

**Responses to Cognitive Behavioral Therapy and Supportive
Psychotherapy in Depressed Individuals with Traumatic Brain Injury**

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I. INTRODUCTION

Traumatic Brain Injury

A Traumatic Brain Injury, or TBI, is caused by a blow or jolt to the head, which causes trauma to the brain. The severity of a TBI varies from mild to moderate to severe (Dawodu, 2005). A TBI can be caused by a closed head injury, where the cerebral hemispheres (usually frontal and temporal) collide with the skull, or a penetrating head injury, when a foreign object pierces the skull, penetrating and damaging the brain (Morales, 2005). Closed head injuries can also include rotational injuries, which result in sheared nerve fibers (Morales, 2005). There are many common problems that can result from a TBI including behavioral/personality changes, cognitive deficits, mood disorders, and other neurological problems. Physical symptoms may also arise including chronic pain, seizures, headaches, fatigue, menstrual cycle changes and other problems with the individual's physical state (Dawodu, 2005).

Traumatic Brain Injuries are a major public health problem in the United States. Each year in the United States alone, there are a reported 1.5 million cases of people who sustain a TBI (Langlois, 2006). Approximately 270,000 individuals sustain a moderate–severe TBI. There are 50,000 deaths resulting from TBI's, which account for one third of all injury deaths. Approximately 230,000 individuals who sustain a TBI are hospitalized and survive. Of those individual, approximately 80,000 develop significant disabilities, which change their lives. These documented injuries underestimate the scale of the problem as many people who sustain these injuries may not go to a hospital and have the injury recorded (Langlois, 2006).

There are many ways to sustain a TBI. The leading cause (28%) is falls which are connected with another high-risk population, the elderly (age 65 and older). Motor vehicle accidents are the second leading cause of the TBI, and are responsible for twenty percent of all TBI's. The highest at risk population is between the ages of 15-24. The reason for this is that this age category represents the largest majority involved in automobile accidents. Children between the ages of 0-4 also represent a large percentage of TBI (Langlois, 2006).

In another recent study, the age group from 0-4 was concluded to be the largest group to sustain a Traumatic Brain Injury (CDC, 2002). The highest death related cause of this is assault, which is leading cause of TBI (Dawodu, 2005). Over half of all traumatic brain injuries involve alcohol (Dawodu, 2005).

This issue is becoming more prevalent with the current ongoing war in Iraq. The veteran's hospitals are becoming overloaded with soldiers who have sustained these brain injuries. According to Lux in 2005, there have been 437 cases of TBI among the wounded soldiers in the Army Hospital. Since the diagnosis and rehabilitation of a TBI is a fairly new field, the Veterans Hospitals are having trouble going about treating the many facets of this injury, including, but not limited to depression.

Less severe TBI's are using common and make up seventy five percent of all traumatic brain injuries. Common symptoms associated with less severe TBIs include headaches, confusion, vision problems, fatigue, sleeping problems, mood changes and memory difficulties, and other difficulties include cognitive problems as well (Dawodu, 2005). These cognitive issues effect awareness, reasoning, problem solving, planning, attention problems, mental processing short-term memory, learning and organizational and social skills. Individuals who sustain more

severe TBI's reveal personality changes, seizures, slurred speech and other neurological manor deficits (NINDS, 2006). The major post TBI problems that accompany these symptoms include cognitive disorders, amnesia, memory deficits, headaches, social problems, mood swings, and in particular anxiety and depression (Dawudo, 2005).

Traumatic Brian Injury's are typically closed head injuries from automobile accidents and the trauma is usually to the frontal and temporal lobes. Many individuals with TBI's can recover, yet 5.3 million people in the United States currently live with disabilities sustained from the TBI. About fifteen percent of people with mild TBI's experience post TBI problems for over one year. One of the most significant post TBI problems is Post TBI depression. Depression is most common among all the manifestations of the injury (CDC, 2002).

Depression and Psychotherapeutic Treatment

Depression is a state of sadness that has developed and advanced to the point where the person is abnormally and constantly sad and/or losses interest in activities that were previously of interest to her or him (Lutz 1999). Major Depressive Disorder or MDD is a severe type of depression that affects from 30-60 percent of the individuals who suffer with a TBI in their first year after sustaining the injury. Studies have revealed that a TBI has a direct connection to major depressive disorder (Bland, 1997). This connection can be explained by either an existing pre-morbid depressive disorder or damage to the parts of the brain that control emotion or a response to the stresses of living with a TBI related disability.

