

# Attuned to the positive? Awareness and responsiveness to others' positive emotion experience and display

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**Abstract** Positive emotions are implicated in affiliation and cooperation processes that are central to human social life. For this reason, we hypothesized that people should be highly *aware of* and *responsive to* the positive emotions of others. Study 1 examined awareness by testing the accuracy with which perceivers tracked others' positive emotions. Study 2 examined responsiveness by testing whether positive emotions were predictive of perceivers responding to new relationship opportunity. In Study 1, multilevel analyses of dating couples' estimates of their partner's emotions across four semi-structured interactions revealed that both women and men tracked partner positive emotions with considerable accuracy. Additional analyses indicated that tracking accuracy was most pronounced for positive emotions whose display is known to include the Duchenne smile. In Study 2, multilevel analyses of dyads who watched a set of positive and negative emotion-eliciting film clips with a stranger indicated that only positive

emotion display predicted subsequent closeness. Together, these findings show that people are highly attuned to the positive emotions of others and can be more attuned to others' positive emotions than negative emotions.

**Keywords** Emotion · Positive emotion · Social interaction · Duchenne smiles

## Introduction

Human survival and reproduction depend heavily on social bonds characterized by affiliation and cooperation (e.g., Frank 1988; Hrdy 1999). Positive emotions are implicated in affiliation and cooperation processes; they invite approach to new relationships and contribute to satisfaction and commitment in on-going relationships (Fredrickson 1998; Gonzaga et al. 2001; Shiota et al. 2004). While the important role of positive emotions in relational processes is increasingly recognized, little work has examined motivated orientation to others' positive emotion. We reasoned that because positive emotions are signals of affiliation and cooperation that are vital to relationships, people should be particularly aware of others' positive emotions and, when there is an opportunity to form a new relationship, particularly responsive to others' positive emotions. We termed this process *positive emotion attunement*. The goal of this work was to examine positive emotion attunement in typical social settings. Study 1 examined the awareness element of attunement by testing the accuracy with which perceivers tracked a partner's positive emotion. Study 2 examined the responsiveness element of attunement by testing whether positive emotions were predictive of perceivers responding to a new relationship opportunity.

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## Positive emotions as signals of affiliation and cooperation

Emotions are fundamentally social processes that communicate information about feeling states, relational orientation, and behavioral intentions to both self and others (e.g., Buck 1984; DePaulo 1992; Keltner and Kring 1998; Van Kleef 2009). As such, emotions enable individuals to respond adaptively to social problems and take advantage of social opportunities (Barrett and Campos 1987; Campos et al. 1989; Frank 1988; Keltner and Haidt 2001; Tooby and Cosmides 1990). As a class of emotion, positive emotions are tightly linked with reward, approach, and the building of resources associated with affiliation and cooperation in relationships (Algoe et al. 2008; Cohn et al. 2009; Fredrickson 1998; Shiota et al. 2004).

Perceivers obtain important information from others' experience and display of positive emotions. When there is an opportunity to form a new relationship, others' positive emotion experience and display signal the likelihood that an individual possesses an affiliative and cooperative disposition that is desirable in relationships. In an on-going relationship, others' positive emotion experience and display can signal the direction of affiliation and cooperation (e.g., toward oneself or toward another). Various lines of research support these claims. Individuals who report frequent and intense positive emotion report greater feelings of connection to new relationships and more commitment in their on-going relationships than people who report less positive emotion (e.g., Clark and Taraban 1991; Gonzaga et al. 2001; Huston et al. 2001; Waugh and Fredrickson 2006). At the dyadic level, couple positive emotional exchanges predict relationship stability and satisfaction (e.g., Gable et al. 2006). Individuals high in positive emotionality have also been observed to have greater ability to solve relationship problems constructively than those high in negative emotionality (e.g., Berry and Hansen 1996; Berry and Willingham 1997). In contrast, individuals high in negative emotionality are more likely to report that their relationships have more frequent conflict and are shorter in duration (Berry and Willingham 1997). In sum, there is ample reason for perceivers to be highly aware of and responsive to others' positive emotions.

Perhaps due to the important relational information they signal, there is also evidence that positive emotion displays readily attract perceiver attention. Happiness, which is signaled by the Duchenne smile<sup>1</sup> and frequently occurs in affiliative social contexts, is the most reliably recognized of

the six basic facial expressions of emotion (90 % or higher recognition rate) identified by Ekman et al. (Ekman 1972; Russell 1994). In addition to expressing felt positive emotion, Duchenne smiles appear to play a role in signaling affiliation and cooperation. They are likely to be displayed during affiliative social interaction (e.g., Messinger et al. 1999) and cooperative behavior (Mehu et al. 2007a). For example, Mehu et al. (2007a) found that people spontaneously displayed more Duchenne smiles when sharing resources with a friend than when not sharing. There is also evidence that positive emotion displays are recognized quickly and accurately under certain conditions. In a "faces in the crowd" task, where multiple faces displaying positive and negative emotion are shown simultaneously, happiness is detected more quickly and accurately than anger or fear displays when photographs of real faces are used (e.g., Juth et al. 2005).

Altogether, research has shown that positive emotions provide perceivers with important information about the likelihood of affiliation and cooperation from others and that positive emotion displays are among the most highly, and quickly, recognized emotion displays. The body of research establishing this evidence has used a range of methodologies that span across experimental protocols that standardize and control emotion displays to naturalistic social interaction that allows for spontaneous emotion experience. Many of these studies also included measures of both self-reported emotion and observed emotion behavior. It is not yet known, however, whether perceivers respond to the important information that positive emotions provide by being particularly attuned to these emotions. Theorists have long suggested that affiliation and cooperation are central to human social life. These claims, however, have been primarily studied through the lens of negative emotion. An extensive literature suggests that attunement to negative emotions is important for identifying and responding to threats or the need of others for caregiving and support (e.g., Baumeister et al. 2001; Graham et al. 2008). It is not yet known, however, if perceiver attunement to others' positive emotions is comparable to that of negative emotions. It is also not yet known whether perceiver attunement to others' positive emotions is focused on those emotions most likely to signal affiliation and cooperation or on positive emotions more broadly. Research on positive emotion differentiation is still new but the evidence to date indicates that positive emotions displayed with Duchenne smiles signal affiliation and cooperation (e.g., amusement, happiness, and love) whereas others do not (e.g., pride) (e.g., Campos et al. 2013; Tracy and Robins 2007). In the present research, we sought to contribute to the literature by answering these questions that have important implications for better understanding the role of positive emotion in human social life.

