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Running Head: Love, Lust, and Processing Styles

How Love and Lust Change People's Perception of Partners and Relationships

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Abstract

Because love is related to thoughts in the distant future and sex triggers thoughts related to the present, based on construal level theory, we propose a link between love and a global processing style as well as a link between lust and a local processing style. These processing styles should further expand to partnership evaluations, partially explaining halo phenomena. In Study 1, college students and senior participants were primed by either imagining a walk with a person they were in love with, or a one-night stand. In Study 2, love and lust were primed subliminally. In all studies, love priming enhanced global, holistic processing and halos, whereas lust priming enhanced local, detail oriented processing and reduced halos. Moreover, in Study 1, temporal distance mediated the effects. Implications for research of moods on processing styles, partner perception, and the distinction between love and lust are discussed.

(word count: 147)

Keywords: love, lust, priming, halo, positivity bias, automatic effects, relationships, partner perception

How Love and Lust Change People's Perception of Partners and Relationships

In an ample set of studies, Liberman and Trope (1998) investigated the relation between temporal perspective and level of construal. Their Construal Level Theory (CLT, Liberman & Trope, 2008; Liberman, Trope & Stephan, 2007) predicts that distant events lead to abstract, global, and holistic processing whereas more proximal events lead to concrete, detail oriented, and local processing. Because, usually, less is known about events in the distant future, people think abstractly about them; whereas more proximal events are often more concrete in nature, allowing for a more detailed processing. As a result of the constant co-occurrence of temporarily distant events and abstractness, people may start habitually thinking in more holistic ways whenever they think about a more distant event, with the reverse being true for more proximal events. To illustrate, in one of their studies (Liberman & Trope, 1998), participants imagined themselves engaging in various activities (e.g., reading a science fiction book, taking an exam) either “tomorrow” or “next year” and described these activities. Consistent with CLT, it was found that participants used more abstract descriptions (e.g., “broadening horizons” versus “flipping pages”) in the distant future condition compared to the near future condition, and that the reverse was true for low-level descriptions. Recently, Liberman & Förster (in press) showed an influence of distant temporal priming on Gestalt-like, global perception whereas proximal temporal priming enhanced perception of details of a stimulus set.

We want to apply CLT's logic to partner evaluation and suggest that love and lust differ with respect to temporal perspective (see Buss & Schmitt, 1993) and, consequently, affect processing styles differentially. With others, we define love as “wishes to self

expand and caring for or identifying with a person, including feelings of infatuation and emotional bonding” and lust as the “wish, need, or drive to seek out sexual objects or to engage in sexual activities, including feelings of sexual desire” (see Aron & Aron, 1986; Diamond, 2003; Regan & Berscheid, 1995; Rubin, 1970).

Romantic love is usually associated with attachment goals (Mikulincer, 1998; Mikulincer & Shaver, 2007) and “foreverness”, the long term goal of commitment and sharing a life time together; lust, however, exists more in the “here and now” and does not necessarily involve a long term perspective, which is for example reflected in the notion of a “one night stand” (see Sprecher & Regan, 1998). We reason that these wishes, attitudes or theories about love and lust may be represented in memory and may trigger different processing styles. From social cognition research it is known that when people frequently and consistently experience certain ways of thinking in certain situations, subtle reminders of these situations are sufficient to trigger those procedures (see for example, Förster, Friedman, Butterbach & Sassenberg, 2005; Kruglanski, Shah, Fishbach, Friedman, Chun, & Sleeth-Keppler, 2002; Schooler, 2002; Shah, 2003a; 2003b). Because of a strong association between a long-term perspective and the concept of love, subtle reminders of love should habitually engender a global way of processing information, whereas subtle cues of lust, should automatically initiate a local way of processing.

These basic processing styles may further influence the well-known halo effect in relationships. Research shows that love may lead to a positively biased, idealized perception of the romantic partner (e.g., Brickman, 1987; Hall & Taylor, 1976; Murray, Holmes, & Griffin, 1996b; Swann, DeLa Ronde & Hixon, 1994; Taylor & Brown, 1988).

In general, the positivity phenomenon has been attributed to the halo effect, which describes a lack of differentiation among unrelated dimensions (Thorndike, 1920). Clearly, with its detail focus, a local processing style should support differentiation processes, whereas a global processing style might impair it. Recently, Förster (2009) found first evidence for a link between differentiation processes and perceptual processing styles: he primed global versus local perception and found a facilitation of similarity search upon global priming whereas after local priming dissimilarity search was enhanced. It is thus possible that a local processing style triggered by lust would enhance the differentiation between dimensions, whereas a global processing style would impair it.

Overview of the Experiments

We primed situations of love, lust, and friendship or happiness supraliminally (via imagination instructions, Study 1) or subliminally (by priming concepts, Study 2) and compared those to a non-primed control group. Next, we administered the Navon (1977) task, asking participants to identify large or small letters (as described above) to measure differences in global versus local processing. Finally, a questionnaire was given to participants in which they were asked to evaluate their partners on several independent dimensions. We expected less (more) differentiation among dimensions when primed with love (lust). We assume this effect to be mediated by global versus local processing as measured by the Navon letter task. We included a friendship priming group in Study 1, and a happiness priming group in Study 2. Whereas friendships are related to long term goals, happiness is usually perceived as a short lived state (see Förster, in press). We

expected that friendship primes would lead to effects similar to love while happiness primes would lead to effects more similar to lust. In Study 1 we also assessed temporal distance of imagined thoughts and predicted this to be a mediator of the relation between love/lust, global/local processing and halo.

Study 1

In order to test the generalizability of our account, we recruited both an undergraduate sample and an elderly sample. One may argue that people in later stages of life perceive their future time as more limited and are more selective when it comes to investing into close personal relationships than younger adults (Lang & Carstensen, 2002), therefore, the concept of foreverness might have a different meaning for different age groups. In addition, research shows age-related variations in the processing of positive information, which might influence the tendency to show a halo effect (Carstensen & Mikels, 2005). Yet, provided that both older and younger generations associate love more than lust with long term goals and wishes, we do not predict any differences.

Method

Design and Participants

The study took the form of a one-factorial design with the factors of Priming (love versus lust versus friendship versus control) and Age Group (16-26 versus 60-85) realized between participants. The main dependent measures were global versus local processing measured with the Navon task (see Förster & Higgins, 2005), temporal

distance of imagined thoughts, overall positivity rating of one's partner, and average deviation across items from the partner evaluation questionnaire.

