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The Role of Personality Traits in Metabolic Syndrome Among Adolescents and Young Adults: A Systematic Review and Meta-Analysis

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Review

The Role of Personality Traits in Metabolic Syndrome Among Adolescents and Young Adults: A Systematic Review and Meta-Analysis

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Abstract: Background. Metabolic syndrome (MetS), characterized by a cluster of interrelated conditions including central obesity, hypertension, dyslipidemia, and insulin resistance, significantly elevates the risk of cardiovascular diseases. Its rising global prevalence, particularly among younger populations, underscores its status as a pressing public health concern. While traditional research has emphasized biological and lifestyle factors, such as poor diet, physical inactivity, and smoking, emerging evidence highlights the critical role of psychological factors, notably personality traits, in the onset, progression, and management of MetS. **Objectives:** This review is primarily focused on the association between specific personality traits and the diagnosis of Metabolic Syndrome. The second objective is to assess the association between behavioral correlates and Metabolic Syndrome. **Method.** Systematic review. The protocol was prior registered in PROSPERO. A search was performed in PubMed, PsycINFO, and Web of Science (CORE), Dissertations & Theses Global, and Google Scholar, with a maximum of 100 results. Observational studies focused on teenagers and young people between the ages of 14 to 30, assessing personality traits and MetS were included. **Preliminary results**. A total of 3606 references were screened by title and abstract after removing duplicates. A total of 27 full-text papers were retrieved from databases, and 6 from Google to be screened. **Dissemination of results**: The primary dissemination strategy will involve submitting the completed review to a peer-reviewed journal aligned with the study's scope. Recognizing the study's focus on adolescents and young adults, dissemination will extend to educational and youth-oriented settings.

Keywords: metabolic syndrome; personality traits; young adults

Background

Metabolic syndrome (MetS), characterized by a cluster of interrelated conditions including central obesity, hypertension, dyslipidemia, and insulin resistance, significantly elevates the risk of cardiovascular diseases and type 2 diabetes (Mommersteeg & Pouwer, 2012; Sutin et al., 2010). Its rising global prevalence, particularly among younger populations, underscores its status as a pressing public health concern (Saklayen, 2018). While traditional research has emphasized biological and lifestyle factors—such as poor diet, physical inactivity, and smoking—emerging evidence highlights the critical role of psychological factors, notably personality traits, in the onset, progression, and management of MetS (Brugger et al., 2023; Kim et al., 2021; Sutin et al., 2010).

Personality traits, defined as enduring patterns of thoughts, feelings, and behaviors, shape how individuals respond to stress, adopt health behaviors, and navigate their environments (Goldberg, 1993). The Big Five model, encompassing Openness, Conscientiousness, Extraversion, Agreeableness, and Neuroticism, provides a widely accepted framework for understanding these traits (McCrae & Costa, 2008). High neuroticism, for instance, is consistently linked to poorer health behaviors, such as emotional eating and smoking, as well as heightened stress responses, all of which

are risk factors for MetS (Burnos & Skrobowski, 2021; Sutin et al., 2010; Terracciano & Costa, 2004). Conversely, conscientiousness is associated with healthier lifestyles, including better dietary habits, regular physical activity, and adherence to medical advice, which may reduce the risk of MetS (Esposito et al., 2021; Linkievicz et al., 2021; McDowell, 2023). Extraversion may promote physical activity through social engagement, whereas low conscientiousness and introversion are associated with sedentary behaviors that increase the risk of Metabolic Syndrome (Ohseto et al., 2018).

Beyond the Big Five, the Dark Triad traits—Machiavellianism, narcissism, and psychopathy—offer additional insights into the influence of personality on metabolic health (Brugger et al., 2023). These traits, characterized by manipulativeness, self-absorption, and impulsivity, are associated with maladaptive behaviors such as risky decision-making and neglect of health recommendations, which can increase the risk of MetS (Hudek-Knežević et al., 2016). For example, psychopathy's link to impulsivity could increase smoking or substance use, while narcissism might prioritize superficial health goals over substantive well-being (Brugger et al., 2023).

