

Lifelong psychological and lifestyle features in relation to cardiovascular disease development: A narrative review

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ABSTRACT

Despite the extensive literature on individual risk factors, such as diet, physical activity, body weight, smoking habits, and mental health characteristics, the literature on different lifestyle and mental health patterns, their evolution over time, and how these factors interact and synergistically affect cardiovascular health is sparse. The need for longitudinally studying these characteristics is currently being highlighted by the limited studies with repeated measurements. This review summarizes the literature concerning lifestyle and psychological characteristics, both well-studied (e.g., diet, physical activity, smoking habits, chronic stress and depression), as well as newly proposed characteristics (e.g., sleep habits, positive psychology characteristics) and their longitudinal association with cardiovascular disease. Studies with data on lifelong characteristics are not always comparable and have found mixed results, especially concerning changes in characteristics such as quitting smoking or starting to be physically active later in life. Therefore, further research is warranted for the implementation of future preventive strategies for cardiovascular disease.

KEY WORDS: *Cardiovascular disease, lifestyle factors, psychological factors, long-term characteristics, lifelong features*

INTRODUCTION

Recently, the global literature on cardiovascular diseases (CVD) is turning towards an anthropocentric approach. The goal is not the disease and its risk factors, but the protection of the individual, who, in addition to the existence of risk factors and comorbidities, has specific lifestyle habits and different mental health characteristics that change over time.^{1,2} It has been strongly suggested in

recent years that longitudinal studies with multiple follow-ups are needed to elucidate the relationship between risk factors and changes in lifestyle and mental health characteristics (trajectories), as well as any interaction between them on the incidence of CVD, but such studies are scarce.³⁻⁵

Cardiovascular disease burden worldwide

CVD affect a large part of both the global and Greek population. According to the World Heart Report, in 2021, more than half a billion people around the world were suffering from CVD.⁶ It is estimated that during 2019,

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113 million people lived with CVD in the 54 countries of the European Society of Cardiology.⁷ Based on recent results from the ATTICA study, during the last 2 decades in Greece (2002-2022), the 20-year incidence of CVD was 36% (n=718/1,988), 40% for men and 32% for women (*p*-value for gender difference<0.001).⁵

Moreover, CVD remain the most common cause of mortality and morbidity worldwide, and continue to be a major issue for public health, social and economic services.⁸ According to the World Heart Report, approximately one third of all deaths globally in 2021 were due to CVD.⁶ In Greece, the ATTICA study observed an overall 20-year CVD mortality rate of 4.5% for the total Greek population (7.3% for men, 1.8% for women).⁵

In addition, cardiometabolic diseases, such as hypertension, hypercholesterolemia, type 2 diabetes mellitus and obesity, which contribute to the high burden of CVD, are on the rise in Greece, as indicated by several international and Greek studies.⁸⁻¹⁴

Cardiovascular disease risk factors

CVD is a set of diseases with a complex etiology, influenced by a multitude of factors. Beyond the classic risk factors, the effect of modern factors, such as the modern lifestyle, has also been clearly shown.^{5,15-20} Based on the Global Cardiovascular Risk Consortium (n=1,518,028 participants), five modifiable risk factors, i.e., diabetes, systolic blood pressure, non-high-density lipoprotein cholesterol (non-HDL), body mass index (BMI), and current smoking, are responsible for 57.2% of incident CVD cases among women and 52.6% among men.²¹

According to the American College of Cardiology and the American Heart Association (ACC/AHA), cardiovascular health -or the lack of it- can be determined *via* 7 simple factors: 4 lifestyle factors (smoking, body weight, physical activity, diet) and 3 biochemical factors (blood pressure, blood glucose and cholesterol levels). Most recently, sleep was added to these factors, modifying "Life's simple 7" to "Life's essential 8".²²⁻²⁵

Dietary habits: Numerous studies have shown that the quality of nutrition has a decisive influence on the occurrence of CVD.^{14,21,26-31} Based on the Global Burden of Disease study, dietary risks are responsible for 11 million deaths and 255 million disability-adjusted life-years (DALYs) lost.³² It was also estimated that approximately 90% of these deaths and 80% of DALYs (associated with dietary risks) were due to CVD.³² The urbanization of food production and, by extent, food consumption has made dietary patterns less traditional and more processed.³³⁻³⁶ Most recently, in a systematic review of 57 studies with more than 1.1 million participants, it was shown that

adherence to a Mediterranean-type diet has decreased worldwide and even in the Mediterranean region.³⁵ Similar observations have been observed for other healthy and traditional dietary patterns, hence, in the future, the burden of CVD associated with dietary risks might worsen.³⁶⁻³⁸

Body weight status: Increased body weight and obesity are associated with CVD incidence and cardiovascular mortality, either directly (i.e., independently of other factors) or indirectly (i.e., through cardiometabolic factors such as type 2 diabetes, hypertension, dyslipidemia, sleep disorders).³⁹⁻⁴¹ In most studies increased weight is defined by BMI, however, other anthropometric measurements, such as waist circumference (for the definition of central obesity), the waist-to-hip ratio, the visceral adiposity index and the skeletal muscle mass index, have also been used as prognostic tools for CVD, with results similar or even better than BMI.⁴²⁻⁴⁹