One hundred sixty two people (47 women and 38 men, average age $M = 22$; $SD = 2.7$; and 40 males, 37 females; age $M = 66$; $SD = 4.11$) who were in a stable relationship (more than 1 year) were recruited to take part in a battery of unrelated psychological experiments for which they received 20 Euro. All participants had a college education and came from a roughly similar social background. Four participants had to be excluded from the analyses because they failed to answer questions in one of our questionnaires.

Materials

The Priming Task. We asked participants to do a task assessing their capacity to imagine pleasant emotional events, for which they would have five minutes. They were told that if they experienced the task as too emotionally involving or intimate, they could terminate it at any time without this affecting their compensation. They were asked to take notes. In the love priming group they were told to imagine a walk with their beloved partner and to try to feel how much they love him or her. In the lust priming group they were asked to imagine a situation of casual sex with a person they were attracted to but not in love with; just as in the love condition, they were asked to imagine the pleasure involved in this event. In the friendship group they were asked to imagine a walk with an old friend they liked a lot but had no romantic inclinations toward and to feel the pleasure involved in this event. In the control condition participants were instructed to imagine having a walk on their own. To make it less likely that participants in the lust priming group generated more behavior related thoughts than participants of the other experimental groups, all participants were asked to think about actions involved in the

respective situations rather than thinking in terms of states. All participants were asked to think about a future rather than a past event in the most positive way.ⁱ

Imagination Questionnaire. Next, participants received a questionnaire probing for experienced difficulty of the imagination task, embarrassment, and liking of the task. Moreover, we used additional variables to learn more whether temporal distance or other factors involved in love and lust drive the effect. We asked participants whether their imagination differed in abstractness (How abstract or concrete is the story? On a scale from 1 = *very concrete* to 9 = *very abstract*); time perspective involved in the stories (When did the event take place? On a scale from -5 = *in the distant past*, 0 = today, and +5 = *in the distant future*); positivity (How positive or negative is the story? 1 = *very negative* to 9 = *very positive*); and whether it involved more behaviors or states (1 = *more behaviors*; 2 = *behaviors and states*; 3 = *more states*).

Mood Questionnaire. We assessed the current mood of participants (“How do you feel right now?”) on a scale from 1 (*very bad*) to 9 (*very good*). They were also asked how “happy”, “worried”, “scared”, “relaxed”, “nervous”, “down”, “disappointed”, “joyful”, “loving”, “calm”, “tense”, “depressed”, “aroused” or “interested in sex”ⁱⁱ, and “relieved” they currently felt on a scale anchored at 1 (*not at all*) and 9 (*extremely*).

The Navon Task. The Navon task is a measure of global versus local processing (for detailed information see Förster & Higgins, 2005). Here, on a computer screen, participants were randomly presented with a series of global letters; the horizontal and vertical lines comprising each global letter consisted of five closely spaced local letters. On each trial, participants were first presented with a fixation cross (“+”) in the center of the screen for 500 ms. Then, one of 8 global composite letters was randomly presented,

and participants were instructed to, as quickly as possible, press a blue response key if the given stimulus contained the letter “L” and to press a red response key if the given stimulus contained the letter “H”. Four of the composite letters included global targets (e.g., an H made of Fs), and four included local targets (e.g., an F made of Hs). Overall, 18 local and 18 global trials were presented, with additional practice trials of 12 stimuli that were not analyzed.

Partner Evaluation Questionnaire. We created a questionnaire which consisted of several unrelated trait dimensions to examine the halo effect. Specifically we asked participants on a scale anchored at 1 (I disagree) to 9 (I agree) whether the different statements were true for their partner (e.g., My partner is ___: intelligent, successful, social, tender, good looking, humorous, motorically skilled, etc.). At the end of the entire session we asked for more information about their relationship status (e.g., how many break ups they had experienced, when did the last break up happen, how many relations they had had, whether they have or had an affair or not, etc.).

Procedure

The current experiment was introduced as a series of completely unrelated tasks; materials were presented in different fonts, colors, paper types, as well as style of instructions to increase the perception of unrelatedness. First, participants received the imagination task. The experimenter terminated the task after 5 minutes. Afterwards, participants were administered the imagination and mood questionnaires as described above. Next, the Navon task was presented as a concentration measure for an unrelated research project. Directly afterwards, the partner evaluation questionnaire was handed

out. Thorough debriefing took place at the end of the study and interviews revealed that none of the participants noticed any relations among the studies.

Results

Age, relationship status, and gender had no effects in any of the following analyses, exceptions made by performances on the Navon reaction time task where older participants were generally slower than younger participants. Consequently, in the following analyses, we collapsed across gender and age; exceptions were made in the Navon Task analysis.

Evaluation of the Imagination Task. Inspection of the stories revealed that all participants followed the instructions (e.g., no participant in the love condition wrote about lust). Using separate ANOVAS with the between factor of Priming, we found no significant differences for experienced difficulty, valence of imagined event, liking of the task and embarrassment, all $F_s < 1$. The only significant effect was a difference with respect to temporal perspective.ⁱⁱⁱ As predicted, participants primed with love ($M = 3.27$; $SD = 2.34$) or friendship ($M = 3.67$; $SD = 1.35$) construed the event in the distant future compared to the control condition ($M = 1.33$; $SD = 1.67$) or the lust priming condition ($M = .21$; $SD = 1.25$), $F(3,55) = 13.09$; $p < .001$. Contrast analyses revealed that love differed from lust priming, $t(55) = -4.79$; $p < .001$ as well as from the control group, $t(55) = 3.09$; $p < .01$ but not from the friendship priming group, $t < 1$. Friendship priming differed from control priming $t(55) = 3.72$; $p < .001$; and lust priming differed from friendship priming, $t(55) = -5.41$; $p < .001$. Lust priming differed marginally from control priming, $t(55) = -1.76$; $p < .09$. Thus, we can conclude that our priming tasks actually differed with respect to temporal distance. When asked whether participants had

experienced an event similar to the one they had imagined, 96% of the love priming group reported they had experienced love without lust, 92% of the lust priming group reported to have had experienced lust without love and 100% that they had imagined friendship without lust.^{iv}

