult to display these biases in patients with negative symptoms. So, currently the role of these cognitive biases in this disorder is not yet known exactly because they are more linked with the delusions rather than with schizophrenia disorder spectrum. The subjects with delusions show a bias in the collection of information because they need fewer data than healthy population to take a final decision.

However, it is clear that these cognitive biases have an important role in the onset, maintenance and possible relapse. Because of this important role, numerous studies have attempted to understand and see the relationship between them. But still no scientific literature agrees with the type of relationship between these cognitive biases. Although it seems that these should be interconnected through two-way relationship, studies show that the relationship between these biases is independent or as much is a partial relationship. Therefore, further study on how these biases work and how they interrelate produces greater understanding and therefore the creation of more effective therapies. Until this happens, cognitive behavioral therapies should continue to work with these cognitive biases independently. This already makes it different therapies like metacognitive training and cognitive bias modification, among others. Intervention studies of these therapies have shown satisfactory results. This type of therapy has improved recovery and avoided relapses. In addition, these therapies make the patient with schizophrenia have a more active role in their recovery, leading to greater control for patients of their disease, a better understanding of it and increased self-esteem and self-control.

In future lines must keep working on greater knowledge of cognitive biases and their relationship with each other in schizophrenia and delusional disorder. Surely, we will find new and new relationships. The ultimate goal is to get a therapy that is more effective and improve the life of these patients.

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References

- [1] Hill SK, Reilly JL, Keefe RS, Gold JM, Bishop JR, Gershon ES, Tamminga CA, Pearlson GD, Keshavan MS, Sweeney JA. Mint: neuropsychological impairments in schizophrenia and psychotic bipolar disorder: findings from the Bipolar-Schizophrenia Network on Intermediate Phenotypes (B-SNIP) study. *American Journal Psychiatry*. 2013; 170 (11): 1275-1284. DOI: 10.1176/appi.ajp.2013.12101298

- [2] Owen MJ, Sawa A, Mortensen PB. Mint: schizophrenia. *Lancet*. 2016; 388 (10039): 86-97. DOI: 10.1016/S0140-6736(15)01121-6
- [3] Kavanagh DH, Tansey KE, O'Donovan MC, Owen MJ. Mint: schizophrenia genetics: emerging themes for a complex disorder. *Molecular Psychiatry*. 2014; 20 (1): 72-76. DOI: 10.1038/mp.2014.148
- [4] Van Os J, Kenis G, Rutten BPF. Mint: the environment and schizophrenia. *Nature*. 2010; 468: 203-212. DOI: 10.1038/nature09563
- [5] Van Os J, Gilvarry C, Bale R, van Horn E, Tattan T, White I, Murray R. Mint: diagnostic value of the DSM and ICD categories of psychosis: an evidence-based approach. *Social Psychiatry and Psychiatric Epidemiology*. 2000; 35: 305-311
- [6] Hoptman MJ, Antonius D, Mauro CJ, Parker EM, Javitt DC. Mint: cortical thinning, functional connectivity and mood-related impulsivity in schizophrenia: relationship to aggressive attitudes and behavior. *American Journal of Psychiatry*. 2014; 171 (9): 939-948. DOI: 0.1176/appi.ajp.2014.13111553
- [7] Wehring HJ, Carpenter WT. Mint: violence and schizophrenia. *Schizophrenia Bulletin*. 2011; 37: 877-878. DOI: 10.1093/schbul/sbr094
- [8] American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 5th ed. Washington: Washington, DC; 2013.
- [9] Tversky A, Kahneman D. Mint: judgement under uncertainty: heuristics and biases. *Science*. 1974; 185: 1124-1131.
- [10] Haselton MG, Nettle D andrews PW. In Buss DM editor. *The Handbook of Evolutionary Psychology*. Hoboken: Wiley; 2005. p. 724-746.
- [11] Hilbert M. Mint: toward a synthesis of cognitive biases: how noisy information processing can bias human decision making. *Psychological Bulletin*. 2012; 138 (2): 211-237. DOI: 10.1037/a0025940
- [12] Pfister HR, Böhm G. Mint: the multiplicity of emotions: a framework of emotional functions in decision making. *Judgment and Decision Making*. 2008; 3 (1): 5-17.
- [13] Juárez Ramos V, Rubio JL, Delpero C, Mioni G, Stablum F, Gómez Milán E. Mint: jumping to conclusions bias, BADE and feedback sensitivity in schizophrenia and schizotypy. *Consciousness and Cognition*. 2014; 26: 133-144. DOI: 10.1016/j.concog.2014.03.006
- [14] Moritz S, Ramdani N, Klass H andreou C, Jungclaussen D, Eifler S, Englisch S, Schirmbeck F, Zink M. Mint: overconfidence in incorrect perceptual judgments in patients with schizophrenia. *Schizophrenia Research: Cognition*. 2014; 1 (4): 165-170. DOI: <http://dx.doi.org/10.1016/j.scog.2014.09.003>

