

# Emerging Non-Pharmacological Therapies for Post-stroke Depression and its Future Aspects: A Review

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## ABSTRACT

Post-Stroke Depression (PSD) is a psychiatric disorder associated with stroke which has an adverse effect on the cognitive function and survival. It usually develops in 40% of the stroke survivors within 3 months. We performed a thorough literature review using PsychInfo, PubMed, Science Direct and PLOS databases for the non-pharmacological treatment of PSD. Early rehabilitation and psychological therapies are effective in treating depression in PSD while physiotherapy and music therapy improves both cognitive and movement disability. Transcranial stimulation and electroconvulsive therapy are invasive procedures used to treat cognitive impairment in PSD. Computerized therapy helps, enhance the attention, memory and executive functioning. DepReT stroke is a package which addresses patients along with their caregiver to have a better understanding of the depression. Robot assisted rehabilitation along with traditional rehabilitation is effective in treating motor function associated with PSD. Early assessment, treatment and rehabilitation are the most effective ways to prevent depression in stroke survivors and thereby improving their quality of life. Non-pharmacological treatment for post-stroke depression seem to be efficacious as antidepressants in improving depressive symptoms with minimal side effects.

**Key words:** Caregiver, Cognitive Impairment, Non-Pharmacological Treatment, Post-Stroke Depression, Quality of Life, Rehabilitation.

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## INTRODUCTION

Stroke is defined as the sudden death of brain cells due to reduced blood supply to the brain usually caused by thrombotic, embolic and other hemorrhagic events.<sup>1</sup> Post-stroke depression (PSD) is a mood disorder occurring after stroke and moreover, an important neuropsychiatric consequence of stroke.<sup>2</sup> 40% of stroke survivors will proceed to post-stroke depression within 3 months.<sup>3</sup>

Depletion of neurotransmitter biogenic amine and changes in post synaptic receptor sensitivities play an important role in the development of post stroke depression.<sup>4</sup> On an average of 10 years, the mortality rate amongst post-stroke depressive patients is

3.4 times which indicates the need of treatment in post-stroke patients.<sup>3</sup>

Pharmacological therapies such as selective serotonin reuptake inhibitor and tricyclic antidepressants are effective in the treatment of post-stroke depression, but these drugs have well known side effects.<sup>5</sup> An analysis of a cohort of patients with stroke, proved that there is a greater risk of stroke (48%) associated with anti-depressants.<sup>6</sup> This article discusses about the various non-pharmacological treatments recommended for post-stroke depression, which are as efficacious as pharmacological therapy with minimal side effects.



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## MATERIALS AND METHODS

We performed a detailed review on the available databases such as PsychInfo, PubMed, ScienceDirect and PLOS databases and articles from 1992 till 2017 in English were reviewed, using search words such as post-stroke depression, non-pharmacological treatments, cognitive impairment, quality of life, rehabilitation and caregiver. The literatures were reviewed thoroughly and non-pharmacological therapies are discussed in the article. This review discusses on the evidences of non-pharmacological treatments used to treat post-stroke depression.

## RESULTS

Non-pharmacological therapies are known to be effective in the treatment of post-stroke depression and the emerging non-pharmacological treatments are listed in Figure 1.

### Self-Management

The main goals of self-management are managing their emotional consequences after stroke, managing medical task, to maintain their behaviour and to deal with the psychological consequences of the stroke. The five self-management skills are: problem solving, decision making, proper utilization of the resources, developing a rapport with the physician and taking appropriate actions.<sup>7</sup> Therefore, self-management is a self-control therapy that helps the patient to manage their depression and self-management skills.

