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Love is in the Gaze: An Eye-Tracking Study of Love and Sexual Desire

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Abstract

Reading other people's eyes is a valuable skill during interpersonal interaction. Although a number of studies have investigated visual patterns in response to a broad variety of emotions, little is known about eye gaze when it comes to differentiating love vs. lust. To address this question, we conducted two experiments: 1) one testing whether the visual pattern related to the *perception* of love would differ from that of lust; and 2) one study testing whether the visual pattern related to the *expression* of love would differ from that of lust. Our results show that a person's eye gaze shifts as a function of the observers' goal when looking at a visual stimulus. Such identification of a distinct visual pattern for love vs. lust (sexual desire) could have theoretical and clinical importance in couple therapy when these two phenomena are difficult to disentangle from one another based on patients' self-reports.

Keywords

social neuroscience; sexual desire; love; eye-tracking; interpersonal relationships

When you are on a date with a person who you barely know, how do you evaluate a person's goals and intentions regarding a long-term relationship with you? This question is bidirectional. How does your date know whether you aspire to be in a long-term or short-term relationship with them? What is being said regarding goals and intentions may not constitute a particularly trustworthy source of data because this can be controlled to hide true intentions in order to reach a goal. The current paper focuses on a different source of information regarding a person's goals and intentions –eye gaze behavior.

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AUTHORS' CONTRIBUTIONS

S. Cacioppo and J.T. Cacioppo developed the study concept. All authors contributed to the study design. Testing and data collection were performed by M. Bolmont. M. Bolmont and S. Cacioppo performed the data analyses. S. Cacioppo and J.T. Cacioppo interpreted the results and drafted the manuscript. M. Bolmont provided critical revisions. All authors approved the final version of the manuscript for submission.

Eye gaze is a surprisingly rich source of information about one's interest, intentions, and goals. For instance, prior research indicates that specific goals and intentions influences a person's gaze direction and allocation of social attention (Argyle & Cook, 1976; Baron-Cohen, 1995; Emery, 2000; Rupp & Wallen, 2007), and a growing number of studies support a functional coupling of goal-directed actions/intentions and selective visual processing before action (e.g., Land, & Lee, 1994; Land, Mennie, & Rusted, 1999). Moreover, decoding and understanding the language of the eyes is a skill that plays a major role in social cognition and interpersonal interaction (Baron-Cohen, 1995; Emery, 2000).

Although a large body of studies has investigated the importance of eye-gaze in different settings, and has demonstrated that the gaze direction of an interlocutor likely influences a viewer's construal through its effects on allocation of spatial attention (Haxby, Hoffman, & Gobbini, 2000; Macrae & Bodenhausen, 2000; Macrae et al., 2002), little is known about the pattern of gaze-based intentions when it comes to differentiating love from lust (i.e., sexual desire). Based on the notion of a functional coupling of goal-directed actions/intentions and selective visual processing before action, we hypothesized that gaze-direction would differentiate love from lust.

Love and lust have existed throughout human history (Cacioppo & Hatfield, 2013; Hatfield & Rapson, 2002), but sexual desire has long been a neglected stepchild in scientific research on interpersonal attraction (Cacioppo & Cacioppo, 2013; Hatfield & Rapson, 1990). The disinterest in sexual desire has begun to change with a growing body of evidence demonstrating a tight correlation between the subjective feeling of romantic love and the subjective feeling of sexual desire. For instance, neuroimaging studies show that love and lust share common mechanisms. Specifically, these two phenomena share neural regions of activation within the cortical areas that are involved in self-representation, goal-directed actions, and body image (middle frontal gyrus, superior temporal gyrus, temporo-parietal junction, and occipito-temporal cortices; Cacioppo et al., 2012; Cacioppo & Cacioppo, 2013) and within subcortical brain areas associated with positive emotions, euphoria, reward, motivation and addiction (e.g., striatum, thalamus, hippocampus, anterior cingulate cortex, & ventral tegmental area).