- [15] Broome MR, Woolley JB, Tabraham P, Johns LC, Bramon E, Murray GK, Pariante C, McGuire PK, Murray RM. Mint: what causes the onset of psychosis?. *Schizophrenia Research*. 2005; 79: 23-34.
- [16] Everaert J, Koster EHW, Derakshan N. Mint: the combined cognitive bias hypothesis in depression. *Clinical Psychology Review*. 2012; 32: 413-424. DOI: 10.1016/j.cpr.2012.04.003
- [17] Buchy L, Woodward TS, Liotti M. Mint: a cognitive bias against disconfirmatory evidence (BADE) is associated with schizotypy. *Schizophrenia Research*. 2007; 90: 334-337. DOI: 10.1016/j.schres.2006.11.012
- [18] Wittorf A., Giel KE, Hautzinger M, Rapp A, Schönenberg M, Wolkenstein L, Zipfel S, Mehl S, Fallgatter AJ, Klingberg S. Mint: specificity of jumping to conclusions and attributional biases: a comparison between patients with schizophrenia, depression and anorexia nervosa. *Cognition Neuropsychiatry*. 2012; 17 (3): 262-286. DOI: 10.1080/13546805.2011.633749
- [19] Moritz S, Woodward TS. Mint: metacognitive training for schizophrenia patients (MCT): a pilot study on feasibility, treatment adherence and subjective efficacy. *German Journal of Psychiatry*. 2007a; 10: 69-78.
- [20] Tran T, Hertel PT, Joormann J. Mint: cognitive bias modification: changing interpretations can alter memories. *Emotion*. 2001; 11 (1): 145-152.
- [21] McKay R, Langdon R, Coltheart M. Mint: need for closure, jumping to conclusions and decisiveness in delusion-prone individuals. *The Journal of Nervous and mental disease*. 2006; 194 (6): 422-426.
- [22] Huq SF, Garety PA, Hemsley DR. Mint: probabilistic judgements in deluded and non-deluded subjects. *Quarterly Journal of Experimental Psychology*. 1988; 40 (4): 801-812.
- [23] Delpero C, Mioni G, Rubio JL, Juárez Ramos V, Gómez Milán E, Stablum F. Mint: decision making and feedback sensitivity. *Journal of Cognitive Psychology*. 2015; 27: 882-897. DOI: 10.1080/20445911.2015.1036759
- [24] Garety P, Joyce E, Jolley S, Emsley R, Walle H, Kuipers E, Bebbington P, Fowler D, Dunn G, Freeman D. Mint: neuropsychological functioning and jumping to conclusions in delusions. *Schizophrenia Research*. 2013; 150 (2-3): 570-574. DOI: 10.1016/j.schres.2013.08.035
- [25] Menon M, Mizrahi R, Kapur S. Mint: jumping to conclusions' and delusions in psychosis: relationship and response to treatment. *Schizophrenia Research*. 2008; 98: 225-231. DOI: 10.1016/j.schres.2007.08.021
- [26] Van Dael F, Versmissen D, Janssen I, Myin-Germeys I, van Os J, Krabbendam L. Mint: data gathering: biased in psychosis?. *Schizophrenia Bulletin*. 2006; 32: 341-351. DOI: 10.1093/schbul/sbj02

