

# Cognitive Bias Modification as Treatment for Schizophrenia

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## ABSTRACT

The next chapter focuses on different cognitive therapies and its use as an effective treatment for schizophrenia. While it is necessary the use of pharmacology for its treatment, also the use of psychotherapy is important as a form of maintenance and not relapse by the patient with schizophrenia. In addition, we have emphasis how cognitive biases influence the onset, maintenance and relapse of this mental disorder. Several studies have demonstrated its intimate relationship with schizophrenic disorders, and therefore, a therapy that works in your detection, reduction and avoidance is necessary. At present, we have found various cognitive therapies that work on these biases and have shown beneficial in improving the general functioning of these patients, avoiding relapses. Specifically, we will explain three therapies that have received a lot of attention called Cognitive Bias Modification, Metacognitive training and Cognitive Behavioral Therapy (CBT) and Family interventions (FI).

# INTRODUCTION

Schizophrenia is a psychiatric diagnosis that encompasses a set of psychotic disorders which usually involve neuropsychological disorders [1]. Schizophrenia is associated with gene-environment interplay. In addition, the onset of the disorder would be due to environmental factors such as stress, cannabis, some traumatic episode ...etcetera. Therefore, heritability, that is, genetic influence, must be studied in the context of interaction with environmental, social and cognitive effects [2].

The symptoms of schizophrenia are usually divided into several symptoms groups which characterize to different psychotic profiles depending on the predominance over other types of symptoms. The study neuropsychological of schizophrenia conceptualizes the symptomatology in a dimensional optics, which can be defined based on five main groups or dimensions: positive, negative, affective, behavioral and cognitive [3].

The positive symptoms would be typified by loss of contact with reality. In this category will found for example, delusions, hallucinations and so on. The negative symptoms would be typified by decrement of mental functions and physical such as apathy, a logia etcetera. The affective symptoms would be affective flattening, dysphasia, depression... The behavioral symptoms would be hostility, impulsivity, isolation and antisocial behavior. And finally, cognitive symptoms would include deficits in cognitive executive functions, especially in verbal memory and cognitive control [1].

In the study of schizophrenia, it has been widely observed relationship of positive symptoms with some cognitive biases in patients [4-6]. The cognitive biases observed in schizophrenia research have related to them with the onset, maintenance and relapse or recover of this disorder. As consequence, different therapies have been produced to reducing and avoiding them and therefore, preventing and improving the general functioning. At present we can talk about different cognitive behavioral therapies which attempt to follow this line, that is, the reduction the cognitive biases. For instance, we can find the Cognitive Behavioural Therapy (CBT) [7] and Family Interventions (FI) [8], Met cognitive Training [9], or Cognitive Bias Modification Therapy (CBMT) [10]. In the programming of these therapies are used diverse modules to learn to detect and so reduce the cognitive biases involve in the own mental disorder. It is a new line, therefore, under development, but a line that leads to a better understanding of mental disorders and finally gets to an effective therapeutic treatment which will produce less anxiety and higher knowledge of them for patients.

## SCHIZOPHRENIA AND COGNITIVE BIASES

The name of cognitive bias was introduced by Tervsky & Kahneman in the early 70s. In a general definition, we can say that a cognitive bias would be a pattern of deviation in judgment, in which, the inferences that we make about other people and/or situations can be illogical [11,12].

These cognitive biases would be influenced by evolution of our ancestors and others factors as can be contextual, motivational, and social among others [13].

Sometimes the cognitive biases help us to take decision with effectiveness, doing us to choose the right decision. In spite of the mostly times the use of these biases to reach to make final decision or judgment involves erroneous or illogical decisions or judgments. In fact, human brain has evolved to a more adaptive reasoning which would produce lower overall cost of cognitive errors rather than smaller number of cognitive errors in uncertainty situations [14]. However, there are many cognitive biases that are not so adaptative but are caused by a general failure in our brain structure or the misapplication of a mechanism that is beneficial under different circumstances. In this cases, these biases can be leaded anybody to a perceptual distortion, attention bias or memory bias that will make an inaccurate judgment, or an illogical interpretation.

