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The impact of social exclusion vs. inclusion on subjective and hormonal reactions in females and males☆

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Summary
Background: The experience of social exclusion represents an extremely aversive and threatening situation in daily life. The present study examined the impact of social exclusion compared to inclusion on steroid hormone concentrations as well as on subjective affect ratings.
Methods: Eighty subjects (40 females) participated in two independent behavioral experiments. They engaged in a computerized ball tossing game in which they ostensibly played with two other players who deliberately excluded or included them, respectively. Hormone samples as well as mood ratings were taken before and after the game.
Results: Social exclusion led to a decrease in positive mood ratings and increased anger ratings. In contrast, social inclusion did not affect positive mood ratings, but decreased sadness ratings. Both conditions did not affect cortisol levels. Testosterone significantly decreased after being excluded in both genders, and increased after inclusion, but only in males. Interestingly, progesterone showed an increase after both conditions only in females.
Discussion: Our results suggest that social exclusion does not trigger a classical stress response but gender-specific changes in sex hormone levels. The testosterone decrease after being excluded in

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both genders, as well as the increase after inclusion in males can be interpreted within the framework of the biosocial status hypothesis. The progesterone increase might reflect a generalized affiliative response during social interaction in females.

1. Introduction

The experience of social exclusion represents an extremely aversive situation in daily life. Social exclusion can threaten fundamental human needs: belonging, self-esteem or control (Williams, 2007). Benenson et al. (2011) proposed that social exclusion is a form of non-directed aggression that is particularly salient to females. Women are socialized to create more intimate, close relationships while males are encouraged to develop a more independent relationship style and focus on self-autonomy (Cyranowski et al., 2000). As a result, women's self-concept is more strongly based on connectedness to others (Cross and Madson, 1997). It has further been hypothesized that females suffer more than males from negative social situations by worrying and attributing these experiences to a lack of personal competence (Rose and Rudolph, 2006). In the present study, we aimed at investigating gender differences in subjective and hormonal responses to social exclusion vs. inclusion.

Previous studies have documented that experimentally induced social exclusion triggers a number of affective responses. A meta-analysis of experimental social exclusion studies using different paradigms (Blackhart et al., 2009) showed larger effect sizes for mood changes as a function of exclusion when samples had a higher proportion of females. Studies using a virtual ball tossing game, the Cyberball paradigm (Williams et al., 2000), found that Cyberball exclusion in samples with a female majority was associated with higher anger (Zadro et al., 2004) and depression ratings (Zoller et al., 2010). Weik et al. (2010) reported increased anger after Cyberball exclusion in both genders, but increased depression ratings only in females. Notably, studies using samples with a higher proportion of male participants also reported mood decreases after Cyberball exclusion (Wesselmann et al., 2012), but others with a sole male sample did not report increases in anger (Geniole et al., 2011). With respect to subjectively experienced distress, however, no previous Cyberball study with mixed samples (e.g., Boyes and French, 2009; Hawkley et al., 2011; Kelly et al., 2012) has explicitly assessed gender differences. Therefore, the first aim of the present study was to examine whether social exclusion has more negative effects on females compared to males on a subjective level. Due to lacking prior experimental evidence, we expected stronger negative responses in females based on theoretical considerations only.

Apart from subjective distress ratings, social exclusion may also affect the release of the major stress hormone, cortisol. Blackhart et al. (2007) showed elevated cortisol levels after subjects have been told that none of their previous interaction partners wanted to work with them. Using the Yale Interpersonal Stressor Task, Stroud et al. (2002) reported stronger cortisol and blood pressure increase in females, but no gender differences in self-reported distress, when being excluded and rejected by two interaction partners that connected well with each other. Notably, studies using the Cyberball paradigm did not observe cortisol increases in the exclusion groups, either in pure male (Geniole et al., 2011), pure female (Zoller et al., 2010), nor in a (rather small) mixed sample (Zwolinski, 2012). Given previous null findings in cortisol response when applying the Cyberball paradigm as an experimental manipulation of social exclusion, we wanted to further investigate whether social exclusion triggers cortisol release in females and males differently. We assumed that if social exclusion does impact cortisol, this effect would be stronger in females based on pioneering findings by Stroud et al. (2002).

However, social exclusion might not only result in gender differences in cortisol responses, but could also affect the release of major sex hormones, such as testosterone and progesterone. Building on the biosocial status hypothesis (Mazur and Booth, 1998), a recent review by Eisenegger et al. (2011) postulated that testosterone plays a role in a broader picture involving power and dominance motives, such as the search for and the maintenance of social status. There are only two previous Cyberball studies investigating effects on testosterone. One study found that increases of testosterone in both sexes correlated with anger changes (Peterson and Harmon-Jones, 2012) but did not report significant testosterone changes from before to after the task. The other likewise did not find a significant change in testosterone responses in a male sample in either exclusion or inclusion (Geniole et al., 2011). Despite limited evidence on testosterone responses to Cyberball exclusion, we expected social exclusion to result in testosterone decrease, related to a loss in social status, as outlined by Eisenegger et al. (2011).

There is limited evidence on the involvement of progesterone in social motivation. Initial studies suggest a positive correlation between progesterone and implicit affiliation motivation in male and female subjects independent of cycle phase (Schultheiss et al., 2003; Wirth and Schultheiss, 2006). Accordingly, Brown et al. (2009) observed increased progesterone after a closeness condition compared to a neutral condition in a female sample. In addition, Wirth (2011) proposed that progesterone release may be especially responsive to social rejection. With regard to social exclusion, Maner et al. (2010) observed that in socially anxious subjects remembering experiences of social exclusion led to a decrease in progesterone. In contrast, subjects with no social anxiety showed an increase in progesterone levels. In a second experimental manipulation subjects were told that a previous online interaction partner did not want to meet them, which resulted in progesterone increases in subjects with high rejection sensitivity. Given the scarce previous evidence on progesterone responses to social interaction manipulations, the present study aimed at further exploring these effects. Pioneering results by Maner et al. (2010) suggest progesterone increase in response to social exclusion. However, based on previous results by Brown et al.