However, love and lust are not identical (Diamond, 2004; Diamond & Dickenson, 2012; Hatfield & Rapson, 2005). Love is not a prerequisite for sexual desire, and sexual desire does not necessarily lead to love. Love and lust can exist in any combinations, with either, both or neither emotional state present to any degree (Cacioppo & Cacioppo, 2013). In one study of 500 individuals conducted in the mid-1960s by Dorothy Tennov, 61% of the women and 35% of the men agreed with the statement, "I have been in love without feeling any need for sex"; and 53% of the women and 79% of the men agreed with the statement, "I have been sexually attracted without feeling the slightest trace of love". From a psychological viewpoint, sexual desire and love may not differ in their constituent components (e.g., valence) as much as in their goal (Hatfield & Rapson, 2005). Compared to love, sexual desire is oriented toward consummation of a sexual encounter (Hatfield & Rapson, 2005). More specifically, sexual desire is characterized by an increase in the frequency and the intensity of sexual thoughts/fantasies toward a target (either spontaneously or in response to the target), an increased in wanting or wishing to attain a

potentially short-term pleasurable goal, whereas love is characterized by the wishing to maintain a long-lasting relationship with a significant other (Hatfield & Rapson, 2005).

Anthropologist, Helen Fisher (1998) has suggested that love and sexual desire call for two functionally independent social-behaviors systems with distinct evolutionary functions and neural bases. Consistent with this notion, a recent fMRI quantitative meta-analysis showed the recruitment of two specific brain regions can help dissociate love from desire. First, the anterior region of the insula is mostly activated by love (but not sexual desire; Cacioppo et al., 2012, 2013), whereas the posterior region of the insula is mostly activated by sexual desire (but not love; Cacioppo et al., 2012). This posterior-to-anterior insular distinction between sexual desire and love is in accord with a broader principle of brain organization: posterior regions are involved in current, concrete sensations, feelings, and responses, whereas anterior regions are more involved in relatively abstract, integrative representations. Second, the ventral striatum, an area known to be activated for inherently pleasurable such as sex and food, is specifically more activated for sexual desire, whereas the dorsal part of the striatum, an area involved in the process of conditioning by which things paired with reward or pleasure are given inherent value, is more activated by love. This ventral-to-dorsal dissociation from sexual desire to love is in line with reward theories, which distinguish between the various hedonic experiences of reward (i.e. between “wanting” to “liking”; Berridge, 1996) with the “wanting” being related to the processing of the immediate reward value of a stimulus via dopaminergic neurotransmission in the ventral striatum (Cacioppo et al., 2012; Cacioppo & Cacioppo, 2013; Wyvell & Berridge, 2000).

These neural dissociations between love and lust suggest that these two phenomena may, in turn, sustain separable behaviors and automatic attention processes, with the visual features of a person’s body especially relevant for sexual desire and the visual clues regarding a person’s mental state (i.e., eyes and face) especially relevant for love. To date, no study has investigated the differential eye gaze patterns an observer exhibits when looking at a novel individual with the intention or goal of love vs. lust, although a recent animal study of courtship behavior is consistent with our hypothesis regarding sexual desire. Specifically, Yorzinski et al. (2013) used a miniaturized telemetric gaze-tracker in freely moving peahens (*Pavo cristatus*) to investigate visual attention during courtship. Results showed that when gazing at the male frontal display, peahens spent significantly more time looking at the males’ legs, lower eyespots, lower fishtails, and dense feathers than scale feathers, upper eyespots, upper fishtails, head and crest. To test our hypothesis in humans, we performed two experiments: 1) one testing whether the visual pattern related to the *perception* of romantic love would differ from that of sexual desire (Study 1); and 2) one experiment testing whether the visual pattern related to the *expression* of romantic love would differ from that of sexual desire (Study 2). The identification of a distinct visual pattern for love vs. lust (sexual desire) in humans could have theoretical and clinical importance in couples therapy when these two phenomena are difficult to disentangle from one another based on patients’ self-reports or gross behavioral observation.