Depression can be treated pharmaceutically or by psychotherapy. One of the leading psychotherapies for depression is cognitive behavioral therapy, or CBT (NINDS). This type of

treatment helps the depressed individual cope with his or her problems. The prominent idea behind CBT is that individuals cognitions or the way they think about something effects their emotional state. Therefore negative, irrational thoughts lead to distress and depression. Moreover, changing depressed persons thoughts from negative, inaccurate and maladaptive to positive accurate and constructive will change the person's mood and help them out of the depression.

Another successful treatment for depression is supportive psychotherapy. This type of treatment provides a patient with a nonjudgmental environment by offering advice, attention and empathy. This psychotherapy is aimed at bolstering the patient's psychological defense mechanisms and giving the depressed individual reassurance and support. This can provide the person with defenses that can help when entering an emotional crisis. This type of treatment is rapidly becoming a top type of psychotherapy in the United States (Rockland, 1993).

Supportive Psychotherapy and Cognitive Behavioral Therapy are both successful treatments and have been proven through multiple reliability studies. Cognitive Behavioral Therapy has been proven successful through clinical studies utilizing double blind randomized controlled trials (Revicki, et al 2005) and systematic reviews with Meta-Analyses (Haby, Kopta, Krause and Orlinsky, 1986). For depressed individuals, the validity of the success in psychotherapeutic treatment for post-TBI depression however has yet to be established. Supportive psychotherapy is another proven treatment that has been used for personality disorders and depression and cognitive deficits. Studies by Perry et al (1999) have revealed the effectiveness of supportive psychotherapy.

A TBI can create complications that interfere with the person's recovery from depression. Therefore, the patient's progress may fluctuate throughout the course of treatment. These complications could include a new sleeping problem or memory problem, which results in forgetting to attend a psychotherapy session. Using this information, the recovery patterns for depressed individuals with a TBI should be different than those for individuals without this type of injury. In theory, the individuals with TBIs may be likely to have a less successful recovery due to the adverse effects of the injury.

Recovery

The recovery pattern of the depressed individual is an unpredictable process. The studies conducted by Lutz I (1999) showed as depicted in Fig. 1 showed a smooth recovery curve, while the recovery curve, shown in Fig 2, had a substantial fault in the recovery pattern. In the second figure, the patient's percentile ranking decreased between the second and the eighth session, yet the individual was able to make a significant recovery within the next six sessions (Lutz, 1999). The expected course of recovery was determined by a logarithmic formula based on the severity of the individuals' depressive condition prior to any psychotherapy, expected treatment efficacy and the therapists' ratings of intake symptoms and functioning. The line graphs in these studies have a normal boundary and a failure boundary to indicate the levels of a normal mental state and a state of dangerous depression (Lutz, 1999). In this study a specific patient went through the treatment and surpassed the predicted response based on the HLM model. At each assessment (sessions 5, 9, 17, and 25) the patients overall status improved. These results were consistent with the majority of the depressed individuals. Fifty percent of the patient sample showed reliable improvements. By session 6, 60% of the patient sample improved, by session 10, 69%

improved and by session 26, 74% improved (Lutz, 1999). These patterns were similar to recovery curves in the studies directed by Howard (1986). These recovery patterns reveal consistent improvement among the depressed individuals using psychotherapy.

A study by Mathias and Coats (1999) showed the emotional and cognitive functioning of a group of mild TBI patients and controls. The findings of this study drew significant conclusions and despite the fact that the difference in cognitive function theory was not conclusive, the higher levels of depression were found in the TBI group than in the control group. This finding solidified the already known fact that there is a direct correlation between Traumatic Brain Injuries and depression. This correlation between TBI and depression was analyzed further in the Kreutzer study (Kreutzer, 2001). This study revealed that 42% of a group of 722 individuals with Traumatic Brain Injuries were suffering from major Depressive Disorder (Kreutzer, 2001). Dikmen et al. conducted a study primarily based upon post injury time intervals. The evaluations were at one, six and twelve month intervals during a 3-5 year period with 283 subjects. Depression was concluded to be related not to injury severity but more to social variables such as unemployment, and alcohol history, and demographics such as low high school education (Dikmen 2004). Hibbard conducted a study of 188 to analyze the progress of the subjects at an average of 2.5-year post injury and a 12-month follow up. Four depression groups were established. 48% had no depression, 29% had resolved depression and ten percent had late depression. This was defined as individuals who were not depressed initially, but developed depression by the second depression assessment, 19% had chronic depression (Hibbard, 2004). Psychosocial function was found to be directly correlated with the extent of the depression. As the resolved depression group began to improve over time the late onset group became more depressed and entrenched in their psychological state (Hibbard, 2004). These