<sup>1</sup> The experience of positive emotion is predominantly displayed by the Duchenne smile (e.g., Campos et al. 2013; Ekman 2003; Frank et al. 1993). This distinct smile involves the simultaneous movement of two facial muscles, orbicularis oculi pars lateralis and zygomaticus major, that respectively raise the cheeks and widen the lips.

## The present research

We examined the extent of perceiver attunement to others' positive emotions in typical social settings in two studies. We defined attunement in two parts: (a) awareness of others' positive emotions and (b) responsiveness to others' positive emotions when there is an opportunity to form a new relationship. Study 1 examined the awareness element of attunement by testing the accuracy with which perceivers tracked partners' positive emotion in a sample of dating couples. Study 2 examined the responsiveness element of attunement by testing whether positive emotions were predictive of perceivers responding to a new relationship opportunity among strangers in a neutral setting. The methods of both studies capitalized on known variation in positive emotion displays to test the role of Duchenne smiles and included the live presence, and spontaneous emotion behavior, of another person. Both studies also compared positive with negative emotions to situate positive emotion attunement in the broader context of emotion and provide a strong test of the extent of positive emotion attunement.

### Study 1: awareness of others' positive emotions

Study 1 used a social interaction research design wherein a sample of dating couples engaged in a series of semi-structured interactions that evoked both positive and negative emotions. After each interaction, both partners reported their own emotions and estimated their partner's emotions. This design thus captured perceiver awareness of partner emotion and allowed us to assess perceiver tracking of partner positive and negative emotions over the course of the interactions, as well as whether tracking accuracy was more pronounced for positive emotions whose display includes Duchenne smiles.<sup>2</sup>

## Method

### Participants

Sixty-six heterosexual dating couples were recruited from the University of California, Berkeley and the surrounding community via flyers, the psychology department subject pool, and university organizations (e.g., sororities, cultural groups). Participating couples were required to be of the

same cultural background and have been monogamously dating for at least 3 months. Couples self-reported European (27 couples), Asian (24 couples), or Latino (15 couples) cultural backgrounds. Couples were in their early 20's ( $M = 20.4$  years,  $SD = 3.59$  for women;  $M = 21.3$  years,  $SD = 4.04$  for men) and had been dating for an average of 17.6 months. There were no differences across cultural background groups in average age or the amount of time the couple had been dating. All procedures were approved by the University of California, Berkeley IRB.

### Procedure

Upon arriving at the lab, each member of the couple was led through the study procedures and asked to sign consent forms. Each member of the couple was then taken to a separate private room to complete demographic, personality, and relationship questionnaires. After finishing the questionnaires, the couple was reunited and led to the video laboratory where they were seated facing each other to engage in a series of social interactions. After finishing the interaction tasks (described in detail below), couples were debriefed and compensated. Each member of the couple received either partial class credit or a payment of \$15 or \$25 for his/her participation. All procedures took approximately 90 min.

### Interactions

Each member of the couple reported their initial baseline emotions as they acclimated to the study and the couple then engaged in four semi-structured interactions designed to mimic typical, emotion-laden relationship experience. The first involved teasing, the second involved talking about a current personal concern, the third involved talking about a past relationship, and the fourth involved talking about their first date together. Experimenters gave instructions to the couple through an intercom. One member of the couple was randomly assigned to speak first in the teasing, concern, and past partner interactions. There was no turn-taking during the first date interaction. Couples were instructed to act as they normally would outside the lab and respond to their partner in whatever manner they saw fit. Couples sat facing each other in chairs approximately 3 feet apart. Cameras were placed in cabinets behind and above the participants to provide an unobstructed view of each partner.

**Teasing** Each member of the couple was given a set of initials (A. D. or L. I.) and asked to create a nickname, and a story justifying the nickname, for their partner using the initials (see Keltner et al. 1998). Couples were given a few minutes to come up with their nicknames and stories and were provided a piece of paper to write notes as needed.

<sup>2</sup> We did not test whether accurate tracking would be associated with relationship satisfaction because the consequences of accuracy are complex; both accuracy and *inaccuracy* have been associated with relationship satisfaction (Hawkins et al. 2002; Simpson et al. 1995). Further, perceived empathic effort appears to be more strongly associated with couple relationship satisfaction than accuracy per se (Cohen et al. 2012).

The couple then took turns delivering the nickname and story to each other.

**Current personal concern** In the initial questionnaire packet, each member of the couple listed three personal, non-relationship, current concerns and rated (a) the seriousness of the concern (1 = *not serious*; 5 = *very serious*) and (b) how much they had discussed the concern with their romantic partner (1 = *not at all*; 5 = *extensively*). The experimenter used these ratings to select the concern that was the most serious and least discussed. Priority was given to finding the balance between the concern listed as most severe and the concern listed as least discussed. Thus, if two concerns were rated as equally severe but one was less discussed, the latter was chosen. Each member of the couple was given 5 min to talk about their most serious and least discussed concern.

**Past partner** Each member of the couple was asked to discuss their most important past romantic relationship (excluding the current relationship). They were asked to talk about: (a) what was best, (b) what was worst, and (c) the most important thing they learned from the past relationship. Again, each partner was given 5 min to talk.

**First date** Couples were asked to talk about their first date. Couples most often discussed what they considered to be their first date, why they considered it their first date, described what they did on the date, and how the date changed their relationship.

### Measures

**Positive and negative emotions** Before and after each partner's speaking turn, each member of the couple reported their own emotions and estimated their partner's emotions. Couples reported on the following 21 emotions (0 = *no emotion*; 8 = *extreme emotion*): amusement, anger, anxiety, arousal, concern, contempt, desire, discomfort, disgust, embarrassment, fear, guilt, happiness, jealousy, love, pride, sadness, shame, shyness, sympathy, and tension. From these, positive and negative emotion composites were created. For the positive emotion composite, we used amusement, happiness, love, and pride. For the negative emotion composite, we used anger, fear, sadness, contempt. These emotions were selected because all have clear positive or negative valence, previous work has shown that these emotions are commonly felt in at least one of the interactions described above, and all have a documented nonverbal display (Campos et al. 2013; Ekman 1972; Gonzaga et al. 2001; Keltner et al. 1998; Tracy and Robins 2007). The latter element ensured the emotions we analyzed were comparable in their likelihood of

providing signaling cues to the partner in the course of the interaction. The four positive emotions also vary in the extent to which their display is characterized by Duchenne smiles. Amusement, happiness, and love displays have all been associated with the Duchenne smile, with amusement and happiness being most strongly linked to Duchenne smiles (Campos et al. 2013; Gonzaga et al. 2001; Keltner 1995). Most research, however, has suggested that pride is not associated with the Duchenne smile (e.g., Tracy and Robins 2007). Means and standard deviations for emotion composites and specific positive emotions are reported in Table 1.