### Rehabilitation

Stroke patients with more than one mental illness an increased probability to be hospitalized or die when compared to patients with no mental illness,<sup>8</sup> therefore, early rehabilitation reduces the frequency of cognitive decline and hypothyria.<sup>9</sup> Rehabilitation is a target oriented therapy, which grants patients with tools to manage their own life by reducing physical, mental and social impairment.<sup>10</sup> The advantages of rehabilitation are improved self-awareness, self-esteem improvement, stress management.<sup>11</sup> Cardiac rehabilitation is used as a secondary preventive measure for transient ischemic stroke or mild stroke, but is not associated with any emotional improvement.<sup>12</sup>

### Psychological Therapy

Psychological therapy is effective in treating mild and moderate depression as well as normal and slightly diminished cognitive abilities provided by the trained professionals and general physicians.<sup>13</sup> Psychosocial intervention is more effective in 5-HTTLPR s-allele

carriers and ST in 2 VNTR 9 allele carriers which are functional length polymorphism of the SERT gene.<sup>14</sup> The psychological therapy includes:

**a) Cognitive therapy:** Aaron T. Beck discovered cognitive therapy for the first time to treat depression. According to him, if negative thoughts and beliefs are corrected, depressive symptoms will be improved.<sup>15</sup> Cognitive Behavioural Therapy (CBT) increases the daily activities, especially pleasant and enjoyable events to improve mood and is efficient to treat depression in primary care settings. Behavioural therapy in Behavioural Activation therapy for Depression After Stroke (BEADS) includes active monitoring, activity scheduling, graded task assignment.<sup>16</sup> Behavioural treatment facilitates problem solving skills and cognitive restructuring skills to manage ongoing tensions.<sup>17</sup> Augmented cognitive therapy includes various phases and improves to alter negative thoughts, relaxed activities, helps in goal setting and individualized treatment.<sup>18,19</sup>

**Problem solving therapy (PST):** PST is effective in the treatment of post-stroke depression by reducing mental disability and is mainly efficacious in elderly patients and the effect continues even after the treatment ends.<sup>20</sup> Consequently, PST reduces the mortality associated with post stroke depression in comparison with escitalopram.<sup>21</sup>

**c) Supportive therapy:** Supportive therapy is a patient centred psychotherapy. A therapist listens to the patient and provides support based on the patient's problem. Problem solving therapy is more beneficial than supportive therapy in treating mental disability in elderly.<sup>20</sup>

**d) Motivational therapy:** Motivational therapy motivates the patient to ameliorate medication adherence and follow their lifestyle modifications and thereby creates awareness among the subjects regarding the consequences and hazards as a result of their behaviour



Figure 1: Non pharmacological treatment options to treat PSD.

and makes them think about their habits and the profit associated with the change in their behaviour or habit.<sup>22</sup>

### Verbal Therapy

Verbal therapy is a psychological therapy for patients with an emotional disability or impairment which involves literature, story and poetry therapy.

**a) Literature therapy:** Literature therapy is an expressive therapy which serves as a tool to identify the emotional status of the patient and treat emotional and behavioural disorders.<sup>23</sup>

**b) Poetry therapy:** Poetry therapy improves the intellectual and mental function which helps to lead a normal life by correlating their sentiments to a poet's feelings as it rely upon poem, metaphor to improve the self-awareness and healing.<sup>23</sup>

**c) Story therapy:** Patients create a story line, in which they wish to live, thereby the story therapy helps in changing the patients depressing state to a bright and fine story.<sup>23</sup>

### Non-Verbal Therapy

Nonverbal therapy is a psychological therapy for patients with language disability or impairment and consists of art and music therapy.

**a) Music therapy:** Music is beneficial not only does it exert on physiological effects such as blood pressure, heart rate, respiration, but also has an influence on emotional aspects of life and motor functions.<sup>24</sup> Listening to music generates motions and emotions; a strong bond between realization and action<sup>25</sup> and additionally enhances both cognitive and emotional functions in healthy people and patients.<sup>26</sup> 64.3% of stroke patients in music therapy showed mood improvement.<sup>27</sup> Music therapy involves exercises using musical instruments to practice enormous motor function<sup>28</sup> and consequently, accelerates the motor function by producing a change in the cortical plasticity and rapid plastic adaptation.<sup>29</sup>

**b) Art therapy:** Art therapy helps the patients to procure the ability to interact within the community, develop a rapport with the therapist and to look into themselves by free self-expression through painting or drawing. Depressive symptoms such as loss of appetite sleep disorders, lack of confidence, over eating is treated by art therapy.<sup>30</sup>

### Community Reintegration (CR)

Community reintegration is the reorganization of physical, psychological and social characteristics of the patient. Assessment of community reintegration is mainly by Reintegration to a Normal Living Index

(RNLI) where it measures the patient's attitude and understanding of their capabilities.<sup>31</sup>