studies are conclusive evidence that the field needs further research into the treatment of depression after a TBI.

II. HYPOTHESIS

Cognitive Behavioral Therapy is a more effective treatment than Supportive Psychotherapy in the recovery from Post-TBI Depression.

(Let A = Cognitive Behavioral Therapy and B = Supportive Psychotherapy)

(Let d = Depression and a = Anxiety)

(Let D = Difference and AC = Average Change)

$X_a - D_d: A > B$ (The difference between the depression score for the first therapy session and the last therapy session; the difference is greater for CBT than SPT)

$X_b - D_a: A > B$ (The difference between the anxiety score for the first therapy session and the last therapy session; the difference is greater for CBT than SPT)

$Y_a - AC_d: A < B$ (The average change in the depression scale results between individual sessions; the average change is greater for SPT than CBT)

$Y_b - AC_a: A < B$ (The average change in the anxiety scale results between individual sessions; the average change is greater for SPT than CBT)

X_0 = the null hypothesis: ($A \leq B$ for both X_b and X_a) and ($A \geq B$ for both Y_a and Y_b)

The difference between the first therapy session and the last therapy session will be calculated by averaging the primary scores and the end scores of the Visual Analogue Scale (VAS). After comparing the differences, it will be possible to compare between the psychotherapies and determine which was more effective for the recovery of depression. This will be conducted for both the anxiety and depression results of the psychotherapies. According to my hypothesis, the Cognitive Behavioral Therapy will be a more effective treatment and thus the difference between the results will be greater than the Supportive Psychotherapy's results.

Also, the average change between sessions will allow for the analysis of which therapy had a smoother, more gradual decrease of depression. This addresses the erratic and unpredictable behavior of the recovery curves due to faults in the psychotherapy. Erratic behavior in the recovery curves pertains to sudden bouts of depression that shows up as instantaneous peaks on the recovery curves. A trend in these peaks is a sign of faults and ineffective techniques in the therapy and thus the psychotherapy with the least peaks is the more efficient treatment.

According to my hypothesis, the Cognitive Behavioral Therapy should have less instantaneous bouts of depression and/or anxiety and thus should be considered the more effective treatment.

The recovery of post TBI depression using Cognitive Behavioral Therapy or CBT and Supportive Therapy, or SPT will determine the effectiveness of both treatments compared to be research literature from past studies of non-TBI depression recovery. This comparison will show whether the recovery results of the individuals with traumatic brain injuries and the recovery results from the research literature (those with out TBIs) are consistent. Along with showing the recovery results, the study will analyze the significance of a TBI. The TBI will most likely be a negative factor which many hinder the effectiveness of the recovery. Another aspect of the study is the comparison of the two different psychotherapy treatments. The recovery curves from supportive psychotherapy and cognitive behavioral therapy will be compared to distinguish the differences between the two types of treatments.

III. METHODS

Criteria

Each participant in the RTC 1 study; CBT vs. SPT, will go through a screening, in order to determine the severity and/or presence of Major Depressive Disorder. The main screening test is a STAI-Screener which is an extensive survey that evaluates the individuals' depression, severity of the injury and other aspects. The criterion for the study is a high baseline score on this screener which deems the individuals morbidly depressed and recommended for treatment. The score on the STAI-Screener, the scores on the depression scales and the severity of the TBI are all the deciding factors whether the individual will be admitted into the study or rejected.

