

Despite significant progress in recent years, our understanding of the adaptive mechanisms underlying individual differences in aging and healthspan (the period of life spent in good health) remains incomplete. As the human lifespan dramatically increased in the past several decades in developed countries understanding of biological mechanisms underlying these differences has important implications for contemporary societies. Evolutionary theories suggest that these differences primarily result from individual trade-offs between reproductive and somatic investments. Reproductive investment refers to the energy and resources an individual allocates towards mating, producing offspring, and ensuring the survival of those offspring. Somatic investment refers to the energy and resources devoted to maintaining and improving the body's condition, health, and longevity. For men, these trade-offs are largely regulated by androgens, which enhance reproductive effort and intra-sexual competition, increase attractiveness by developing traits of morphological masculinity, promote mating behaviors, boost libido, and foster aggressive competition for mates. However, high androgen levels are postulated to also have negative effect for health and longevity. Elevated testosterone may suppress immune function, increase oxidative stress, raise the risk of cardiovascular disease, and heighten susceptibility to injuries, potentially reducing lifespan. Yet, human studies show little support for testosterone's immunosuppressive, prooxidant, or atherogenic properties, and many results are contradictory.

To fully understand androgens' role in shaping men's life history trade-offs and their impact on aging, it is crucial to consider androgen receptor (AR) sensitivity, which mediates the peripheral effects of testosterone and its metabolites. AR sensitivity may be key to understanding testosterone-dependent life-history trade-offs and their significance for biological condition and aging. This study aims to clarify testosterone's role in reproductive/somatic trade-offs by incorporating AR sensitivity and verifying its importance for a man's reproductive and somatic investment. We suggest that higher AR sensitivity might predispose individuals to increased mating effort (more pronounced masculinity and higher fertility), while lower AR sensitivity might relate to decreased mating effort and lack of constraint in health investment.

To investigate the importance of androgen receptor sensitivity for testosterone-dependent life-history trade-offs, a cross-sectional study will examine the relationship between AR sensitivity, androgen levels, interactions between AR and androgen levels, and various measures of reproductive and somatic effort. The research group will include 130 men aged 20-30 years and 130 men aged 45-55 years, allowing for the detection of age-specific impacts of AR sensitivity and its interaction with androgen levels on reproductive or somatic effort. Aging and biological condition will be assessed based on various physiological and functional markers, such as hormone levels, chronic inflammation, oxidative stress, bone density, physical strength, gait speed, etc. The reproductive effort will be assessed based on fertility measurements (sperm quality and hormone levels), morphological masculinity (traits related to intra- and inter-sexual competition), and androgen-dependent behaviors of importance for competition for mates (e.g. dominance, aggression).

This research could significantly enhance our understanding of the intricate balance between reproductive and somatic investments in men and how androgen receptor sensitivity influences this balance, ultimately shedding light on the broader impacts of testosterone on health and aging.