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HEALTHY LIFESTYLE - HEALTHY MIND: THE ASSOCIATION BETWEEN HEALTH BEHAVIORS AND DEPRESSION AMONG ADULTS

Dolev KAROLINSKY^{1,2}

Abstract

Depressive disorders are one of the main causes of morbidity worldwide among adults. Although there are abundant scientific evidences on the relationship between sociodemographic and health characteristics and depression, the empirical evidence addressing the impact of health behaviors on depressive symptoms remained inconclusive. The current review describes in detail the associations between several main healthy lifestyle and depression among adults, including the possible influence of the locus of control component on compliance with health behaviors. In addition, this article discusses on the meaning of a “healthy lifestyle” as a predictor for depression, informed by methodological and conceptual challenges of biosocial approaches.

Keywords: depressive symptoms, healthy lifestyle, health behaviors, locus of control, biosocial approach, synergistic effect.

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Introduction

Depressive disorders, characterized by low mood, a reduced ability to experience pleasure (anhedonia) and a combination of cognitive symptoms, such as low self-esteem, and physiological disturbances, such as insomnia or loss of appetite, are one of the most debilitating mental illnesses in the modern world that significantly impairs social and occupational functioning (Sibille & French, 2013; Smithson & Pignone, 2017). One of the findings of mental health surveys conducted by the WHO (World Health Organization) since 2001 and included Israel, was that the point prevalence rate of major depressive disorder (in the last 12 months) is approximately 6% during the last decade (Kessler *et al.*, 2010; Kessler & Bromet, 2013). During the years 2003-2004 the WHO survey was conducted in Israel and similar rate of major depressive disorder was reported (5.9%) (Levinson *et al.*, 2007).

Regardless of the level of severity, depressive symptoms, whether major, moderate, or sub-threshold were related to increased risk for comorbidity, disability, decreased quality of life and mortality (Geulayov *et al.*, 2007). The evidence of association between chronic conditions and depression is abundant (Caneo *et al.*, 2016). In an international study a direct relationship was found between the number of depression symptoms, and self-reported poor health status and functioning (Herrman *et al.*, 2002). There are correlation between depression and various chronic conditions, such as cancer, asthma, obesity, heart coronary diseases and diabetes (Chapman, Perry & Strine, 2005; Katon, 2004; Kessler & Bromet, 2013). However, chronic conditions might be independent risk factors for depression; several cohort studies demonstrated casual relationships in the association between different chronic conditions and depression. For instance, one study showed that each of the following conditions increased the risk for depression occurrence: cardiovascular diseases, metabolic syndrome, autoimmune diseases and migraine. Moreover, several studies demonstrated dose-response between the number of physical illnesses and depression severity (Caneo *et al.*, 2016).

Empirical studies have consistently demonstrated associations between socioeconomic and demographic variables and the prevalence of depressive disorders both in Israel and worldwide (Iancu *et al.*, 2003; Kaplan *et al.*, 2010; Kessler & Bromet, 2013; Piccinelli & Wilkinson, 2000). Yet, those studies cannot capture the full picture in its entirety because of overlooking other important factors that may be related to the occurrence of depression, such as healthy behaviors and lifestyle (Elizur *et al.*, 2010). Israel has not been an exception, as most of the studies conducted in this country did not focus on the independent influence of health patterns on depression, with emphasis on health-related behaviors (Iancu *et al.*, 2003; Kaplan *et al.*, 2010). The purpose of the current review is to describe in detail the associations between healthy lifestyle and depression among adults, with emphasis on the following behaviors: vegetables and fruits consumption, physical activity, weight watching and smoking status.

Methodology

Search strategy and selection criteria

The sources for articles searching were “Pubmed” and “Google scholar”, using the following search terms: ‘Depression’, ‘Depression and Health’, ‘Mental health’, ‘Depression and Health behaviors’ and ‘Depression and Healthy Lifestyle’. The search was limited to English only. Studies were included in case that they focus on health behaviors and depression among the adult population. In addition, articles that discuss the benefits or risks of health behaviors and related socio-cultural issues were also included.

Results

According to WHO recent report, negative health behaviors, such as physical inactivity, poor nutrition, and smoking are among risk factors for morbidity and mortality in the world (WHO, 2009). In particular, the unhealthy lifestyle was found as either directly or implicitly related to development of mental disorders, including depression. Moreover, the co-existence of several negative health behaviors may exacerbate the influence (Cabello *et al.*, 2017). For instance, Adjibade *et al.* (2018) found that unhealthy diet, smoking status, and obesity were independently associated with the risk of developing depressive symptoms; in addition, the findings show that increased number of healthy lifestyle behaviors was associated with decreased risk of depressive symptoms; finally, it was found that 14% of cases were attributed to the combination of unhealthy diet, overweight (BMI) and smoking. In essence, the scholars sought to bridge the empirical lacunae and study the combined effect of those variables by calculating a Healthy Lifestyle Index (HLI) which included several health behaviors, with the purpose of further investigating its association with the incidence of depressive symptoms (Adjibade *et al.*, 2018). Another research that was conducted by Japanese scholars revealed four variables that were significantly associated with the prevalence of depressive symptoms: 1) insufficient sleep, 2) a poorly-balanced diet, 3) snacking between meals and 4) physical inactiveness (Furihata *et al.*, 2018).