Emotions. We ran separate ANOVAs with the between factor of Priming for each single emotion. There were no effects on most of the emotions tested, with the exception of feeling “loving”, “interested in sex” and “aroused”. Participants felt more loving after love priming, $M = 5.53$; $SD = 2.11$, followed by the control group, $M = 4.38$; $SD = 2.36$, followed by lust priming $M = 3.51$; $SD = 2.05$, followed by friendship priming $M = 3.64$; $SD = 1.91$, $F(3,154) = 7.53$; $p < .001$. Ratings on “aroused” and “interested in sex” were highly correlated ($r = .92$). Therefore we computed a sum score of “lust”. Participants reported higher lust after having imagined a one night stand with a person they were attracted to but not in love with, $M = 4.92$; $SD = 2.29$; than participants that imagined a walk with a loved-one, $M = 3.03$; $SD = 1.64$; followed by participants that imagined a walk with a friend, $M = 2.67$; $SD = 1.68$, and the control group, $M = 2.23$; $SD = 1.00$, $F(3,154) = 18.98$; $p < .0001$.

Navon Task. We excluded response times for incorrect responses (1 %), and removed outlying responses (which exceeded 3 standard deviations from the mean for each stimulus; 5.2 %). The number of exclusions did not vary by condition. The data were analyzed using an ANOVA for mixed designs (4 Priming X 2 Level of Processing X 2 Age). Since Age only produced a trivial main effect in that younger participants, $M = 673$ msec; $SD = 91$, were generally faster than older participants, $M = 710$ msec; $SD = 75$, $F(1,150) = 7.42$; $p < .001$, Table 1 summarizes the means collapsed over this factor.

There was also a main effect of Processing Level, reflecting the typical “global dominance effect” (Navon, 1977) meaning that average reaction times across conditions were slower for the local, $M = 713$ msec; $SD = 134$; than for the global letters, $M = 668$ msec; $SD = 98$; $F(1,154) = 24.50$; $p < .001$. As predicted, this difference was strongest in the love priming condition and reversed in the lust priming condition, with the control group falling in between the two conditions, $F(3,154) = 14.93$; $p < .0001$, for the interaction effect. The friendship group was in between the love priming group and the control group. There were no other effects.

Contrast analyses revealed that for global letters, differences between love priming and lust priming, between lust priming and friendship priming, between love priming and control group, and between lust priming and control group were significant. Thus, for global letters we obtained the predicted pattern that love, compared to lust and control groups, facilitated perception of global letters. For local letters, only the differences between love and lust, lust and friendship, and lust and control were significant.

Lack of differentiation. To see whether priming affected the differentiation of dimensions in the questionnaire, we calculated the average deviation across items (AD). For example, for the partner evaluation questionnaire, we calculated the MEAN [(ABS(question1 – question2) + ABS(q1-q3) + ABS(q1-q4)ABS (q2-q3) + ABS (q2-4)] etc.- The higher the value the higher the AD^v. We conducted an ANOVA with Priming as the only between participants factor. As predicted and shown in Table 2, in the partner evaluation questionnaire, participants primed with love showed the lowest deviation (or differentiation), compared to participants primed with friendship, and the

control group; with the lust priming group showing the highest deviation, $F(3,154) = 12.86$; $p < .001$. Contrast analyses revealed that the love and lust priming group differed, as well as the love priming and the control group, the lust priming and friendship priming group, and the lust priming and control group.

The Positivity Bias. Research shows that lack of differentiation is different from positivity bias. To illustrate, it has been shown that whereas a positivity bias predicts a good relationship, lack of differentiation does not (McNulty, O'Mara & Karney, 2008). To see whether love and lust differently affected the overall positivity of the partner, we calculated the average mean, reflecting overall positivity (see also Table 2). ANOVAs on partner evaluation with priming as the only factor reflected that the partner was evaluated significantly more favorably after love priming, compared to friendship priming or the control group, with the lust priming group showing the lowest values, $F(3, 154) = 7.53$; $p < .001$. Contrast analyses revealed a significant difference between love and lust priming, between love priming and the control group, and between lust and friendship priming.

Mediation analyses for the Effects of Love and Lust on Halo and Bias.

First, we ran mediation analyses to examine whether the relation between love/lust priming and global/local processing was mediated by temporal distance. We followed recommendations by Baron and Kenny (1986) by coding the lust priming group with -1 and the love priming group with $+1$. We used the difference between global and local reaction times, so that lower values reflect a relatively faster reaction to global letters compared to local letters, and thus a more global processing style.

Love versus lust priming affected both the dependent variable (global versus local processing; $\beta = -.731$, $t(77) = -9.39$, $p < .0001$), and the potential mediator (temporal distance, $\beta = .605$, $t(77) = 6.67$, $p < .0001$). Distance was correlated with global versus local processing, $\beta = -.630$, $t(77) = -7.08$, $p < .0001$. In the final analysis, the independent variable as well as temporal distance were entered jointly to predict the global versus local measure. The effect of temporal distance was still significant, $\beta = -.553$, $t(76) = -5.98$, $p < .0001$; the effect of love versus lust priming, however, was reduced, $\beta = -.293$, $t(76) = -3.17$, $p = .002$. A Sobel test was significant, $Z = -4.45$, $p < .001$ ^{vi}. It can thus be concluded that the predicted effect on global versus local processing is partially mediated by temporal distance.

Furthermore, the relation between distance and lack of differentiation should be mediated by global/local processing. Distance affected both the dependent variable (differentiation; $\beta = -.823$, $t(77) = -12.71$, $p < .001$), and the potential mediator (global versus local processing, $\beta = -.630$, $t(77) = -7.08$, $p < .0001$). Global versus local processing correlated with lack of differentiation, $\beta = .602$, $t(77) = 6.62$, $p < .001$.

In the final analysis, the independent variable and global versus local processing were entered jointly to predict the differentiation measure. The effect of global versus local processing was still significant, $\beta = .735$, $t(76) = 8.94$, $p < .0001$; the effect of temporal distance, however, was reduced, $\beta = -.141$, $t(76) = -1.71$, $p = .09$. A Sobel test was significant, $Z = 5.73$, $p < .0001$. Thus it can be concluded that global versus local processing mediated the effects of distance on lack of differentiation.