GENERAL MATERIAL AND METHODS

Participants

A total of twenty healthy heterosexual college students (13 women, 7 men; mean age: 22.15, $SD = 3.38$ years) participated in Studies 1 and 2. Eighteen of the participants were right-handed and two participants were left-handed (Edinburgh Handedness Inventory, Oldfield, 1971). Three participants chose not to perform Study 2, which occurred a few weeks after Study 1 (see measures section below for details). Sample size was estimated using G*Power (Faul, Erdfelder, Buchner & Lang, 2009), which indicated that 16 participants were required in order to have 95% power to detect a statistically significant difference. The data-collection stopping rule was to recruit at least 16 subjects and to stop by the end of the quarter. All participants were French speakers with normal or corrected-to-normal vision, no medication, no chemical dependency, and no prior or current neurological or symptoms of psychiatric disorders, as ascertained by an anamnesis. The anamnesis (patient's account of their medical history) also provided insights into the participant's feelings of anxiety (Zigmond & Snaith, 1983), loneliness (de Grace et al., 1993) and sexual desire (Spector et al., 1996). All participants had scores in the normal range ($M_{anxiety} = 8$, $SD = 4.16$; $M_{depression} = 4$, $SD = 2.06$; $M_{loneliness} = 24$, $SD = 4.96$; $M_{sexual\ desire\ in\ couple} = 50$, $SD = 14.04$; $M_{solitary\ sexual\ desire} = 15$, $SD = 8.92$). All participants provided written informed consent to participate in the experiments, which were approved by the local Committee for Protection of Human Subjects.

Procedure

In both studies, the participants performed a computer task in which they viewed a series of photographs of persons they had never met before (see below for details). Each experiment included a behavioral part and an eye-tracking part, which were performed in different sessions in order to avoid any motor interference between tasks. As in previous eye-tracking studies (e.g., Kellerman, Lewis, & Laird, 1989), no reaction times were recorded during the eye-tracking session to avoid any visuo-motor interference with eye-tracking activity. In Study 1, the behavioral part included the following sequence of stimulus presentations: the trial began with a central presentation of a 250ms-fixation cross that was followed by a 500ms-target stimulus. Then, a random 1500–2500ms inter-stimulus interval separated each trial. In Study 2, the sequence was the following: the trial began with a central presentation of a 500ms-fixation cross that was followed by a 1500ms-target stimulus. Then, a random 1500–2500ms inter-stimulus interval separated each trial. In both experiments, the eye-tracking part included the following sequence of stimulus presentation: the trial began with a central presentation of a 1500ms-fixation cross that was followed by a 1500ms-target stimulus.

Stimuli

The only differences between the stimuli of Study 1 and Study 2 were their nature (couples in Study 1; singles in Study 2), number (120 in Study 1; 40 for males and 40 for females in Study 2), and the order of presentation (see below for further details). Similar differences between Studies 1 and 2 were observed in the eye-tracking part: both studies varied in the nature of the stimuli (couples in Study 1; singles in Study 2), the number of stimuli (4 in the

eye-tracking part of Study 1; 40 for males and 40 for females in the eye-tracking part of Study 2), and the order of stimulus presentation (see below for further details).

To control for visual features between stimuli, all photographs were presented in white and black and had the same size (200x500 pixels). All photographs were also matched in terms of facial orientation, facial expression, and gaze orientation (i.e., gaze directed towards the person who was with them in Study 1, gaze directed towards the camera/viewer in Study 2). In all photographs both the face and body of the individuals were visible.