The mechanisms linking personality to MetS are multifaceted, involving behavioral and physiological pathways. Behaviorally, personality traits influence diet, exercise, and substance use. Conscientious individuals exhibit greater self-regulation, adhering to balanced diets and consistent exercise routines, whereas neuroticism often correlates with stress-induced overeating and unhealthy food choices (Esposito et al., 2021; Kim et al., 2021). Physiologically, chronic stress, exacerbated by high neuroticism, activates the hypothalamic-pituitary-adrenal (HPA) axis, leading to elevated cortisol levels that promote visceral fat accumulation, insulin resistance, and inflammation (LeBlanc & Ducharme, 2005; Stewart-Knox, 2005). Similarly, autonomic nervous system (ANS) dysregulation, seen in individuals with high neuroticism or low conscientiousness, increases sympathetic activity, contributing to hypertension and glucose intolerance (Ohseto et al., 2018).

Among adolescents and young adults (aged 14–30), these relationships may be particularly salient due to developmental transitions and the early establishment of health behaviors (Arnett, 2000; Steinberg & Morris, 2001). Emerging adulthood, a period of exploration and instability, amplifies the influence of personality on lifestyle choices, potentially setting the stage for MetS later in life (Perovic, 2016). For instance, neuroticism-driven stress may be heightened during this phase, while conscientiousness could foster resilience through disciplined health habits (Leger et al., 2021). Understanding these dynamics is crucial for designing targeted interventions to mitigate the risk of MetS in this vulnerable population.

Review Question

The review question was developed according to the PEO acronym, i.e., Population, Exposure and Outcome, as recommended for systematic reviews that focus on exposures/risk factors and outcomes (Munn et al., 2018). Thus, the review question would be "Are young adults aged 14-30 years with specific personality traits at higher risk of developing a metabolic syndrome?"

Objectives

This review is primarily focused on the relationship between specific personality traits and the diagnosis of Metabolic Syndrome. The second objective is to assess the association between behavioral correlates and Metabolic Syndrome.

Method

The protocol of this systematic review was prior registered in PROSPERO, available at https://www.crd.york.ac.uk/PROSPERO/view/CRD420250632696

Search Strategy

A systematic review was performed searching in PubMed, by National Institutes of Health (NIH), US National Library of Medicine, by the National Center for Biotechnology Information (NCBI); PsycINFO, Psychological Information, by Proquest; and WoS (Web of Science CORE) by Thomson Reuters. In addition, Dissertations & Theses Global, by ProQuest, and Google Scholar (up to 100 results) were used for searching grey literature (see Supplementary file).

The search strategy followed the Peer Review of Electronic Search Strategies (PRESS) guidelines (McGowan et al., 2016) that will consist of 3 filters composed of search terms for the following: (1) Personality traits, (2) Metabolic syndrome, (3) Young adults. All search terms were adapted for use across all databases, and no restrictions were placed on publication years or language. Search was performed in March 2025, and search alerts were set.

Eligibility Criteria

Study Design

Included

Observational studies were included, including cross-sectional and cohort studies (both prospective and retrospective), as well as case-control studies.

Excluded

Individual case studies, randomized, qualitative, and mixed designs, letters to the editor, opinions, reports, book chapters, conference abstracts, indices, and studies focused on developing or validating an instrument; systematic reviews; literature reviews; scoping reviews; rapid reviews; and meta-analysis were excluded.

Population

Included

This review encompasses adolescents and young adults aged 14–30 years, collectively referred to as "youth" according to the classification proposed by Perovic (2016). This age range encompasses two distinct yet interconnected developmental phases: adolescence and emerging adulthood. Adolescence, spanning approximately ages 14 to 17, is characterized by significant physical, cognitive, and social transitions, including puberty and the initial formation of identity, as outlined by Steinberg and Morris (2001). This phase transitions into emerging adulthood, typically defined as ages 18 to 25, with some extensions up to 29, a period marked by exploration, instability, and the gradual shift toward independence, as introduced by Arnett (2000).