We conducted a similar analysis for the positivity bias. Distance affected the positivity bias, $\beta = .618$, $t(77) = 6.89$, $p < .001$ and global versus local processing, $\beta = -$

.630, $t(77) = -7.08$, $p < .0001$. Global versus local processing correlated with the bias, $\beta = -.504$, $t(77) = -5.12$, $p < .001$. In the final analysis, the independent variable of distance and global versus local processing were entered jointly to the positivity measure. The effect of global versus local processing was still significant, $\beta = -.498$, $t(76) = 4.37$, $p < .001$; the effect of temporal distance, however, was reduced, $\beta = .192$, $t(76) = 1.69$, $p = .10$. A Sobel test was significant, $Z = 3.75$, $p < .001$. Thus, global versus local processing mediated the effects of distance on lack of differentiation.

Moods. We also entered the mood ratings both as an average valence score and separately into all of the above mentioned mediation analyses. We further entered moods as covariates into all of the above mentioned analyses of variance. There was no indication of moods or feelings being a mediator for the partner differentiation or positivity bias.

Study 1 thus confirmed our predictions. Moreover, we were able to demonstrate four effects for the first time: First, we showed that lust versus love priming affected temporal distance. Second, we showed an influence of love versus lust priming on global and local processing. Third, we showed an effect of love versus lust on both indicators of halo (lack of differentiation and overall positivity) and fourth, we showed that temporal distance mediated the effects on global processing, which in turn predicted the halo. In the next study, we aimed to find further evidence for our model.

Study 2

In this study, we wanted to exclude more conscious processes or demand effects that could possibly explain our results and focused especially on the link between love/lust, processing styles and halo effects. Therefore, we used a priming procedure in

which concepts of love, lust and happiness were presented subliminally. It is known that subliminally priming a concept can activate processing styles (see Förster & Liberman, 2007). This is because the accessibility of situations of love or elements suggestive of it should immediately evoke processing styles relative to being in love or pursuing sexual goals.

We further examined an underlying assumption of our model. We suggest that when thinking of love (lust), a global (local) processing style is elicited which carries over to all kinds of tasks, such as, for example, the evaluation of a partner. Similar carry over effects of processing styles to rather unrelated tasks have been demonstrated in social cognition research (Schooler, 2002). To illustrate, Macrae and Lewis (2002) have shown that if people were primed with global processing in one phase of the experiment (participants had to look at large letters which were made of small letters) they show better performance in an unrelated subsequent task requiring a holistic processing style such as face recognition. In contrast, for participants who were primed with a local processing style (participants had to look at the small letters that large letters were made of), subsequent performance in the face recognition task decreased.

In analogue, we expect carry over effects for love and lust to even unrelated domains. Such finding would also be informative with respect to the functionality of our effects. It seems that the effect of love on the halo via global processing might not in itself be functional but rather an epiphenomenon of the effect of love on temporal distance. Because of an habitualized link between distance and global processing (Liberman & Förster, in press), a processing style is elicited upon reminders of love which carries over to even unrelated tasks.

In order to show this effect, following the partnership evaluation questionnaire of Study 1 we asked participants to evaluate a chair on several dimensions. We expected to see the same effect on AD differentiation scores in this questionnaire as produced by local and global processing styles. We did not predict an effect on the positivity scores though, since it might be possible that whereas some participants liked the chair in the first place, some might not. This may lead to less pronounced evaluative biases if averaged across conditions.

In addition we replaced the friendship prime by a happiness prime. Pretests showed that the emotion of happiness is equally abstract and positive as love; however, it does not have a long time perspective (which friendship had) – participants thought that while love (and friendship) stays, happiness vanishes quickly (see also Förster, 2009). Thus, we explored whether it is the "foreverness" of love that triggers global thinking and not abstractness or valence. In other words, using happiness as a control prime allowed us examine the important role of temporal distance in a different way.

Method

Design and Participants

Only differences to the former experiment will be described. The study took the form of a one factorial design with the factor of Priming (love versus lust versus happiness versus neutral concepts) realized between participants. The main dependent measures were performance on the Navon task, and responses in a relationship and a chair evaluation questionnaire.

Sixty German college students not majoring in psychology (29 women and 31 men) took part in a battery containing several unrelated experiments (mean age $M = 21.17$, $SD = 3.21$). One participant had to be excluded because of a computer failure.

Materials

The Priming Task. Depending on the experimental condition, participants were subliminally primed with either “Liebe” (love), “Erotik” (eroticism, lust), “Glück” (happiness) or with a non-word letter string “XQFBZ” in the control condition^{vii}. Participants were led to believe that this task examined attention by measuring reaction times to visual stimuli. Specifically, they were informed that brief flashes would appear on the computer screen at unpredictable places and times; their task was to indicate as quickly and accurately as possible whether the flash appeared on the right or the left side of the screen by pressing the designated keys marked with a green or a yellow sticker.

Our priming procedure closely followed the one employed by Chartrand and Bargh (1996), including all suggested precautions for preventing conscious awareness of the priming stimuli, such as very brief presentation of the primes, immediate masking, and placement of stimulus content in the parafoveal processing area. 48 experimental primes were presented for 70 ms immediately followed by an 80-ms mask in the same location.^{viii}

Chair Evaluation Questionnaire. For the chair evaluation, a new questionnaire was designed that differed in style and type from the partner evaluation questionnaire, so that participants were unlikely to see any relationship between the tasks. They were shown a picture of a chair and were asked to indicate on a 9-point scale anchored at 1

(*not at all*) and 9 (*very much*) whether they considered the chair comfortable, beautiful, stylish, classical, practical, ugly, over-done, etc.

Procedure

Participants were presented with the alleged attention task unrelated to subsequent tasks which was actually the priming task. Next, a mood questionnaire was administered, followed by the Navon task, which allegedly measured people's concentration. Directly afterwards, the partner evaluation was handed out, followed by the chair evaluation questionnaire. Thorough debriefing took place at the end of the study and interviews revealed that none of the participants noticed any relation among the alleged studies. Furthermore, none of our participants noticed that the priming task contained any words.

Results

In all of the reported analyses, gender had no effects and was excluded as a factor for the analyses.