Emotion composite reliability at the within-person and between-person levels was assessed following Geldhof et al. (2014) using Mplus 7.3. For the positive and negative emotion self-report composites, we found satisfactory reliability within-persons (positive:  $\omega = .89$ ; negative:  $\omega = .90$ ) and between-persons (positive:  $\omega = .81$ ; negative:  $\omega = .94$ ). Similarly, reliability was satisfactory for partner positive emotion composites within-persons ( $\omega = .89$ ) and between-persons ( $\omega = .87$ ). For partner negative emotion composites, reliability was satisfactory between-persons ( $\omega = .86$ ), but only moderate at the within-persons level ( $\omega = .53$ ).

**Relationship satisfaction** Each member of the couple completed a 22-item version of the Marital Adjustment Test (MAT) modified for dating relationships (Locke and Wallace 1959; Keltner et al. 1998). For married couples, satisfaction typically averages 115 (e.g., Karney and Bradbury 1997) and scores <100 indicate some distress. The dating couples in this sample were highly satisfied and a paired sample *t* test showed that women ( $M = 134.42$ ;  $SD = 13.22$ ) and men ( $M = 134.55$ ;  $SD = 11.26$ ) did not differ in their relationship satisfaction,  $t(65) = .08$ , *ns*.

**Table 1** Study 1: Perceiver tracking accuracy of partner emotion for (a) positive and negative emotions across interactions and (b) specific positive emotions across interactions

	Overall sample <i>M (SD)</i>	Women		Men	
		$\beta$	<i>SE</i>	$\beta$	<i>SE</i>
<i>Overall emotion, across interactions</i>					
Positive emotions	3.56 (1.51)	.44***	.03	.44***	.02
Negative emotions	.81 (.77)	.15***	.03	.16***	.03
<i>Specific positive emotions, across interactions</i>					
Amusement	3.92 (2.74)	.68***	.04	.74***	.04
Happiness	3.78 (2.69)	.74***	.04	.65***	.04
Love	4.65 (2.84)	.50***	.05	.41***	.04
Pride	2.01 (2.52)	.18***	.05	.17**	.05

\*\*  $p < .01$ ; \*\*\*  $p < .001$ ; Emotion ratings on 0 (*no emotion*) through 8 (*extreme emotion*). Beta values are reported as unstandardized coefficients

**Results**

*Data analysis approach*

We operationalized perceiver awareness of others’ emotion as tracking accuracy—the extent to which variation in a partner’s emotion report was predicted by perceiver estimates of the partner’s emotion over the course of the interactions. We centered the ratings of each emotion at the mean of the four emotions in a category (positive or negative) for a person at a particular interaction. This approach eliminated variance due to differences between persons or interactions, and the resulting predictors represented profiles across the four positive or negative emotions in a category. This approach also provided a strong test of the hypothesis because it required perceivers to be aware of their partner’s specific positive (amusement, happiness, love, and pride) and negative (anger, fear, sadness, contempt) emotions, as opposed to one emotion or the general valence of emotion, over the course of the interactions. For example, Carlos may have reported strong amusement and happiness but no love or pride during the teasing interaction and strong happiness, love, and pride but no amusement during the first date interaction. If so, his partner Estela was tracking accurately to the extent that she estimated Carlos’ higher amusement and happiness than love and pride during the teasing interaction and higher happiness, love, and pride than amusement during the first date interaction.

These data—of two individuals belonging to a couple who provided estimates on several emotions within the same situation and across several interactions—have a complex structure and multiple dependencies. To deal with these dependencies, we ran a dyadic multivariate multi-level model, considering women and men’s partner ratings as belonging to one of four reports of a particular emotion category (positive or negative) in a given interaction, with eight interactions (two teasing, two current concern, two past partner, one first date, plus baseline). Thus, we simultaneously estimated coefficients for positive and negative emotions in a single model.

*How aware were perceivers of partner positive emotions?*

Using the strategy described above to test this hypothesis, the following level-1 model was estimated (Eq. 1):

$$EMO\_P_{ijk} = \beta_{1jk}(WOMAN) + \beta_{2jk}(MAN) + \beta_{3jk}(P\_EMO\_W)_i + \beta_{4jk}(P\_EMO\_M)_i + r_{wijk} + r_{mijk} \tag{1}$$

$EMO\_P_{ijk}$  is an individual’s partner’s self-reported emotion type  $i$  reported for interaction  $j$  of couple  $k$ . The estimate for  $\beta_{1jk}$  and  $\beta_{2jk}$  represent the intercepts of couple

$k$ ’s women and men’s partner emotions in interaction  $j$ , and  $\beta_{3jk}$  and  $\beta_{4jk}$  reflect the extent to which couple  $k$ ’s women and men’s reports about their partner’s emotion  $i$  in interaction  $j$  covary with their partner’s self-reported emotion  $i$ . These coefficients were used to reflect perceiver tracking of the partner’s emotions. Finally,  $r_{wijk} + r_{mijk}$  are the level-1 residuals of the woman and the man, which are correlated over time.

An examination of this model’s fixed effects showed that both women and men perceivers significantly predicted their partner’s self-reported positive and negative emotions (see Table 1). To compare whether positive emotions were tracked more accurately than negative emotions, the deviance statistics of the current model were compared with the deviance of an alternative model where tracking accuracy for positive and negative emotions was constrained to be equal. This analysis revealed that partner positive emotions were tracked with significantly more accuracy than negative emotions,  $\chi^2(2) = 114.742$ ,  $p < .001$ , and women and men did not differ in this regard (positive emotions,  $\chi^2(1) = .231$ ,  $p > .50$ ; negative emotions,  $\chi^2(1) = .461$ ,  $p > .50$ ).

*Was accurate tracking of positive emotions more pronounced for positive emotions whose display includes Duchenne smiles?*

We examined this possibility with a model that estimated accurate tracking from the covariance of within-person fluctuations of self and partner reports for each of the specific emotions in the positive emotion category—amusement, happiness, love, and pride—across the eight couple interactions, and examined differences among these estimates of emotion tracking accuracy. We used a multivariate model to simultaneously estimate accuracy scores for amusement, happiness, love, and pride, for women and men. The basic level-1 model, estimated for each of the four positive emotions, is shown in Eq. 2:

$$EMO\_P_{ij} = \beta_{1j}(WOMAN) + \beta_{2j}(MAN) + \beta_{3j}(P\_EMO\_W) + \beta_{4j}(P\_EMO\_M) + r_{wj} + r_{mj} \tag{2}$$

$EMO\_P_{ij}$  is a partner’s self-reported amusement, happiness, love or pride, in interaction  $i$  in couple  $j$ . The estimate for  $\beta_{1j}$  and  $\beta_{2j}$  represent the intercepts of couple  $j$ ’s women and men’s partner emotions, and  $\beta_{3j}$  and  $\beta_{4j}$  reflect the extent to which couple  $j$ ’s women and men’s reports about their partner’s emotions covary with their partner’s self-reported emotions. Finally,  $r_{wj} + r_{mj}$  are the level-1 residuals of the woman and the man, which are correlated over time.