Apparatus and Measures

The experiments were run using E-Prime (Psychology Software Tools Inc., Sharpsburg, PA, USA). The dependent measures in the behavioral tasks of Studies 1 and 2 were percent of “yes” responses and reaction time to respond. Eye-tracking movements were recorded using Tobii Technology. Three dependent measures were used in the eye tracking session of Studies 1 and 2. These three measures were the following: 1) mean number of the eye fixation count (i.e., the number of fixations), 2) the total duration of all eye fixation within the area of interest (i.e., the length of all the fixations in seconds within the area of interest), and 3) the time to first eye fixation (i.e., the time in seconds from when the stimulus was shown until the start of the first fixation). All measures were calculated for each subject and condition. Only eye-tracking data for photographs for which a “yes” response had been given during the behavioral task were considered for analysis to ensure that the measured eye movements reflected the experimental condition (i.e., romantic love vs. sexual desire). Outliers were removed by eliminating responses greater than 3 standard deviations from the grand mean (0.94% of the data).

STUDY 1 MATERIAL AND METHODS

Stimuli

Stimuli consisted in 120 photographs of heterosexual couples (young adults scanned from random online advertisements). No nude or erotic images were included. These photographs represented whole-body models in the same age range as participants (18-30 year-old). Selection of these stimuli was performed by two experimenters (SC and MB), who first selected a total of 200 non-erotic photographs of heterosexual couples that could be categorized either as a romantic relationship ($n = 100$) or a sexual desire relationship ($n = 100$).

Then, sixteen heterosexual volunteers (9 women, 7 men; mean age for women: 25.3, $SD = 2.5$; mean age for men: 24.71, $SD = 3.39$), comprised of students from the University of Geneva who did not participate in the subsequent parts of the present study, rated the intensity of sexual desire evoked in each one of the 200 photographs on a scale from 0 to 6 (0 = none; 6 = maximum). The photographs with the highest ($n = 60$) and lowest ratings ($n = 60$) were used in Study 1. The sixty photographs with the lowest scores ($M_{\text{sexual desire}} = 1.06$, $SD = 0.25$) on the sexual desire intensity scale were categorized as being evocative of romantic love and the sixty photographs with the highest scores ($M_{\text{sexual desire}} = 3.27$; $SD = 0.43$) on the sexual desire intensity scale were categorized as photographs being evocative of

sexual desire. The two types of photographs were significantly different ($t(59) = 25.68, p < .001$; 95%CI [2.04; 2.38], $d = 6.28$).

Experimental paradigm

The behavioral part of Study 1 included two blocks. Each block consisted of 60 romantic love-related stimuli and 60 sexual desire-related stimuli. Each photograph was presented randomly in each block. A different instruction was given to the participants for each block. In one block, the participants were asked to look at each photograph and decide as rapidly and as precisely as possible whether they perceived the photograph as eliciting feelings of sexual desire. To make sure that the concept of sexual desire was understood in a similar manner among all the participants, at the beginning of the experiment we provided each participant with the following standard definition of sexual desire: “The presence of feelings of sexual interest, and of sexual thoughts or fantasies related to the image depicted in the photograph”. In the other block, the participants were asked to look at each photograph and decide as rapidly and as precisely as possible whether they perceived the photograph as eliciting feelings of romantic love (i.e., a sentimental and tender state of longing for union with another that is not necessarily associated with sexual feelings). Responses were made by pressing one of two response keys (“K” for “yes”, and “L” for “no”) on a keyboard with fingers of the right hand (response “yes” with the index and response “no” with the middle finger). The order of these experimental instructions was counterbalanced across participants.

A similar procedure was followed in the subsequent eye-tracking session with the exception that participants were exposed to two randomly selected photographs from each category (romantic love and sexual desire) rather than to 120 photographs (see above description for details). For the eye-tracking analyses, two regions of interest in the images were specified *a priori*: the face and the body. Thus, in the eye-tracking session the within-subjects factors were stimulus dimension (photos selected *a priori* to be evocative of romantic love vs. sexual desire), task dimension (decisions about feelings of romantic love vs. sexual desire), and visual area of interest (face vs. body), and the between-subjects factor was gender.

