



FRUIT AND VEGETABLE CONSUMPTION AND MENTAL HEALTH

A large body of epidemiological and trial evidence supports the beneficial role of fruit and vegetable (F&V) intake in general wellbeing and prevention of major chronic diseases across several populations and age groups, including positive effects in the prevention and management of common mental disorders, such as depression and anxiety. Epidemiological evidence on the potential drivers of mental health is now emerging. Recent findings from population-based studies suggest that higher intake of F&V may be associated with increased odds of high mental wellbeing and reduced odds of low mental wellbeing. In addition, several antioxidants found in F&V have been shown to be associated with optimism and positive mental wellbeing in middle aged adults. Studies have also reported a dose-response relationship of F&V intake with mental health, up to seven portions a day. F&V consumption might also be acting as a proxy for a complex set of highly correlated dietary exposures, including fish and whole grains, which might contribute to the observed associations with mental wellbeing. As most of the epidemiological data is based on cross-sectional studies, further prospective studies and

randomized clinical trials should be carried out to corroborate the causality of this association.

In terms of recommendations for the application in daily practice, people should strive to:

- meet recommended dietary guidelines (at least 5 portions of F&V, 400g/day);
- fill their plate with fruits and veggies during every snack or meal;
- add more color and variety to diet by trying new types of produce, which will enhance nutritional diversity;
- improve home environment by placing fruits and veggies in prominent places;
- integrate F&V intake within an overall healthy lifestyle.

We are pleased to share with you in this issue of *the Global Fruit & Veg Newsletter* three articles that highlight the importance of F&V consumption on mental health.

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Fruit and vegetable consumption and the overall health of the elderly in Europe

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Health, as defined by the World Health Organization in 1948, is not just the absence of disease but is the state of overall physical, mental and social well-being. Nutrition plays a key role in a person's health. And within nutrition, the regular consumption of fruit and vegetables is a major step toward a healthy diet. Fruit and vegetables provide numerous micronutrients, microconstituents, fibre, etc., which are all involved in many metabolic functions. They contribute to keeping the heart, blood vessels, lungs, bones, muscles and brain healthy, thereby assisting a person in their physical activities and cognitive functions. Fruit and vegetables probably have an effect not only on life expectancy and longevity but also on the quality of life and length of time a person lives healthily without suffering any impediment or disease.

The majority of studies are interdisciplinary, although few have considered confounding factors linked to lifestyle. Furthermore, interventional studies are extremely difficult to carry out. For these reasons, longitudinal studies are invaluable and appreciated. Yet, little research has been carried out on the overall health of European populations in forward-looking studies.

SHARE: pan-European survey of 22,635 individuals

This research used the Survey of Health Ageing and Retirement in Europe (SHARE), a pan-European study of 22,635 individuals aged over 50 from 11 European countries*. Two waves of data collection were carried out in 2011 and 2013. The parameters measured were:

- self-assessment of physical health using a visual analogue scale from 1 to 5;
- the measure of muscular strength using a hand grip test,
- ratings for independence (ADL – Activities of Daily Living), activity (IADL – Instrumental Activities of Daily Living), mobility, depression (EURO-D scale);
- quality of life scale (CASP-12);
- cognitive performance assessed using a simplified short- and long-term memory test.

Lifestyle was also taken into account (smoking, alcohol consumption, physical activities, education). The consumption of F&V along with other eating habits were

self-assessed using a scale of 1 (less than once a week) to 5 (every day).

Fruit and vegetable consumption linked to better overall physical and mental health

Frequent consumption of fruit and vegetables was associated with better perceived health, a better quality of life, better short- and long-term memory, as well as better scores for independence and mobility and a lower score for depression. This was after adjustments for gender, age, education, living conditions, tobacco and alcohol use, moderate exercise and the consumption of meat and dairy products.