A literature review revealed that four of the main indicators of health behaviors predicting the depression occurrence are level of vegetables and fruits consumption, physical activity level, weight watching status and smoking status, as well as their combinations. The following sections present a detailed description of these variables.

Vegetables and fruits consumption

Consumption of vegetables and fruits supplies essential vitamins and minerals to the human body and constitutes a source of phytochemicals, serving as antioxidants and anti-inflammatory agents contributing to the body's defense mechanisms (Slavin & Lloyd, 2012). The National Institute for Cancer in the USA recommends on consumption of 5 doses of vegetables and fruit every day. The decision on this dose relies on the recommendation of the WHO, according to which the recommended daily amount of vegetables and fruits is 400 grams (not including potatoes) (WHO, 2003). In a meta-analytic study which included more than 200,000 people, the highest levels of consumption of vegetables and fruits (by comparison to the lowest consumption levels of both vegetables and fruits) were found to reduce the risk for depression by 14% and 11%, respectively (Liu *et al.*, 2016). Scientific evidences show a relationship between a lack of antioxidants and psychiatric disorders. Vegetables and fruits are considered to be enriched foods by fiber, vitamins, minerals, antioxidants, flavonoids and phytochemicals. These nutrients are a protective factor against depression. In the biological system, some of the agents which are found in vegetables and fruits, such as beta-carotene, vitamin E and vitamin C are efficient antioxidants (Liu *et al.*, 2016).

Particular dietary deficiencies may explain the association between vegetables and fruits consumption and depression. For instance, a lack of folates involved in the production of neurotransmitters or vitamin B12 may lead to an increase in homocysteine levels. A high level of homocysteine may lead to processes that will cause brain damage and thus increase the risk for depression. In addition, vitamin B6 is part of the production process of neurotransmitters (like serotonin) that contributes to mood enhancement. Therefore, a deficiency of this vitamin may also be related to higher risk for depression (Saghafian *et al.*, 2018). Magnesium deficiency which is associated with inflammatory processes can in turn increase the risk for depression, and deficiency in zinc leads to increased neurological, physical, and psychopathological symptoms which are associated with a depressive disorder (Liu *et al.*, 2016).

However, with regard to the relationship between vegetables and fruits the findings are still inconsistent. Several studies found that while fruits intake was significantly related to decreased risk for depression, vegetables intake was not found to be significant in reducing the risk for depression, and vice versa. Other studies did not reveal any association between vegetables and fruits consumption and depression (Saghafian *et al.*, 2018). Moreover, a few studies even indicated harmful influence of vegetables and fruit consumption on the development of depression, i.e. higher consumption levels were related to higher risk for depression (Liu *et al.*, 2016).

Physical activity

The current recommendations for physical activity performance were published by the Health Department of the United States in the year 2008 (Buchner *et al.*, 2008). These recommendations were adopted by the WHO (WHO, 2010). According to the updated recommendations one should perform aerobic physical activity

that accumulates either to 150 minutes per week of moderate-intensity (activity involving a moderate rise in the breathing rate and in heartbeats, a light feeling of heat and sweat) or 75 minutes per week of vigorous-intensity (an activity involving a large rise in the breathing rate and heartbeats, an intense feeling of heat and sweat) or an equivalent combination of both intensities (Buchner *et al.*, 2008).

Research evidences show that physical activity has a contribution to physical health status (Galily *et al.*, 2012). Performing physical activity on a regular basis contributes to prevention of a variety of diseases and chronic conditions, such as cardiovascular diseases, diabetes, cancer diseases, hypertension, obesity, etc. (Warburton, Nicol, & Bredin, 2006).

Physical activity has consistently emerged as an important predictor of depressive symptoms and depression. Epidemiological studies indicated that doing exercise at the recommended level was associated with few depressive symptoms, while non-exercising or exercise at an inadequate level was related to an enhanced probability for developing depressive symptoms (Mammen & Faulkner, 2013; Teychenne, Ball & Salmon, 2008). The majority of studies demonstrated a positive relationship between engagement in physical activity and mental health (Mammen & Faulkner, 2013; Teychenne *et al.*, 2008). It was found that compliance with the recommended level of physical activity (at least 150 minutes per week) reduced the risk for developing depression in 19%-27% (Mammen & Faulkner, 2013). An additional study identified the minimal level of physical activity that may serve as a protective measure for depression occurrence. It was found that daily physical activity of 10-29 minutes reduces the risk for depression by 10%, and that there is a dose-response relationship between the average daily duration of physical activity and the risk for developing depression; a longer duration of activity was related to a greater reduction of the risk (Lucas *et al.*, 2011).