Together, these stages bridge the developmental continuum from mid-adolescence through the late twenties, culminating around age 30, when many individuals transition into full-fledged adulthood (Arnett, 2000). The broad 14–30 age range aligns with Perovic's (2016) conceptualization of "youth," particularly within the predominant European model and other frameworks that define youth as starting around 14 or 15 and extending to 29 30, capturing the dynamic interplay of dependence and autonomy across these formative years.

Intervention(s) or Exposure(s)

Included

The review is focused on personality traits assessed with validated instruments (e.g., questionnaires or scales measuring traits such as neuroticism, conscientiousness, extraversion, openness, or agreeableness) as the primary exposure.

These traits are evaluated for their association with metabolic syndrome, highlighting their role in influencing health behaviors such as diet, exercise, and stress management, as supported by prior research (Sutin et al., 2010; Kim et al., 2021). Only studies using standardized, psychometrically validated tools were included to ensure reliability and comparability of findings.

Excluded

Exposures not related to personality traits, such as genetic factors, pharmacological interventions, or non-validated measures of personality (e.g., informal assessments or unstandardized tools), will be excluded. Studies focusing solely on other psychological constructs (e.g., mood disorders, stress without personality trait assessment, personality disorders) or lacking a clear link to metabolic syndrome will also be excluded to maintain the review's specificity.

Context

Global context, with no restriction on geographic regions. Studies have been conducted in clinical, community, and academic settings.

Data Collection Process

Data Selection

References identified by the search strategy were entered into Rayyan bibliographic software (Ouzzani et al., 2016), and duplicates were removed. Titles and abstracts were screened independently by two reviewers. When decisions could not be made based solely on the title and abstract, the full paper was retrieved. Full-text inclusion criteria were screened independently by two reviewers. Discrepancies during the process were resolved through discussion, with a third reviewer consulted where necessary. The agreement between raters in the first screening phase was analyzed using Cohen´s kappa (Cohen, 1960), with a kappa of k = 0.6 (CI95%: 0.4-0.7). After resolving conflicts, the agreement was 100%.

Data Extraction

Extracted information of each selected study included general information in a Microsoft Excel template designed to document data concerning: General information (author, title, year, country); methodological data (type of design, aim of the study, setting, geographic region, sample size); Sample general characteristics (age, sex, gender, socio-economic status, race/ethnic); Sample clinical characteristics (e.g., diagnosis of metabolic syndrome, other diagnoses); Theoretical framework; Personality traits assessment tools (name of measurement tool and description of what it measures exactly, validity and reliability); Behavioral correlates (e.g., physical activity, diet, sleep patterns).

Risk of Bias (Quality) Assessment

Risk of bias (RoB) of the included studies will be assessed. Tools proposed by the Joanna Briggs Institute (JBI) for cross-sectional, cohort, and case-control studies will be utilized (Moola et al., 2017). Two independent reviewers will assess the RoB. No studies will be excluded due to high risk of bias (RoB), but this will be taken into account in the conclusions. To maximize the quality of reporting in the systematic review, we will follow the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Page et al., 2021).

Planned Data Synthesis

Strategy for Data Synthesis

First, studies included will be classified according to their design. Second, data extraction will be performed using a form. This form will include bibliographic data of included studies, and the extracted data will be collated, tabulated, and synthesized narratively. If the available data permits, a meta-analysis will be conducted. Descriptive analyses will detail the identified tools used to evaluate the measurement properties of instruments, with extracted information summarized in a comparative table.

Analysis of Subgroups or Subsets

Subgroup analyses will be conducted, whether information is available, to explore variations in outcomes based on demographic, psychological, and contextual factors e.g., Age Groups: Adolescents and Young Adults; Gender: Male, Female, and Other; Lifestyle: Variations in physical activity, diet, and sleep patterns; Education: Differences based on educational attainment levels; Race: Racial and ethnic diversity among participants.