Emotions. We ran separate ANOVAs with the between factor of Priming for each single emotion. The only effects were found for "loving" and "joyful". For both emotions, participants primed with love indicated higher values ($M_{loving} = 6.40$; $SD = 1.89$; $M_{joyful} = 7.00$; $SD = 1.56$), than participants primed with happiness ($M_{loving} = 4.93$; $SD = 2.82$; $M_{joyful} = 5.87$; $SD = 1.55$), the control group ($M_{loving} = 5.67$; $SD = 2.56$; $M_{joyful} = 5.80$; $SD = 1.94$), or the lust primed group ($M_{loving} = 3.57$; $SD = 2.74$; $M_{joyful} = 4.57$; $SD = 1.79$). These differences proved to be statistically significant, $F_{loving}(3,55) = 3.31$; $p = .027$; $F_{joyful}(3,55) = 4.85$; $p = .005$.^{ix}

Navon Task. As in the previous study, we excluded response times for incorrect responses (1 % of the sample) and removed outlying responses (which exceeded 3 standard deviations from the mean for each stimulus; 3.5 % of the sample). The number of exclusions did not vary by condition. Data were analyzed using an ANOVA for mixed designs (4 Priming X 2 Level of Processing). Again, we found a general tendency of quicker responses for global compared to local letters with an average reaction time across conditions of $M = 653$ msec; $SD = 88$, for the global, and $M = 681$ msec; $SD = 118$, for the local letters, $F(1,55) = 5.56$; $p < .022$, for the main effect of Processing Level. As predicted, however, this difference was strongest in the love priming condition (see means in Table 1), and reversed in the lust priming condition, with local letter perception in the control condition being close to the love priming condition, and with the control group falling in between the love and lust conditions for global letters. The happiness group demonstrated a similar pattern as the control group. Supporting our hypothesis, the interaction between the factors was significant, $F(3,55) = 7.24$; $p < .001$. The main effect of priming was not significant, $F < 1$. Contrast analyses found that for the global letters, differences for the love versus lust priming group, and for the love versus control priming group were significant, whereas the difference between the love versus happiness priming group was marginally significant. For the local letters, only the difference between the lust priming group and control group was significant, and the difference between lust and love priming was marginally significant.

Lack of differentiation. We calculated the AD across items as reported in Study 1. We conducted two ANOVAs with priming as the only factor for the partner and the chair questionnaires, respectively (see Table 2).

As predicted, in the partner evaluation, participants primed with love showed the lowest deviation, compared to participants primed with happiness, and the control group. The lust priming group showed the highest deviation, $F(3,55) = 3.78; p < .015$. Contrast analyses revealed that the differences between lust and love priming, between love priming and the control group, and between love and happiness priming were (marginally) significant (see Table 2).

A similar pattern emerged for the chair questionnaire, in that, as predicted, participants primed with love showed the lowest deviation, compared to participants primed with happiness, and the control group. The lust priming group again showed the highest deviation, $F(3,55) = 3.45; p < .023$. Here, contrast analyses revealed that the differences between lust and love priming, between love priming and the control group, and between love and happiness priming were (marginally) significant.

The Positivity Bias. As in Study 1, we calculated general positivity scores for the partner evaluation - and this time also for the chair evaluation - and conducted an ANOVA for each of the targets, respectively. The priming affected the overall ratings for the partner evaluation, $F(3,55) = 2.90; p < .043$, but not for the chair questionnaire, $F < 1$. The partner was evaluated significantly more favorably after love priming, compared to happiness priming, and the control group; the lust priming group showed the lowest values (see Table 2). Contrast analyses revealed that the differences between lust and love priming, between love priming and the control group, and the difference between love and happiness priming were (marginally) significant. The differences between the chair and the partner evaluation is striking since it suggests a conceptual independency between lack of differentiation and positivity bias. In the case of a more ambiguous

attitude object such as a chair, lack of differentiation may lead to globally negative evaluations for some people (who initially disliked the chair) and to more positive ones for others (who initially liked the chair). Averaged scores build upon those different evaluations may be not informative with respect to lack of differentiation. In general, the findings point to the fact that in order to measure halos, both, differentiation scores as well as overall evaluations should be used.

Mediation analyses. We ran two different mediation analyses, for the partner evaluation and the chair questionnaire, respectively. As in Study 1, lust priming was coded -1 , and the love priming was coded $+1$. Again, we examined mediation by processing styles with respect to the halo in partner evaluation (see Study 1).

As the above analyses revealed, love versus lust priming affected both lack of differentiation (relationship: $\beta = -.559$, $t(27) = -3.50$, $p < .002$; chair: $\beta = -.548$, $t(27) = -3.40$, $p < .002$) as well as global versus local processing styles ($\beta = -.713$, $t(27) = -5.29$, $p < .002$). More relative global processing was a significant predictor of lack of differentiation on both the partner evaluation $\beta = .732$, $t(27) = 5.58$, $p < .001$, and the chair questionnaire $\beta = .765$, $t(27) = 6.174$, $p < .001$. The higher the relative global processing, the less differentiation on the questionnaires. Finally, the independent variable as well as relative global processing advantage were used to predict the lack of differentiation. The effect of global processing advantage was still significant in the analysis, for both the partner, $\beta = .678$, $t(26) = 3.56$, $p = .001$, and the chair questionnaire, $\beta = .762$, $t(26) = 4.23$, $p = .001$. The independent variable of love versus lust priming, however, was reduced for the partner $\beta = -.075$, $t(26) = -.392$, *ns.*, and the chair questionnaire, $\beta = -.004$, $t(26) = -.024$, *ns.* Sobel tests were significant both for the

partner ($Z = -3.63, p < .001$) and the chair ($Z = -3.63, p < .001$). It can thus be concluded that the predicted effect on lack of differentiation is mediated by relative global versus local processing.

We further investigated the relations between love/lust and the positivity sum score for the partner questionnaire. Love versus lust priming affected the positivity bias, $\beta = .594, t(27) = 3.84, p < .001$, as well as global versus local processing styles, $\beta = -.713, t(27) = -5.29, p < .002$. More relative global processing was a significant predictor of positivity bias, $\beta = -.614, t(27) = 4.05, p < .001$. In the final analysis, the effect of global processing advantage was still marginally significant in the analysis, $\beta = -.388, t(26) = -1.83, p = .08$, whereas the effect of love/lust was not, $\beta = .317, t(26) = 1.50, p = .15$. A Sobel test was marginally significant, $Z = 1.87, p = .06$.

