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Romantic love modulates women's identification of men's body odors

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ABSTRACT

Romantic love is one of our most potent and powerful emotions, but very little is known with respect to the hormonal and psychological mechanisms in play. Romantic love is thought to help intimate partners stay committed to each other and two mechanisms have been proposed to mediate this commitment: increased attention towards one's partner or deflected attention away from other potential partners. Both mechanisms find support in the literature. We explored the potential influence of each of these mechanisms by assessing women's ability to identify (ID) body odors originating from their boyfriend, a same-sex friend, and an opposite-sex friend and the relationship between this ability and the degree of romantic love expressed towards their boyfriend. We hypothesized that an increase in attention towards one's partner would render a positive correlation between ID of a boyfriend's body odor and degree of romantic love; conversely, we hypothesized that attention deflected away from other potential partners would render a negative correlation between ID of an opposite-sex friend's body odor and degree of romantic love for the boyfriend. Our results supported the deflection theory as we found a negative correlation between the degree of romantic love for the subjects' boyfriends and their ability to ID the body odor of an opposite-sex friend but not of their boyfriend or same-sex friend. Our results indicate that romantic love deflects attention away from potential new partners rather than towards the present partner. These changes are likely mediated by circulating neuropeptides and a testable model is suggested.

Introduction

Romantic love is a cross-cultural, universal phenomenon that is believed to have existed since the dawn of mankind and is known to modulate a wide range of human behaviors and emotions (Sternberg, 1986). Romantic love has been demonstrated to elicit widespread changes in basic biological and psychological functions, but experiments on the neurobiology of love are rare in larger animals, and most of the literature focuses on neuroendocrine changes in rodents. In humans, romantic love is known to induce widespread changes in neuroendocrine states (Esch and Stefano, 2005), neurological functions (Aron et al., 2005; Bartels and Zeki, 2004), and overt behavior (Frank, 1988). However, the mediating biological and psychological mechanisms remain unresolved.

The psychological mechanism of romantic love has long been attributed to heightened attention towards one's partner, which in turn leads to heightened feelings of attachment, reward, and commitment (Frank, 1988; Sternberg, 1986). However, at least two separate, yet interconnected, mechanisms are now proposed in the literature (Frank, 1988; Gonzaga et al., 2001): increased attention towards one's partner (here called *attention theory*) or deflected attention away from other potential partners (here called *deflection theory*). The attention theory postulates that an increase in attention towards one's partner leads to an increase in attachment and promotes shared activity and a long-term relationship. This theory is supported by the correlation between reported feelings of romantic love and the increased release of oxytocin (Zeki, 2007), a neuropeptide known to facilitate attachment and bonding (Keverne and Curley, 2004). Moreover, behaviorally, it is commonly reported that intense feelings of love result in a desire to be close to and an obsession with the individual who is the target of these feelings. In contrast, the deflection theory postulates that an increase in passionate love will lead to a decrease in attention towards other potential mates in one's surroundings, which in turn leads to a reduction in relationship threats and aids in the long-term commitment to one's current partner (Miller, 1997). Indeed, individuals engaged in a romantic relationship are known to spend less time observing attractive opposite-sex individuals (Miller, 1997), and their attractiveness ratings of alternative partners are known to be lower than those of unattached controls (Simpson et al., 1986). Romantic love also seems to affect perceptual attention in that individuals in a state of romantic love demonstrate reduced attention to alternative partners at an early and more automated stage of visual perception than do controls

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(Maner et al., 2008). There seems to be a clear link between measures of attention and romantic love; however, conflicting evidence exists in the literature regarding the underlying psychological mechanisms.

The ability to recognize an individual could arguably be the foundation for all social relationships, including those between kin, mates, and friends. Whereas it is well known that humans can identify individuals based on visual or auditory cues, e.g., faces or voices, it is not as well known that we are capable of accurately identifying individuals based on odor cues alone (Olsson et al., 2006; Porter and Moore, 1981; Weisfeld et al., 2003). Furthermore, recent findings demonstrate that humans also seem to use odors as an aid in mate selection (Jacob et al., 2002; Ober, 1999; Wedekind et al., 1995). Hence, body odors carry within them information that, among other things, allows the human sensory system to identify the individual emitting them (Lundstrom et al., 2008b; Lundstrom et al., In press). However, in contrast to the identification of an individual based on visual or auditory cues, identification by body odor alone is done with a large degree of underconfidence (Lundstrom et al., 2008b). This underconfidence in our ability to identify an individual based solely on their body odor indicates that one may tap into perceptual abilities with a limited amount of interference from direct conscious recognition. Similar to other sensory modalities, odor identification performance is known to correlate with allocated attention (Murphy et al., 2001; Zelano et al., 2005).

