Biological Psychology 96 (2014) 66–71

Contents lists available at ScienceDirect

Biological Psychology

journal homepage: www.elsevier.com/locate/biopsycho

Immunoglobulin A response to acute stress in intimate partner violence perpetrators: The role of anger expression-out and testosterone

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ARTICLE INFO

Article history:
Received 28 April 2013
Accepted 25 November 2013
Available online 6 December 2013

Keywords:
Acute stress
Anger expression
Cortisol
Intimate partner violence
Immunoglobulin A
Testosterone
2D:4D ratio

ABSTRACT

Aggressive behavior and immune activity are shown to be positively associated in perpetrators of intimate partner violence (IPV). This relationship follows an inverted-U curve, with the most violent individuals showing lower levels of immunocompetence than those with a history of moderate violence. Moreover, the activational and organizational effects of testosterone (T) may indirectly stimulate the immune response. Given this, we used the Trier Social Stress Test to establish whether the salivary immunoglobulin A (sIgA) response to acute stress was a specific psychobiological feature in perpetrators of intimate partner violence (IPV). IPV perpetrators showed higher sIgA levels than controls for the preparation period. Moreover, higher anger expression and T (baseline and AUC_i) were only related to higher sIgA levels in IPV perpetrators. We hypothesize that in IPV perpetrators, the use of violence against partners could benefit their psychological well-being – through immunological modifications such as mucosal immunity changes expressed by the sIgA – and so be rewarding for them. This research may provide a wider explanation of why IPV perpetrators use violence against their partners.

1. Introduction

Aggressive behavior and immune activity may be positively correlated (González-Bono & Moya-Albiol, 2010; Mommersteeg, Vermetten, Kavelaars, Geuze, & Heijnen, 2008; Pesce et al., 2013; Ranjit et al., 2007; Suárez, Krishnan, & Lewis, 2003; Suárez, Lewis, & Kuhn, 2002; Tsuboi et al., 2008) consistent with aggressive people having a high likelihood of suffering wounds (Granger, Booth, & Johnson, 2000). Furthermore, increases and decreases in the levels of salivary immunoglobulin A (sIgA) were observed after the induction of anger and depression, respectively (Tsuboi et al., 2008). The sIgA is one of the most important humoral factor of the local immune system of the oral cavity. It is produced by plasma cells locally in salivary glands and can transverse mucous membrane. It can reduce bacterial adherence in the oral cavity by the bacterial aggregation which allows eliminate infectious agents (Bosch, de Geus, Veerman, Hoogstraten, & Nieuw Amerongen, 2003). Studies have revealed higher levels of antibodies in aggressive populations, especially adults with conduct disorders, than controls (Fetissov et al., 2006; Pajer, Rabin, & Gardner, 2002). These findings are consistent with the pattern in non-human primates, in which aggressive individuals appear to have stronger immune systems than non-aggressive peers. In evolutionary terms, aggressive behavior is important for gaining and maintaining dominant status, access to females and food, protecting young individuals, fighting off predators, and competing with conspecies for resources and territory. For this reason, high immunocompetence could be a compensatory mechanism to protect aggressive individuals against their high risk of exposure to immune stimuli (Granger et al., 2000). In line with this, dominant status would be related to a low risk of diseases and a rapid recovery from illnesses (Archie, Altmann, & Alberts, 2012).

Intimate partner violence (IPV) perpetrators use physical and/or psychological abuse to control their partners and obtain a dominant status (Antai, 2011). Such behaviors may contribute to improving their health at the expense of that of the battered women (Inslicht et al., 2006), who are in a subordinate position. Further, levels of immune function were observed to increase more after arguing in couples with higher than those with lower baseline hostility (Kiecolt-Glaser et al., 2005).

Arguing with others could be considered an acute stressor and its effects on the immune system can be simulated using a standardized psychosocial stress test such as the Trier Social Stressor Test (TSST). To date, however, only one study in non-violent men has employed an anger induction procedure as an acute stressor: in

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http://dx.doi.org/10.1016/j.biopsycho.2013.11.009

this, authors found a positive association between negative affect including anger feelings and the secretion of cytokines (Suarez, Boyle, Lewis, Hall, & Young, 2006). Further, as far as we know, no studies have explored whether the immune system is different in IPV perpetrators and non-violent men.

On the other hand, positive relationships have recently been reported between current testosterone (T) levels, immune response to a vaccine and T-dependent traits such as facial attractiveness, being these relationships moderated by low cortisol (C) levels. Concretely, they analyzed blood levels of anti-hepatitis B surface antigen anti-HBsAg before and after the administration of a single dose of a hepatitis B vaccine. The C is released when immunological processes are stimulated and only the inverse relationship between C and T may be the link between T and the immune system (Rantala et al., 2012). Inversely, in non human-primates, T levels diminished and C levels increase when the status is lost (Henry & Stephens, 1977). The positive relationship between violence and immune activity in aggressive individuals may be explained by the fact that hypoactivity of the hypothalamic–pituitary–adrenal (HPA) axis has been observed in aggressive individuals, both in baseline conditions and in response to stress (Pajer et al., 2002; Popma et al., 2007). In line with this, our previous research revealed that IPV perpetrators had higher T levels and a weaker C response to a conflict stress task than controls (Romero-Martínez, Sariñana-González, González-Bono, Lila, & Moya-Albiol, 2013). We also found that the imbalance between T and C levels, which may indicate a predisposition to violence, was associated with better self-esteem and mental health (Romero-Martínez, González-Bono, Lila, & Moya-Albiol, 2013). Moreover, a peripheral T-dependent indicator of prenatal masculinization of the central nervous system, the 2D:4D ratio (Romero-Martínez et al., 2013), was more masculinized in IPV perpetrators than controls (Romero-Martínez, Sariñana-González, et al., 2013). Given these previous findings, we wondered whether mental health might be better and the immune system stronger in people with high T levels, more masculinized traits and low C levels.

