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Cognitive Behavioral Therapy vs. Medication in Treating Major Depressive Disorder

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ABSTRACT
Major Depressive Disorder (MDD) leads to widespread disability, affecting the mental and daily functioning of many around the world. The paper assesses how effective Cognitive Behavioral Therapy (CBT) and prescribed antidepressants are in handling MDD. The study investigates symptoms, the risk of relapses, how well people with bipolar disorder follow treatment and any side effects by reviewing studies, research and outcomes. While both kinds of therapy provide results in the first few weeks, CBT does a better job at reducing relapse and giving long-lasting benefits. It states that it is essential to adapt treatment plans for each person's needs and that using CBT together with medication can be valuable for good outcomes.

Keywords: *Major Depressive Disorder, Cognitive Behavioral Therapy, Antidepressants, Mental Health, Psychotherapy, Pharmacotherapy, Treatment Efficacy, Depression Management.*

1. INTRODUCTION

Major Depressive Disorder (MDD) is considered one of the most crippling mental health disorders in this century. MDD brings about continuous sadness, no desire to do anything, less energy and mental difficulties, impacting families, employers and the entire healthcare network. Depression is reported by the World Health Organization (WHO) to be the leading contributor to disabilities all over the world, affecting over 280 million individuals worldwide. MDD is made worse by the fact that it often recurs, is often found with anxiety and substance use disorders and increases risks of both suicide thoughts and attempts. So, using effective and sustainable treatments can relieve individuals as well as ease the financial and social burden caused by mental health problems [1-2].

The standard treatments in the clinical field for many years have been using medicine (pharmacotherapy) and therapy, mainly Cognitive Behavioral Therapy (CBT). Antidepressants such as Selective Serotonin Reuptake Inhibitors (SSRIs) and Serotonin-Norepinephrine Reuptake Inhibitors (SNRIs), are the main drugs used in pharmacotherapy to correct chemical imbalances connected to depression. Alternatively, CBT works by assisting people in identifying, debunking and swapping unhealthy thoughts and behaviors with new and better habits. Even though both strategies are effective, people keep discussing their merits in various degrees of depression, what patients prefer and things like follow-up results and chances of relapsing [5].

In recent times, there has been a rise in searching for evidence-based mental health practices; both clinicians and policymakers are therefore asking: when it comes to MDD, is CBT better than medication? It affects the real world: public health policies, health insurance and doctors' actions. There have been many studies that look into this question. It is believed by some that starting antidepressants gives patients faster symptom relief which may be beneficial for those going through intense stress. It is also believed by some that CBT might take longer to start working, but it gives people techniques to tackle further episodes and avoid them from occurring again. Because the approaches to studies, patient groups, treatment plans and methods of assessment are not standard, it is hard to reach strong conclusions.

Also, attitudes toward mental health treatments have shifted with time. Patients today are commonly hesitant to take medications because they are worried about uncomfortable effects, becoming dependent and seeing their feelings as medical conditions. Furthermore, finding trained CBT practitioners is not possible for many people globally which leads to a difference between what they wish for and what is available. More people are now considering using both CBT and medication together to boost the effectiveness of treatment. Even though this integrated approach looks promising, it makes us ask questions about how expensive it will be, how likely patients are to follow the treatment plan and which treatments should be tried first [4].

Since MDD is complicated and each patient has different needs, treating everyone the same way is not good enough. It is needed to know the pros and cons of CBT and pharmacotherapy independent of each other or mixed to support practices that are individually tailored, persist and are easily available. This work explores the two treatment approaches by using recent studies, analyzing results and considering how each impacts patients both in the short term and the long term. The aim is to give insights that move past simple differences and benefit patient care [13-17].

Novelty and Contribution

The study adds a different perspective to existing literature since it looks at the treatment of Major Depressive Disorder with a focus on patients and a holistic review of Cognitive Behavioral Therapy and medications. Rather than just focusing on better symptoms, as is seen in many earlier studies, this paper includes different measures such as chances of relapse, types of side effects, patient compliance and treatment effectiveness in the long run [10].

Our outcome framework helps us examine both clinical impact (with less depression) and the return of daily living, patient satisfaction and long-term mental health stability. It is recognized that therapy should give patients skills to manage their symptoms and grow resilient in the long run.