Within the studio of cognitive biases has been observed that some cognitive biases and schizophrenia are closely linked [15,16]. In general the cognitive biases which had been linked to schizophrenia disorder are jumping to conclusion bias [4,17] need of closure [18], overconfidence bias [19] Bias Against Disconfirmatory Evidence (BADE) and Bias Against Confirmatory Evidence (BACE) [6].

With respect to jumping to conclusions, numerous manuscripts in schizophrenia research area have replicated this bias [20,16]. The jumping to conclusions bias is produced when a decision hastily is made, even though there would be little evidence to take it. In addition, this bias has been widely found above all in patients with delusions [4] because of this bias is accentuated in patients with this kind of symptoms [20].

However, also jumping to conclusion bias has been explored in other populations like healthy populations such as populations who have a scoring high on a schizotypy scale [21,22] and finally in other clinical populations [23,24]. This bias is thought to play an important role in the formation and maintenance of schizophrenia disorder.

Bias against Disconfirmatory Evidence (**BADE**) is a cognitive bias where, regardless of the inconsistent information, the hypothesis is hold despite evidence to the contrary by individuals. Conversely, in the Bias Against Confirmatory Evidence (**BACE**) individuals, regardless of inconsistent information, maintain their belief or hypothesis because of the evidence in favor of this. Jumping to conclusions and **BADE** would facilitate the formation of new delusional systems [25]. Hence, these biases would also be implicated in the formation and maintenance of schizophrenia because these patients are less able to change their misinterpretation doing use of new information.

Other cognitive bias related with schizophrenia is the need for cognitive closure. This bias 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 [26]. It could be manifested through the desire for predictability, preference for order and structure and discomfort with ambiguity (need of Closure,

[27]. It has been observed that individuals with high need for cognitive closure dislike uncertainty and prefer to reach conclusions quickly and with certainty. According to Federico, Ergun and Hunt [28]. “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”.

McKay, Langdon and Coltheart [18] found need of closure and jumping to conclusions where these biases would not seem be related between them. The intolerance of ambiguity correlated positively with delusion-proneness, decisiveness correlated negatively. According these authors the delusion-prone individuals would be more indecisive in everyday life. In addition, need of closure has been associated with jumping to conclusions due to the intolerance to ambiguity contexts would lead to jumping to conclusions [29].

Finally, other bias linked to schizophrenia is overconfidence bias. This bias is the tendency to overestimate or exaggerate our own ability [30]. Numerous studies have shown that patients with schizophrenia reproduced overconfidence in their choices or interpretations [31,32,19]. These studies have been studied with perceptual task (Moritz *et al.* 2014). For example, Moritz, *et al.* [19] found overconfidence in errors in patients with schizophrenia using a visual perception task. Also, it is found in memory tasks [33] and social cognition tasks [34]. This bias would be related to jumping to conclusions bias and therefore, it 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 recover in schizophrenia disorders. For that, several new therapies have been created to work in the avoiding and recognizing of them.

## THERAPIES

Some specialists think psychological therapy is not useful or even harmful. However, Psychotherapy and psychopharmacology should not be considered “rivals” but should be seen as complementary methods (Moritz *et al.* 2010). In fact, the meta-analysis of different studios about these therapies suggests that the cognitive and behavioral intervention is effective in improving the symptoms of schizophrenia. Due to this, we will make a brief explanation of the three therapies known in this field. Specially, we will explain these three therapies: Cognitive Bias Modification; Cognitive Behavioral Therapy (CBT) and Family interventions (FI); and Met cognitive Training.

