Getting to Know You:

Effects of Positive Emotions on Naturalistic Conversation and Social Coordination

by

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ABSTRACT

The broaden-and-build theory of positive emotion suggests that positive emotions should broaden thought and behavior repertoires in order to develop lasting resources. In the social domain, this means deploying a variety of affiliative strategies in order to build cooperative relationships. A functionalist perspective on positive emotion suggests that different positive emotions should have distinct effects on these affiliative mechanisms. This study elicited awe, amusement, pride or a neutral control in pairs of same sex strangers. They then completed an open-ended "getting to know you" conversation, which were recorded and coded for affiliative behaviors—smiling, laughter, mimicry, and asking questions. After, they rated their perception of the other as complex and how much they liked each other. Then they played the prisoner's dilemma game. Results indicate that there was a significant mediated effect such that being in the pride condition predicted greater smiling, and smiling predicted cooperation on the prisoner's dilemma. This was true both when an individual's own smiling was predicting their cooperative behavior and when their partner's smiling was predicting their cooperative behavior. However, these effects were only seen in female dyads, not male dyads. There was also a significant mediated effect such that pride led women to ask more questions, which led partners to like each other more. Additionally, awe led to greater mimicry in men, which in turn led to greater cooperation. In women, awe led to greater perception of the other as complex. Overall, these results indicate that there are broaden and build effects of positive emotions, but these are specific to both the emotion and the sex of the interaction members. This is also the first study to demonstrate both an actor and a partner effect of smiling on cooperation in a prisoner’s dilemma. An important area for further inquiry

will be the interaction of emotion and sex in predicting social behavior. While sex differences in responding to threats have been characterized by the “tend and befriend” versus “fight or flight” action patterns, a similar approach may also need to be developed for sex differences in response to opportunities.

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INTRODUCTION

How do positive emotions help strangers become friends? The broaden-and-build theory suggests that positive emotions broaden thought and action repertoires, allowing individuals to try new things and explore the environment, and this builds lasting resources—such as new skills (Fredrickson, 1998). Applied to the social domain, it suggests that positive emotion might activate a diverse array of affiliative mechanisms that help build social resources. Positive emotions are thus a functional response to social opportunities, facilitating the formation of friendships and alliances (Shiota et al., 2004; Tracy & Robins, 2004; Shaver et al., 1996). Previous research provides some evidence of these effects, demonstrating that general positive emotion can lead to thoughts and behaviors that enable affiliation (Dunn & Schweitzer, 2005; Forgas, 2011; Waugh & Fredrickson, 2006). However, recent theorizing and empirical work demonstrates that distinct adaptive functions among positive emotions can lead to differing effects (Griskevicius, Shiota, & Neufeld, 2010; Griskevicius, Shiota, & Nowlis, 2010; Shiota, Neufeld, Yeung, Moser, & Perea, 2011). In this study I test the broaden-and-build effect in social interaction, but making functional distinctions among positive emotions. Theorizing about the adaptive functions about these emotions led me to make more nuanced predictions about how positive emotion helps build friendships.

This study compared the effects of three different positive emotions—awe, amusement, and pride—on five affiliative mechanisms—smiling, mimicry, laughter, asking questions, and perception of another as complex—in a social interaction between strangers. It then tested whether activation of these affiliative mechanisms increased liking and cooperation among these strangers. The broaden-and-build theory suggests

that I should find a mediated effect such that emotion leads to activation of affiliative strategies, which leads to liking. Functional theories of positive emotions suggest that each positive emotion should selectively activate a subset of possible affiliative strategies related to the evolved function of that emotion. Thus each positive emotion should have a broaden-and-build effect—some affiliative strategies are activated, leading to liking—but they might differ in how they broaden-and-build—which affiliative strategies are activated.