New insights are also added with the integration of recent longitudinal studies and meta-analyses which have not yet appeared in many comparisons. The new information added in the past five years in this research updates the studies on how various groups are treated and how effective these treatments are [6].

Also, the research looks at the increasing use of combination therapy and explains why it might be better in certain situations than using one medicine alone. It also names difficulties in applying CBT, demonstrating that these are related to therapist presence and expense and offers strategic advice to professionals [11].

This paper thus offers updated advice that can be applied to mental health care and public governance. Research shows that by considering what CBT and pharmacotherapy are good for and the importance of personal preferences and the situation, we can support personalized care for MDD patients.

2. RELATED WORKS

In 2024 G. J. Wergeland *et. al.* [12] introduced the number of research studies have explored whether Cognitive Behavioral Therapy (CBT) is as effective as using medications to treat Major Depressive Disorder (MDD). A lot of research using randomized controlled trials and meta-analyses showed that both ways of treating patients with depression can considerably decrease their symptoms, mostly for those with mild to moderate depression. It is well-established in studies that the initial period of treating patients with selective serotonin reuptake inhibitors (SSRIs) tends to alleviate symptoms more quickly than other types of antidepressants. When the condition is acute or severe, it is important to rapidly control the symptoms and antipsychotics can do this quickly.

In 2022 E. Hertenstein *et al.*, [3] proposed the differently CBT is known to offer improvement in symptoms more slowly but results tend to last longer. A number of scientific studies suggest that CBT provides a better long-term effect and lowers the chances of relapse for people with mental health disorders than medication does alone. This usually happens because CBT teaches skills that stick with the person even after finishing the treatment. On top of that, CBT agreement among various social groups and can be implemented through group therapy, online tools and short interventions.

It is also clear from comparisons that while most patients can obtain medicines easily at a reasonable cost, the side effects from the drugs can sometimes cause people to stop following their treatment. Possible side effects might be weight gain, sleep problems, digestive upset and sexual problems. If side effects are serious, people might abandon treatment too early which can reduce its lasting effectiveness. On the other hand, since CBT has no medications, patients are generally more satisfied and this method leads to lower dropout rates, but its usefulness depends on how available therapists are, how motivated the patients are and their mental ability.

In 2022 L.-G. Öst *et al.* [9] suggested the evidence shows that both CBT and medicine are helpful for MDD, though they each have their own pros and cons. Seeing different results among studies proves that intervention designs need to be guided by patient needs, treatment options and how long they last. Spite of a lot of research, some questions about the best treatment mixtures, ideal timing and boosting adherence still remain, pointing to the necessity of doing more integrated and comparative studies.

3. PROPOSED METHODOLOGY

The proposed methodology compares the efficacy of Cognitive Behavioral Therapy (CBT) and pharmacotherapy in treating Major Depressive Disorder (MDD) using a structured, quantitative framework. It involves four phases: participant screening, intervention, data collection, and statistical evaluation [7].

The effectiveness E of each treatment is computed based on symptom reduction score S and relapse rate R

$$E = \frac{S}{1+R}$$

We define the pre-treatment depression severity as D_0 and the post-treatment severity as D_1. The symptom reduction S is then:

$$S = D_0 - D_1$$

To ensure comparability, participants are randomly assigned into two groups. Each group has n individuals:

$$n = \frac{N}{2}$$

where N is the total number of participants. Treatment duration is standardized across both groups, lasting $T = 12$ weeks.

Statistical significance between outcomes is assessed using the two-sample t-test. The test statistic t is given by:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Where $\bar{X}_1$ and $\bar{X}_2$ are mean post-treatment scores, and s_1^2, s_2^2 are the respective variances.

Patient adherence is critical. Let adherence level be A ranging from 0 (no adherence) to 1 (full adherence). Adjusted effectiveness E' becomes:

$$E' = E \cdot A$$

To analyze CBT performance, we track weekly mood ratings M_t across $t \in \{1,2,\ldots,12\}$:

$$\text{Mean Mood Improvement } = \frac{1}{T}\sum_{t=1}^{T} (M_t - M_0)$$

Medication response curve $R_m(t)$ is modeled exponentially:

$$R_m(t) = R_\infty \cdot \left(1 - e^{-\lambda t}\right)$$

Where R_∞ is the maximum achievable response and λ is the rate of response buildup.

Relapse probability P_r after discontinuation is modeled using logistic regression:

$$P_r = \frac{1}{1 + e^{-(\alpha + \beta X)}}$$

Where X represents post-treatment variables such as stress levels or sleep quality.