As hypothesized, positive emotions whose displays are known to include Duchenne smiles were tracked with significantly more accuracy than positive emotions whose display does not include the Duchenne smile (Table 1). Specifically, tracking accuracy for amusement and happiness was significantly higher than for love,  $\chi^2(2) = 31.241$ ,  $p < .001$ , and tracking accuracy for love was significantly higher than tracking accuracy for pride,  $\chi^2(2) = 15.404$ ,  $p < .001$ .

## Discussion

As hypothesized, the awareness element of positive emotion attunement was evident in the accuracy with which others' positive emotions were tracked during the emotion-laden interactions of a sample of dating couples. There was also evidence that tracking accuracy was most pronounced for emotions whose display is most strongly linked with Duchenne smiles (e.g., amusement, happiness, and love vs. pride). These findings emerged despite perceivers' general awareness of partner emotions, including negative emotions. Mean levels of positive emotion were higher than negative emotion but negative emotions had sufficient variability for comparable tracking comparisons. Altogether, these findings are consistent with our theorizing that people are motivated to be particularly aware of others' positive emotions.

An alternative explanation for the observed pattern of partner emotion tracking is that our sample of highly satisfied couples tended to perceive their partners in relationship enhancing ways that attuned them only to partner positive emotions. Indeed, it may be the case that positive emotion attunement is most likely to occur during early stage relationships. Like the "marriage shift," wherein people prefer to be seen by dating partners in more positive ways but by marriage partners in more realistic ways (Swann et al. 1994), dating couples may be particularly motivated to perceive one another's positive emotion. Another possibility is that the interactions elicited too little negative emotion for perceivers to accurately track. The significant tracking accuracy for negative emotions, however, makes either of these alternatives unlikely.

A strength of Study 1 was the comparison of specific positive and negative emotions, and within specific positive emotions whose display is known to vary in the extent to which it is characterized by Duchenne smiles, as they occurred over the course of on-going social interaction. Our analyses provided a strong test of awareness of others' positive emotion because perceivers had to be aware of their partner's specific positive emotions, rather than any one emotion or the general valence of emotion, in our tracking index. Study 1 also had limitations. The sample

was already in an on-going relationship and thus not suited for assessing attunement responsiveness to new relationship opportunity. Positive emotions characterized by Duchenne smiles were tracked with greater accuracy than positive emotions not characterized by Duchenne smiles, but we did not code emotion displays to assess the relative contribution of self-reported and displayed emotion for tracking accuracy. However, we are confident that the sample readily displayed positive emotions because other research has documented emotion display in this dataset (Gonzaga et al. 2006).

To test the responsiveness element of attunement and address the limitations of Study 1, Study 2 elicited positive and negative emotion via film clips in a neutral setting, randomly assigned participants to a social context that provided an opportunity for a new relationship, and assessed both self-reported and displayed emotion.

## Study 2: responsiveness to others' positive emotions

Study 2 used a 3 (social context: alone, stranger, roommate)  $\times$  2 (emotion: positive, negative) mixed factor experimental design to test the responsiveness element of positive emotion attunement: that others' positive emotions would predict perceiver responsiveness to a possible new relationship. The stranger condition was the key condition that represented an opportunity for a new relationship; the other two conditions allowed us to assess whether emotion experience and display in the stranger condition were influenced by the presence of another (e.g., Buck et al. 1992; Fridlund 1991). Same-gender dyads of women were recruited to control for the additional variability that could be introduced by mixed-gender stranger dyads. Emotion elicitation via film clips in a neutral laboratory setting standardized emotion experience across conditions and constrained the possibility of other processes (e.g., self-disclosure) that are known to influence relationship formation. Self-reported and displayed emotions were assessed over the course of the study, and closeness was assessed at the end of the study as a measure of responsiveness to the new relationship opportunity. We also assessed personality to rule out the possibility that personality differences accounted for the hypothesized effects. To ensure a neutral context, participants were not told about the relational focus of the study until the end of the study session and care was taken to ensure that all participants had independent study experiences. For this reason, we did not assess roommate emotion tracking; to do so may have alerted participants of our interest in relational processes.

## Method

### Participants

Ninety-one women were randomly assigned to view six emotion eliciting film clips alone ( $n = 27$ ), with a stranger ( $n = 28$ ), or with a roommate ( $n = 36$ ). Participant mean age was 21 years old and the diverse sample reported European (32 %), Asian (47 %), Latino (12 %), African (1 %), and “other” (8 %) cultural backgrounds.

### Procedure

Participants were recruited through the psychology department participant pool or advertisements posted throughout campus for a study on emotion experience. A research assistant coordinated scheduling and randomly assigned participants to the alone, stranger, or roommate conditions at the time of first contact with a potential participant who expressed interest in taking part in the study. Participants assigned to the alone condition were scheduled at a time of their convenience. Participants assigned to the stranger condition were scheduled at the same time as an already scheduled participant they did not previously know. Participants in the roommate condition were requested to ask a roommate to take part in the study with them. All participants received partial class credit in return for taking part in the study with the exception of roommates. Roommates brought in at researcher request were compensated \$10.

Participation took place in a two phase laboratory session. In Phase 1, participants completed consent forms and questionnaires containing demographic and personality measures. In Phase 2, participants were taken to a quiet room and seated at a table in front of a widescreen television to watch six emotion eliciting clips. Two video cameras were positioned behind the television and set up to capture the head and torso of each participant on a split screen as they watched the emotion eliciting clips. Participants viewed one baseline clip and six emotion eliciting clips in partially counterbalanced order: positive clips preceded negative clips but clip order within these categories was varied. This order was chosen to mimic typical life experience that is characterized by a baseline norm of positive emotion with negative emotions being less frequent, less normative, and more disruptive (e.g., Baumeister et al. 2001; Diener and Diener 1996; Rozin et al. 2010). After each clip, participants self-reported the emotions they experienced during the clip. After the final clip, participants in the stranger and roommate conditions completed a self-report measure of the closeness they felt toward the other person in the study. Participants were then debriefed and informed of the videotaping. The option of

consenting to have their video coded for research purposes or having the research assistant destroy the videotape in their presence was carefully explained. No participant chose to have her video destroyed. All procedures were approved by the UCLA IRB.