### Physiotherapy

**a) Physical exercise:** Physical activity consists of voluntary bodily movement that requires energy above resting levels<sup>32</sup> and in addition, increases dopamine and brain derived neurotropic factor, thereby enhancing mood.<sup>33</sup> Physical activities play an important role in post-stroke depression by improving functional performance, quality of life and thereby reducing cardiovascular risk and also encourages the stroke survivor.<sup>34,35</sup>

**b) Weight management:** Weight reduction is effective in post-stroke depression, the latest system CHANGE™ aids to motivate overweight stroke survivors to reduce their weight up to 5% and to improve their health outcomes, mainly by diet, sleep and physical activity.<sup>36</sup>

**c) Virtual reality games:** Virtual reality games in addition to standard physiotherapy was found to be as effective as that of standard therapy alone to improve the physical function of the stroke survivor. Virtual games constitutes various tests like Time up and go test, 30 sec sit to stand test, Timed ten metres walk test and Six minutes walk test.<sup>37</sup>

**d) Yoga:** Yoga extends the health well-being and awareness about oneself and the daily practice of yoga improves plasticity, muscle strength, aerobic capacity and vital capacity and especially for melancholic depression, yoga breathing exercises are beneficial.<sup>38</sup> No adverse events reported due to yoga practise.<sup>39</sup>

### Acupuncture

Acupuncture therapy (traditional Chinese medicine) was initiated in China, is the process of restoring the neuroimaging activity of the brain region involved in the emotional activity processing and thereby initiating antidepressant effect.<sup>40,41</sup> Acupuncture when compared to the western medicines in the treatment of post-stroke depression revealed that curative rate is high in acupuncture.<sup>42</sup> Both fluoxetine and acupuncture improves the symptoms of ischemic post stroke depression, but the latter has no obvious side effects.<sup>43</sup> The advantages are its low cost and feasibility.<sup>44</sup>

### Computerized Therapy

Cognitive neurorehabilitation, a computerised programme, which employs Schulte's table with biological feedback where the patient has to identify numbers from 1-25 in ascending order within the time provided in training of attention. Noteworthy improvement was observed in cognitive function of the patients who used this computerized cognitive Neurorehabilitation.<sup>45</sup>

'Beating the blues' is a computerized cognitive behavioural therapy package to treat the post stroke depression symptoms with best evidence within primary care.<sup>46</sup>

### Electroconvulsive Therapy

Electroconvulsive therapy is a procedure where an electric current is passed through the brain along with the help of an anaesthetic and muscle relaxant which intentionally produces a brief seizure for 20-50 sec. Electroconvulsive therapy shows success rate in the treatment for post stroke depression and is well tolerated when the patient offers resistance to pharmacotherapy.<sup>47</sup>

### Transcranial Stimulation

Repetitive transcranial magnetic stimulation is a neuro-protector which targets the distributed brain network responsible for depression and delivers magnetic stimulation in short time.<sup>48</sup> Cognitive control therapy and transcranial direct current stimulation combination used to treat depressive symptoms in post stroke depression showed a response rate of 25%.<sup>49</sup> In conclusion, transcranial stimulation is effective to treat post-stroke depression in patients contraindicated to antidepressant therapy and is beneficial in chronic stroke patients.<sup>50</sup>

### Role of Caregivers in Post-Stroke Depression

Stroke survivors need a carer to support and care for them. However, it shows 40% of carers will experience depression within 3 months of stroke and furthermore, the patient's impaired motor function and psychological changes will have a great effect on carer's mental health.<sup>51</sup>

**DepReT stroke:** A manualized intervention, composed of six sessions lasting for 30 min each, delivered by the nurse where she monitors the medication adherence and ensures that families have a better understanding of the depression.<sup>51</sup>

### Future aspects of non-pharmacological treatment in post-stroke depression

**Robot Neurorehabilitation and Robotic Telerehabilitation:** Robot assisted rehabilitation, with the help of a robotic instrument can emphasize the improvement of motor function in stroke patients by controlling interaction forces and providing assistance to the patient's disabilities. To conclude, this instrument is efficient in reducing hand impairment and is maintained for 6 weeks after the therapy completion.<sup>52</sup> Robotic leg orthosis is a portable mobile intention oriented robotic device, battery powered and wearable bionic leg used to improve mobility, gait speed, quality and tolerance.<sup>53</sup> Robotic Telerehabilitation is the delivery of rehabilitation services and monitoring for the post-stroke

depressive patients over telecommunication networks. Telerehabilitation, along with robot assisted therapy, is a novel approach in rehabilitation where the therapist can monitor the patient through telerehabilitation.<sup>54</sup>