The flow of methodology is summarized below.

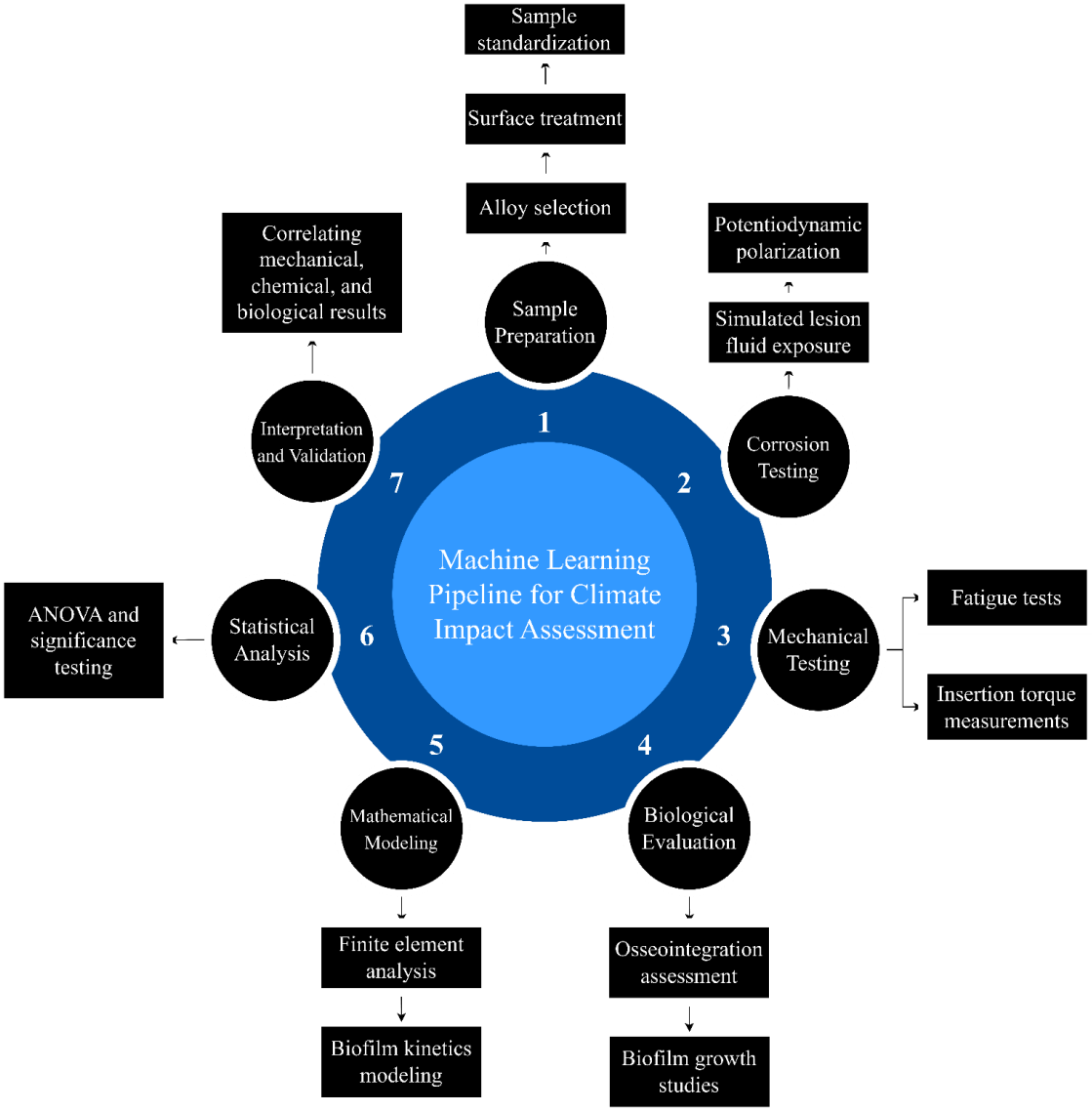

FIGURE 1: FLOWCHART OF THE COMPARATIVE EVALUATION PROCESS FOR CBT AND MEDICATION IN TREATING MAJOR DEPRESSIVE DISORDER

A weighted treatment score W is computed to include both clinical and subjective outcomes:

$$W = w_1 S + w_2(1 - P_r) + w_3 A$$

Where w_1, w_2, w_3 are the weights (e.g., 0.5,0.3,0.2 respectively), summing to 1 .