Studies revealed that physical exercises increased the release of serotonin thereby acting as an “anti-depressant”. In addition, long-terms effects of routine physical activity may enhance neuroendocrine regulation axis thereby leading to normalization of cortisol levels, alongside with increased release of endorphins that contribute to mood improvements (Sarris, Kavanagh & Newton, 2008). In addition to biological benefits, exercise affects the moderators of self-efficacy and self-esteem and thus may help to reduce the development of depression. Moreover, exercise-oriented sessions are an opportunity to enlarge supportive social network, thereby diminishing the risk for developing depressive symptoms (Deslandes *et al.*, 2009; Sarris *et al.*, 2008).

However, several studies found that physical activity was not related to depression, while others found that engagement in physical activity serves as a protective factor for depression among women, but not among men (Mammen & Faulkner, 2013). Furthermore, it has been found that for men, the desire for muscularity is a component of their body image and that a higher drive for muscularity correlates with a lower level of well-being, indicating negative relationship between exercise and depressive symptoms (Swami *et al.*, 2018).

Weight watching

Obesity is an independent risk factor for metabolic disorders. Moreover, it might result in serious health consequences for individuals. Scientific evidences showed that there are around 20 co-morbidities which are related to overweight and obesity. In addition, obese individuals more frequently suffer from significant joint pains disorders than non-obese people. Moreover, obesity may result in social and psychological impairments (Djalalinia, *et al.*, 2015).

A longitudinal meta-analysis showed bidirectional associations between depression and obesity: obese persons had a 55% increased risk of developing depression over time, whereas depressed persons had a 58% increased risk of becoming obese (Luppino *et al.*, 2010). It is noteworthy that the effect of obesity on developing depressive symptoms was stronger in American studies, indicating the difference between sociocultural mechanisms which could be more stringent in one culture than in the other (Atlantis & Ball, 2008).

Weight issues were found to affect developing depressive symptoms both biologically and psychologically. Biologically, obesity causes inflammatory conditions in the body, which are known to be associated with depression. In addition, obesity can affect the hypothalamus-pituitary-adrenal glands (HPA axis). It is known that regulation problems in this axis are associated with depression (Luppino *et al.*, 2010).

The social aspects, such as perceptions of ideal body by Western culture, as well as media influence, increase the possibility of experiencing distress because of physical and therefore social inadequacy. The feeling of inadequacy, accompanied by dissatisfaction with their bodies, and negative effect on the self-image, in turn, may lead to developing depressive symptoms (Atlantis & Ball, 2008; Derenne & Beresin, 2006; Hoek *et al.*, 2005).

Smoking

Consumption of tobacco is expected to be one of the prominent health problems all over the world in terms of mortality and disability (Klungsoyr *et al.*, 2006). Previous studies found that in developed countries, smoking constitutes a primary risk factor for early death, with 28% of the cases attributed to lung cancer. More than 400,000 cases of death and 30% of all cancer diseases were attributed to smoking in the USA (Bergen & Caporaso, 1999).

There is a bidirectional relationship between depression and smoking, as depression is more prevalent among smokers, and, similarly, smoking is more prevalent among depressed individuals than in non-depressed ones (Freedland, Carney, & Skala, 2005). It seems that there is a dose-response relationship between smoking levels and depression. In a study done in Norway it was found that higher smoking amounts (as based on the number of cigarettes and years of smoking) was associated with higher risk for developing major depression (Klungsoyr *et al.*, 2006). Prolonged smoking period is also associated with subclinical depression (Weinberger *et al.*, 2012). The negative effect of smoking is associated with increased depressive symptoms and with decreased motivation to comply with treatment for depression (Sarris *et al.*, 2014).

However, empirical evidence regarding the possibility of a causal association between smoking and depression remains inconsistent. For instance, findings from two researches have shown that the association between smoking and the occurrence of depression is merely circumstantial. They concluded that this association was derived from genetic factors, which increased both the risk for smoking and the vulnerability to depression (Freedland *et al.*, 2005). In addition, smoking as a marker of unhealthy behavior is embedded in the framework of social acceptance, as in the US, where it varied tremendously from time to time, thereby affecting people's likelihood of smoking, as well as the degree to which genetic susceptibility to it is related with smoking behavior (Boardman, Blalock, & Pampel, 2010).