### Measures

**Emotion elicitation** The positive emotions were amusement, awe, interest, and love; the negative emotions were fear and sadness. Again, emotions were selected to have clear positive or negative valence and a documented non-verbal display (Campos et al. 2013; Ekman 1972; Gonzaga et al. 2001; Keltner et al. 1998; Tracy and Robins 2007). Sadness and fear provided a strong test of our predictions because the distress signals associated with these two emotions can elicit caregiving responses (e.g., Buss and Kiel 2004) that could also promote relationship building.

Film clips are widely used in the emotion literature to induce emotion. We pilot tested each 1–4 min clip to ensure elicitation of the intended state. Pilot testing occurred with small groups of undergraduate students in a class and members of the 4th author’s laboratory to ensure relevance to potential participants. The final clips chosen were those that received a combination of high ratings for the target emotion and low ratings for other target emotions (e.g., high amusement ratings but lower ratings on awe, interest, and love). Additional information can be provided by the authors upon request. For amusement, two short clips were shown in sequence. The first showed a comic skit where an actor wore inappropriate clothing and seemed oblivious to the reactions of his coworkers. The second showed a monkey comically falling from a tree. For awe, we used a clip from a PBS documentary that showed people reaching Mt. Everest. For interest, we used a clip from the documentary “Step Into Liquid” that showed a demonstration of tow surfing. For love, we used a clip from the “Princess Bride” that showed the princess and her stable boy realizing they were in love. For fear, we used a clip from “Vertical Limit” that showed family members about to fall off of a mountain while rock climbing. For sadness, we used a clip from “My Girl” that showed a young girl overwhelmed with grief upon learning that her best friend had died. To establish a neutral baseline, all participants first viewed a clip that showed a yoga instructor demonstrating the correct use of props.

**Self-reported emotion experience** After each clip, participants indicated whether they felt any of 21 emotions during the clip and then rated the intensity of the emotions they felt on a 7-point Likert scale (1 = *no emotion*; 7 = *intense emotion*). The 21 emotions were: amusement, anger, anxiety, awe, compassion, contentment, contempt,

discomfort, disgust, embarrassment, enjoyment, fear, gratitude, interest, love, pleasure, pride, sadness, shame, sympathy, and tension.

**Nonverbal emotional displays** Emotion displays were coded by a team of five research assistants. All were blind to hypotheses but received extensive training by the first author (B. Campos), who is certified in the Facial Action Coding System (FACS) developed by Ekman and Friesen (1978). Coders overlapped on 26 % of the videos (24 of 91), evenly distributed across social context, to establish reliability.

Display codes were drawn from existing literature documenting the displays associated with each emotion. Amusement displays were defined as facial movements resulting in Duchenne smiles such that there was an upturning of lip corners, cheeks lifting, eye corners crinkling and a slight lower jaw drop that may or may not have occurred with laughter,  $\kappa = .69-.79$  (Campos et al. 2013; Keltner 1995). Due to their similarities, awe and interest were coded together and defined as facial movements resulting in raising of the inner eyebrows, eyes widening, and jaw dropping that showed visible space between teeth,  $\kappa = .66-.94$  (Reeve 1993; Shiota et al. 2003). Love displays were defined as facial and body movements resulting in the body leaning toward partner, Duchenne smiles such that there was an upturning of lip corners, cheeks lifting, eye corners crinkling, use of hands to point, gesture, or communicate with imagined or real other, and up and down head nodding (Gonzaga, et al. 2001). The love display was found to occur too infrequently to calculate reliability and was dropped. Fear displays were defined as facial movements resulting in the raising of the inner and outer eyebrows, with crinkling in space between eyebrows, and eyes widening,  $\kappa = .44-.77$ . Sadness displays were defined as facial movements resulting in raising of the inner eyebrows, lips corners turning down, and chin center raising to give the appearance of wrinkling,  $\kappa = .50-.78$ .

Coders watched the video continuously, stopping when the video showed the participant's face and body shifting from neutral. At that point, coders used a 1 to indicate that a code occurred and 0 to indicate that a code had not occurred. Coders then went back to the video as necessary until they were satisfied that all relevant codes had been documented. Only displays that occurred during corresponding film clips (e.g., amusement during amusing clip; fear during the fear clip) were used in analyses.

**Closeness** We operationalized responsiveness to new relationship opportunity as felt closeness to the stranger at the end of the study. Participants indicated closeness to the stranger at the end of the study using the Inclusion-of-Other-in-the-Self (IOS) measure. The IOS measures

closeness in terms of perceived overlap between self and a specific other with a single item (Aron et al. 1992). This well-validated closeness measure consists of seven circles (1 = *non-overlapping*; 7 = *almost completely overlapping*) that represent the extent to which the self overlaps with a relationship target. Participants were instructed to "please choose the pair of circles that best represents your relationship with the other person who you viewed the film clips with." Stranger mean closeness was 2.52 with a standard deviation of 1.37.

**Personality** Participants completed a 44-item self-report measure of the five-factor model of personality (John et al. 1991). Participants indicated the extent to which items that measured extraversion, agreeableness, conscientiousness, neuroticism, and openness were self-characteristic on a 5-point Likert scale (1 = *disagree strongly*, 5 = *agree strongly*). All five subscales were reliable ( $\alpha$ 's = .73-.87).

## Results

### *Emotion elicitation and experience check*

First, we assessed whether the film clips successfully elicited the intended emotions. For all clips, at least 70 % of participants chose to rate the target emotion (Table 2). All other emotions were chosen infrequently. Next, we collapsed the separate emotion variables into self-report and display composites for further analysis. The positive emotion composites consisted of amusement, awe, interest, and love (love was only included in the self-report composite) across the four positive emotion film clips. The between-subject reliability of the emotion self-reports was moderate ( $\omega = .62$ ), mainly due to a lack of correlation of awe with other positive emotions (reliability without awe:  $\omega = .75$ ). The negative emotion composites consisted of fear and sadness across the two negative emotion film clips (self-reports:  $\omega = .64$ ). The correlation of self-reported emotion and displayed emotion (across emotions) was moderate for awe ( $r = .23$ ,  $p < .05$ ) and sadness ( $r = .24$ ,  $p < .05$ ), and close to zero for all other emotions ( $r < .04$ ).