We sought to elucidate the contributing factors behind the two potential mechanisms of romantic love by assessing the ability of human participants to identify individual body odors. We postulated that if romantic love enhances attention towards one's partner, a high degree of romantic love felt towards that partner should enhance the ability to identify that partner's body odor. Conversely, if romantic love focuses attention away from potential rivals, a high degree of romantic love felt towards one's partner should suppress the identification of an opposite-sex friend's, but not same-sex friend's, body odor in heterosexual participants. Here, we address whether a heterosexual woman's ability to identify the body odor of her romantic partner, and that of a male and female friend, is influenced by the degree of romantic love she feels towards her partner.

Methods

Participants

Twenty nulliparous, self-described exclusively heterosexual women (mean age: 21 years, SD ± 1.6) participated. Of the participating women, 3 were within 5 days of menstrual onset, 3 were in the follicular phase (days 6–14), and 14 were in the luteal phase (days 15–30) of their menstrual cycle; all women described their menstrual cycle length as stable and within the normal range (mean menstrual cycle length = 28.4 days, range 28–30). In addition to the participants described above, their male partner (mean length of relationship: 26 months) and two close heterosexual friends (mean length of friendship: woman friend 53.6 months, man friend 34.5 months) participated as body odor donors. Only couples that had been together for 12–36 months, were self-described heterosexuals, and had expressed deep romantic love towards each other in a semi-structured interview were included in the study. To control for possible hormonal influences originating from stage of romantic love (Marazziti and Canale, 2004), we selected a time window that was meant to exclude participants who were in the early stage of their relationship and those who had entered a more mature phase of love common in long-term relationships (Diamond, 2004). There was no significant difference in the length of friendship between sex of friends (paired samples Student's *t*-test, $t(19) = 2.19$, $p = 0.07$). Detailed written informed consent was obtained from all participants and the experimental protocol was approved by the McGill University's Human Research Ethics Board.

Materials and procedures

To collect the body odors, each odor donor slept for seven consecutive nights alone in a cotton t-shirt with odorless cotton nursing pads (Ultra-Thin Nursing Pads, Gerber Inc., On, Canada) sewn into the underarm area and followed instructions regulating their contact with other individuals and pets, personal hygiene, and diet to prevent contamination of the pads (Lundstrom et al., In press). However, to keep the burden of participation to an acceptable level, only tactile contact was prohibited and social contact with body odor donors remained unregulated during the collection week. Prior to insertion of the pads, the t-shirts and any bedding used by the participants were washed with a scent-free wash detergent provided by the experimenters. The t-shirts were stored in a closed zip-locked bag when they were not being worn. T-shirts were returned on the morning of the eighth day, and the pads were removed from the shirts and placed in large-mouthed glass bottles. After behavioral testing, the pads were deep frozen (−80°C) until used. General ability to identify odors was assessed with the Sniffin' Sticks 16-item cued olfactory identification test (Hummel et al., 1997). The Sniffin' Sticks test is comprised of felt-tip pens containing suprathreshold odors, each of which represents an odor object; each pen is presented in conjunction with a cue card listing four labels, and the participants are instructed to select the label corresponding to the odor object.

Ratings of passionate love felt towards the partner were obtained using the Passionate Love Scale (Hatfield and Sprecher, 1986). The Passionate Love Scale consists of 30 statements such as "In the presence of my boyfriend, I yearn to touch and be touched" or "For me, my boyfriend is the perfect romantic partner", and the participant is asked to rate each statement's degree of accuracy with respect to their own feelings towards their boyfriend. The passionate love scale is considered a reliable tool to assess this complex sentiment (Aron et al., 2005; Bartels and Zeki, 2004; Hatfield and Sprecher, 1986).

Ability to identify an individual's body odor was assessed for each body odor category in a three-alternative, no-feedback, forced-choice task with seven trials, using the target body odor and the odors of two same-sex strangers as lures. The body odor collected from the other participants' friends or boyfriends were used as the odors of strangers. Identification of body odors is known to be influenced by perceived intensity (Doty et al., 1982). To allow us to identify potential effects due to this phenomenon, ratings of perceived intensity of each body odor category were obtained using 10 cm visual analog scales (Lundstrom et al., 2008a). All behavioral tests were performed in a counterbalanced order and the true aim of the experiment was revealed to the participants and their body odor donors after completion of the study.

Statistical analyses

Identification performance above chance for the respective body odor categories was assessed with separate one-sample Student's *t*-tests with chance performance as target value. Potential differences in perceptual ratings were analyzed with repeated measures analyses of variance (ANOVAs) with body odor category as the independent variable, and potential differences between menstrual cycle phases were analyzed with a one-way ANOVA using menstrual cycle phase as a between-groups measure. Potential connections between body odor identification performance and variables of interest were assessed in two ways. First, individual bivariate Pearson correlation analyses were performed for each body odor category. Second, to assess coefficient of determination and whether other collected measures contributed significantly to the relationship between ability to identify a male friend's body odor and degree of love felt towards one's romantic partner, a multiple regression analysis with stepwise exclusion was performed with subsequent correlation analyses. Only two-tailed significance testing was performed and, unless explicitly stated otherwise, all significant results withstood Bonferroni corrections for multiple statistical comparisons.