- [27] Averbeck BB, Evans S, Chouhan V, Bristow E, Shergill SS. Mint: probabilistic learning and inference in schizophrenia. *Schizophrenia Research*. 2011; 127 (1–3): 115-122. DOI: 10.1016/j.schres.2010.08.009
- [28] Lincoln TM, Ziegler M, Mehl S, Rief W. Mint: the jumping to conclusions bias in delusions: specificity and changeability. *Journal of Abnormal Psychology*. 2010; 119 (1): 40-49. DOI: 10.1037/a0018118
- [29] Veckenstedt R, Randjbar S, Vitzthum F, Hottenrott B, Woodward TS, Moritz S. Mint: incorrigibility, jumping to conclusions and decision threshold in schizophrenia. *Cognitive Neuropsychiatry*. 2011; 16 (2): 174-192. DOI: 10.1080/13546805.2010.536084
- [30] Moritz S, Woodward TS. Mint: plausibility judgment in schizophrenic patients: evidence for a liberal acceptance bias. *German Journal of Psychiatry*. 2004; 7: 66-74.
- [31] Moritz S, Woodward TS, Hausmann D. Mint: incautious reasoning as a pathogenetic factor for the development of psychotic symptoms in schizophrenia. *Schizophrenia Bulletin*. 2006; 32: 327-331
- [32] Moritz S, Woodward TS. Mint: a generalized bias against disconfirmatory evidence in schizophrenia. *Psychiatry Research*. 2006; 142: 157-165. DOI: 10.1016/j.psychres.2005.08.016
- [33] Munz MT. Mint: Jumping to Conclusions, Liberal Acceptance and the Bias Against Disconfirmatory Evidence: An Evaluation of Reasoning Deviations in Delusions. Rostock: Rostock University, 2011. DOI: urn:nbn:de:gbv:28-diss2012-0089-520
- [34] Garety P, Freeman D. Mint: the past and future of delusion research: from the inexplicable to the treatable. *Brain Journal Psychiatry*. 2013; 203: 327-333.
- [35] Kwapil TR, Barrantes Vidal N, Silvia PJ. Mint: the dimensional structure of the Wisconsin schizotypy scales: factor identification and construct validity. *Schizophrenia Bulletin*. 2008; 34: 444-457.
- [36] Konings M, Back M, Hansen M, van Os J, Krabbendam L. Mint: validity and reability of the CAPE: a self-report instrument for the measurement of psychotic experiences in the general population. *Acta Psychiatry Scand*. 2006; 114 (1): 55-61.
- [37] Evans SL, Averbeck BB, Furl N. Mint: jumping to conclusions in schizophrenia. *Neuropsychiatric Disease and Treatment*. 2015; 11: 1615-1624. DOI: 10.2147/NDT.S56870
- [38] Colbert SM, Peters ER. Mint: need for closure and jumping-to-conclusions in delusion-prone individuals. *The Journal of Nervous and Mental Disease*. 2002; 190 (1): 27-31.
- [39] Kruglanski AW. Mint: the psychology of being “right”: the problem of accuracy in social perception and cognition. *Psychological Bulletin*. 1989; 106: 395-409.
- [40] Webster D, Kruglanski A. Mint: individual differences in need for cognitive closure. *Journal of Personality and Social Psychology*. 1994; 67: 1049-1062.

- [41] Federico CM, Ergun D, Hunt CV. Mint: opposition to equality and support for tradition as mediators of the relationship between epistemic motivation and ideological affinity. *Journal of Research in Personality*. 2014; 17 (4): 524-541. DOI: 10.1177/1368430213517273
- [42] Juárez Ramos V. Mint: Cognitive Neuroscience: Differences between different populations in decision making tasks. Granada: University of Granada; 2014.
- [43] McKay R, Langdon R, Coltheart M. Mint: jumping to delusions? Paranoia, probabilistic reasoning and need for closure. *Cognitive Neuropsychiatry*. 2007; 12 (4): 362-376. DOI: 10.1080/13546800701203769
- [44] Bentall RP, Swarbrick R. Mint: the best laid schemas of paranoid patients: autonomy, sociotropy and need for closure. *Psychology and Psychotherapy*. 2003; 76 (Pt 2): 163-171.
- [45] Moritz S, Veckenstedt R, Hottenrott B, Woodward TS, Randjbar S, Lincoln TM. Mint: different sides of the same coin? Intercorrelations of Cognitive Biases in Schizophrenia. 2010; 15 (4): 406-421. DOI: 10.1080/13546800903399993
- [46] Gaweda L, Moritz S, Kokoszka A. Impaired discrimination between imagined and performed actions in schizophrenia. *Psychiatry Research*. 2012; 195: 1-8. DOI: 10.1016/j.psychres.2011.07.035
- [47] Peters MJ, Cima MJ, Smeets T, de Vos M, Jelicic M, Merckelbach H. Did I say that word or did you? Executive dysfunctions in schizophrenic patients affect memory efficiency, but not source attributions. *Cognition Neuropsychiatry*. 2007; 12: 391-411.
- [48] Barber B, Odean T. Boys will be boys: gender, overconfidence and common stock investment, *Quarterly Journal of Economics*. 2001; 116: 261-292.
- [49] Peters MJ, Hauschildt M, Moritz S, Jelinek L. Impact of emotionality on memory and meta-memory in schizophrenia using video sequences. *Journal of Behavior Therapy and Experimental Psychiatry*. 2013; 44 (1): 77-83. DOI: 10.1016/j.jbtep.2012.07.003
- [50] Köther U, Veckenstedt R, Vitzthum F, Roesch-Ely D, Pfueller U, Scheu, F, Moritz, S. "Don't give me that look" — overconfidence in false mental state perception in schizophrenia. *Psychiatry Research*. 2012; 196: 1-8. DOI: <http://dx.doi.org/10.1016/j.psychres.2012.03.004>