As Table 3 shows, one-way ANOVAs indicated that self-reported positive emotion, self-reported negative emotion, and negative emotion displays did not differ by social context (all  $F$ 's  $< 1$ ). There was an effect for displayed positive emotion by social context,  $F(2,77) = 32.42$ ,  $p < .001$ . Follow up t-tests showed that roommates displayed more positive emotion than strangers,  $t(43.36) = 5.94$ ,  $p < .001$ , or those who were alone,  $t(42.23) = 6.06$ ,  $p < .001$ . Importantly for our study, however, the displays of strangers were not influenced by the presence of another (e.g., Buck et al. 1992; Fridlund 1991); strangers displays did not differ from alone displays.

**Table 2** Study 2: Frequency of target emotion experience during each film clip

Film clips	All conditions (N = 91)	Alone (n = 27)	Strangers (n = 28)	Roommates (n = 36)
<i>Positive emotions</i>				
Amusement clip				
Amusement	85	25	26	34
Love clip				
Love	69	18	22	29
Awe clip				
Awe	66	19	21	26
Interest clip				
Interest	72	23	22	27
<i>Negative emotions</i>				
Fear clip				
Fear	85	24	28	33
Sadness clip				
Sadness	88	27	27	34

**Table 3** Study 2: Self-reported and displayed positive and negative emotion across social context conditions

	Alone (n = 27) M (SD)	Strangers (n = 28) M (SD)	Roommates (n = 36) M (SD)	Social context differences?
<i>Self-reported</i>				
Positive emotion	2.96 (.71)	2.98 (.73)	2.90 (.77)	No
Negative emotion	3.78 (.83)	3.81 (.92)	3.97 (1.14)	No
<i>Displayed</i>				
Positive emotion	.46 (.37)	.47 (.40)	1.52 (.78)	R > S & A
Negative emotion	.74 (.77)	.45 (.50)	.86 (.91)	No

N = 91; Self-reported emotion ratings on a 1-7 scale (1 = no emotion; 7 = intense emotion)

R Roommate, S Stranger, A Alone

*Did others' positive emotions predict perceiver responsiveness to new relationship opportunity?*

We tested this hypothesis by comparing the extent to which self-reported and displayed positive and negative emotion predicted closeness in stranger dyads using the actor-partner interdependence model (APIM) within a multilevel model where interaction partners (level 1) were nested within dyads (level 2). As appropriate for APIM (e.g., Cook and Kenny 2005), we tested and report both actor effects (does own positive emotion experience or display predict own closeness rating?) and partner effects (does partner positive emotion experience or display predict own closeness rating?). We used one-tailed tests of statistical significance due to the high likelihood that our small Study 2 sample was underpowered for hypothesis testing. One-tailed tests reduce the likelihood that meaningful effects might be obscured by an overly conservative significance level.

The results of this analysis are presented in Table 4 and illustrated in Fig. 1. Significant coefficients emerged only for positive emotion display, for which we found both an

actor and a partner effect. Both own and partner display of positive emotion were significantly associated with closeness reports.<sup>3</sup> A comparison of the deviance statistic for this model with that of a model where actor and partner effects of positive emotion display were constrained to equality indicated that these two coefficients did not differ significantly ( $\chi^2(1) = .15, p = .70$ ). We used an analogous strategy to test whether the size of the estimate for partner positive emotion display differed from that of the estimate for partner negative emotion display [a comparison of an unconstrained model with a model where the estimates for positive and negative emotion displays in the stranger condition were constrained to be of the same size but inverse valence (e.g., 1 vs. -1)]. Tests indicated that the size of the effects for the partner's positive emotion display was significantly greater than that for the partner's negative emotion display ( $\chi^2(1) = 2.998, \text{one-tailed } p = .04$ ). A comparison of the size of actor effects,

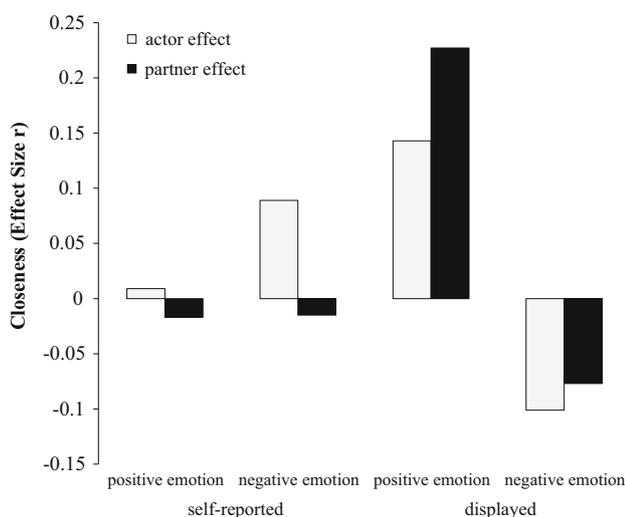
<sup>3</sup> This pattern held when all non-significant predictors were dropped from the model and only the actor's and the partner's positive emotion display were used as predictors.

**Table 4** Study 2: Summary of APIM multilevel analysis for positive and negative self-reported and displayed emotion as predictors of closeness in stranger condition

Predictor	<i>B</i>	Estimates	
		<i>SE B</i>	<i>ES r</i>
Intercept	2.500***	.206	.870
Self-reported positive emotion (actor)	.122	.271	.009
Self-reported positive emotion (partner)	-.167	.270	-.017
Self-reported negative emotion (actor)	.344	.234	.089
Self-reported negative emotion (partner)	-.135	.234	-.015
Displayed positive emotion (actor)	1.313*	.686	.143
Displayed positive emotion (partner)	1.766**	.695	.227
Displayed negative emotion (actor)	-.775	.492	-.101
Displayed negative emotion (partner)	-.676	.499	-.077

$n = 28$ . *ES r* = Effect size *r*. Positive emotion and negative emotion experience and display were centered at their social context group means

\*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ . (one-tailed tests)

**Fig. 1** Study 2: Associations between self-reported and displayed positive and negative emotion and closeness in stranger condition

( $\chi^2(1) = .76$ , one-tailed  $p = .19$ ), found no significant difference.

Testing discrete emotion self-reports in a joint model was not appropriate in Study 2's small sample due to degrees of freedom constraints. We therefore ran separate tests for discrete emotion self-reports and displays (both actor and partner effects for self-reports and displays in one model). These analyses indicated that own display of awe ( $B = 3.517$ ,  $ES r = .526$ ;  $p = .011$ ) was significantly associated with perceived closeness and partner display of amusement was a significant predictor of perceived

closeness ( $B = .780$ ,  $ES r = .403$ ;  $p = .039$ ). All other coefficients were nonsignificant ( $p > .135$ ).