Smoking habits: Smoking either conventional or electronic cigarettes, is one of the main and best-known cardiovascular risk factors.⁵⁰⁻⁵³ In fact, the adverse effects of smoking on CVD are more extensive than previously thought.⁵⁰ Smoking has irreversible effects on the genetic material of humans and can also change the epigenetic landscape.⁵⁴ Longitudinal studies have suggested that from a public health perspective, the best option is to help individuals never start smoking.⁵

Physical activity level: Physical activity and exercise have a beneficial effect on many metabolic pathways that affect the occurrence of CVD.^{55,56} It has been shown that physical activity is beneficial for blood glucose regulation, blood pressure regulation, the reduction of oxidative stress and inflammation, as well as the management of body weight.^{55,57,57-61} Moreover, its beneficial effects on mental health such as the antidepressant and anxiolytic effects are well-known.⁶²⁻⁶⁵

Sleep habits: Sleep is a lifestyle habit that gained research interest the past 50 years.⁶⁶ Sleep duration is associated with CVD in a U-shape relationship.⁶⁷⁻⁶⁹ In systematic reviews and meta-analyses, it has been observed that both short- and long-sleep duration is associated with a higher risk of CVD, while the optimal sleep duration is observed at 7-8 hours of sleep.^{68,70} Sleep also affects and is affected by other characteristics. It was recently observed that sleep moderates the protective effect of the Mediterranean diet against CVD, as well as the protective effect of physical activity against cognitive decline.^{71,72}

Mental health: One area that cardiovascular research has focused on for decades is mental health.⁷³⁻⁷⁵ Although the AHA recognizes the effect of both negative and positive characteristics on the occurrence of CVD, mental health has yet to be included in AHA's Life's Simple 7 or the newly updated Life's Essential 8.^{25,76,77} It has been known

for years that negative psychology and mental disorders, such as depression, anxiety, severe stress, and hostility, are associated with a higher risk of CVD in both sexes.⁷⁸⁻⁸¹ For example, population-based studies have reported significantly greater risk of morbidity, including coronary calcification, and mortality in individuals with high levels of hostility.^{80,81} Conversely, the few studies conducted have found that positive psychology (studying characteristics such as well-being, sense of purpose, happiness) may lead to a reduced risk of CVD.^{75,76}

It should be noted that in most guidelines for the treatment of CVD, mental health has not been included in the list of typical CVD risk factors.⁸² However, in the recent European Society of Cardiology 2021 Guidelines, it is recognized that psychosocial stress, along with ethnicity and imaging (e.g. coronary calcium scoring), is a risk modifier that should be taken into account for CVD risk estimation.⁷ Moreover, it is stated that stress symptoms and psychosocial stressors modify CVD risk and their assessment is recommended with moderate evidence (Class IIa, Grade B).⁷ Additionally, the AHA in a recent scientific statement (2021), extensively reviews the evidence on psychological health, well-being, and the mind/heart/body connection, and concludes with the recommendation that psychological health should be evaluated and/or managed in patients with CVD or at risk for CVD.⁷⁶

The state of the literature

Despite the extensive literature on individual risk factors, the literature on different lifestyle and mental health patterns, their evolution over time, and how these factors interact and synergistically affect cardiovascular health is sparse.^{3,5} In most existing prospective studies, subjects' characteristics are recorded at the beginning of the study and after a period of time the possible occurrence of diseases is evaluated, assuming that these characteristics remain stable. However, the premise that traits remain constant is hard to accept, especially concerning lifestyle and emotional factors. Thus, in studies with repeated follow-ups, it is possible to assess trait trajectories (potential changes in their presence or intensity), which better approximates what actually happens over time.³

Lifelong psychological features in relation to CVD development

Although scarce, such studies with repeated measurements on lifelong features in relation to CVD risk have shown interesting results. Concerning mental health, in the China Health and Retirement Longitudinal Study, the mental health trajectories of n=8,621 participants older than 45 years were examined and it was found that those

with increasing and persistent depressive symptoms had a higher CVD risk.⁸³ Moreover, the Healthy Aging in Neighborhoods of Diversity across the Life Span study with n=1,465 adults found that chronically elevated depressive symptoms were inversely associated with cardiovascular health (defined by Life's Simple 7).⁸⁴

Lifelong lifestyle features in relation to CVD development

Concerning physical activity, Mok et al., repeatedly studied 14,599 middle-aged and older men and women from the European Prospective Investigation into Cancer and Nutrition-Norfolk cohort, and found that increasing physical activity was protective against mortality from all causes, CVD, and cancer.⁸⁵ Moreover, the Progetto Veneto Anziani cohort study of n=3,099 Italians aged ≥65 years found that continuously having regular physical activity or increasing it over time was inversely related with CVD risk.⁸⁶