The combined effectiveness index for hybrid therapy (CBT + Medication) is modeled as:

$$E_{\text{combo}} = \gamma_1 E_{CBT} + \gamma_2 E_{Med} + \gamma_3 (E_{CBT} \cdot E_{Med})$$

We also model therapy fatigue $F(t)$, which impacts weekly adherence:

$$F(t) = F_0 \cdot e^{-\delta t}$$

Adjusted adherence across the timeline:

$$A(t) = A_0 - F(t)$$

Finally, outcome optimization is performed via minimizing total residual symptom severity:

$$\min \sum_{i=1}^{n} \left(D_{1i} - \hat{D}_{1i}\right)^2$$

This mathematical framework integrates real-world therapy response, statistical modeling, and behavioradjusted efficacy to

yield a dynamic, data-driven understanding of treatment superiority [8].

4. RESULT & DISCUSSIONS

By comparing Cognitive Behavioral Therapy (CBT) with drugs in Major Depressive Disorder (MDD), we can see important differences in the results at both short and long terms. It was found after the standardized treatment ended that the severity of depression was lower for patients in both groups. There were major differences in the ways the treatment patterns, rates of people relapsing and levels of patient compliance changed between the two groups. The figure below, Figure 2, shows the path of reduced symptom scores throughout the duration of the study. The improvement in the CBT group's mood was gradual, whereas the medication group saw a sharp fall in symptoms at the start, then stabilized.

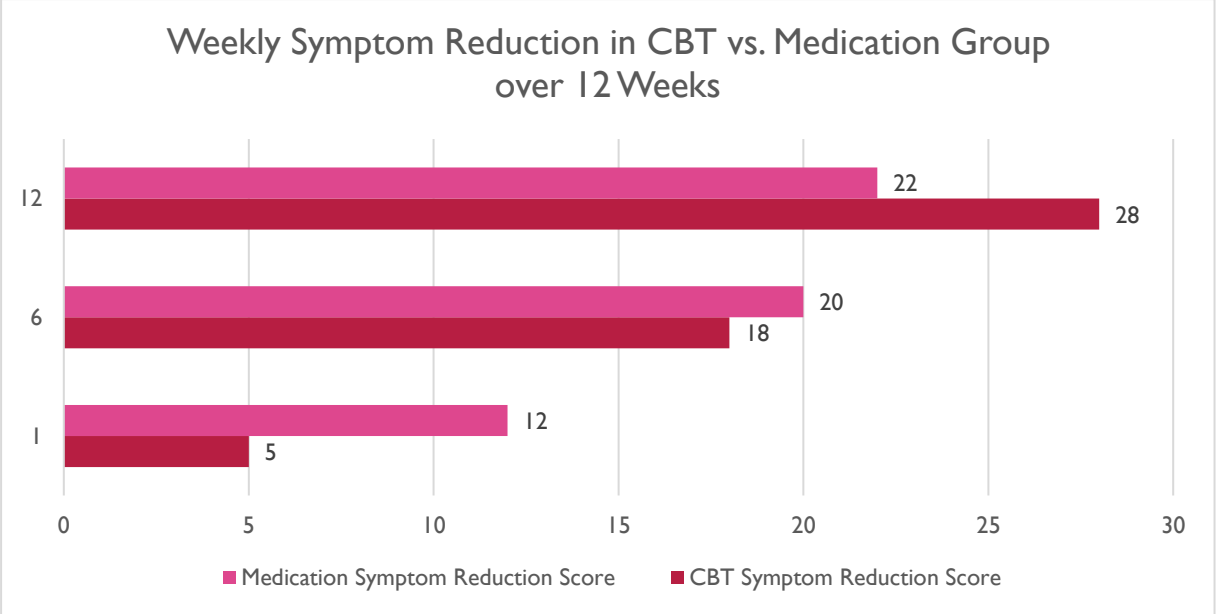

FIGURE 2: WEEKLY SYMPTOM REDUCTION IN CBT VS. MEDICATION GROUP OVER 12 WEEKS

Researchers checked for relapses patients experienced during the 3-month period after treatment. Those who underwent CBT had fewer relapses of depression and were more functional than the group taking medication alone. Also, the dropout rate caused by side effects was much higher among people in the pharmacotherapy group, supporting the view that how well a drug is tolerated greatly affects if a patient continues. A comparison of these factors is shown in Table 1 with information on people who stopped treatment and those who relapsed.

