



Sex differences in testosterone reactivity during marital conflict

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ABSTRACT

When attempting to resolve relationship problems, individuals in close relationships sometimes challenge their partners with statements that oppose their partners' point of view. Such oppositional behaviors may undermine those partners' relational value and threaten their status within the relationship. We examined whether perceptions of opposition from a partner during a series of problem-solving interactions were associated with reactivity in testosterone levels and whether those associations were different for men and women. Fifty newlywed couples discussed four marital problems. Each member of the couple reported how much oppositional behavior they perceived from their partner during the discussions. Pre- and post-discussion saliva samples were assayed for testosterone. For men, but not for women, perceptions of oppositional behavior were associated with heightened testosterone reactivity, and this result replicated across three different measures of testosterone reactivity. Findings were specific to men's *perceptions* of oppositional behavior, and held controlling for objective measures of oppositional behavior coded from videos of the conversations. Results highlight the benefits of considering pair-bonded relationships as a novel context for investigating associations involving hormones and behavior. Findings also raise the possibility that sex differentiated hormonal reactions to opposition partly explain why conflict among heterosexual partners can be so divisive.

Imagine Rob and Molly, two people in a romantic relationship who live together and lead busy lives. One day, they find themselves in a disagreement about child-rearing. When Rob expresses his views on a number of topics (grades, chores, religion), he perceives that Molly opposes some of his opinions. Rob perceives Molly's statements as a challenge and feels a threat to his status and relationship value. The current research addresses the question: What physiological responses in Rob might be evoked by this sense of threat?

There is reason to believe Rob may experience testosterone reactivity (i.e., relatively positive changes in testosterone). Testosterone is a hormone often associated with competition and aggression outside the context of a close relationship (Archer, 2006; Carré and McCormick, 2008; Carré et al., 2011; Mazur and Booth, 1998; Mehta and Josephs, 2006). Specifically, several theoretical perspectives imply that testosterone reactivity serves adaptive functions in the context of social challenge or threat (Archer, 2006; van Anders et al., 2011; Wingfield et al., 1990) by preparing the individual for possible aggression or competition (Carré et al., 2011). Traditional perspectives, such as the challenge hypothesis (Wingfield et al., 1990), and related research (for meta-analyses see Archer, 2006; Geniole et al., 2017) have emphasized the role of testosterone reactivity during competition. Much of the evidence to support the link between challenge and testosterone

reactivity in humans thus has been from research focused on physiological responses in the context of sports competitions (e.g., Edwards et al., 2006; Mazur and Lamb, 1980; Neave and Wolfson, 2003) or in instances in which individuals are partnered with strangers in lab experiments (e.g., Carré et al., 2010; Gladue et al., 1989; Henry et al., 2017; Maner et al., 2008). This literature has for the most part stopped short of examining situations in which individuals may feel challenged by their close relationship partners.

Yet, people also face important challenges in their romantic relationships. As illustrated in the scenario about Rob and Molly, when discussing important areas of disagreement people may use oppositional behaviors, such as blaming their partners, rejecting their point of view, and demanding that they behave differently (Overall and McNulty, 2017). Although such behaviors are not inherently detrimental to the relationship, and can even be functional in the context of severe problems (McNulty and Russell, 2010), perceiving that one's partner is behaving in an oppositional manner may nevertheless be associated with feeling challenged or threatened. Conflict can also lead people to feel uncertain about whether their partners value and accept them (Murray et al., 2006), and such feelings of threat and uncertainty become especially pronounced when partners try to exert their influence through oppositional behaviors (Overall et al., 2009; Overall and

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McNulty, 2017). Indeed, oppositional behavior can be perceived as fundamentally threatening to one's relational value and status in the relationship (see Lemay et al., 2012; Overall et al., 2016; Reis et al., 2004). Perceptions of a partner's oppositional behavior, thus, may be associated with reactivity in levels of testosterone.

If perceptions of opposition from a partner are associated with testosterone reactivity, there is some reason to expect sex differences in this association. Traditional perspectives have focused on testosterone reactivity in men, and evidence suggests that social threat leads to testosterone reactivity in men more than women (Archer, 2006; Carré et al., 2013; Gladue et al., 1989; Kivlighan et al., 2005; Mazur and Booth, 1998). Such findings are consistent with theories emphasizing greater levels of intrasexual competition among men than among women (Ainsworth and Maner, 2012; Wilson and Daly, 1985), and the role testosterone plays in that competition (Archer, 2006; Trivers, 1972). Nevertheless, as noted, such perspectives have not been applied to contexts in which threat is experienced in close relationships. Further, recent perspectives such as the Steroid/Peptide Theory of Social Bonds (S/P theory) suggest that testosterone reactivity can extend to threats perceived by both men and women involved in a pair-bonded relationship (van Anders et al., 2011) by specifically positing that testosterone reactivity can prepare both men and women to respond to perceived threats to their status in the relationship. Indeed, men and women tend to engage in oppositional behavior with the same frequency (e.g., Hellmuth and McNulty, 2008; McNulty and Russell, 2010). Thus, although there are reasons to think the link between perceptions of oppositional behavior and testosterone reactivity is greater among men than women, there are also reasons to question whether there are sex differences in the link between perceived opposition and testosterone reactivity in close relationships.