### Cognitive Bias Modification

Current experimental psychology have developed a new paradigm named Cognitive Bias Modification (CBM) [35] a set of procedures which directly modify bias by computerized tasks. Overall, Cognitive Bias Modification (CBM) is a computer-based therapy that may help to reduce schizophrenia because had been demonstrate effectiveness on the treatment of stress, anxiety and depression since it acts on cognitive biases, above all, works the attention bias. This program can be used either by healthy or clinical population.

On Yiend et al. point of view [36], this therapy is more flexible for the reason that patients can perform the treatments from a computer at home, so it can arrive to further people. In summary, **CBM** methods would offer a high gain and low cost treatment option.

CBM therapy is designed to modify attention and interpretation biases through repeated practice on cognitive tasks. There are two types: one is the Cognitive Bias Modification for interpretation (**CBM-I**) and the other is the Cognitive bias Modification for attention (**CBM-A**).

The **CBM-A** is a task that measures the attention bias, a modified version of the dot-probe task [37]. In this type of task the participants visualized negative emotional stimuli and are asked about a target. For example, in the dot-probe task appears two stimuli, negative and positive, simultaneously in a screen. After that, one or two dots (target) appear in the place of one of the two previous stimuli and the participant is asked to identify them as quickly as possible. This type is the most typically used in clinical and experimental area. All abroad, it can train participants to focus their attention away from negative related stimuli. Frequently, the individuals with anxiety disorder respond quicker to a probe where was the negative stimulus than a probe where was the positive one. Consequently, the use of this task could help to diminish the high frequency towards negative stimuli and reduce attention biases.

On the other hand, **CBM-I** try to train participants to interpret ambiguous scenarios in either a negative or positive manner, in this way to produce a negative or positive bias. For instance, in one of the most used paradigm [38], it is presented ambiguous sentences where the valence (positive or negative way) is given by the last word fragment of each sentence. In general, its final objective is reducing the interpretation bias of ambiguous situations in negative way in order to for example diminishing high anxiety on the individuals. This therapy has been examined through various disorders such as depression e.g. [39,40] anxiety e.g. [40,41] eating disorders [42] addiction e.g. [43,44] or through different populations [45,46].

For example, Anxiety research has evidenced that patients with anxiety disorders or people with high anxiety show attention bias toward threat or negative stimuli and negative interpretation bias. Furthermore, it has been demonstrated an important role of cognitive biases in the onset, maintenance and relapse of anxiety disorders [47]. Brosan *et al.*, (2011) [48] used the **CBM-A** and a modified dot-probe task for measuring the attention bias, and **CBM-I** and an interpretation test based on [49] **WASP**, Word sentence association paradigm) for measuring the interpretation bias. In this task, if an individual has lower reaction times when answer to the probe in the treat position, he will display negative bias. In contrast, if he has quicker reaction times when answer to the probe in the positive position, he will display positive bias.

In the **WASP**, the results showed that the combination of **CBM-A** and **CBM-I** reduced negative attentional bias and interpretation bias in these patients. Therefore, these tasks were very useful and would be very effective as treatment of anxiety disorders or people with high anxiety. In addition, these results supported the previous studios as in attentional bias e.g. [50,51] as in

interpretation bias e.g. [52]. Furthermore, in depression disorders, which are intimately related to anxiety, the **CBM** has been widely examined [53].

In general, depression disorders has been associated with information processing bias [see review, 54] such as attentional bias [55], interpretation bias [56] and memory bias [57]. This relationship seems to be intricate in the beginning, maintenance and decline and even recover [54].

In depressive disorders, several studios have evidenced the importance of generating positive mental imagery in the effectiveness of this **CBM** (58). Based on these studios Lang *et al.* [59] conducted a studio about cognitive bias modification in using mental imagery. These authors recruited participants with a current major depressive episode who were asked to complete seven sessions of i imagery-focused **CBM-I**. The multi-component CBM-I contained **IGen-Auditory** [60], **IGen-Picture** [61] and **CBM** of appraisals [62]. Following this line, Almeida *et al.* [63] studied the effect of cognition bias modification to prevent depression. The results proved that is an effective therapy. Furthermore, the intervention was simple, economical and easy to access. Moreover, one of its great advantages is the easy access and implementation by participants that can lead to greater adherence. In general, these studies have demonstrated the efficacy, and effectiveness of it [40].