#### Did personality account for the positive emotion findings?

We considered whether personality could have accounted for the predictive value of positive emotion display for strangers' felt closeness. For example, people high in extraversion or neuroticism vary in their comfort with expressing emotion in the presence of known and unknown others (John and Srivastava 1999). One-way ANOVA's on extraversion, neuroticism, agreeableness, conscientiousness, and openness showed no mean differences by social context (all  $F$ 's  $< 1$ ) and the five factors were not correlated with self-reported emotion, emotion display, or closeness (all  $p$ 's  $> .05$ ).

#### Discussion

Only positive emotion displays during positive emotion film clips predicted closeness among strangers who presented an opportunity for a new relationship in a neutral setting. This was true for others' positive emotion displays as well as own positive emotion displays. Further, others' positive emotion display was significantly more predictive of perceiver felt closeness than others' negative emotion display. Negative emotion, self-reported or displayed, during the relevant film clips did not predict closeness. These patterns emerged even though participants reported similar emotion experience across contexts, strangers displayed positive and negative emotion with almost equal frequency (see Table 3), and the film clips for the negative emotions were relationally relevant (e.g., loss of a loved one; family in danger) and could have reasonably elicited a desire to comfort, nurture, and be close among stranger dyads. Importantly, the effect for displayed positive emotion could not be attributed to differences in personality or level of response to the film clips, which were similar across contexts. We were limited in our ability to test the role of the Duchenne smile for the closeness findings, but our results indicated that others' positive emotion display that is chiefly signaled by a Duchenne smile (amusement) was a significant predictor of perceived closeness among strangers.

Although own positive emotion was not the focus of this work, the finding that own positive emotion displays, and specifically awe, predicted closeness is consistent with other research (Van Cappellen and Saroglou 2012; Waugh and Fredrickson 2006). Unexpectedly, others' self-reported positive emotion did not predict stranger closeness. Expressive displays are the more socially visible and response-evoking emotion information (Ekman 2003). There is also some indication that Duchenne smiles in particular

are a reliable signal of cooperation and affiliation (Mehu et al. 2007a; Messinger et al. 1999). Thus, it is reasonable that expressive displays of positive emotion would be more salient and predictive of closeness than internal state information alone among strangers. Few studies have separately examined both internal feelings and expressive display for multiple positive emotions in the context of relationship formation; future research will be needed to better understand their relative or combined importance.

We also considered the possibility that the observed effects on closeness might have originated from psychological processes activated during the study incidental to heightened responsiveness to others' positive emotions. For example, closeness ratings after the emotion-eliciting film clips may have been influenced by misattribution of arousal (e.g., Fraley and Aron 2004), emotion contagion (e.g., Parkinson 2011), or transference processes (e.g., Andersen and Glassman 1996). None of these possibilities, however, explains why effects were only observed for positive emotions when the negative emotions that we studied were also relationally relevant.

The strengths of Study 2 were experimental control and measures of both emotion experience and emotion display in a neutral setting. There were also limitations. Our small sample was all women. Not all positive emotions were displayed. Perhaps due to the social contexts studied, love displays were scarcely observed. Positive emotion film clips were shown first and closeness ratings may have been affected by primacy of exposure. We note, however, that negative emotion film clips were shown last and it was just as likely that closeness ratings could have been affected by recency of exposure. On balance, this makes it unlikely that order effects could account for the observed data patterns. Further, positivity is considered a baseline of sorts that is more frequent and normative than negativity (Baumeister et al. 2001; Rozin et al. 2010). Thus, our emotion film clip order was ecologically valid. Of perhaps greater importance, fear and sadness, the two negative emotions studied, could have elicited a desire to comfort and be close to a person feeling and displaying these emotions, but they did not.

## General discussion

In two studies we found evidence of positive emotion attunement—that perceivers are highly aware of others' positive emotions and that perceivers are responsive to others' positive emotions when there is opportunity to form a new relationship. In Study 1, awareness of others' positive emotion was evident in the accuracy with which perceivers' tracked their partners' positive emotions in a sample of dating couples. In Study 2, responsiveness to others' positive emotions under conditions of new

relationship opportunity was evident in the closeness that perceivers felt toward strangers who displayed positive emotion. In both studies, attunement to positive emotions exceeded attunement to negative emotions. There was also evidence that Duchenne smiles were the signal to which perceivers were most attuned. These findings provide new evidence of the motivated salience of positive emotions in social settings and highlight the role of positive emotion display in the development of new social connections.

What information are positive emotions providing to perceivers? Our interpretation is that others' positive emotions provide uniquely important information regarding the likelihood of affiliation and cooperation that humans depend on for survival and successful reproduction. Awareness of others' positive emotions helps individuals monitor on-going relationships for affiliation and cooperation that people are motivated to obtain. Responsiveness to others' positive emotions, particularly their displays, helps individuals obtain new relationships that may have a high likelihood of being characterized by affiliation and cooperation. This interpretation is consistent with a large body of theory and research that has implicated positive emotions in affiliation, cooperation, and satisfying long-term close relationships (e.g., Algoe et al. 2008; Cohn et al. 2009; Fredrickson 1998; Shiota et al. 2004).

Are there particular signals that facilitate positive emotion attunement? Based on our read of the literature on positive emotion display, we suspected that Duchenne smiles play a critical role in positive emotion attunement. Duchenne smiles, however, are complex phenomena. They signal felt enjoyment (Ekman and Friesen 1978; Ekman et al. 1987), can signal affiliation and cooperation (Mehu et al. 2007b), and are most likely to occur in social interaction marked by affiliative positive emotion (Gonzaga et al. 2001; Messinger et al. 1999). At the same time, Duchenne smiles are absent in positive emotions whose functions appear to be primarily cognitive, such as awe and interest, or status-focused, such as pride (Campos et al. 2013; Shiota et al. 2007; Tracy and Robins 2007). We found that others' pride was tracked with less accuracy than happiness, amusement, and love in Study 1. One possibility is that positive emotions whose display includes Duchenne smiles signal a unique and potent combination of enjoyment, affiliation, and willingness to cooperate. Another is that Duchenne smiles occur when positive emotion is felt in the context of affiliation, which in turn, signals a high likelihood of cooperation to perceivers. This latter possibility would be consistent with Scherer's (1994) proposal that expressive displays may be response elements rather than emotion specific patterns. These possibilities can be teased apart by future research to refine current understanding of the functions that positive emotions, and their expressive displays, serve.

