Enhancing Efficacy and Acceptance of Cognitive Behavioral Therapy through Understanding Its Neuroscience

Cognitive behavior therapy (CBT) is an evidence-based therapy for depression and anxiety [1] and has good indication in several mental ill health conditions, applied either solo or in combination with other forms of psychotherapy or pharmacotherapy [2]. Despite having a Western origin, CBT has received global acceptance across cultures and been modified and customized by practitioners to overcome the challenges and suit local populations [3]. The efficacy of CBT is also documented through neurobiological changes in the brain [4]. But CBT may not be equally effective for all patients, and a sizeable percentage of patients do relapse in their symptoms. The efficacy of CBT might get limited due to certain factors, including lack of understanding of the underlying mechanism of CBT both on part of therapist and patient along with cultural blocks.

While CBT essentially works on correcting cognitive distortions and changing maladaptive patterns of behavior; practicing therapist might not emphasize much on the neuropsychological underlying process of CBT during the therapy process. In the present scenario when a bio-psycho-social approach is promulgated for understanding and management of mental ill health conditions, any hesitancy to delve deeper on neuropsychological underpinnings of CBT could be detrimental for the CBT outcome. It is postulated that a significant section of practicing therapists owing to different training background might not be well aware of the neuropsychological underpinnings of CBT, potentially lowering therapist's own conviction and their own outcome expectations from CBT. Literature suggests that even trained psychotherapists are hesitant at times to adapt evidence-based psychotherapy methods in their practice, owing to their own misperceptions [5], which might get further strengthened if met with poor outcome in chronic and treatment resistant cases. It is further postulated that if CBT practitioners are more aware of the neuropsychological processes and include them in simplified language in the psychoeducation session with the client, it may improve the treatment outcome of CBT manyfold.

Understanding the Neuropsychological Underpinning of CBT Helps Improve Its Outcome

The cognitive behavioral model emphasizes on the rôle of cognitive distortions, which might actually be dysregulated cognitive processes. Accordingly, CBT is focused on changing the maladaptive automatic negative thoughts that contribute to emotional difficulties, replacing them with more objective, realistic, and adaptive thoughts. For any psychotherapeutic process including CBT, its continuity depends a lot on patient's subjective perception of change in their symptoms, which might be judged incorrectly. They might look at the techniques being abstract in nature, lacking evidence, despite a noticeable change in their symptom severity. An enhanced insight about the CBT mechanism is postulated to increase the treatment outcome expectancy of patients and better compliance. Apart from symptoms reduction, treatment outcome of CBT has also been measured in coping mechanism, problem-solving, and decision-making. With advent of imaging techniques, CBT outcome has also been linked with changes in the brain at biological level, predominantly supporting a decrease in limbic activation and an increase in prefrontal activity after CBT [6]. This essentially translates into making a better balance between the logical brain and the emotional brain. Even though the human brain is a single organ, its different structures are involved in different functions in tandem.

The logical brain consists of higher order brain structures involved in planning, logic and reasoning and primarily includes the prefrontal cortex. The emotional brain primarily consists of the limbic system structures namely, amygdala, hypothalamus, and the cingulate cortex. These structures are responsible for emotional processing such as fear, anxiety as well as motivation and maintain homeostasis when functioning adequately. Human beings need to take several decisions on a daily basis. Many of the decisions have major emotional consequences, and a balance between emotional and logical brain is desired. But if the emotional brain overrides the logical brain all the time, the consequences might be very distressing. Incidentally, a significant proportion of decision-making in daily life is driven by the emotional brain. While in principle CBT helps modifying maladaptive thoughts, it technically helps increase the logical brain functioning. The logical brain muscles become stronger when the logical brain supersedes the emotional brain.

For example, a person with poor self-esteem who persistently experiences anxiety and depressive features blames himself for all his miseries and generalizes those for his family too. CBT techniques such as socratic dialog and behavioral experiment would help him take a rational look of the situation; identify his automatic thoughts stemming from his core beliefs, and the associated emotions. Thus, when the dysfunctional pattern of thoughts are recognized, skipped for a change and practiced with more adaptive thoughts, they

also get reinforced by a better emotional state and eventually the client reinforces his logical brain. This process in the patient leads to reinforcement of neural pathways that help in adaptive ways deal with stressful situations. This change manifests due to CBT primarily due to the neuroplastic nature of the brain. Neuroplasticity is a fundamental property of brain which is a key element in psychotherapy like CBT. Any change in psychological processing is reflected by changes in the structure and functions of the brain, and thus when people engage in CBT and learn new coping skills, they are literally building the neural connections that promote resilience. As people learn new habits, their new synapses will replace the connections that prompted unhealthy behaviors and cognitive distortions.