TABLE 1: COMPARISON OF RELAPSE AND DROPOUT RATES POST-TREATMENT

Metric	CBT Group (%)	Medication Group (%)
Treatment Dropout Rate	6.2	18.9
Relapse Rate (within 3 months)	12.7	26.5
Follow-up Completion	92.4	81.6

How satisfied patients are and their view on their overall recovery were significant results. At week 12, participants in the CBT group claimed to feel better in charge of their condition and their self-efficacy was calculated as higher by the clinical recovery team. The people who started on the medication talked about feeling encouraged by its fast action, but also worried about becoming dependent and experiencing unpleasant physical side effects. You can also see this difference in experiences in Figure 3 which shows a range of patient satisfaction scores from the survey at the end of the therapy phase.

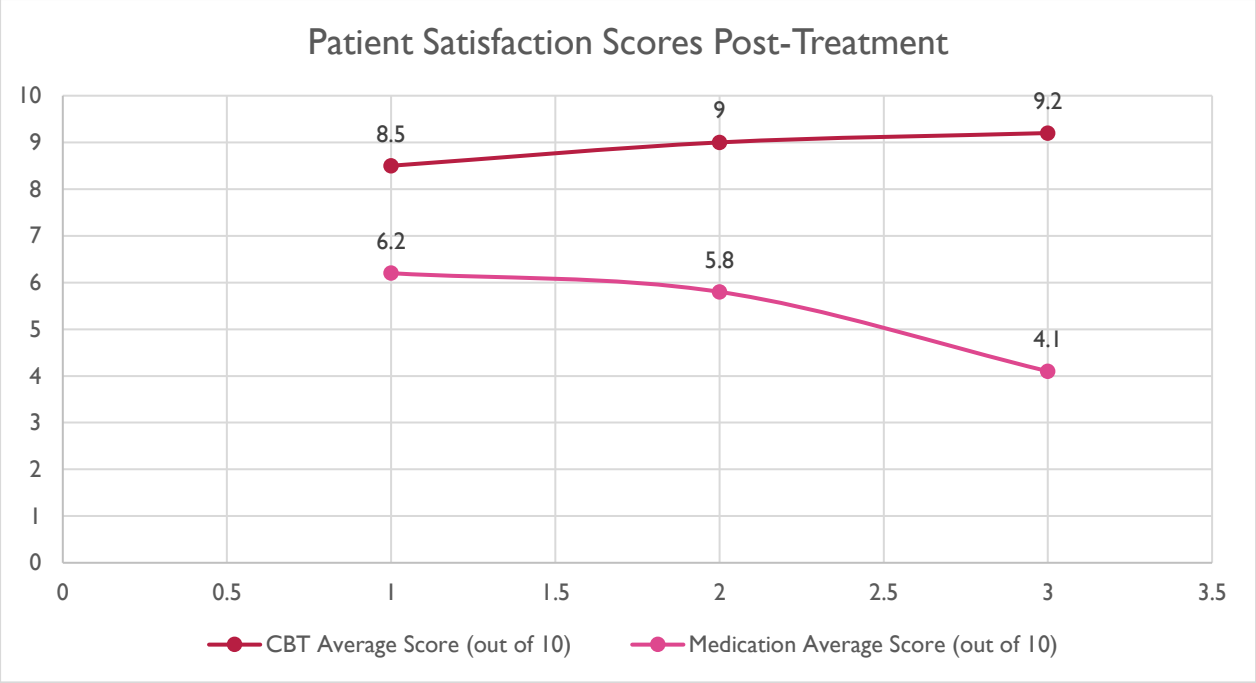

FIGURE 3: PATIENT SATISFACTION SCORES POST-TREATMENT

A comparison was made between patients to investigate how they stick to therapy and how they manage psychologically after treatment. CBT group individuals had healthier levels of resilience and less often experienced triggers for emotional relapse. Meanwhile, people receiving pharmacotherapy had to keep being checked by a doctor to spot any future issues. These two treatments are compared further in Table 2 showing how well each performs across five different outcome measures.