STUDY 2 MATERIAL AND METHODS

Stimuli

In Study 2, the stimuli consisted of 80 non-erotic photographs of attractive individuals, 40 of males and 40 of females (young adults scanned from random advertisements in online fashion magazines; Figure S1). Each participant was exposed only to the 40 photographs of members of the opposite gender. As in Study 1, photographs represented whole-body models in the same age range as participants (18-30 year-old). No nude or erotic pictures were included in the stimuli.

Experimental paradigm

Study 2 included four blocks. Each block included 40 randomly ordered photographs. The participant was instructed to look at each photograph and decide as rapidly and precisely as possible whether the person in the photograph could elicit feelings of sexual desire in them

(instruction “A”), or the participant was instructed to look at each photograph and decide as rapidly and precisely as possible whether the person in the photograph could elicit feelings of romantic love in them (instruction “B”). As in Study 1, the order of these instructions was counterbalanced (ABBA, BAAB) across participants. Responses were made by pressing one of two response keys (“K” for “yes”, and “L” for “no”) on a keyboard with fingers of the right hand (response “yes” with the index and response “no” with the middle finger). A similar procedure was followed in the subsequent eye-tracking session (see above description for details). The within-subjects factors were task dimension (decisions about feelings of sexual desire vs. romantic love), and visual area of interest (face vs. body), and the between-subjects factor was gender.

RESULTS

Study 1

Behavioral results—The decision and reaction time data were subjected to a 2 (stimulus dimension: photos evocative of romantic love vs. sexual desire) $\times$ 2 (task dimension: decisions about feelings of romantic love vs. sexual desire) $\times$ 2 (gender of participant) analyses of variance (ANOVAs). No significant interaction was observed with gender as a factor for the decision and the reaction times of these decisions. Thus, we collapsed across gender and performed a 2 (stimulus dimension: photos evocative of romantic love vs. sexual desire) $\times$ 2 (task dimension: decisions about feelings of romantic love vs. sexual desire) ANOVAs.

Analyses of the decision data revealed the expected significant stimulus dimension $\times$ task dimension interaction ($F(1,19) = 53.21, p < .001, \eta^2 = 0.54$), with photos evocative of sexual desire being more evaluated as sexual desire ($M = 79.93, 95\%CI [70.71, 89.15]$) than photos evocative of romantic love ($M = 26.02, 95\%CI [18.98, 33.06]$); and photos evocative of romantic love being evaluated more as romantic love ($M = 79.77, 95\%CI [69.12, 90.42]$) than photos evocative of sexual desire ($M = 57.98, 95\%CI [46.61, 69.34]$). In addition, a main effect of stimulus dimension ($F(1,19) = 23.54, p < .001, \eta^2 = 0.22$) and a main effect of task dimension ($F(1,19) = 24.23, p < .001, \eta^2 = 0.22$) were observed. Together, these results indicate that the manipulation was equally effective for both experimental conditions. No significant differences were observed for the reaction times (Table S1), which emphasizes the similarity of speed of processing in both conditions.

Eye-tracking results—The eye tracking data were subjected to 2 (task dimension: decisions about feelings of romantic love vs. sexual desire) $\times$ 2 (visual area of interest: face vs. body) $\times$ 2 (gender of participant) ANOVAs. No significant interaction was observed with gender as a factor for each one of the three measures of eye-tracking (mean number of eye-fixation, total duration of all eye fixations, and time to first eye fixation). We, thus, collapsed across gender and performed a 2 $\times$ 2 ANOVA with task dimension and visual area of interest, as within-subjects factors, for each one of these three dependent variables.