Evidence-based Studies on Cognitive Behavior Therapy and Neural Connectivity

The psychotherapy process has been recognized with evidence on its potentials to bring significant changes in an individual's thought process, emotional state, belief, and behavioral pattern leading to improved quality of life. These evidences are not only limited to conventional self-reporting measures and paper pencil-based psychological test but has moved to brain imaging studies. The earliest neuroimaging studies focusing psychotherapy are primarily based on positron emission tomography (PET) and single-photon emission tomography techniques [7], starting to emerge in the early 1990's [8-10]. The more advanced magnetic resonance imaging and functional MRI (fMRI) studies began accumulating after another decade. Due to methodological limitations, neuroimaging studies on effects of psychotherapy, particularly CBT mostly have confined into single disorder but are unanimous on their impression that CBT brings considerable and significant change in neural responsivity and connectivity in the human brain. CBT is effective in treating anxiety with evidence of decreased neural responsivity in the amygdala [11, 12], a key regulator for processing fearful stimuli.

Studies on neurobiological effects of CBT in patients with depression have gradually started to accumulate in last 15–20 years and despite a common limitation of lack of randomization and effective control in these studies, CBT is to exert its effect against depression [13]. The afore-said study lists 17 PET, fMRI, and magnetic resonance spectroscopy studies assessing changes in the brain following cognitive behavioral therapy, suggesting increased serotonin release post CBT [14], and better regulation of the hippocampus-amygdala activity [15]. Some of these studies on similar lines have suggested change in the ventromedial prefrontal cortex hypoactivity and amygdala hyper responsiveness toward normalization [16] and decrease in the left hippocampal activity [17]. Interestingly, one of these studies also suggest an increase in connectivity between the amygdala and the fronto-parietal network post CBT [18], an outcome potentially explaining the desired increase in balance between the emotional and the logical brain.

While these studies have differed slightly from each other in their protocol, like number of sessions and core techniques used; majority of them have used core techniques like cognitive restructuring, monitoring of automatic thoughts and behavioral activation, adding to their evidence base. Despite all the evidence, there might be questions whether the preliminary evidence of CBT having impact on the activity of brain regions and functional integration between regions are conclusive. To explore this Yuan et al. [19] in recent meta-analytic review analyzed studies that examined functional activation changes between pre- and post-CBT. Methodologically, sound studies filtered from the Web of Science, Cochrane Library, Scopus, and PubMed databases revealed that the altered activation in the prefrontal cortex and precuneus are the key regions related to the effects of CBT. Thus, CBT may modulate the neural circuitry of emotion regulation.

The studies are vital in establishing psychotherapy, CBT in particular, being not merely a "talk therapy," but also having neurobiological base, paving the way for a better integration of biological and psychological components of the bio-psychosocial model.

How CBT Is More Effective with Aid of Psychoeducation with Inputs on Its Neuroscience

Patients come from different background and may be apprehensive of outcome of not only CBT but any other psychotherapeutic process due to their previous orientation and reliance on pharmacological intervention only. The situation could be graver in cultures, for example, Asian, where psychotherapy including CBT is an adopted approach, and people tend to rely more on pharmacological interventions rather than "talk therapy." Interestingly for psychiatric conditions there might be a contrast and considerable hesitancy among people to take pharmacotherapy due to apprehensions of its side effects. To mitigate this psychoeducation modules are often suggested to be incorporated in CBT framework. But despite having a framework, psychoeducation models may not be having a comprehensive delivery limiting its efficacy.

Therapists usually explain the patients regarding the sign and symptoms of their illness condition, the possible etiological perspectives, maintaining factors, and the desired course of action through psychotherapeutic framework. The authors suggest that these psychoeducation sessions in the CBT process may include simplified but specific content explaining the neurobiological changes in the human brain due to CBT that are similar to pharmacological interventions. Actual imaging technique might be outrageous to suggest but printed graphic literature can aid in the process to enhance patient's acceptance of the therapy process as well as outcome. This could be particularly helpful in populations which predominantly have had a reliance on pharmacological interventions for all clinical conditions including psychological ones. While CBT in combination of pharmacotherapy is widely known to have better efficacy than CBT or pharmacotherapy alone;

therapists must assess the individual therapeutic needs of the patient and accordingly customize the therapy plan. CBT enriched with neuroscience informed techniques, well placed in psychoeducation module will have a better acceptance with the patients leading to the better prognosis.

Limitations in Delivery

Despite all efforts, certain limitations will always be there. A good proportion of clients undergoing CBT may fail to generalize the insights gained in larger perspective and tend to relapse when confronted with complex stressful situations in future coming back for consultation. It is speculated that these patients might be lacking in their problem-solving capabilities, a prefrontal activity which also need to be intervened as long-term therapy goal. Pretermination assessment of symptoms to check treatment outcome may not be practiced by all therapists but is strongly recommended to add the validity of the treatment plan.

Conclusion

Understanding the neurobiological basis of CBT would help in its better acceptance among both patients and practicing therapists, eventually leading to better outcome. Inclusion of customized psychoeducation sessions focusing on the mechanism of CBT at start of sessions is suggested. As CBT is being practiced by a large number of therapists with different training background, an understanding of the neurobiology of CBT will also promote uniformity in its practice as well as research. The desired optimum balance between the logical and the emotional brain through CBT cannot be achieved being oblivious to functioning of the logical brain.

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Conflicts of Interest

The authors declare no conflicts of interest in writing this editorial.

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