Moods. We also entered the mood ratings both as an index and separately into all of the above mentioned mediation analyses; we further entered moods as covariates into all of the above mentioned analyses of variance. There was no indication of moods or feelings being a mediator for any of our findings.

To sum up, the experiment replicated the findings of Study 1 with a subliminal priming procedure. Again, we found the predicted relation between love, relative global processing and the lack of differentiation for the relationship as well as for the chair questionnaire. After lust priming, relative local processing was elicited which led to greater differentiation whereas for love priming the opposite was true. We could also identify the underlying processes producing halos. Since the priming manipulation influenced both the overall differentiation of the partner and the chair, it seems that halos are produced by global processing styles that operate beyond the target of affection.

Again, even though we found emotions to be influenced by our priming, they did not affect the performance on the Navon task or the halo.

General Discussion

Two studies support our processing style model of love and lust and found five genuinely different and new effects, namely an effect of love versus lust on processing styles (Studies 1 and 2), a relation between processing styles and differentiation of evaluative dimensions (halo effects; Studies 1 and 2), a relation between love and lust and temporal distance (Study 1), a mediation of temporal distance with respect to the effect of priming on halo (Study 1), and a processing shift of once elicited processing styles on halos with respect to unrelated objects (Study 2). Both the fact that participants in Study 1 reported no awareness of the interrelatedness of the studies as well as our use of a subliminal priming procedure in Study 2 point to effects happening outside of participants' awareness. Furthermore, the lack of emotions involved in the process points to a rather cognitive procedural priming effect.

The Processing Style Model of Love and Lust

Former models have assumed a cognitive component for love versus lust that produces effects beyond the feeling component (see Noller; 1996; Neff & Karney, 2002; 2005; Rubin, 1970, Shah, 2006; Sternberg, 1986). This is because concepts of love and lust are represented cognitively in our mental system and are associated with specific exemplars, semantic associations, expectancies, behavioral manifestations, images and thinking processes. For example, Noller (1996) and Rubin (1970) pointed out that love can be conceptualized as an attitude toward a particular individual, which is stored in memory like any other attitude. Some models already acknowledged differences in

abstract versus concrete *semantic* construals, suggesting that global and specific perceptions can be represented in a hierarchical structure, in which global perceptions (“he is the greatest”) serve to integrate related specific perceptions (“he is motorically skilled”) within an organized associative network (Hampson, John & Goldberg, 1986; John, Hampson, & Goldberg, 1991; McNulty & Karney, 2001, Neff & Karney, 2002; 2005). Our results expanded this notion, showing that mental representations about lust and love are not only associated with *semantic* concepts (i.e., perceptions and situational representations) but directly elicit content-free *processing styles* or ways of perceiving the world (Smith, 1989; Schooler, 2002; Schooler & Engstler-Schooler, 1990; Schooler, Ohlsson, & Brooks, 1993) that are independent from semantics (for reviews on the different kinds of priming see Förster & Liberman, 2007; Förster, Liberman & Friedman, 2007). Note that in the Navon task, the semantic content is kept constant (e.g., while all participants detected the letter F, for some it was a global and for some it was a local letter) and is unrelated to love or lust.

A link between global processing and love and local processing and lust may have evolved because of differences in temporal perspective; temporal perspective is then related to typical ways of thinking when people are in situations of love or lust. In Study 1 we found such a relation: temporal distance triggered by the imagination tasks predicted global/local processing which further influenced the halo. In Study 2 we could show that abstractness or valence per se did not drive effects. Here, whereas according to pretests love and happiness were both equally abstract, frequent and positive, they differed in temporal perspective. In the happiness priming group, no enhanced global processing or halo was found, whereas love enhanced both global processing and halo.

It is striking that for primes similarly triggering long distance goals such as in case of friendship (but not in the case of happiness which is short lived), effects similar to those with love priming occurred. One may suggest, then, that attachment needs linked to love and friendship drove our effects (Mikulincer & Shaver, 2007). If this is the case, the impact of love on global processing is not specific for (long term versus long term) mating strategies (Buss & Schmitt, 1993), but is rather based on the wish to maintain stable relationships (see Diamond, 2003). Future research is needed to clarify the role attachment plays in our effects.

Notably, across studies, global letter processing was enhanced after love priming and reduced after lust priming relative to control groups; however, local letter perception was enhanced after lust priming but not reduced after love priming compared to the control group. This may indicate that whereas lust might “blind” people from perceiving the global features while at the same time enhancing processing of local information, love may enhance global processing *without* reducing local processing. This pattern of results supports Neff and Karney’s (2005) model, predicting that when in love, global perception and related biases do not necessarily impair recognition of the concrete levels. These authors showed that happy spouses can keep globally favorable representations of their partners over a long time, while they are constantly increasing accuracy for the specific details, which may also include negative aspects (see also McNulty & Karney, 2001).

Thus, in happy couples, people can be accurate at a concrete level while still loving their partners (e.g., “Yes, he is a bad car driver, but I love him anyway!”). Our results suggest further that when in love, global and local *processing* both function quite well (by still showing a relative global processing advantage), whereas sexual cues do reduce the

ability to perceive the global Gestalt (by still showing a relative local processing advantage). Our data support the notion that in love, global perception – that in the end may lead to an overall positive evaluation – does not necessarily go at the expense of the perception of detail (McNulty, O'Mara, and Karney, 2008).

Moods and Processing Styles

Recent results by Gasper and Clore (2002; Gasper, 2004) demonstrated a relation between positive mood and global processing in Navon-like tasks. Thus, one might assume that positive emotions elicited by love could drive the relative global processing advantage; alternatively, one might assume that in some individuals lust may cause anxiety, high (negative) arousal or worry, and, thus, mediation of local processing by negative moods may occur in such cases (Andersen & Cyranowski, 1994). In both studies, however, it seems that thinking of lust did not affect negative emotions; moreover, even though the priming procedures affected certain positive emotions, the effect on global versus local processing was not mediated by these feelings.