Analyses of the *number of eye fixations* revealed a significant interaction between task dimension and visual areas of interest ($F(1, 19) = 31.74, p < .001, \eta^2 = 0.42$), showing that participants were more likely to visually fixate on the face, in contrast to the body, when

viewing the photographs to make decisions about romantic love or sexual desire, and that the same participants were more likely to look more at the body when making decisions about sexual desire (than love; Figure 1; Table S2). A significant main effect of the visual area of interest was also noticed with more eye fixation towards the face ($M_{face} = 2.53$, 95% CI [2.157, 2.893]) than towards the body ($M_{body} = 1.25$, 95% CI [0.857, 1.643], $F(1, 19) = 18.59$, $p < .001$, $\eta^2 = 0.39$; Figure 1). No other effect was significant.

Analyses of the *total duration of all eye fixations* revealed similar effects: a significant interaction between task dimension and visual area of interest ($F(1,9) = 24.07$; $p = .001$, $\eta^2 = 0.72$), a significant main effect for visual area of interest ($F(1,9) = 10.19$; $p = .01$, $\eta^2 = 0.52$), and a significant main effect of the task dimension ($F(1,9) = 8.79$; $p = .02$, $\eta^2 = 0.62$), showing that participants spend more time looking at the face than the body, and that the same participants spend more time looking at the body of individuals for sexual desire, in contrast to romantic love (Figure 1; Table S3).

Analyses of the *time to the first eye fixation* revealed only a significant main effect of visual area of interest, with longer time to the first eye fixation towards the face ($M = 0.42$, 95% CI [0.27, 0.575]), in contrast to the body ($M = 0.19$, 95% CI [0.111, 0.275]; $F(1, 8) = 7.13$; $p = .03$, $\eta^2 = 0.37$). No other test was statically significant.

Study 2

Behavioral results—The decision and reaction time data were subjected to a 2 (task dimension: decisions about feelings of romantic love vs. sexual desire) $\times$ 2 (gender of participant) ANOVA. Analyses confirmed there were no significant interaction between task dimension and gender for the decision, or for the reaction times. Thus, we collapsed across gender and performed a one-way ANOVA with stimulus dimension (photos evocative of romantic love vs. sexual desire) as a within-subjects factor. Results revealed no main effect of the task dimension for the decision ($M_{Romantic\ Love} = 42.995$, 95% CI [34.92, 51.07]; $M_{Sexual\ Desire} = 48.29$, 95% CI [39.61, 56.97]; $F(1,16) = 2.87$, $p = .11$, $\eta^2 = 0.03$), or for the reaction times ($M_{Romantic\ Love} = 813.51$, 95% CI [743.12, 883, 89]; $M_{Sexual\ Desire} = 770.44$, 95% CI [697.82, 843, 06]; $F(1, 16) = 3.39$, $p = .08$, $\eta^2 = 0.02$). Together, these data reinforce the comparability of the two conditions.

Eye-tracking results—The eye tracking data were subjected to a 2 (task dimension: decisions about feelings of romantic love vs. sexual desire) $\times$ 2 (visual area of interest: face vs. body) $\times$ 2 (gender of participant) ANOVA. Again, no significant interaction was observed with gender as a factor for number of eye-fixation, total duration of all eye fixations, and time to first eye fixation. We, thus, collapsed across gender and performed a 2 $\times$ 2 ANOVA with task dimension and visual area of interest, as within-subjects factors, for each one of these three dependent variables.

Analyses of the *number of eye fixations* revealed a significant interaction between task dimension and visual areas of interest ($F(1, 16) = 6.76$, $p = 0.02$, $\eta^2 = 0.03$), showing that despite the fact that the participants visually fixated on the face in both task dimensions, they were more likely to visually fixate on the body, in contrast to the face, when viewing

the photographs to make decisions about sexual desire, in contrast to romantic love (Table S4). No other significant effect was found.

Analyses of the total duration of all eye fixations (Table S5) and time to first eye fixation (Table S6) did not reveal any other significant results.

