

THE ROLE OF BDNF AND MEMORY IN MAJOR DEPRESSIVE DISORDER

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SUMMARY

The role of BDNF in depression and Major Depressive Disorder (MDD) has been extensively investigated in the literature. A summary of relevant papers, including a number of independent literature reviews, is presented, and the possibility that alteration in BDNF causes depression by altering memory is analysed and criticised in the context of consistency with cognitive models of depression.

Key words: BDNF – memory - Major Depressive Disorder

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AIM

The role of BDNF in depression and Major Depressive Disorder (MDD) has been extensively investigated in the literature. A summary of relevant papers, including a number of independent literature reviews, is presented, and the possibility that alteration in BDNF causes depression by altering memory is analysed and criticised in the context of consistency with cognitive models of depression.

BACKGROUND

While a neurotrophic hypothesis of depression has been suggested by multiple sources, a potential causal link between BDNF signalling and the development of depression is not yet accepted. Since BDNF has been implied in memory processes (Heldt 2007), and patients with MDD have been observed to have altered memory in a number of areas (Burt 1995), it is possible that these BDNF-mediated memory changes are the cause of certain subtypes of depression, or alternatively might be utilised for novel forms of treatment centred around altering BDNF or other neurotrophin signalling. The evidence is reviewed and compared for consistency with psychological models of depression (Mathews 2005).

METHODS

A literature search using PubMed was carried out, with important keywords including “BDNF”, “major depressive disorder”, “memory”, “plasticity”. Out of many results a number were utilised on the review.

RESULTS

There is a convincing link between BDNF and memory, backed up by studies of the synaptic mecha-

nisms of its action in neuronal plasticity, which are consistent with the processes we would expect memory to involve (Autry 2012). BDNF seems to influence a wide variety of modalities of memory, with specific effects depending on the area where it is upregulated or dysregulated (Berton 2006, Heldt 2007). There is also a well established body of evidence suggesting BDNF's involvement in depression, including decreased BDNF in patients post mortem (Karege 2002), decreased BDNF after stress (Berton 2006), and BDNF's almost universal involvement in the mechanism of action of many antidepressants (Neto 2011). There are several cognitive models with components involving memory (Mathews 2005), and there are a number of experimental observations which are consistent with these models (Heldt 2007), such that it is plausible to suggest that BDNF may be involved in the causal events of MDD. As additional evidence for this idea there are studies into the epigenetic regulation of BDNF (Lubin 2011, 2008), especially involving stressful events in early life, proposing a mechanism for how MDD may both be passed between generations and also developed after proximal or distal life events, without the need for polymorphisms, studies of which have not found a definitive mode of inheritance of the tendency for developing depression.

CONCLUSION

The psychological models of depression chosen for the review all either directly contain a component involving memory, or components which may be influenced by memory dynamics. The correlation of BDNF with both memory and depression is suggested to precipitate the development of MDD via altering the relative retention and/or extinction of positive and negative emotional memories. The most convincing models in this context are Beck's Cognitive model and

Seligman's Learned Helplessness model (and its further developments). The varied role of BDNF in many forms of memory, influencing retention and extinction in many different ways, suggests the role of complicated neural circuits where BDNF may have different effects depending on the specific area where it is dysregulated. Further investigations into whether BDNF levels are associated with depression-causing memory deficits will be informative and useful.

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