Positive Emotions and Relationship Outcomes

Positive emotions have been linked to a variety of beneficial social outcomes in a variety of populations. Expressions of positive emotion in women's college yearbook photos have been correlated with personality measures of affiliativeness (Harker & Keltner, 2001). These positive emotion expressions were also related to likelihood to get married by age 27 and negatively related to staying single into middle adulthood, suggesting that positive emotion led to development of romantic relationships. A study of positive emotions in the workplace found that self-reported positive emotion predicted better supervisor ratings and more support from both the supervisor and coworkers 18 to 20 months later (Staw, Sutton, & Pelled, 1994). A cross-cultural study examining relationships among emotion, relationships, and satisfaction across four groups—European Americans, Asian Americans, Chinese, and Koreans—found that the correlations between positive affect and quality of interpersonal relationships in these groups ranged between .32 and .43 (Kang et al., 2003). Finally, a study of personality and relationship satisfaction in couples found that an individual's trait-level higher positive

emotionality led to greater relationship satisfaction; additionally, a woman's higher positive emotionality increased her husband's relationship satisfaction (Robins, Caspi, & Moffitt, 2000). Together, these studies show that in love and work, and across cultures, positive emotions are linked to better relationships.

Unfortunately, this research is correlational and examines positive emotion at the trait level. A stronger test of theory would experimentally manipulate emotion to see how it affects relationship outcomes. Additionally, these studies examine positive emotion as an undifferentiated whole; a functional approach attempts to add nuance to this literature by making emotion-specific predictions.

Another approach to testing relationship outcomes is by examining specific behaviors associated with support and cooperation. A study by David DeSteno and colleagues (2010) did this by experimentally inducing gratitude to see its effects on an economic decision-making game, the "give some dilemma game" (GSDG, a variant of the prisoner's dilemma that allows for variable levels of cooperation). Results of that study indicate that experiencing gratitude leads to greater cooperation. This study is an important antecedent to the one I conducted, because it demonstrates that positive emotions lead specifically to cooperation on economic decision-making tasks, and because it examines the effects of a specific type of positive emotion. My own research expands on this by examining a broader range of positive emotions, and by specifically examining the mediating effects of affiliative mechanisms on this cooperative decision.

Positive Emotions and Affiliative Mechanisms

How do individuals form friendships? Psychological research has identified many affiliative mechanisms that increase liking and closeness between individuals, often testing their effects in independent models (Hatfield, Cacioppo, & Rapson, 1994; Chartrand & Bargh, 1999; Sande, Goethals, & Radloff, 1988; Aron & Aron, 1996; Berg & Archer, 1983; Collins & Miller, 1994; Miller & Kenny, 1986; Harker & Keltner, 2001). From the broad set of identified mechanisms, I choose to sample five: mimicry, perception of another as complex, laughter, asking questions, and smiling. These were chosen in order to capture several modalities, including facial expressions, vocalizations, verbalizations, bodily movements, and internal cognitive processing of the other. It was therefore more likely I would find independent effects of these mechanisms, though they were operating in parallel during the social interaction task.

They were also chosen based on theoretical predictions regarding the effects of the positive emotions I was testing. I wanted to select a group of affiliative behaviors that would distinguish between the emotions, with some predictions suggesting similarity between emotions and others suggesting differences. Also important, previous research has linked these mechanisms to positive emotions, or emotions more generally (Hatfield, Cacioppo, & Rapson, 1994; Harker & Keltner, 2001; Forgas, 2011; Moody, McIntosh, Mann, & Weisser, 2007; Waugh & Fredrickson, 2006), but has not compared the effects of different positive emotions on these mechanisms[1].

[1] Although research has examined differences in smiling among prototypical positive emotion expressions, it has not examined differences in spontaneous smiling in a social interaction resulting from emotion manipulation.

Mimicry

People often spontaneously and automatically mimic others, and several have theorized that this mimicry can lead to bonding between the mimicker and mimicked (Hatfield, Cacioppo, & Rapson, 1994; Chartrand & Bargh, 1999; Lakin, Jefferis, Cheng, & Chartrand, 2003; Van Baaren, Maddux, Chartrand, De Bouter, & Van Knippenberg, 2003). Empirical evidence shows that mimicry increases rapport, liking, interpersonal closeness, felt similarity toward others, and smoothness of an interaction (Bailenson & Yee, 2005; Bernieri & Rosenthal, 1991; Chartrand & Bargh, 1999; LaFrance, 1979; Stel, Vonk, & Smeets, 2005). Mimicry can also lead to prosocial behavior, helping someone who mimicked you (or who you mimicked), donating more to charity, and helping complete strangers (Stel, Van Baaren, & Vonk, 2008; Van Baaren, Holland, Kawakami, & Van Knippenberg, 2004; Van Baaren, Holland, Steenaert, & Van Knippenberg, 2003).