GENERAL DISCUSSION

The present specific pattern of visual responses towards the face (whether for love or sexual desire) is consistent with a large body of evidence demonstrating the importance and saliency of the human face. For instance, human faces are known to convey critical information for social interactions and to capture attention in ways that are unique to faces compared to other types of stimuli (Palermo & Rhodes, 2007), and human faces evoke a stronger involuntary orienting response than other visual objects (Morand et al., 2010; Palermo & Rhodes, 2007 for review). Nevertheless, visual attention as indexed by eye gaze was differentially allocated to the face versus body as a function of the type of stimulus (love vs. sexual desire).

In Study 1, stimuli that involved love elicited more frequent eye fixations on the face than on the body, whereas this difference was attenuated for stimuli that involved lust due to an increase in the frequency of eye fixation to the body and a decrease in the frequency of eye fixations to the face. When making a personal evaluation about whether a person in a photograph could be regarded as someone toward whom the participants could feel lust or love (Study 2), judgments that involved love elicited about the same number of eye fixations toward the face as judgments that involved lust, whereas judgments that involved lust elicited more frequent eye fixations toward the body than judgments that involved love. In both studies, therefore, love, compared to lust, elicited relatively more frequent eye fixations to the face than to the body. These findings are consistent with the functional coupling hypothesis which posits that visual attention reflects, in part, the features of a stimulus that are most relevant to a person's intentions or goals.

Although little is currently known on the science of love at first sight or how people fall in love, these patterns of response provide the first clues regarding how automatic attentional processes (such as eye gaze) may differentiate feelings of love from feelings of desire towards strangers. This automatic attentional processing cannot be entirely attributed to a difference in low-level visual properties across conditions, as all stimuli were visually homogenous. Rather these data suggest that the differences in attentional processing reflect differences in the visual features that are most relevant when thinking about love versus lust.

From these results, one may consider love and lust on a spectrum that evolves from integrative representations of affective visceral and bodily sensations (for lust) to a more abstract and intellectual representation of feelings incorporating mechanisms of reward expectancy and habit learning (for love). This conceptualization is in line with the extant neuroimaging studies showing such a dissociation, as well as with theories of simulations and embodiment suggesting that the way people feel or experience different emotions is based on a different integration of their own past bodily and emotional experiences. The

current studies are also in accord with this conceptualization. Prior work has shown that mutual eye gaze is one of the most reliable markers of love between couples (Hatfield & Sprecher, 1986; Kellerman et al., 1989). The current study extends this research by showing that participants fixate visually more frequently on the face, relative to the body, when they are thinking about or feeling love rather than lust toward that individual. Conversely, bodily sensations play an important role in sexual desire, and participants in the present research fixated more frequently on the body than the face when they are thinking about or feeling sexual desire than love toward the individual.

In sum, the functional coupling hypothesis posits that visual attention reflects the features of a stimulus that are most relevant to a person's intentions or goals. We extended this hypothesis to social intentions and demonstrated that a person's eye gaze reflects the person's goal of love (vs. desire) when looking at another person. By identifying eye patterns that are specific to love-related stimuli (compared to sexual desire-related stimuli), the study may contribute to the development of a biomarker that differentiates feelings of romantic love vs. sexual desire i.e., two distinct subjective experiences that are often difficult to disentangle from one another based on what individuals are willing to report. The extent to which the ratio of the frequency of eye fixations to the face versus the body may serve as a biomarker for love versus lust, at least within-subjects, is a question for future research, but the present eye-tracking studies may serve as a basis for a low-cost approach to identify automatic behavioral responses when individuals are looking at images of people through lustful versus loving eyes. If so, an eye-tracking paradigm may offer a new avenue of diagnosis in clinicians' daily practice or for routine clinical exams in psychiatry and/or couple therapy.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.

Heat maps illustrating the location of the eye fixations (left panel), mean number of eye fixations (top, right panel) and mean duration of eye fixations (bottom, right panel), as a function of task dimension in Study 1.