Procedure

My study consists of data from 11 depressed individuals (N=11) with TBI. Each was given either Cognitive Behavioral Therapy or Supportive Psychotherapy to alleviate their depression which is a result of the TBI. The individuals were assigned to a treatment through a random, double-blind clinical trial, which ensures a non-bias organization of the individuals. The therapy consists of 16 sessions of therapeutic treatments including scales taken at either every session or at intervals in the course of therapy. Each session is approximately 45 minutes long and is conducted by the same therapist throughout the therapy trial. Different therapists are assigned psychotherapy and conduct the same psychotherapy in order to keep the study organized. The scale which determines depression and anxiety (Visual Analogue Scale) was used to collect

data as the study proceeded and organized the change of the depressed individuals' mental health index (depression levels) throughout the 16-session trial period.

Scales

The Visual Analogue Scale was distributed at each session and allowed the study to achieve a data set which is a recovery curve that follows through each session. The scale is a measurement of both the anxiety levels and depression levels before and after the psychotherapy treatment. The scale which creates the recovery curves for my project is solely based off results from the Visual Analogue Scale. This is a measurement instrument that measures the depression and anxiety that ranges across a continuum of values (Wewers et al. 1990). The Beck Depression Inventory, or BDI, was given out at the beginning, middle and end of the therapy (sessions 1, 9, 16) in order to determine the overall change of the individuals' state of depression. The BDI is a 21-question self-report inventory which studies the individuals' negative thoughts and emotions. It has been clinically proven to unveil the emotions and depression levels of psychologically troubled individuals (Steer, 1999). This test will not be presented in the study but will be a reference for the depression trends of the individuals' recovery. Both these scales are effective ways to measure the anxiety and depression levels of the depressed individuals'.

IV. RESULTS

Figure 1: Recovery Curves for Depressed Individuals with TBI using Supportive Psychotherapy in a 16-session trial period (n=6) Note: Erratic behavior of the recovery curves as the depression levels spike at unpredictable times.

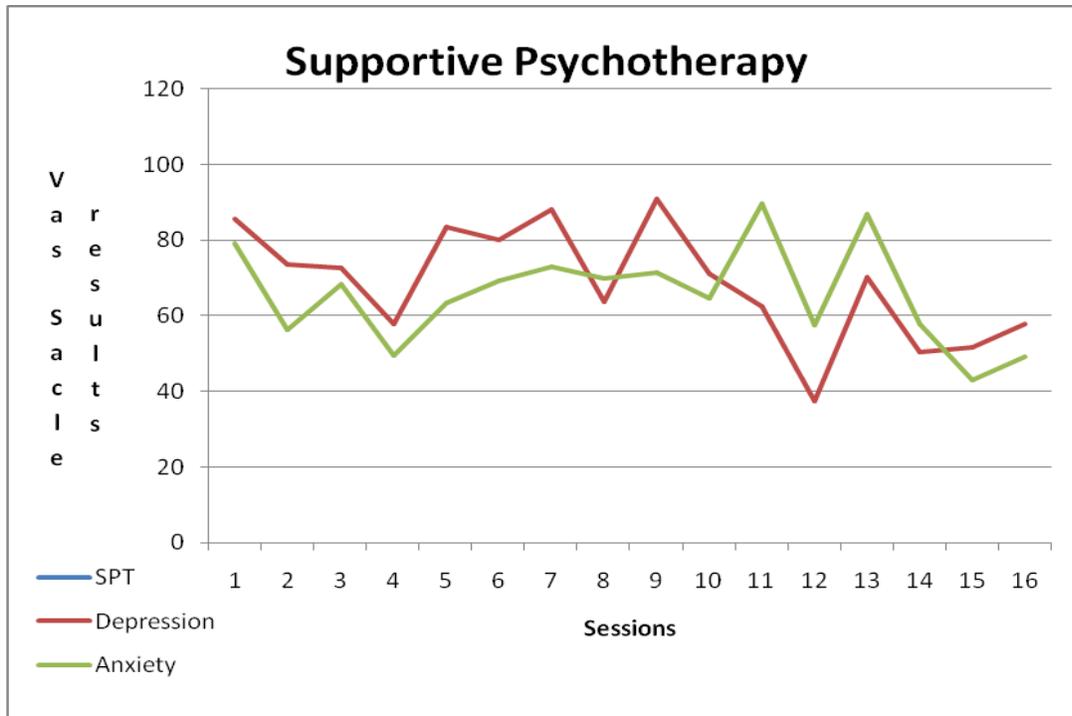
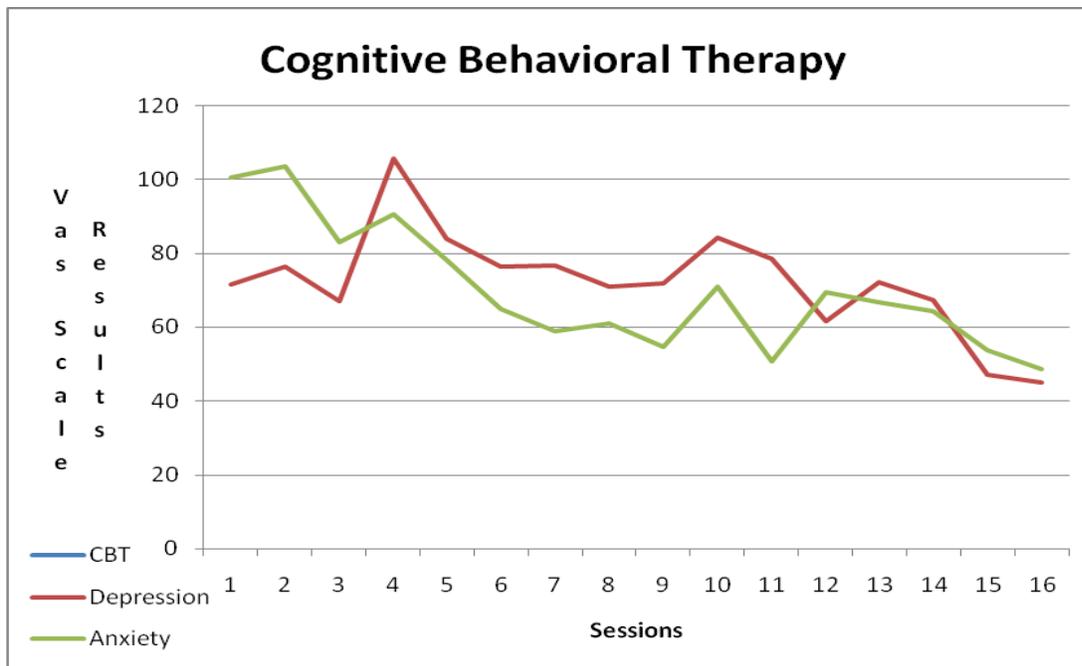


