



Review

A review of lifestyle factors that contribute to important pathways associated with major depression: Diet, sleep and exercise



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ABSTRACT

Research on major depression has confirmed that it is caused by an array of biopsychosocial and lifestyle factors. Diet, exercise and sleep are three such influences that play a significant mediating role in the development, progression and treatment of this condition. This review summarises animal- and human-based studies on the relationship between these three lifestyle factors and major depressive disorder, and their influence on dysregulated pathways associated with depression: namely neurotransmitter processes, immuno-inflammatory pathways, hypothalamic–pituitary–adrenal (HPA) axis disturbances, oxidative stress and antioxidant defence systems, neuroprogression, and mitochondrial disturbances. Increased attention in future clinical studies on the influence of diet, sleep and exercise on major depressive disorder and investigations of their effect on physiological processes will help to expand our understanding and treatment of major depressive disorder. Mental health interventions, taking into account the bidirectional relationship between these lifestyle factors and major depression are also likely to enhance the efficacy of interventions associated with this disorder.

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1. Introduction

Technological advances have changed according to how we communicate, the activities we engage in, our occupational and recreational pursuits, and even the foods that we eat. While sport and leisure activity levels have remained stable or increased slightly over time, physical activity associated with work, home, and transportation has declined significantly (Brownson et al., 2005; Juneau and Potvin, 2010). In the United States it was estimated that over the past 50 years occupation-related energy expenditure decreased by more than 100 cal/day (Church et al., 2011). Driving to work increased from 67% of the working north American population in 1960 to 88% in 2000 (Brownson et al., 2005) and, in US school children, walking or riding bikes to school decreased from 40% in 1969 to 13% in 2001 (McDonald, 2007). Dietary changes are also significant as worldwide sugar consumption has increased by 74-kcal/day per person from 1962 to 2000. Of this increase, 80% was derived from sugared beverages with additional contributions from restaurant and fast food sources (Popkin and Nielsen, 2003). Alarmingly, sugar consumption has increased most in children aged 6–11 years with an approximate 20% increase from 1988 to 2004 (Wang et al., 2008).

These and other changes of modernity over the past few decades have coincided with a reported increase in the prevalence of many psychiatric problems, including major depression. Between 1991–1992 and 2001–2002, one-year prevalence rates of major depression increased from 3.33% to 7.06% in a community population of American adults (Compton et al., 2006). Increases have also been observed in Australian communities with prevalence rates rising from 6.8% to 10.3% between 1998 and 2008 (Goldney et al., 2010). While these increased rates of depression may be due, in part, to improvements in diagnostic recognition, changes in diagnostic criteria and increased community acceptance of this condition, contemporary lifestyles might also explain why depression is on the rise. However, underlying mechanisms are not well understood. This review provides a summary of three major lifestyle mediators—diet, exercise and sleep—associated with major depression and their impact on a range of relevant biological and physiological pathways.

2. Methods

2.1. Search strategy

The PubMed, Google Scholar, and PsycInfo databases were searched from all years of record until August 2012. Most references were obtained from combinations of the following key terms:

“depression”, “diet”, “nutrients”, “sleep”, “exercise”, “inflammation”, “oxidative stress”, “mitochondria”, “neurogenesis”, “BDNF”, “HPA”, “cortisol”, “serotonin” and “monoamines”. The reference lists of relevant papers were also examined to locate additional studies that were not identified by the database searches.

2.2. Eligibility criteria

Studies were included in this review if they were published in English, comprised animal or human investigations and examined areas of exercise, sleep or diet and their impact either on inflammation, hypothalamic–pituitary–adrenal (HPA) axis, neurotransmitters, neuroprogression and oxidative/nitrosative stress.

3. Dysregulated pathways in major depression

Major depression has a multifactorial aetiology arising from environmental, psychological, genetic and biological factors. As outlined in Fig. 1, research over the past decade has clarified that depression is associated with neurotransmitter imbalances, HPA disturbances, dysregulated inflammatory pathways, increased oxidative and nitrosative damage, neuroprogression, and mitochondrial disturbances (Leonard and Maes, 2012; Lopresti et al., 2012; Maes et al., 2009c; Manji et al., 2001; Raison and Miller, 2011). While these disturbances will each be discussed briefly that they are not mutually exclusive.

3.1. Neurotransmitter imbalances

Imbalances in the production and transmission of neurotransmitters such as serotonin, dopamine, noradrenaline and glutamate are commonly observed in the central nervous system in major depression (Maletic et al., 2007). Deficiencies in serotonin

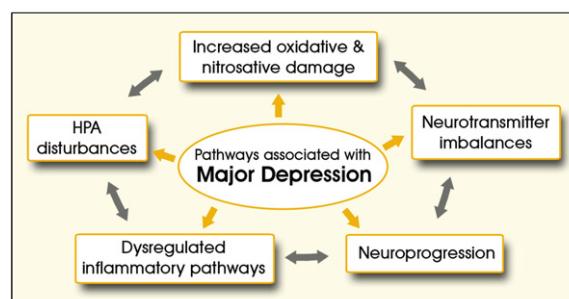


Fig. 1. Multiple pathways associated with major depression.

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