Mimicry may subtly signal that the mimicker wants to affiliate, and it may be used to gather information about another person (Cheng & Chartrand, 2003; Lakin & Chartrand, 2003; McIntosh, 2006). Previous research has shown that when individuals want another to like them, they tend to unconsciously mimic that person's movements (Cheng & Chartrand, 2003; Lakin & Chartrand, 2003). Mimicry also facilitates emotional contagion—a two-step process wherein a person first mimics another's behaviors and expressions, and then, as a result of feedback from activated muscles to the brain, feels that person's emotions (Stel, van Baaren, & Vonk, 2008; Hatfield, Cacioppo, & Rapson, 1994). This "simulation" of another's emotion might be used as an information gathering strategy. Mimicry may thereby gather information that increases understanding of other people (Stel, Vonk, van Baaren, & Smeets, 2008).

Mimicry has not been directly linked to positive emotion, but it has been linked to emotional contagion (Hatfield, Cacioppo, & Rapson, 1994). Additionally, manipulations have been shown to affect responses to viewed expressions, suggesting that mimicry is not merely a reflexive response but a strategy that is selectively employed under certain conditions (Moody, McIntosh, Mann, & Weisser, 2007; Bourgeois & Hess, 2007). Mimicry is therefore a process that could be increased or decreased based on which emotion an individual is feeling.

Perception of Others as Complex

People tend to view themselves as having more complex, multifaceted personalities than others (Sande, Goethals, & Radloff, 1988; Beer & Watson, 2008). Thus perception of another person as complex can increase liking of others because it involves viewing them the way we view ourselves. One way in which this manifests is in ratings of the self as containing opposing pairs of traits—for example, my rating of myself as being both serious and carefree—while I rate others as being only either serious or carefree (Sande, Goethals, & Radloff, 1988). Individuals who are closer to each other rate their friends more similarly to the way they rate themselves (Prentice, 1990; Aron, Aron, Tudor, & Nelson, 1991; Goldberg, 1981). Individuals who are liked more are also rated as more complex (Sande, Goethals, & Radloff, 1988). Perceiving another person as complex has thus been seen in individuals who are more familiar and liked. Positive emotion generally has been found to increase the use of this affiliative mechanism, causing individuals to rate their roommates as more complex (Waugh & Fredrickson, 2006).

Laughter

Laughter is commonly associated with amusement (Herring, Burleson, Roberts, & Devine, 2011). It is also thought to have an adaptive function of encouraging play—which leads to the practice of fitness-relevant skills in a safe context (Weisfeld, 1993). This adaptive function matches the proposed adaptive function of amusement in Shiota et al.'s (2014) positive emotion framework. Additionally, laughter has been associated specifically with amusement as compared to joy, suggesting that it corresponds to a particular positive emotion and not to all positive emotions (Herring et al., 2011).

Research also suggests that laughter can undo the cardiovascular effects of negative emotion, which might be particularly important in interpersonal interactions (Bonnano & Keltner, 2004). Laughter might serve as a reset button on tension, allowing for its release and the conversation continuing from a more open, affiliative attitude.

Smiling

Smiling is an expression that signals prosocial intent. Social smiles often elicit assistance and can help interactions go more smoothly (Bower, 1977). Smiling can increases a person's attractiveness as a potential interaction partner, which may help form and maintain relationships (Harker & Keltner, 2001). Frequency and intensity of smiling predicts interpersonal intimacy, liking, and warmth—and whether the smiler is rated as a better potential friend (Argyle, 1972; Bayes, 1970; Harker & Keltner, 2001; LaFrance & Hecht, 1995; Otta, Abrosio, & Hoshino, 1996; Ray & Floyd, 2006; Reece & Whitman, 1962; Reis et al., 1990). Smiling is also part of the prototypical expressions of certain positive emotions, such as amusement, joy, and love (Campos et al., 2012). Smiling has also been previously linked with cooperation on a prisoner's dilemma game (Reed,

Zeglen, & Schmidt, 2012). Smiling is an important reference because of its ubiquity in previous research on affiliation and emotion.

Asking Questions

Asking questions may be an indicator of one person taking an interest in another. It is a solicitation of more information about a partner, which signals engagement. Previous research on question asking suggests that it follows certain heuristic information search rules (Wong & Weiner, 1981). Information seeking, particularly in the form of asking questions, has not been closely linked to emotional processes. However, it fits particularly well with the proposed adaptive function of awe, discussed below, so its assessment might yield important insight.