Possible effects of fruit and vegetables

The authors provided some hypotheses on the possible contribution of F&V to these results. One reason could be from a direct effect on various bodily functions by the specific nutrients in F&V: vitamin B9, vitamin C, antioxidants (carotenoids, polyphenols, etc.), minerals (magnesium, potassium, etc.), fibre. The results could also have derived from the consumption of more balanced diet with a reduced intake of sugar and fat, along with a better lifestyle associated with better eating habits. Yet, a reverse causal link could not be ruled out. Because the subjects were in better physical and cognitive health and from a better socio-economic background, they ate better.

Limitations of the study

Besides the strengths of the survey (sample size, longitudinal study), the authors analysed its weaknesses: self-rating and self-assessment of food intake, cultural diversity of the population sample reducing the efficacy of the analysis, non-reproducible results in non-European countries. It also lacked any dose-response analysis, analysis by fruit and vegetable type and a closer country-by-country examination.

Overall, it seems clear that among this population of Europeans aged over 50, a higher consumption of fruit and vegetables is associated with better overall physical and mental health and cognitive functions. The precise reasons are still unknown.



* Austria, Belgium, Denmark, France, Germany, Italy, Netherlands, Slovenia, Spain, Sweden, Switzerland

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Association between fruit and vegetable consumption and depression among Korean adults

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Depression, a mood disorder that includes feeling of worthlessness, being overwhelmed, and a lack of confidence¹, is a major mental disorder and one of the leading cause of disability worldwide². The World Health Organization estimates its prevalence to 4.3% worldwide. In Korea, the prevalence of depression among adults is estimated to be 6.7% in 2011 and increased to 10.3% in 2013³.

Beside the known causes of depression such as biological, genetic, psychological and environmental factors⁴, diet has recently gained an attention for its potential role in depression. Healthy dietary patterns such as the Mediterranean diet (high in fruit, vegetables and olive oil) has been reported to decrease depressive symptoms⁵. A recent study in south Asia showed that an intake less than 5 servings of fruit and vegetables (F&V) per day increases depression risk⁶.

The aim of this study is to investigate the association between F&V intake and the prevalence of depression among 4,349 Korean adults (299 in depression group and 4,050 in non-depression group) who participated in the Korean National Health and Nutrition Examination Survey (KNHANES, 2014). Self-Report Patient Health Questionnaire was used to assess depression. The 24-h recall method allowed the assessment of food intake, categorized into 18 food groups.

General characteristics of participants according to depression

Participants in the "depression" group were mostly:

- Females (68.5%);
- Aged between 30 and 49 years (31.4%);
- Unemployed (55.8%).

In addition, depression was higher in those who had college or higher education level (40.4%) and low household-income level group (34.1%).

Dietary behavior of participants according to depression

Compared to subjects without depression, those with depression showed a significantly lower intake of:

- Total food (depression group: 1,453.2 g/day VS non-depression group: 1,650.7 g/day);

• Legumes and their products (depression group: 26.8 g/day VS non-depression group: 39.3 g/day);

• Non-salted and salted vegetables ("depression" group: 291.2 g/day VS "non-depression" group: 343.6 g/day);

• Fresh fruits ("depression" group: 150.6 g/day VS non-depression group: 190.8 g/day).

These subjects also skipped more often lunch, were mostly in the "mildly insecure" food security group and ate out 1 to 3 times per month.



Higher F&V intake associated with a decreased prevalence of depression

The depression rate of all subjects was between 4.7 and 8.7%. When F&V intake increased, this rate decreased from 6.4 to 2.5% in males and from 11.4 to 6.6% in females. The odds ratios show that F&V intake was inversely associated with depression with no adjustment. When data were adjusted for age, energy intake, obesity, smoking, drinking, stress, eating-out frequency, breakfast and food security, depression was also inversely associated with F&V intake: subjects reported significantly lower rates of depression with higher F&V intake.

Therefore, the results of this study reveal an inverse association between F&V intake and depression. However, additional epidemiological studies are needed to find the underlying reasons for that association.

