

Gender and social environment modulate the effects of testosterone on social behavior: comment on Eisenegger *et al.*

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Eisenegger and colleagues [1] recently published in this journal an important review on the role of testosterone (T) in social interaction. We agree with the main premise of the article that T is related to status-seeking (see [2] for a previous review that drew a similar conclusion). The authors, however, overlooked the important roles of gender and social environment in moderating testosterone-behavior associations. Also, some of the references were incorrectly cited, and correcting these in fact bolsters the authors' theoretical position.

Testosterone and human aggression

In their review, the authors concluded there is “no evidence for a direct causal link between testosterone administration and laboratory measures of non-physical aggression in humans” ([1], p. 264). This conclusion, however, is based exclusively on studies conducted in women-only samples and is therefore misleading. Studies that support a causal link between T and aggression (assessed using validated behavioral tasks) in men were not included in the review [3,4]. Although more carefully controlled pharmacological challenge experiments are certainly needed, a more appropriate conclusion based on the available literature is that T may play a more prominent role in reactive aggression among men.

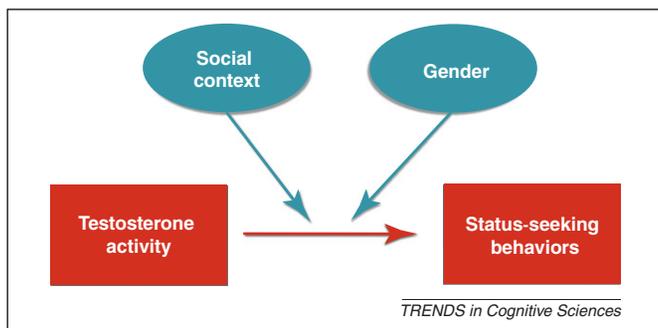


Figure 1. Importance of social context and gender in moderating testosterone (T) – behavior associations. Behavioral studies indicate that social context (e.g., winning or losing a dominance contest; presence or absence of a status threat) influences the association between T and status seeking behaviors (e.g., aggression, competitiveness). Pharmacological challenge experiments indicate that the association between T administration and status seeking behaviors depends on gender. Thus, it will be important to consider these moderating variables in future studies that examine the role of T in promoting human social behavior.

Testosterone's influence on behavior depends on the social environment

We believe that recent studies of the relationship between circulating T and status [5–10] have been instrumental in laying the theoretical and conceptual groundwork for studies on the effects of T administration on social behaviors, yet the key insights from these studies are not discussed in [1]. Even though many of these articles are cited in the review, they are cited incorrectly or inappropriately. For example, some studies are cited as supportive of an effect of competition outcome on changes in T, when in fact none of these studies measured changes in T [5–7]. What this group of studies show is that T is a powerful predictor of status-relevant behavior, but only when an individual's status is threatened [5–10]. In the absence of status threat (e.g., when one has won a dominance battle or when status is not relevant), T fails to predict behavior (see Figure 1). These findings provide strong support for a relationship between T and status-seeking behavior and provide an answer to the first ‘outstanding’ question in Box 1 in [1].

In summary, a more inclusive consideration of the literature than that provided in [1] supports the conclusion that (i) T increases reactive aggression in men (but not women), and (ii) T is most strongly related to status-relevant behaviors *after* social status is threatened (e.g., after losing a dominance battle). We believe strongly that increased attention to the role of gender and the social environment in moderating T-behavior associations is crucial to understanding how and when T influences complex social behavior.

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