A Functional Approach to Positive Emotions

Theorists posit that improving social interactions is an important adaptive function of positive emotions (Shiota et al., 2004; Tracy & Robins, 2004; Shaver et al., 1996). Positive emotion might be a *signal* that the current situation is relatively safe, and therefore exploratory social behavior would be beneficial, and also a *trigger* activating a set of coordinated cognitive and behavioral mechanisms that allow us to take advantage of present social opportunities. Evidence bears this out. As described above, positive emotion generally can increase the use of certain affiliative mechanisms. Empirical work has also demonstrated that positive emotions are associated with long-term, adaptive relationship outcomes, increasing marital satisfaction (Harker & Keltner, 2001), trust (Dunn & Schweitzer, 2005), and social support (Fredrickson et al., 2008).

However, the myriad social opportunities presented by group living are not best responded to by a single set of emotional responses. Advertising status in a bid for

dominance, initiating a playful peer relationship, and exploring the complexities of the social world—hypothesized functions of pride, amusement, and awe—all require the use of different cognitive and behavioral strategies. This nuanced view of social opportunities requires a nuanced view of emotion, distinguishing between different positive emotions.

Guiding the prediction of different effects among positive emotions is a functional approach, which proposes that emotions help us respond adaptively to certain common, prototypical, fitness-relevant scenarios (Cosmides & Tooby, 2000; Ekman, 1992; Frijda, 1986; Keltner, Haidt, & Shiota, 2006; Lazarus, 1991). According to this perspective, each emotion elicits a suite of responses—in behavior, cognition, and physiology—that prepare the individual to avoid a threat or take advantage of an opportunity.

Not all challenges are the same, however, and distinguishing between different kinds of threats and opportunities has helped distinguish among the effects of various emotions (Kreibig, 2010; Lerner & Keltner, 2001; Levenson, 1999; Scherer, 1997). Simply calling an emotion negative is not enough to describe its function; empirical research has demonstrated distinct effects for different negative emotions like fear, anger, sadness, and disgust (Ekman, 1992; Griskevicius, Goldstein, Mortensen, Cialdini, & Kenrick, 2006; Lerner, Gonzalez, Small, & Fischhoff, 2003; Levenson, 2011). For example, fear makes people risk averse while anger makes them risk seeking (Lerner & Keltner, 2001). Research has similarly demonstrated that different positive emotions can have different effects on physiology (Shiota, Neufeld, Yeung, Moser, & Perea, 2011), persuasion processing (Griskevicius, Shiota, & Neufeld, 2010), and goal activation and decision-making (Griskevicius, Shiota, & Nowlis, 2010).

The present study compared the effects of three distinct positive emotions: pride, awe, and amusement. I expect each positive emotion to improve relationship outcomes, but via different affiliative mechanisms. The mechanisms that the emotions activate will correspond to the specific adaptive function of the emotion.

The function of pride is thought to be gaining and maintaining status within a group (Tracy, Shariff, & Cheng, 2010; Shiota, Campos, Keltner, & Hertenstein, 2004). Pride should therefore lead to thoughts, behaviors, and physiological changes that help an individual advertise success, gain social status, and motivate further achievement. Empirical results support this, showing that pride encourages perseverance and achievement (Williams & DeSteno, 2008; Herrald & Tomaka, 2002; Riskind & Gotay, 1982; Verbeke et al., 2004); pride increases self-esteem, which relates to social status (Brown & Marshall, 2001); pride increases the desire for flashy, status-oriented consumer goods (Griskevicius, Shiota, & Nowlis, 2010); and individuals feeling or displaying pride are perceived as higher status by others (Tiedens et al., 2000; Shariff & Tracy, 2009; Williams & DeSteno, 2009).

Pride would reduce smiling, because smiling can be a signal that someone does not pose a threat or is submissive (Anderson & Guerrero, 1998; Hall et al., 2005). For example, women who smile are more likely to be interrupted in conversation (Kennedy & Camden, 1983). It should also reduce laughter, because laughter can similarly be thought of as a non-threatening, potentially submissive display. Pride should reduce question asking, perception of the other as complex, and mimicry because it would increase self-focus and reduce information seeking. The effects of pride on liking and cooperation should therefore occur entirely through mechanisms outside the coding in this study.