Adherence to healthy lifestyle: the locus of control component

Cultural and social characteristics may play a role in health perceptions, compliance with health behaviors etc. For instance, one of these domains is the Health Locus of Control (Al-Krenawi, 2005; Baron-Epel *et al.*, 2005; Cohen & Azaiza, 2007). The locus of control expresses the perception of control that people have or do not have over their life events, such as their health status. The focus of health control may be internal (i.e., people believe that their health status is influenced by their behaviors and mode of functioning) or external (i.e., the people believe that their health depends on force majeure or on fate) (Cohen & Azaiza, 2007). Studies show that people with an internal locus of health, unlike those with an external one, tend to proactively follow a healthy lifestyle and take action to improve their health. For instance, it was shown in previous studies that the external locus of health was negatively related to high rates of physical activity, while internal control locus of health was positively associated with high rates of exercise (Cohen & Azaiza, 2007). In addition, individuals who have an external locus of control of health tend to suffer from depression and having lower compliance with treatment for depression because of their basic belief that they can not affect their health status, including their mental health condition (Shojaee, 2014).

Discussion

The review of the research from the last decades shows empirical lacunae in regard to those predictors of depression in adults which are related to health behaviors. There is a consistent support for the negative impact of unhealthy behaviors upon mental health in general and developing depressive symptoms, ranging from subclinical to major depression (Adjibade *et al.*, 2018). However, there are two major flaws in the current research body: (1) health behaviors have been mostly studied independently and in separation; therefore, their cumulative and joint influence still needs further investigations; (2) gaps and ambiguities in findings, such as absence of direct causality between smoking and depression or unexpected gender differences regarding physical exercise. These problems highlight the challenges of the biosocial approaches in establishing links between social environments and healthy behaviors, both methodologically and concep-

tually (Short & Mollborn, 2015). The whole is larger than the sum of its parts. Health-related behavioral patterns do not occur in isolation; rather, they cluster together and are cumulative in specific population subgroups, thereby calling for a more holistic approach to health. Furthermore, since clustering of unhealthy behaviors have synergistic effect, their combination is even more detrimental to health than any added individual effects of health behaviors (Stringhini *et al.*, 2010; Kaczynski *et al.*, 2008).

Further exploring the construct of “healthy lifestyle” should comprise a dimension of Locus of Control (Cohen & Azaiza, 2007). Negative health behaviors and tendency to depression may be affected independently by the pattern of control locus of health; individuals who have an external locus of control of health tend to suffer from depression and having lower compliance with treatment for depression because of their basic belief that they cannot affect their health status, or their mental health (Shojaee, 2014). Therefore, locus of health control may constitute one of the indicators for “healthy lifestyle” of the individuals by directly influencing their health choices. Integrating the dimension of locus of control into the construct of “lifestyle” is informed by the research that identified links between cognitive processes such as decision-making and framing and health behavior (Reyna *et al.*, 2015). In this context, implementing policies that emphasize the norms of healthy eating may be more effective than those which regulate food prices (Zhang *et al.*, 2014).

Conclusion

Health behaviors identified as major predictors for depression in adults should be further crystallized into a synergistic construct of what can be deemed “healthy lifestyle”. Such a construct is informed by the premises of biosocial approaches that link between social and biological influences (Adjibade *et al.*, 2018). More empirical insights are needed into the nature of associations between the variables of health behaviors and other moderators, such as locus of control or cultural perceptions. Exploring internal associations between variables, such as physical activity and obesity, may lead to developing a valid index of a healthy lifestyle. The main purpose of refining the clusters is to create a conceptual and methodological framework of reference which addresses biosocial processes in the interdisciplinary space.

Identifying and exploring the clusters of health-related behaviors in a population can contribute to better planning of prevention and designing intervention strategies (Schuit, van Loon, & Ocke, 2002). Such planning should address sociocultural and demographic variance between target populations and consider existing norms and values, codes of behavior, attitudes and perceptions of “being ill” or “healthy” in the given society. People with similar social locations are found to exhibit similar health behavioral patterns, even though those behaviors might change with age (Øvrum, Gustavsen, & Rickertsen, 2014). Future interventions should be based on understanding of the dynamic interplay between and within various environments and biological processes; for example intervention related

to obesity should include inputs such as poverty and local food environment (Ip *et al.*, 2013).

As health behaviors affect and shape health and well-being of individuals and populations, and in particular their mental health, there is a need to expand the scholarly approach by shifting the perspective and viewing health behaviors as multidimensional constructs, related to individual and society health lifestyles; those behaviors are affected and penetrated by ideologies, policies, and institutions; therefore, they can be understood by exploring the triangle of social, cultural, and biological aspects. Consequently, the future research will situate the individual and public health in context of multiple influences and advance the methodological and conceptual representations of this complexity.

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