Admittedly, self reports of specific emotions may be error prone and it is possible that we did not capture the respective feeling that may have driven effects; however, it is not unreasonable to predict effects of situational (positive and negative) cues on perception beyond emotions. For example, research shows that high power (Smith & Trope, 2006), a promotion focus on ideals (Förster & Higgins, 2005), or interdependence (Kühnen & Oyserman, 2002) elicit a global processing style without mediation of mood. More generally, our results are consistent with social cognition approaches showing that mere reminders of certain situations (of love or lust) can elicit ways of perceiving the world without intervening mood states, regardless of the fact that moods can as well

produce independent effects on processing (see Friedman & Förster, 2008). In our case, we suggest that people wish to maintain a current state of affairs. They want to keep social relationships and transcend them into the future. Temporal distance includes a habitualized link to global processing (Lieberman & Förster, in press). This cognitive component may produce effects on lack of differentiation beyond feelings.

However, if for example, some people associate lust or love with highly negative events (which was not true in our studies), it is possible that mood determines the processing style, overrunning the more cognitive effects we found. Yet, in general, one should not overestimate the size of mood effects on processing. A recent meta analysis shows that only in case of strong or arousing moods, mood effects on processing can be found (Baas, De Dreu & Nijstad, 2008). One may speculate that in case of emotional concepts that do not involve intense feelings, a cognitive component drives effects, whereas in case of strong feelings, the emotional component takes over (see Friedman & Förster, 2008). Future research should explore interactions with cognitive cues and affect triggering processing styles.

Implications of the Halo Effect for Love or Lust

We furthermore applied our model to the halo effect when in love. Interestingly, our results indicate that the halo effect is produced by at least two different processes: a (cognitive) lack of differentiation and a (evaluative) positivity bias. When in love, people may use a positive anchor value as a starting point for evaluations and at the same time may lack differentiation among evaluative dimensions. Theoretically, an anchor value can in other situations be negative, such as when people hate others. Such a negative value could as well carry over to other dimensions. If hate has a long term perspective

(one may think that one will never stop hating a certain person), then a lack of differentiation with a negativity bias may also be observed. Thus, a lack of differentiation may be independent of evaluative biases. The subtle difference between the positivity bias and the lack of differentiation was striking in Study 2, where priming affected the deviation scores for both the partner and the chair questionnaire but it did not affect the overall positivity bias for the chair, while it did so for evaluations of the partner. It may be the case that participants started with different anchor points for the chair (some liked the chair and some did not), and that this led to the lack of a systematic effects. It would be interesting for further research on the halo to examine the difference in overall evaluation scores and differentiation as measured by AD scores. Coincidentally, we also, found a perceptual basis for lack of differentiation, namely global processing. Future research may further focus on this exciting link between perception and differentiation of concepts.

Importantly, our findings suggest a cognitive basis of halos that operates beyond any motivation and is not even functional – after all, what is the function of disregarding the diverse aspects of a chair, when in love? Our findings point to a rather mechanistic perceptual processing shift to attitude objects unrelated to a relationship. A recent study attests to this notion. Förster (in press), arguing that global processing enhances face perception and that local processing enhances verbal perception (see Macrae & Lewis, 2002), found enhanced face recognition upon love priming whereas verbal recognition was enhanced upon lust priming. It is hard to argue that it is functional to remember words better than faces when imagining a situation of lust. Thus, while it is reasonable to assume that love includes wishes of foreverness, transcending the here and now by

imagining distant future, the halo effects we found may be epiphenomena of a change in processing styles when people think about love or lust.

Limitations to our Studies

Love or lust primes surely cannot capture the entire complexity of the phenomenon. Furthermore, a critic may argue against the generalizability of our results for different people, from different cultures and socio demographic backgrounds. Based on the logic of accessibility models (Förster & Liberman, 2007; for a summary), one can define boundary conditions for our effects on theoretical grounds. Priming effects are based on availability of information and associations (see Higgins, 1996; Higgins & King, 1981). That is, our results are certainly restricted to people that have no strong overlap between lust and love represented in memory.

This, however, taps into the ongoing debate whether love and lust are closely related or quite different. There is abundant social psychological evidence in support of the contention that in most people's minds, love and lust are tightly related – to the extent that most people find it hard to imagine passionate love absent of sexual desire (Hatfield & Rapson, 2005; Regan, Kocan, & Whitlock, 1999; Regan & Berscheid, 1999). Furthermore, in a recent study Gillath, Mikulincer, Birnbaum, & Shaver, (2008), showed that sex can prime love. However, this does neither mean that passionate love and lust are identical nor that this link is fixed in human nature or that people can not think separately about the two.

For starters, the size of this overlap may vary with culture, history, education and social values. Here are some examples: in the US, males report having less problems imagining sex without love than females do (Hatfield & Rapson, 2005); in China,

however, the link between love and romance seems to be generally less pronounced than in Western cultures (Dion & Dion, 1988); and in the West, the views of sexuality and love differed between the Victorian and the Freudian era (Hatfield & Rapson, 2009).

Recently, neuroscientists and evolutionary psychologists joined in a heated discussion on whether love and lust are very different systems (Diamond, 2003 and 2004; Gonzaga, Turner, Keltner, Campos, & Altemus, 2006) or are tightly linked (Bartels & Zeki, 2000). Overall, however, they seem to agree that all of the brain systems for passionate love, sexual desire, and attachment do in fact communicate and coordinate with one another or, in other words, conclude that love and lust are tightly related but not identical (see Meyers & Berscheid, 1997; Berscheid & Hatfield; 1969). Our question is more as to *when* love and lust produce different psychological effects.

With respect to our studies, one may then predict that for those who think that, for whatever reasons, love and lust are closely related rather than different, no systematic effects may occur. Note that while we were careful in choosing priming procedures that reflect more companionate (loving) than passionate (in love) love, choosing different primes such as “passion” may render both, love and lust accessible. Similarly, for people that do not connect love with foreverness (maybe because they had bad experiences with relationships or due to socialization) no effects may occur. Strength of links between lust and love may differ across populations and thus, gender and age effects may be found in other samples.

Notably, in our studies no such differences were found. Recently, we replicated Study 1 successfully with a sample of college students from 80 different nations (Förster, Epstude & Özelsel, 2009), showing that the effects are more universal than one may

expect. Moreover, relationship status and experiences (e.g., number of break ups) did not mediate results in our studies; thus, one may suggest that *wishes* of foreverness rather than actual experiences drove the effects. While this is mere speculation, future research may disentangle between the two possibilities. Therefore, we may suggest that although priming fails to establish the entire complexity of the phenomenon of lust and love, a marriage between the rarely overlapping research disciplines of social cognition and relationship research can produce reliable results.