In contrast, the hypothesized function of awe is information seeking and updating internal knowledge structures (Keltner & Haidt, 2003; Griskevicius, Shiota, & Neufeld, 2010; Shiota, Keltner, & Mossman, 2007). Awe is thought to be triggered by vast stimuli, which are difficult to process using existing knowledge structures, and to lead to a need for accommodation—updating or changing these knowledge structures to account for this vast, new stimulus (Keltner & Haidt, 2003). Because awe has the adaptive function of updating and changing internal knowledge structures, it should thus reduce reliance on stereotypical categories and heuristic thinking. Research has demonstrated this in the context of persuasion processing, showing that awe reduces reliance on heuristic cues in evaluating an argument (Griskevicius, Shiota, & Neufeld, 2010). In an interpersonal context, this updating of internal knowledge structures would lead to perceiving another person as complex. Indeed, in Aron and Aron's (1986; 1996) self-expansion theory, they posit that it is an individual's desire to expand the self—similar to the information-seeking motivation awe might induce—leads to increased understanding of the other.

Awe's information gathering function should increase the number of questions asked. Mimicry facilitates understanding of others through empathy, and I therefore predicted that awe would also increase mimicry and perceptions of the other as complex. However, smiling and laughter signal a more active engagement in the interaction, which may be at odds with the more passive, receptive social attitude elicits.

The hypothesized function of amusement is to encourage play, which affords an opportunity to practice skills needed for resource acquisition and defense (Shiota et al., 2013; Shiota, Campos, Keltner, & Hertenstein, 2004). Panksepp (2011) has proposed that a play system of this sort is common across mammals, and serves to help young animals

engage with others to build practical skills. Empirically, amusement has been shown to involve smiling (Campos et al., 2012), but has not been related to a wide variety of behaviors.

Individuals experiencing amusement may smile in order to signal their affiliative intent. Mimicry is a common play behavior, which demonstrates engagement and facilitates liking—again in line with amusement's function. Additionally, laughter is the cue most strongly associated with amusement, so I would expect amusement to increase it. Amusement does not necessarily engage an intellectual information-seeking, however, so I predicted it would not increase asking questions. Perception of the other as complex is not as clear, but I suggest that the cognitive flexibility encountered in amusement would increase it.

The predicted effects of these positive emotions on the affiliative mechanisms and cooperation are summarized in table 1, below.

Table 1: Hypothesized Effects of Positive Emotions on Affiliative Mechanisms

Emotion	**Affiliative Mechanism**				
Pride	↓smiling	↓laughter	↓ perception of other as complex	↓mimicry	↓asking questions
Amusement	↑ smiling	↑laughter	↑ perception of other as complex	↑ mimicry	↓asking questions
Awe	↓smiling	↓laughter	↑ perception of other as complex	↑ mimicry	↑ asking questions

Positive Emotion, Affiliation, and Sex

Sex differences in emotion and non-verbal communication are well-studied. For example, a meta-analysis found that women tend to smile more than men, but that this was often moderated by features of the situation—such as whether the situation was emotional (LaFrance, Hecht, & Paluck, 2003). By emotional these authors mean a situation that is intense and negative, where women might be expected to help smooth out feelings or otherwise manage the affective dynamics in order to make others feel comfortable. The authors found that women smiled more in these kinds of uncomfortable social situations.

There is also a body of literature that finds sex differences based on power and dominance. For example, one study testing statistical mediation found that women are expected to smile more, and this is in part explained by perceptions of women as more affiliative; conversely, men are allowed to show anger more freely, and this is in part explained by perceptions of men as more dominant (Hess, Adams, & Kleck, 2005). Additionally, power has been found to predict non-verbal behaviors in both men and women, such as amount of talking in a conversation (Cashdan, 1998). These are only a handful of studies examining these sex differences; even these few, however, serve to illustrate the point that we may expect sex differences in use of affiliative mechanisms.