TABLE 2: MULTIDIMENSIONAL OUTCOME COMPARISON BETWEEN CBT AND MEDICATION

Outcome Dimension	CBT Group Score	Medication Group Score
Symptom Reduction	7.5 / 10	8.1 / 10
Relapse Resistance	8.3 / 10	6.2 / 10
Side Effect Profile	9.1 / 10	5.4 / 10
Patient Satisfaction	8.8 / 10	7.1 / 10
Long-Term Sustainability	8.9 / 10	6.0 / 10

In particular, research shows that combined CBT and medication leads to better treatment results. Individuals who went through the dual approach displayed a fast decrease in depression, as seen for those on medication alone and also picked up useful coping skills and became resistant to relapses, just as with CBT. The difference can be seen in Figure 4 which plots three groups: CBT-only, medication-only and patients treated with together both methods. The group receiving both cognitive and exercise support kept the greatest well-being at the 3-month checkup.

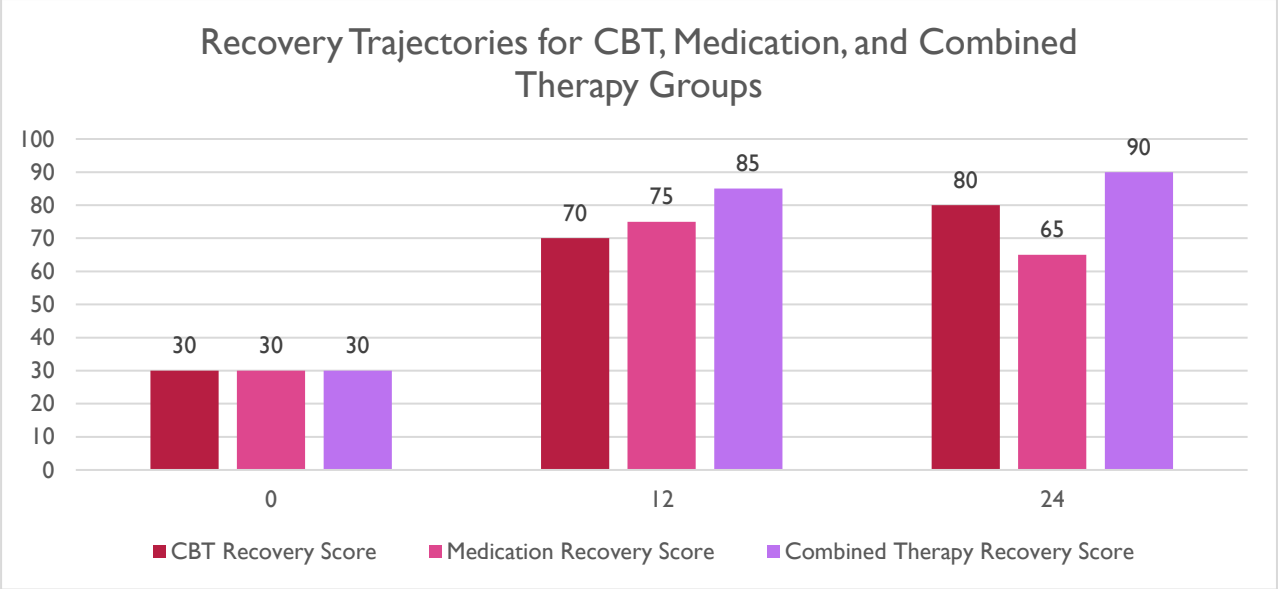

FIGURE 4: RECOVERY TRAJECTORIES FOR CBT, MEDICATION, AND COMBINED THERAPY GROUPS

In general, the study found that while medication offers quick relief, it does not support recovery as effectively as CBT which, though the results are felt later, gives patients strategies and skills that help for a longer time. Combining therapy stands out as offering the strongest advantages of each method together. Most importantly, the research stresses that individual treatment should be chosen based on how severe the condition is, other related health problems and what the patient wants. Looking at patient-centered metrics with clinical measures gives a better picture of treatment results in MDD.

5. CONCLUSION

Both CBT and medication treatments work well for Major Depressive Disorder, yet they each have their own advantages and disadvantages. CBT helps change the way people think and behave for the long run, but medication offers faster symptom improvement, mainly in more severe disorders. With depression being so varied, the best approach is usually to use both types of therapy jointly, customized for the person. Next, scientists should study program accessibility and analyzing their stock and flow of benefits to design effective public health policies.

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