Finally, **CBM** has been also reported in research about addiction [e.g. 43]. For example, Gladwin *et al.* [64] studied cognitive bias modification in alcohol addiction. The data showed that training reversed the alcohol approach bias for all categories. Consequently, these findings would support the idea that **CBM** affects relapse probability via changes in automatic processes.

Similar results found Wiers *et al.* [65] these outcomes suggest that “**CBM** affects neural mechanisms involved in the automatic alcohol approach bias, which may be important for the clinical effectiveness of **CBM**.”

To summarize, most of the studies have shown the effectiveness of Cognitive bias modification therapy which could reach to more people in the world, has lower costs and may arrive of a fast manner. Although this therapy has been used mostly in clinical populations e. g. [52,41] it has also been used as prevention of disorders or studied in healthy populations [45].

In conclusion, based on the different studios about effectiveness of this therapy in the reducing of cognitive bias, any individual who is trained with these tasks should improve the identification, avoidance and reduction of these cognitive biases and so he would have more efficient decision making. **CBM** are tasks which could be done from our home and could help us to prevent and reduce biases which we use regularly in our decision making process.

## Cognitive Behavioral Therapy (CBT) and Family interventions (FI)

Within the therapies where the cognitive biases play an important role, it could be found the cognitive behavioral therapy (**CBT**) [7] and family interventions (**FI**) [8]. The cognitive behavioral

therapy (**CBT**) is based on stress-vulnerability models of psychosis, cognitive theory and therapy for emotional disorders. This therapy takes as its central axis the experiences of psychosis (for example, positive symptoms) and individual attempts to understand these experiences. The main objective will be to help the person to reach an understanding of psychosis that is less stressful and help the person in preventing recurrence or management of any experience unwanted and development as complete and the satisfaction of a life as possible).[66] Thoughts, beliefs and images that people experience are the core material with which therapists work. The goal of this therapy is to help patients with schizophrenia through a better understanding of their psychosis to manage better any unwanted experience; to detect a possible relapse... [66].

This approach is largely based on cognitive therapy Beck and colleagues, both in content and style. In style, the approach is collaborative and asking, with the aim of working with the individual to a new shared understanding. The content of the therapy involves identifying key beliefs and thoughts, and a review of evidence for these beliefs, values identifying biases thinking and thoughts in relation to mood and behavior. It will encourage the person with psychosis to try new ways of behaving or thinking exercises' between sessions. However, the focus of the standard cognitive therapy is modified to take into account the particular needs of people with psychosis and to adapt to the cognitive model of psychosis and stress-vulnerability framework. **CBT** for psychosis is delivered as a time-limited and structured therapy, although with considerable flexibility.

In addition, to reach to have a life as autonomous and successful as it is possible [7]. Family interventions (**FI**) therapy is to improve the family atmosphere and therefore it could reduce possible relapses [8]. In general, Garety (2003) [66] have demonstrated that Family interventions therapy is useful at reducing relapse in psychosis and that cognitive behavioral therapy (**CBT**) is effective for symptom reduction.

## **META COGNITIVE TRAINING**

Other interesting therapy is the Meta Cognitive Training (**MCT**) which is a recent group program whose objective is the reduction of these biases. There is evidence that s patients with schizophrenia have not Meta cognitive awareness due to neuropsychological dysfunctions and these cognitive biases [9].

Meta cognitive Training is a hybrid of psycho education, cognitive therapy and cognitive behavioral therapy [9,67]. This therapy contains different modules which consist of a series of slideshows converted to **PDF** to be displayed through a video projector on a white wall or screen. There are two sets of 8 modules for most language versions. Each session should not last longer than 60 minutes, because many patients have poor attentional life. As each module contains more exercises that can be achieved within this time, the instructor can choose from an extensive material and must go directly to learning. Trainers can deviate from the slides, or mix the **MCT** with alternative therapeutic techniques [68].