To address these lacunae in the literature, the first aim of the current study was to assess whether IPV perpetrators have higher baseline sIgA levels or magnitude of response to stress than non-violent men, using several measurements of sIgA in response to stress. In our previous publications we have indicated that IPV perpetrators have presented higher T levels and a hypoactive HPA axis (Romero-Martínez, González-Bono, et al., 2013; Romero-Martínez, Sariñana-González, et al., 2013), joined with the inverse relationships between T and C and between C and immune system. We hypothesized that IPV perpetrators would present higher sIgA baseline levels and magnitude of response to stress than controls. Further, there is high amount of evidence that aggression and violence produce biological stress responses including modifications in the central nervous, endocrine and autonomic systems (González-Bono & Moya-Albiol, 2010; Herrero, Gadea, Rodríiguez-Alarcón, Espert, & Salvador, 2010; Mommersteeg et al., 2008; Pesce et al., 2013; Ranjit et al., 2007; Suárez et al., 2003; Tsuboi et al., 2008). Hence, we explored the moderator role of anger expression and endocrine parameters in the sIgA baseline levels and magnitude of response to stress. Concrete, we analyzed the relationships of sIgA (baseline and magnitude of response to stress) with anger expression, as it has been reported that only severely violent IPV perpetrators exhibit more anger after marital conflict discussions (Babcock, Green, Webb, & Yerington, 2005). We hypothesized that high levels of anger expression, especially in IPV perpetrators, would be related to higher sIgA baseline levels and magnitude of response and, consequently, to stronger immune responses. Finally, taking into account the findings of our previous studies (Romero-Martínez et al., 2013; Romero-Martínez, González-Bono, et al., 2013; Romero-Martínez, Sariñana-González, et al., 2013) and the results of Rantala et al. (2012), we hypothesized that in IPV perpetrators current low C levels would be associated with high immunocompetence (sIgA baseline levels or magnitude of response). Moreover, current T levels (due to its inverse relationship with the C) and a masculinized 2D:4D ratio would be positively associated with high sIgA baseline levels or magnitude of response.

2. Method

2.1. Participants

The final sample was composed of 38 healthy male volunteers: 19 IPV perpetrators and 19 controls, who were age matched, due to the fact that both T and C are age related. Data are missing for two controls as the saliva samples were insufficient to complete the laboratory tests (not enough salivation). IPV perpetrators were recruited from among the participants in the CONTEXTO psycho-educational treatment program (mandatory for male abusers) at the Department of Social Psychology, University of Valencia, and we advertised for volunteers for the control group. The selection criteria and assessment of candidates have been described in detail previously (Romero-Martínez, González-Bono, et al., 2013; Romero-Martínez, Sariñana-González, et al., 2013; Romero-Martínez, Lila, Williams, González-Bono, & Moya-Albiol, 2013).

All participants were right-handed and healthy, lived in Valencia (Spain), and gave written informed consent. The experiment was performed in accordance with the Helsinki Declaration and approved by the University of Valencia Ethics Committee.

2.2. Procedure

Each subject participated in one session in the psychobiology laboratories of the University of Valencia. Firstly, participants were interviewed to identify (and subsequently to reject) participants who suffered from serious medical conditions, such as strokes, hyper and hypotension, hyper and hypothyroidism, diabetes, neurological disease, allergies and acute or chronic infections such as sexually transmitted diseases among others. Three IPV perpetrators were excluded of the study because two of them suffer from psychiatric disorders and one of them a stroke with important cognitive deficits.

Experimental procedure was always carried out between 4:00 pm and 7:00 pm to minimize hormonal circadian variations. Participants who were included in the study were instructed to abstain from food, caffeine, alcohol, brushing their teeth, exercise and any medication in the 2 h before the second laboratory session. It was explained that they would be asked to provide saliva samples for hormone and immune marker measurements and to perform several behavioral tasks. Specific time points for measuring the sIgA, C and T levels were carefully chosen following previous recommendations (de Andrés-García, Moya-Albiol, & González-Bono, 2012). After arriving at the laboratory, participants were taken to a room (adjoining to the stress room and similar to it) where they signed informed consent forms and anthropometric data (height and weight) were obtained. Before stress exposure, participants remained sitting and silent three saliva samples were collected (for assessing sIgA, C and T levels) and the anger expression and control subscales of the Spanish version of the State-Trait Anger Expression Inventory (STAXI-2, see below) were administered and the participants were conducted to the stress room. Subsequently, participants were taken to a sound-proofed room with a steady temperature ($22 \pm 1\,^{\circ}C$) for the Trier Social Stress Test (TSST) (Kudielka, Buske-Kirschbaum, Hellhammer, & Kirschbaum, 2004). This is a standardized psychosocial laboratory stressor that