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## **Mindfulness-based treatments for posttraumatic stress disorder: a review of the treatment literature and neurobiological evidence**

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Abstract:

Mindfulness-based treatments for posttraumatic stress disorder (PTSD) have emerged as promising adjunctive or alternative intervention approaches. A scoping review of the literature on PTSD treatment studies, including approaches such as mindfulness-based stress reduction, mindfulness-based cognitive therapy and metta mindfulness, reveals low attrition with medium to large effect sizes. We review the convergence between neurobiological models of PTSD and neuroimaging findings in the mindfulness literature, where mindfulness interventions may target emotional under- and overmodulation, both of which are critical features of PTSD symptomatology. Recent emerging work indicates that mindfulness-based treatments may also be effective in restoring connectivity between large-scale brain networks among individuals with PTSD, including connectivity between the default mode network and the central executive and salience networks. Future directions, including further identification of the neurobiological mechanisms of mindfulness interventions in patients with PTSD and direct comparison of these interventions to first-line treatments for PTSD are discussed.

Conclusion:

Existing evidence indicates that mindfulness-based therapies, including MBSR,<sup>129,131–134,136–139</sup> MBCT,<sup>142</sup> MBET,<sup>36</sup> meditation–relaxation<sup>143,145</sup> and mantram repetition<sup>144,146</sup> approaches are effective in reducing PTSD symptomatology, with preliminary evidence showing that reductions in avoidance<sup>134,143</sup> and improvements in shame-based appraisals<sup>131</sup> and self-blame cognitions<sup>142</sup> may be key mechanisms underlying treatment efficacy. Furthermore, there is considerable overlap between neurobiological models of PTSD and the neurobiology of mindfulness,<sup>72,102,112,115</sup> lending strong support to the potential utility of these treatment approaches. Further work is needed to determine the effectiveness of mindfulness-based approaches in comparison to first-line psychotherapies for PTSD, including PE and CPT. In addition, future studies should aim to investigate alterations in neurobiological activity and functional connectivity in areas associated with the neurocircuitry model of PTSD (e.g., mPFC, amygdala) and within and between ICNs, including the DMN, CEN and SN, in order to improve our understanding of the neurobiological mechanisms underlying mindfulness-mediated alterations in PTSD symptomatology.