Although other recent studies have examined the role of testosterone in romantic relationships (e.g., Kaiser and Powers, 2006; Roney and Gettler, 2015; van Anders et al., 2011; Wardecker et al., 2015), we are aware of only one study that has examined testosterone reactivity in the context of conversations in romantic couples (Peters et al., 2016), and that study did not examine conflict discussions. Peters et al. (2016) examined the association between testosterone reactivity and the self-regulation of emotions. Those authors asked both members of a couple to watch an emotionally evocative film clip and then randomly assigned one member of the couple to suppress or express emotions during a discussion with the partner. Both men and women who were asked to regulate their emotional responses experienced greater decreases in testosterone than people who expressed their emotions naturally, suggesting that testosterone plays a role in emotion regulation for both sexes. However, the authors did find a sex difference in the extent to which this association was moderated by the partner's level of authoritativeness; a particularly pronounced drop was observed in female but not male participants with authoritative partners. In our research, we examined whether testosterone is also reactive to perceptions of oppositional behavior from one's partner. We predicted that people's perceptions of their partners' oppositional behaviors would be positively associated with their own testosterone reactivity. We also tested for possible sex differences in this association.

1. The current research

We examined a sample of married couples engaged in a series of problem-solving discussions and assessed the association between each individual's testosterone levels and their perceptions of their partners' oppositional behavior. We predicted that people's perceptions of oppositional behavior from their partner would be associated with heightened testosterone reactivity. Moreover, we predicted that this effect would emerge even when controlling for objective features of the partners' oppositional behavior. Indeed, both the S/P Theory and the Integrated Specificity Model of Stress (Kemeny, 2003) posit that people's perceptions of the environment are responsible for initiating the

cascade of physiological reactions displayed in response to environmental stimuli (e.g., Goldey and van Anders, 2011).

We examined whether testosterone reactivity would be associated with perceived opposition independent of other aspects of the discussions, such as observable opposition by the partners and individuals' perceptions of problem severity, as well as whether testosterone reactivity would be independently associated with these variables. Perceptions of problem severity may indicate that the discussion is about an important topic and disagreeing with one's partner on this topic is not a pleasant experience. However, perceptions that a problem is severe do not imply that an individual is being challenged or threatened by their partner's behavior. These additional analyses, thus, allowed us to examine the specificity of our hypothesized effect.

2. Method

2.1. Participants

Participants were 102 members of 51 newlywed couples participating in an ongoing longitudinal study of 120 couples (for additional information about the total sample, see Hicks et al., 2016, Study 1)¹; given funding constraints, we assayed the hormonal data available from only the first 51 couples with usable data. Testosterone was reliably assessed for 97 of those 102 participants (47 women) ($M_{\text{age}} = 31.43$, $SD_{\text{age}} = 8.16$; 81% White/Caucasian). All couples in this subset were heterosexual. Due to a camera malfunction, video data were not available for one couple, leaving a final sample of 50 couples.

2.2. Procedures

Both members of each couple attended a laboratory session within three months of their wedding. During this session, couples completed a variety of tasks beyond the scope of the current analyses² and engaged in four eight-minute discussions of marital problems (two chosen by each spouse), each of which was separated by approximately 5–10 min. At the end of each conversation, participants answered questions about their perceptions of their partners' behavior during the discussion. Before beginning the first discussion and approximately 8 min after the last discussion, participants provided saliva samples via passive drool.

2.3. Measures

2.3.1. Testosterone

Samples were frozen at -20°C immediately after each session. Before samples were assayed, they were thawed, centrifuged for 15 min at 3000 RPM, and the supernatant was refrozen in aliquots. Testosterone was assessed using commercially available enzyme-linked immunosorbent assay (ELISA) kits (Salimetrics, State College, PA). Samples were run in duplicate. The inter-assay coefficient of variability was 10.65 and the intra-assay coefficient of variability was 3.19.

Researchers have operationalized testosterone reactivity in three ways (see Carré et al., 2013): absolute testosterone change (e.g., Peters et al., 2016), percent change in testosterone (e.g., Carré and Putnam, 2010), and the residuals from regressing post-manipulation testosterone onto baseline levels (e.g., Welker et al., 2017). To ensure effects were not specific to one operationalization, we provide results for all three approaches. Similar patterns emerged using all three

¹ Although data from this sample have been described in several other published reports, none have involved data on either testosterone or variables related to these discussions (e.g., behaviors or perceptions of behaviors).

² Given broader study goals, participants were photographed, had their hands scanned, and completed several implicit tasks in individual rooms prior to engaging in the discussions that are investigated in this paper. Couples did not engage in any interpersonal tasks before the start of the discussions.

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