Based on: Ju, S. Y., & Park, Y. K. (2019). Low fruit and vegetable intake is associated with depression among Korean adults in data from the 2014 Korea National Health and Nutrition Examination Survey. *Journal of health, population, and nutrition*, 38(1), 39. doi:10.1186/s41043-019-0204-2

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Impact of consuming green and yellow vegetables on the depressive symptoms of junior and senior high school students in Japan

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Adolescents with mental health problems face major challenges; they tend to be stigmatized, isolated, and discriminated against. In particular, depression is the most common mental health disorder among young people^{1,2}. A more recent meta-analysis (21 studies from ten countries) has shown that a high intake of fruits, vegetables, whole grains, fish, olive oil, low-fat dairy products, and antioxidants, coupled with a low intake of animal foods, may be associated with a decreased risk of depression in all population (i.e. adolescents, adults and elderly)³.

Are particular dietary patterns associated with depressive symptoms?

Healthy dietary patterns may reduce the risk of depression. However, there is little published information on the relationship between daily food consumption and mental health in adolescents. Therefore, we examined whether particular dietary patterns (e.g., meat, fish, green and yellow vegetables, milk and dairy products, and fruits) were associated with depressive symptoms in junior and senior high school students.

A total of 858 adolescents (mean age = 15.49 years old, SD = 1.78) participated in this study.

Why green and yellow vegetables are important

This study demonstrated that adolescents who consumed green and yellow vegetables every day (one or more times per day) had significantly lower depressive symptoms than those from the “Never/1–2 times a week” group (Figure 1). On the other hand, other food patterns (i.e., meat, fish, milk and dairy products, and

fruits), had no significant association with depressive symptoms.

In the preclinical study, we reported that pretreatment with sulforaphane (a potent anti-inflammatory natural compound found in cruciferous vegetables) significantly blocked the increase in serum tumor necrosis factor- α (TNF- α) levels after a single administration of lipopolysaccharide (LPS). Furthermore, pretreatment with sulforaphane also blocked depression-like phenotypes in mice after LPS administration⁴. In addition, we reported that an intake of glucoraphanin (a glucosinolate precursor of sulforaphane) during late childhood and adolescence might prevent the onset of the depression-like phenotype in mice after chronic social defeat stress⁵. These preclinical findings suggest that the dietary intake of sulforaphane-rich vegetables has prophylactic effects on inflammation-related depressive symptoms in humans.

Healthy dietary patterns and mental health

The side dish intake pattern of Japanese people is typically characterized by a high intake of seaweeds, mushrooms, green and yellow vegetables, seafood, light-colored vegetables, potatoes, and pickles. This intake pattern was found to be associated with lower rates of depressive symptoms in Japanese university students⁶. Our study also revealed that dietary patterns have a large impact on adolescents’ depressive symptoms. Specifically, the consumption of green and yellow vegetables may play a role in lowering the depressive symptoms of adolescents. The consumption of green and yellow vegetables may be vital in the context of adolescents’ mental health.

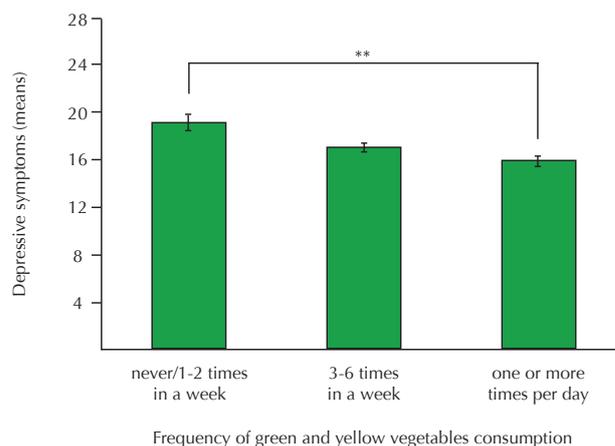


Figure 1: Difference in depressive symptoms by frequency of green and yellow vegetables consumption (After adjusting for covariates, age and sleep duration). Error bars represent standard error of the mean. **p < .01.)

Based on: Tanaka M., & Hashimoto K. (2019). Impact of consuming green and yellow vegetables on the depressive symptoms of junior and senior high school students in Japan. PLOS ONE; 14(2): e0211323.

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