Does positive emotion attunement extend to all positive emotions? In the last 20 years, great variation in positive emotions has been documented, including multiple states and multiple social functions (e.g., Campos et al. 2013; Fredrickson 1998; Shiota et al. 2004). Although many of these positive emotions signal affiliation and cooperation, some do not. Pride, for example, signals status and is neither theorized nor empirically linked with affiliation and cooperation (e.g., Tracy and Robins 2007). We found that pride was tracked with less accuracy than a set of comparison emotions that have been strongly linked with affiliation and cooperation (i.e., happiness, amusement, and love) in previous research. This pattern may indicate that positive emotion attunement is primarily driven by positive emotions that reliably signal affiliation and cooperation. However, pride was still tracked with significant accuracy by our sample of dating partners. Future research will be needed to establish whether attunement to positive emotion is a general phenomenon or, as our theoretical rationale and empirical evidence suggest, particularly evident in positive emotions that signal affiliation and cooperation.

These two studies demonstrate that people are highly attuned to others' positive emotions but future work will be needed to better understand the contexts in which people may be most attuned to the positive emotions of others. We suspect that positive emotion attunement is most relevant in the two contexts we studied—in on-going relationships and when there is a possibility of forming a new relationship. In these contexts, awareness of others' positive emotions can provide important information about whether a relationship is characterized by affiliation and cooperation; responsiveness to others' positive emotions may lead to the formation of new relationships characterized by affiliation and cooperation. In both cases, attunement to the positive emotions of others can help people pursue and maintain the mutually beneficial social relations that humans depend upon for survival and successful reproduction. It is also possible that positive emotion attunement may matter more in early stage relationships, when people are assessing the long-term potential of a relationship. In contrast, longstanding partners may be more equally attuned to partner positive and negative emotions because both are important for long-term stability and satisfaction. New research indicates that one partner's daily positive emotion can reduce the psychological distress of the other partner in long-term couples (Randall and Schoebi 2015). We also note that positive emotion attunement may be less relevant in competitive or task-oriented contexts that rely less on affiliation and cooperation to generate desired outcomes. Future research can address these possibilities.

Awareness of others' positive emotions may provide important information about the likelihood of affiliation and cooperation, but the consequences of this awareness for on-going relationships is likely to be complex and not

always desirable. Attunement to a partner's positive emotion can let one know that a partner feels love for you or for a rival. In the first example, positive emotion attunement may lead an individual to feel valued and secure in their relationship whereas in the second example, positive emotion attunement may lead to feelings of threat and the possibility of relationship dissolution. In both scenarios, however, attunement to others' positive emotions would provide important information regarding the likelihood of affiliation and cooperation that people should be motivated to obtain.

An alternative explanation for the observed findings is that the contexts we studied were more evocative of positive emotion than negative emotion. Certainly, our dating couples were highly satisfied but the semi-structured interactions they participated in were selected to be evocative of both positive and negative experience and couples did track their partners' negative emotions with considerable accuracy. The strangers we studied came together in a neutral laboratory setting and took part in a standardized emotion induction procedure. These settings are not more or less evocative of positive and negative emotion than is typical of everyday life.

In both studies, attunement to others' positive emotion exceeded attunement to negative emotion. Positive and negative emotions both serve important, independent, social functions (e.g., Diener and Emmons 1984; Gable et al. 2000). Indeed, negative emotions may be of heightened importance in particular relationship situations that have implications for whether a relationship thrives or dissolves (e.g., conflict resolution). Negative emotions, however are more tightly linked to both beneficial and detrimental relational processes. For example, others' negative emotions can elicit care and support (e.g., Graham et al. 2008) but can also escalate conflict and aggression (e.g., Levenson and Gottman 1983). Further, the absence of negative emotions does not equal the presence of affiliation and cooperation. In our view, just as attunement to negative emotions is important for identifying and responding to threats or the need of others for caregiving and support (Baumeister et al. 2001; Graham et al. 2008), attunement to positive emotions is important for identifying and responding to opportunities for affiliation and cooperation.

The present work has a number of important strengths. Affiliation and cooperation are theorized to be central to human survival but most emotion research has examined this question through the lens of negative emotion (e.g., who poses a threat to affiliation and cooperation?). Here, we drew on that theorizing to test the prediction that there is a motivated attunement to positive emotion. This focus yielded unique new findings for positive emotion attunement, including the finding that positive emotion attunement can exceed negative emotion attunement. These

results have important implications for better understanding relationship formation and maintenance processes. Our findings also raise important questions for future study (e.g., what is the role of Duchenne smiles in positive emotion attunement? what are the relational contexts in which people are most attuned to others' positive emotion?). Our research also had methodological strengths. We examined emotion at multiple levels—self-reported, partner perceived, and behaviorally displayed—using social interaction and experimental methods that captured spontaneous emotion behavior in the live presence of others. This multi-method approach is key to understanding emotions, which are inherently social processes.

Our work also had limitations. The Study 1 sample consisted solely of dating couples, who may be particularly attuned to one another's positive emotions, and Study 2 did not include men. To better understand the extent to which positive emotion attunement is a human universal, future research will need to examine these processes across varying social contexts. For example, it may be useful to study positive emotion attunement in cultures that emphasize elevated positive emotion expressivity, as is true of U.S. Latino culture (Holloway et al. 2009), or more moderated positive emotion, as is true of East Asian cultures (Tsai 2007).

We hope that the findings reported in this paper generate additional research on *positive emotion attunement*. Human social life depends on affiliation and cooperation. Positive emotions are a salient index of the possibility of affiliation and cooperation. As such, people should be highly attuned to others' positive emotions. Without the rewards of affiliation and cooperation with others, successfully avoiding threat, predation, or exploitation would be a hollow victory.

**Acknowledgments** Portions of this work were completed while Belinda Campos was supported by a National Science Foundation Graduate Fellowship and a Graduate Opportunity Fellowship at UC Berkeley; National Institute of Mental Health Training Grant T32MH15750-25 for the study of biobehavioral issues in physical and mental health at UCLA; and the UCLA Sloan Center on the Everyday Lives of Families. Dominik Schoebi's work was supported by Grant PA001-10899 from the Swiss National Science Foundation. We are thankful to the team of Berkeley RAs who assisted with the Study 1 data collection. We are also thankful to Noah Fast, Ronit Menasche, Eileen Pitpitan, and Sid Tsai for their assistance in Study 2 data collection and to Ronit Menasche, Eileen Pitpitan, Sid Tsai, DaniMae Mundo, Mishell Hyun, and Kelvin O for their contribution as coders in Study 2.

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