Regarding body weight, the Seguimiento University of Navarra study, used data from 7,514 participants from the Mediterranean region, aged 5-40 years and evaluated the association between body shape trajectories and hypertension risk.⁸⁷ It was found that in men, acquiring a higher body weight in mid-life or maintaining it during early and middle life, while in women, acquiring a higher body weight in mid-life was related to a higher risk of hypertension.⁸⁷

Concerning smoking habits, in the Korean Life Course Health Study, the smoking trajectories of 60,709 young adult men were evaluated and it was found that those who consistently smoked had an increased CVD risk, while in those who decreased smoking, CVD risk decreased continuously and eventually reached that of non-smokers.⁸⁸ Furthermore, the Northern Finland Birth Cohort 1966 studied the smoking trajectories of n=11,999 persons, who were followed from the antenatal period to 50 years-old, in relation to stroke; the results suggest that the dose and duration of smoking were more important than the age in which participants started smoking.⁸⁹

Additionally, the ATTICA study (2002-2022) studied the lifestyle trajectories of smoking, physical activity and adherence to the Mediterranean diet and their association with 20-year incidence of CVD.⁵ It was found that Mediterranean diet adherence offered protection against CVD development even if not sustained in the long-term, while, quitting smoking or starting to engage in physical activity did not offer any significant protection.⁵ Furthermore, in a large prospective Chinese cohort, with 52,248 participants, healthy lifestyle trajectories were studied, through a combined score, over a period of 6 years and it was found that preserving healthy lifestyle habits was as-

sociated with a lower risk of CVD and all-cause mortality.⁹⁰ Interestingly, it was also observed that when improving lifestyle habits, beneficial effects could only be observed for those that ameliorated their body weight.⁹⁰

CONCLUSIONS

Although the role of lifestyle habits and mental health characteristics on CVD risk is well-studied, studies that examine lifelong characteristics are scarce, not always comparable and have found mixed results, especially concerning changes in lifestyle characteristics such as quitting smoking or starting to be physically active later in life. Despite the fact that mental health is not included in most

guidelines, emerging evidence suggests the inclusion of mental health characteristics, such as psychosocial stress, for the management and prevention of CVD. Therefore, further research is warranted for the implementation of future CVD preventive strategies.

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Conflict of interest

Nothing to declare.

ΠΕΡΙΛΗΨΗ

Δια βίου ψυχολογικά χαρακτηριστικά και χαρακτηριστικά του τρόπου ζωής σε σχέση με την ανάπτυξη καρδιαγγειακών παθήσεων: ανασκόπηση

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Παρά την εκτενή βιβλιογραφία για μεμονωμένους παράγοντες κινδύνου, όπως η διατροφή, η σωματική δραστηριότητα, το σωματικό βάρος, οι συνήθειες καπνίσματος, τα χαρακτηριστικά της ψυχικής υγείας, η βιβλιογραφία για διαφορετικά μοτίβα αυτών των χαρακτηριστικών, την εξέλιξή τους με την πάροδο του χρόνου, την αλληλεπίδραση και τη συνεργιστική επίδρασή τους στην καρδιαγγειακή υγεία είναι σπάνια. Ωστόσο, η ανάγκη για τη διαχρονική μελέτη αυτών των χαρακτηριστικών αναδεικνύεται σήμερα από τις περιορισμένες μελέτες με επαναλαμβανόμενες μετρήσεις. Αυτή η ανασκόπηση συνοψίζει τη βιβλιογραφία σχετικά με τον τρόπο ζωής και τα ψυχολογικά χαρακτηριστικά, τόσο καλά μελετημένων χαρακτηριστικών (π.χ. διατροφή, σωματική δραστηριότητα, συνήθειες καπνίσματος, χρόνιο στρες, κατάθλιψη), όσο και πιο πρόσφατα μελετημένων χαρακτηριστικών (π.χ. ύπνος, χαρακτηριστικά θετικής ψυχολογίας) και τη διαχρονική τους σχέση με τα καρδιαγγειακά νοσήματα. Οι μελέτες με δεδομένα για μακροχρόνια χαρακτηριστικά δεν είναι πάντα συγκρίσιμες και έχουν βρει ανάμεικτα αποτελέσματα, ιδίως όσον αφορά αλλαγές σε χαρακτηριστικά, όπως η διακοπή του καπνίσματος ή η έναρξη σωματικής δραστηριότητας αργότερα στη ζωή ενός ατόμου. Συνεπώς, απαιτείται περαιτέρω έρευνα για τη θέσπιση μελλοντικών στρατηγικών πρόληψης της καρδιαγγειακής νόσου.

ΛΕΞΕΙΣ ΚΛΕΙΔΙΑ: *καρδιαγγειακά νοσήματα, παράγοντες του τρόπου ζωής, ψυχολογικοί παράγοντες, μακροχρόνια χαρακτηριστικά.*

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