

Face and body traits that develop in response to sex hormones influence in men (mainly androgens in adolescence) are referred to as masculinization features. These traits are perceived as an important component of men's physical attractiveness. According to one of the key concepts of evolutionary biology, physically attractive traits are cues or signals of an individual's biological condition, i.e. general health, immunity and fertility. Thus, from a biological point of view, the level of face and body masculinization in men may be important to women in mate choice. Previous studies on the relationship between the level of face and body masculinization and men's biological condition report equivocal results. While some studies indicate that masculinization is positively related with health and immunity in adult men, other show that morphological masculinization is at best weak indicator of a man's health or immunity. In light of these heterogeneous research results, the role of masculinization as a biological cue still remains elusive and requires further research. According to the Zahavi's handicap hypothesis, a physically attractive trait can be seen as a signal of an individual's condition only when the development and maintenance of such trait is associated with significant biological costs that cannot be borne by an individual of low biological condition what assures honesty of biological signals. Thus, only individual of high biological condition can develop, and maintain costly, attractive features. The results of experimental studies show that high levels of androgens (e.g., testosterone), which stimulate face and body masculinization, are physiologically costly. This is suggested to result from immunomodulating and prooxidative properties of androgens, that may result in lower immunity and higher oxidative stress. However, previous research on the relationship between masculinization and various measures of health suffered from many limitations and were mostly conducted on young adults. Inconsistent results of these studies may result from the fact that the cumulative effect of the negative influence of androgens on the body may not manifest until middle or old age. In young men, relatively high effectiveness of body repair mechanisms (e.g. immune or antioxidant mechanisms) may counteract the temporary biological costs of androgens, especially in well-fed populations with low pathogen burden.

The aim of this study is to verify the signaling role of morphological masculinization in men by testing whether face and body masculinization level is related with health status in middle-aged men. We hypothesize that only men of high biological condition are able to maintain high androgen levels and develop and maintain high morphological masculinization throughout ontogenesis. Thus morphological masculinization should positively correlated with health and biological age in middle-aged men. The study will include 200 men, aged 50-60 years. Masculinization will be assessed based on morphological and functional (muscle strength) markers as well as based on androgens level. Health will be assessed based on physiological, functional and morphological indicators, including hormone levels, biochemical blood tests, markers of biological age, skin condition and oral health – with the two latter introduced as new markers of biological condition in middle-aged individuals. We will control for socioeconomic status, lifestyle factors, stress level and dietary habits. Additionally, COVID-19 infection and vaccination status, as well as anti-SARS-CoV-2 IgM and IgG antibodies level, will be controlled in order to exclude the potential influence of acute infection or possible long-term effects of COVID-19. The results of this study will allow to better understand the inconsistent findings in research examining the association of morphological masculinization and health in men. Furthermore, this project will allow to introduce the new concepts into the studies from the field of biology of attractiveness, verifying the signaling role of physically attractive traits, showing that the cumulative cost linked with ornamental traits may not manifest until later in life. Regarding the comprehensive evaluation of participants' health the results will also provide a valuable medical and epidemiological data concerning the link between sex hormones levels and health status, what potentially may help to identify new risk factors for certain diseases in middle-aged men.