Figure 2: Recovery Curves for Depressed Individuals with TBI using Cognitive Behavioral Therapy in a 16-session trial period (n=5) Note: The gradual decrease in depression levels and less erratic behavior depicted by the recovery curves.



According to Figure 1, the psychotherapy recovery curves are decreasing from session 1 to session 4. Yet, directly after session 4, the first erratic peak occurs as the depression increases dramatically. At session 7, the depression levels have risen to the patients' original depression status yet they do decrease shortly after. Unfortunately, after this immediate decrease, there is another unpredictable bout of depression and thus the recover curve returns to the level of high depression. After these setbacks of irregularity, the recovery curves does decrease dramatically within the next few sessions. Despite another spike in depression, the final 7 sessions due show an overall declination in depression.

In Figure 1, the average change between sessions, for depression, is 14.8 points, on the Vas, while change between sessions for anxiety are 14.87. Also, according to Figure 1, the baseline depression score is 85.6 and the end score is 57.9, making the overall improvement 27.7 points. Anxiety has relatively the same overall improvement score (29.8), considering the baseline score is 79.1 and the end score is 49.3.

According to Figure 2, the depression peaks by the 4th session, yet the beginning of the psychotherapy in many cases should not be subjected to in-depth analysis. All of the patients in the study have been diagnosed with MDD and thus they should have very high scores on the Vas, a relatively low score at the first session is usually either a results of a positive initial effect to the therapy or an optimistic view of a new beginning which may show a misleading baseline score. After session 4, there is a steady, gradual declination throughout the sessions. At no point in time is there a serious or significant peak or dramatic increase in depression. This gradual decrease occurred for approximately 12 sessions and the Vas score fell about 60 points. This

decrease is a prime example of a successful recovery curve because the lack of unpredictable activity and its trend to follow a steady negatively-sloped trend line.