Implications for Research

The systematic review and meta-analysis outlined in this protocol aim to synthesize evidence on the association between personality traits and metabolic syndrome among adolescents and young adults aged 14–30 years. By examining this relationship, the findings are expected to have several implications for future research. First, identifying specific personality traits—such as neuroticism, conscientiousness, or Dark Triad traits—that are consistently linked to metabolic syndrome can direct mechanistic studies exploring underlying pathways, including stress responses, cortisol dysregulation, and behavioral mediators like diet and physical activity (Sutin et al., 2010).

For instance, if neuroticism emerges as a significant risk factor, future investigations could focus on how chronic stress or emotional instability influences metabolic health outcomes over time. Second, given that this review encompasses observational designs (cross-sectional, cohort, and case-control studies), the findings may underscore the need for longitudinal research to establish causality and temporality between personality traits and the onset of metabolic syndrome. Such studies could track personality development alongside metabolic changes, providing stronger evidence for preventive strategies. Third, the review's focus on validated personality assessment tools underscores the importance of standardizing measurement approaches. Variability in instruments across studies may limit comparability; thus, future research could prioritize developing or endorsing consistent, psychometrically robust tools to enhance reliability and synthesis in this field.

Additionally, the planned subgroup analyses, considering factors such as age, gender, lifestyle, education, and race, may reveal heterogeneity in how personality traits interact with demographic or contextual variables. This could prompt targeted studies on vulnerable populations, such as adolescents with low socioeconomic status or specific ethnic groups, to understand differential risks and tailor interventions accordingly. Finally, the inclusion of behavioral correlates (e.g., physical activity, diet, sleep patterns) as secondary objectives suggests opportunities to explore how personality traits mediate health behaviors linked to metabolic syndrome. Future interventional research could investigate whether personality-tailored programs, such as those that enhance conscientiousness-driven self-regulation, improve adherence to lifestyle modifications, providing practical applications for prevention. Collectively, these implications aim to advance the understanding of personality as a modifiable factor in metabolic health among young populations.

Research Dissemination

The research team is committed to disseminating the findings of this systematic review and meta-analysis broadly to ensure maximum reach and impact across academic, clinical, and public audiences. The primary dissemination strategy will involve submitting the completed review to a peer-reviewed journal aligned with the study's scope, such as Journal of Adolescent Health, Personality and Individual Differences, or Metabolism. Publication in a reputable outlet will facilitate engagement with researchers, psychologists, and health professionals interested in personality and metabolic syndrome.

To further enhance accessibility, the review is deposited in Preprints.org (https://www.preprints.org/). Beyond publication, the findings will be presented at national and international conferences, such as the Society for Adolescent Health and Medicine Annual Meeting or the European Congress of Psychology. These venues will allow direct interaction with experts in adolescent health, psychology, and metabolic research, fostering discussion and collaboration. To reach practitioners and policymakers, the team will develop concise summaries, such as policy briefs

or infographics, and distribute them through professional networks, newsletters, or webinars hosted by institutions like the Universitat de Barcelona or the Universitat Autònoma de Barcelona.

Recognizing the study's focus on adolescents and young adults, dissemination will extend to educational and youth-oriented settings. Key results will be shared with school counselors, university health services, and organizations focused on youth well-being, potentially through workshops or online resources. Social media platforms (e.g., Twitter, LinkedIn) will also be leveraged to share highlights and engage a broader public audience, utilizing hashtags such as #MetabolicSyndrome, #PersonalityTraits, and #YouthHealth to increase visibility. Given the absence of external funding, these strategies prioritize cost-effective and high-impact channels to ensure the research informs both scientific advancements and practical health initiatives.

Supplementary Materials: The following supporting information can be downloaded at the website of this paper posted on Preprints.org.

Conflicts of Interest: No conflict of interest declared.

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