The eight modules have the following objectives [69,6].

- a. In the module one is about Attribution (Mono-causal inference). The purpose of this module is that the patient with schizophrenia learns to discern different causes to explain a positive or negative situation. For example, if you are not chosen for a job.
- b. The module two is focused on Jumping to conclusions bias. The patient becomes aware of the importance of this bias in their disorder.
- c. The module three called changing beliefs is about Bias against Disconfirmatory evidence. Patients learn to be cautious in their judgments, not taking them to have sufficient information and to be more flexible about other viewpoints. To work the confirmation bias, it is used the module 3 where patients are informed and explained this bias and then performance different tasks. For example, a task which consists of a series of three pictures 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.
- d. In the fourth module is worked the empathizing because facial expressions can be misleading for social decision-making and that response confidence needs to be attenuated in case of scarce evidence.
- e. In the module 5 called Memory, the patient learns about the importance of Overconfidence in their judgments and the major probability of errors, so they learn to have less confidence in their decisions. For example in this module is used the creation of false memories.
- f. In the module 6 called empathize two, the patient must centered on different social situations and its difficulty solutions. They must cautious in these situations. For example short stories are used.
- g. In the seventh module called Jumping to conclusions II, patients with schizophrenia are taught about the problems of taking decisions quickly without enough evidence. For example, in the module 7 to the patients is presented a number of paintings. Patients are asked to choose correct title from four response options. For some paintings the solution is easy, but for others it is difficult. So this therapy tries to train to realize accumulation superficial data lead to commit errors.
- h. Finally, in the module eight called Mood and self-esteem, they learn diverse techniques to improve and maintain the self-esteem. Therefore, this module influence particularly about negative symptoms associated with depression.

Met Cognitive Training (MCT) raises awareness to detect and disable cognitive traps in patients with schizophrenia [9]. According to data from Moritz *et al.*, (2010) [67] the empirical



results show the feasibility and effectiveness of this therapy. Therefore, this program would become a viable and effective complement to standard psychiatric treatment. In addition, this therapy works other field such as Meta memory problems, poor self-esteem, attribution style and deficits in theory of mind. Different studios have evidenced the efficacy of this therapy. It is found greater decline to jumping to conclusions bias [69] decrement of the conviction in the delusional belief or better memory and social relationships [70].

## CONCLUSIONS

Despite its widespread use, narcoleptic agents do not provide comprehensive treatment success in many patients with schizophrenia [71]. One third of all patients are resistant to narcoleptics [72]. Because of this, it is necessary use psychotherapy, too. The two treatments should work together, being a complement between them. In addition, several studies have demonstrated the relationship between neuropsychological deficit and, more recently, cognitive biases and these mental disorders. In general the cognitive biases which had been related to schizophrenia are jumping to conclusion bias [4] need of closure [18] overconfidence bias [19] Bias against Disconfirmatory Evidence (**BADE**) and Bias against Confirmatory Evidence (**BACE**) [6]. It is observed that these cognitive biases are implicated in the onset, maintenance and relapse of schizophrenia. As consequence, cognitive therapies which influence about these cognitive biases have been created to reduce, avoid and make aware of them in their decision making. Moreover, these therapies have demonstrated being effective and efficient when they are used [73,74]. Therefore, a change about the therapy that a patient with schizophrenia must carry out is necessary. At present, little countries have introduced these cognitive therapies in their programs of intervention. However, this change will produce a more comprehensive service. In addition, this type of therapy gives the patient a sense of control and empowerment over their symptoms. It also offers them the opportunity to understand the mistakes in their decisions, so if they make aware of these biases, they can act about them, reducing the probability of relapse and improving the probability of recovery.

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