Notably, even though in real life the overlap between lust and love may be prevalent, our studies show that people are able to imagine lust (love) without love (lust), and thus our results show what happens, if people separate the two. This, however might have repercussions for real life. One may suggest that, for example, if a person perceives her/his partner mainly as a sexual object, local processing and differentiation processes are frequently activated. In these cases, the positivity bias that was shown to help to maintain a good relationship may not operate anymore (Showers & Zeiglar-Hill, 2004).

Final Remarks

Our research contributes to a growing body of evidence showing the influence of processing styles on other tasks and phenomena. To illustrate, global processing has been said to support other more complex tasks such as metaphor understanding, understanding of humor (where understanding means going beyond the information given; see Beeman, 1998), and creative thinking (see e.g., Finke, 1995; Förster, Liberman & Friedman, 2004; Friedman & Förster, 2005; Ward, 1995), and the acceptance of abstract art and fringe exemplars of categories (Schimmel & Förster, 2008). Are people more creative when in love? Are they more open to novel or strange objects? Are they more likely to take risks?

We hope that our model may even inspire more of such counterintuitive research questions.

ACCEPTED MANUSCRIPT

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Table 1. Mean response latencies in milliseconds in the Navon-Task

Level of processing	Love priming	Lust priming	Friendship (Study 1) or Happiness (Study 2) priming	
			Control	Control
Study 1				
Global	620 ¹ (63)	726 ³ (88)	650 ^{1,2} (116)	678 ² (91)
Local	723 ^{1,2} (92)	671 ³ (83)	725 ^{1,2} (151)	731 ² (111)
Study 2				
Global	603 ¹ (57)	696 ³ (87)	654 ^{1,2} (95)	664 ² (89)
Local	693 ^{1,2} (110)	636 ¹ (72)	691 ^{1,2} (166)	704 ² (104)

Note. The numbers in parentheses are standard deviations.

Numbers within a row that do not share superscripts, differ from another at $p < .05$.

In Study 2, for global letters, the difference between love and happiness was marginally significant; moreover, for local letters the difference between love and lust was marginally significant (at $p < .10$).

Table 2: Average differentiation and positivity scores for the evaluation of the partner or the relationship and a chair

Measure	Love priming	Lust priming	Friendship priming (Study 1), Happiness Priming (Study 2)	Control
Study 1				
partner (differentiation)	1.20 ¹ (.43)	1.86 ³ (.54)	1.27 ^{1,2} (.55)	1.49 ² (.55)
Partner (positivity)	7.04 ¹ (.91)	5.99 ³ (.99)	6.79 ^{1,2} (1.25)	6.37 ² (1.08)
Study 2				
relationship (differentiation)	1.51 ¹ (.64)	2.37 ³ (.69)	1.98 ^{1,2} (.75)	2.10 ² (.75)
Chair (differentiation)	2.08 ¹ (.51)	2.82 ³ (.65)	2.52 ^{1,2} (.36)	2.56 ² (.87)
Relationship (positivity)	7.08 ¹ (.69)	5.84 ³ (1.03)	6.23 ^{1,2} (1.60)	6.16 ² (1.27)
chair (positivity)	5.90 ¹ (.94)	5.52 ¹ (.94)	5.47 ¹ (1.29)	5.38 ¹ (1.16)

Note. The numbers in parentheses are standard deviations.

Numbers within a row that do not share superscripts, differ from another at $p < .05$.

In Study 2, for the differentiation scores for both relationship and chair, and the positivity scores for the relationship, the differences between love and happiness were marginally significant (at $p < .10$).

Footnotes

ⁱ The inductions were carefully pretested with respect to whether imagination would lead to differences in abstractness, time perspective, valence of content, and whether more actions than states were used. The only obtained group differences related to time perspective. Participants primed with love and friendship reported more wishes, goals or events that related to future events compared to participants primed with lust. Detailed pretest results can be acquired from the first author.

ⁱⁱ It is difficult to ask for a feeling of lust in German, since either the expressions are too colloquial and could potentially offend people or they are very clinical. We asked participants whether they were sexually aroused or interested in sex instead which we found to be closest to the concept of lust.

ⁱⁱⁱ Even though other research found gender and valence differences with respect to women's sexual self schemata, in our sample no such effects were obtained.

^{iv} More information can be acquired from the first author.

^v Scoring modelled after the formula of the 'average deviation (AD)' differs from a scoring modeled after the formula of the 'standard deviation (SD)'. Whereas when AD-like scores are calculated, all differences between answers to different questions are weighted equally, when SD-like scores are calculated, smaller deviations are weighted downward and larger deviations are weighted upward. This is the case, because SD-like scoring involves a squaring of differences, which are then brought back to the scale of the original measure by drawing the square root of the sumtotal. In the given case, we are not interested in sample or population dispersion, but in the size of the average deviation as an inverted measure of the halo effect. This means that AD-like calculations produce no bias, while a decision to proceed with an SD-like calculation would need a justification, why larger differences should be weighted upwards and smaller differences downwards.

We see no theoretical justification for such a weighting and therefore decided to use a scoring modeled after the AD formula.

^{vi} We reran all the mediation analyses reported using the Zprime critical value with MacKinnon, Lockwood, Hoffman, West, & Sheets (2002) and found no differences in levels of significance.

^{vii} Recent studies showed that priming verbs (loving) instead of nouns (love) did not lead to any differences (Förster, in press; Förster, Özelsel & Epstude, 2009). Further, we found that our love primes were only weakly related to lust and our lust primes, in turn were weakly related to love.

^{viii} For detailed information please see Förster (in press).

^{ix} Notably, these findings were unexpected, given that former research had failed to elicit emotions by just priming emotional concepts via semantic concepts. Innes-Ker and Niedenthal (2002) showed that unscrambling emotional sentences (e.g., "to succumbed sorrow she") did not produce any priming effects. However it seems that in our study, emotions were elicited out of awareness. Even though this finding was not predicted and is not central to our hypothesis, it warrants further experimental examination in the future. We also fail to explain why general mood or feelings of happiness were not affected by our primes. However, for the purpose of this study it will thus be necessary to control for these emotions in the following analyses in order to understand whether expected effects were driven by unconsciously elicited emotions or not.