Low Testosterone

Psychological studies investigating the hormone testosterone and its associated social behaviors, cognitive effects, and personality traits commonly define testosterone levels in a relative sense. As such, "low testosterone" is defined here as low relative to other members of a given sample and excludes individuals with atypically low levels due to medical conditions. Generally, testosterone is associated with a variety of human social behaviors, including dominance, concern for status, and cooperation. Specifically, low testosterone is implicated in attenuated dominance, diminished proclivity to seek and maintain high status, and increased cooperative behavior.

Variability of Testosterone Levels

Baseline testosterone levels vary naturally between individuals, but also within an individual, with testosterone rising at the onset of puberty and decreasing in old age—particularly among males. Testosterone levels can also vary within an individual on a smaller timeframe based on social context, e.g., winning or losing a competition can result in temporary changes in testosterone levels. The largest difference in testosterone levels is between sexes, with males having 7-8 times the amount of circulating testosterone found in females. For example, low levels of testosterone in a given male individual may still be equal to or exceed the average levels of testosterone in a sample of females.

Relationship to Social Behavior

Much like in non-human animals, testosterone has been linked to aggression in humans, with lower testosterone levels being associated with lower levels of aggression. However, among humans such findings are inconsistent and, when present, show smaller effects in comparison to non-human animal models. Often, aggression is interpreted as a manifestation of dominance.

Dominance is a general proclivity to acquire and maintain higher rank within a social hierarchy. Behavioral displays of dominance are varied, but may include assertiveness; intimidation; coercion; extended stare duration; body posturing that conveys superiority; and in some contexts, physical violence. From this perspective, the role of testosterone becomes clearer, as the relationship between it and dominance, rather than aggression *per se*, is more robust. (Two predominant theories that attempt to explain this relationship are *The Challenge Hypothesis* and *The Biosocial Theory of Status;* see Further Readings).

Typically, individuals with low baseline testosterone exhibit less dominance than their higher testosterone contemporaries. This is measured in a variety of ways. For example, low testosterone individuals exhibit less dominant behaviors in competitive social interactions than individuals with high baseline testosterone. Low testosterone individuals also show diminished selective attention to angry faces, which are often indicators of social threat. The hormone cortisol is frequently used as a measure of stress, with increases in cortisol usually indicating a stressful event. When their status is threatened, low testosterone individuals show reduced cortisol reactivity, i.e., reduced stress, in comparison to high testosterone individuals. Beyond seemingly not seeking higher status, low testosterone individuals appear not to prefer high status even when it is freely given. That is, when placed in a position of higher status, individuals with low testosterone have shown declined cognitive performance, increased physiological arousal, and increased negative emotions (all indicators of stress).

Individuals with low testosterone appear to be more inclined toward cooperative behavior. Prior to a team competition, low testosterone individuals have shown increased team bonds. Although outperformed by their higher testosterone contemporaries in individualistic competitions, those with low testosterone performed better than high testosterone individuals in

intergroup, cooperation-based competitions. In economic decision games, people with low baseline testosterone are more likely to accept offers perceived as unfair, suggesting a diminished concern for perceived threats to status as well as an increased proclivity to cooperate.

Caveats

Although baseline testosterone has been linked to various social behaviors, evidence suggests that the stronger predictor of competitive and aggressive behaviors (i.e., dominant behaviors) is *changes* in testosterone in response to an event, rather that baseline testosterone *per se*. For example, individuals with decreases in testosterone after a competitive event were less likely to engage in further competitive tasks than those whose testosterone remained steady or increased. No such association was found when investigating differences in baseline testosterone. Further, the relationship between context-related testosterone dynamics and dominance is less consistently found in women, though frequently found in men. This latter inconsistency may be due to actual differences in psychobiological processes between sexes. However, it may instead be due to methodological issues in measurement sensitivity, given that women have far less circulating testosterone than men, and thus changes in testosterone are difficult to measure accurately in women.

Further Readings

Mazur, A. & Booth, A. (1998). Testosterone and dominance in men. *Behavioral and Brain Science,* 21, 353-397.

Archer, J., 2006. Testosterone and human aggression: an evaluation of the challenge hypothesis. *Neuroscience and Biobehavioral Reviews,* 30 (3), 319–345.