## DISCUSSION

Post-stroke depression is a sensitive concern among patients, physicians, caregivers and society because of its psychological, physical and personal consequences. Strangely, more than half of the cases of PSD are neither identified nor treated. Early assessment, treatment and rehabilitation are the most effective way to prevent depression in stroke survivors and thereby improving the quality of life. Pharmacological therapies such as selective serotonin reuptake inhibitors and tricyclic antidepressants are observed to be efficacious in post-stroke depression, however it is associated with greater risk of stroke (48%). Non-pharmacological treatment for post-stroke depression suggests to be efficacious as antidepressants in improving depressive symptoms, though the former has no obvious side effects and additionally, they are much safer and improve patient's disability, satisfaction, social reintegration, helplessness, motor function, self-esteem, adherence to treatment thereby exhibits better outcomes and quality of life. The emerging and promising non-pharmacological treatments for post-stroke depression are self-management, rehabilitation, cognitive behavioural therapy, supportive therapy, problem solving therapy, motivational therapy, literature therapy, poetry therapy, story therapy, music therapy, art therapy, community reintegration, weight management, physical exercise, yoga, virtual reality games, acupuncture, computerized therapy, electroconvulsive therapy, transcranial stimulation. In the future, non-pharmacological treatment for PSD can play a pivotal role in treating PSD as it is widely acceptable by both patients and caregivers with minimal side effects, when compared to the pharmacological therapies.

## CONCLUSION

Early assessment, treatment and rehabilitation are the most effective way to prevent depression in stroke survivors and thereby improving quality of life. Non-pharmacological treatment for post-stroke depression seems to be efficacious as antidepressants in improving depressive symptoms with minimal side effects.

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## CONFLICT OF INTEREST

The authors of this paper have no conflicts of interest to declare.

## ABBREVIATIONS

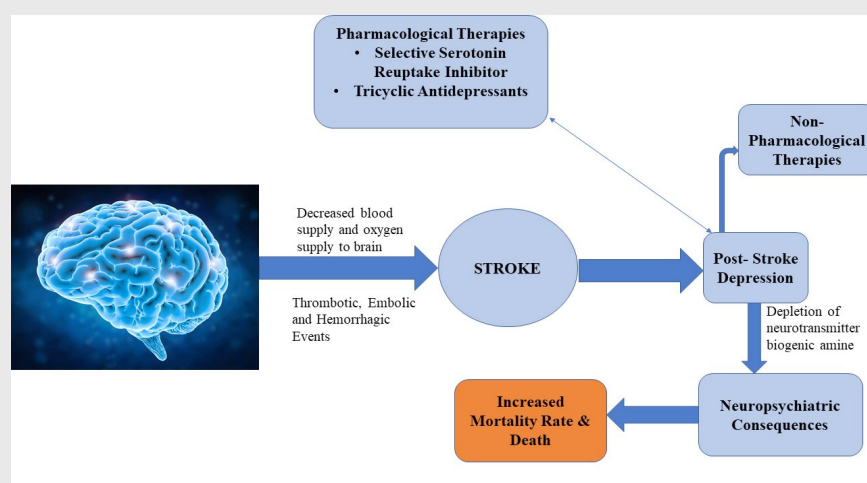
**PSD:** Post Stroke Depression; **QOL:** Quality of Life; **ESD:** Education on Stroke and Depression; **EFT:** Ecosystem Focused Therapy; **RNLI:** Reintegration to Normal Living Index; **PST:** Problem Solving Therapy; **ECT:** Electro convulsive therapy; **SERT:** Serotonin; **TM:** Theoretical model; **DepReT:** Depression Recognition and Treatment; **CBT:** Cognitive Behavioural Therapy; **SFBT:** Solution Focussed Behavioural Therapy.

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## PICTORIAL ABSTRACT



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