In Figure 2, the CBT baseline score on the Vas for depression was a 71.6, yet the baseline could have been considered 105.75 (session 4) because this was an immediate peak in depression after the baseline. Hypothetically, if this score is considered to be the baseline the total change is 60.75 because the end score is 45, yet the results show the true total change is 26.6. The total change in the anxiety score is 51.97 because the initial score is 100.6 while the end score is 48.63. The average change, for this psychotherapy, is 10.69 point on the Vas. Concerning anxiety, the average change is 9.66 points, roughly the same as the depression.

V. DISCUSSION

The line graphs reveal much about the nature of a TBI, depression, and the depressed individuals' response to psychotherapy. Most of the individuals showed a trend of irregularity along the recovery curves at random isolated points indicating that the TBI has the ability to produce spontaneous regression into a more depressed state. Comparing these recovery curves to those of Lutz 1999 studies (which shows a smooth recovery curve for depressed individuals using psychotherapy without a TBI); it is apparent the TBI has a significant effect on the recovery of depression.

The Supportive Psychotherapy shows an overall improvement of the mental index (depression levels), yet also shows many sporadic and unpredictable peaks in the recovery curves. These sudden increases represent sudden increases in depression and seem to be common on the SPT recovery curves (Figure 1). Supportive Psychotherapy also has a higher average

change between sessions ($AC_d = 14.80$; $AC_a = 14.87$) than Cognitive Behavioral Therapy ($AC_d = 10.69$; $AC_a = 9.66$) for both depression and anxiety. This data supports both hypotheses ($Y_a - AC_d: A < B$) and ($Y_b - AC_a: A < B$) which stated that SPT would have a greater average change between sessions than CBT. This reality shows that SPT may be a more erratic and unpredictable psychotherapy considering the fluctuation of the recovery curves compared to those of CBT.

Considering the overall improvement from depression, hypothesis $X_b - D_a: A > B$ was confirmed according to the data. The overall anxiety improvement was greater for CBT (51.97) than SPT (29.8) according to the data. This concluded that the Cognitive Behavioral Therapy was more effective in the overall treatment of anxiety compared to Supportive Psychotherapy. Yet, hypothesis $Y_a - AC_d: A < B$, was not confirmed due to the fact that the SPT overall recovery for depression (27.7) was greater than that of CBT (26.6). With a larger number of participants the data could be more conclusive and could show a more marked difference in the scores. Another inconsistency in the data is the sudden increase that occurs at session 4 of the CBT recovery curve, in which the depression raises above the baseline score to 105.75. If this score was considered to be the baseline, the overall change would be 60.75 which would confirm the hypothesis. This occurrence (Session 4 depression increase) is a result of both a possible denial of depression and/or an optimistic view of the treatment which was soon encountered with a depression relapse.

The data shows that TBIs have a hindering effect on recovery from the depression. The recovery curves become very erratic at points due to common bouts of depression which is most likely a direct result of difficulty from the injury. The data set shows this inevitability of having an erratic few weeks, yet this may be a result of the therapy or an outside uncontrollable factor.

VI. CONCLUSIONS

After comparing both the Supportive Psychotherapy and Cognitive Behavioral Therapy recovery curves it seems, as a whole, the Cognitive Behavioral Therapy was less sporadic, smoother and an overall more effective treatment. The Cognitive Behavioral Therapy also had more success nearing the end of the psychotherapy sessions, concluding the therapy was more effective in suppressing the depression's ability to return (patient relapse). Though Supportive Psychotherapy did show an overall decrease in depression levels, according to results from the Vas Scale, the Cognitive Behavioral Therapy not only seems more effective, but also more consistent and predictable.

As a whole, my project has only scratched the surface of psychotherapies' effectiveness on Post-TBI depression. There is still not a significant amount of data and information to draw strong conclusions about the recovery from Post-TBI depression using psychotherapy. There a strong need for future research in this field, especially with the increase cases of TBIs from the war in Iraq. Recovery curves for Post-TBI depression using psychotherapy is a new field of research which demands many participants in order to show significant results and draw strong conclusions. The effectiveness of psychotherapy for post-TBI depression needs to be investigated along with many other aspects pertaining to the validity of Cognitive Behavioral Therapy's success over Supportive Psychotherapy. I concluded that the Cognitive Behavioral Therapy seemed to be a more effective compared to Supportive Psychotherapy yet the size of the study limits the validity of this conclusion. With the increasing prevalence of TBI, the need for research on Post-TBI depression is becoming more necessary.

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