Sex differences may also be due to how emotions function in men and women. For example, Shelley Taylor's "tend and befriend" theory suggests that women respond to threats differently from men (Taylor, 2006). One might similarly predict that individuals of different sexes react to positive stimuli differently. For example, one stereotype holds that women with a good sense of humor tend to make more situational-

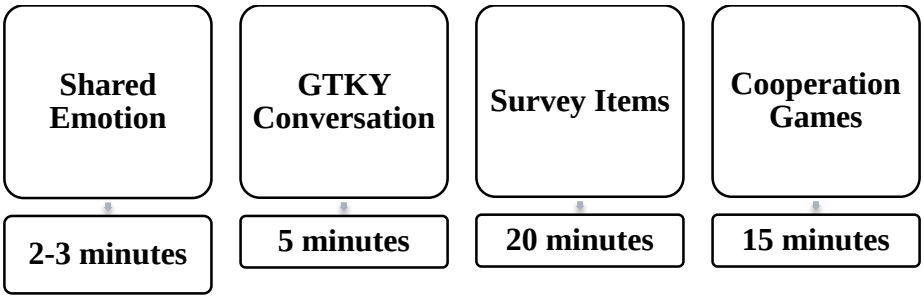
based jokes, whereas men with a good sense of humor tend to make more narrative-based jokes. If this stereotype were true, I would expect that eliciting amusement would create different behavioral biases in men and women. These differences may be due to biological constraints or predispositions, as Taylor posits; cultural expectations, as Hess, Adams, and Kleck (2005) show; or some combination of the two.

However, I hypothesize that emotions have the same adaptive function in both sexes. For example, although there are reasons to believe men and women might differ in their frequency of expressing pride, and that outwardly expressing pride might have different fitness consequences for men versus women, I posit that *pride itself* has the same function in both sexes—increasing and maintaining status. Therefore I am basing my hypotheses specifically on a functional account of positive emotions, but including sex as a possible covariate.

The Present Study

This study had four sequential stages. Pairs of unacquainted individuals came into the lab, where they were randomly assigned to watch a video together inducing amusement, awe, pride, or a neutral control. After the emotion induction, they completed a "getting to know you" conversation, in which they were asked to try to get to know each other as best they can, with no script or objectives. This conversation was video recorded and coded to detect the behaviors described above. Participants then completed some questionnaires assessing their liking and impressions of the other person, and their perception of the other as complex. Finally, participants performed two cooperation games, only one of which will be considered here. The structure of this study is represented in the diagram in figure 1.

Figure 1: Structure of the Getting to Know You Study



METHOD

Participants

176 dyads—352 individuals—were recruited to participate. Participants were undergraduates at Arizona State University who received course credit in addition to a $5 payment. They were able to win up to $5 more based on the outcome of the prisoner's dilemma, and up to 64 pieces of candy in another cooperation game (not considered here).

Four dyads were removed because the sound did not play when they watched the emotion videos. Two dyads were excluded because only the audio, not the video, played. Two dyads were removed because they were of mixed gender.

Additionally, 36 dyads were run with participants experiencing the emotion manipulation videos separately on laptops. These were included as a pilot study for future research. Among these, 9 received the awe manipulation, 10 amusement, 8 pride, and 9 neutral. Within this subsample, mean age was 19.33; 52.8% were male; 52.8% were white, 20.8% were East Asian, and 12.5% were Hispanic.

129 dyads received the emotion manipulation together. In this sample the average age was 19.33 years; 68 dyads were male (52.7%), while 61 were female. Ethnicities of

participants are given in Table 2. The final mix of dyads by emotion and gender is given in Table 3.

Table 2: Ethnicities of Participants

White/European	129
Hispanic Latino	42
East or Southeast Asian/Pacific Islander	42
South Asian	6
Middle Eastern	4
Black/African American	13
Other	13
Prefer not to answer	5
Total	254

Table 3: Dyads by Emotion Condition and Gender

	Female	*Male*	*Total*
Amu	17	18	35
Awe	15	15	30
Neu	14	16	30
Pri	15	19	34
Total	61	68	129

Procedures

Emotion induction.

As mentioned, two different versions of the emotion induction were used: one where individuals experienced the induction together, one where they experienced it apart. The majority of sessions were conducted in the together condition, but the apart condition was included as a pilot for future research.

Participants were seated side-by-side in the lab room in chairs facing a wall-mounted TV screen, but tilted towards each other. One of four different video clips was played on the TV, while both participants watched. These clips were each approximately 2 minutes in length, all in color, and all involving human speech. Each dyad was be randomly assigned to view either: (1) instructions on how to build a wall in your

backyard (to induce neutral emotion); (2) a clip from South Park (to induce amusement); (3) the "powers of ten" video, which starts at a galactic scale and then zooms in through different scales of complexity to the quantum level (to induce awe); or (4) an ASU recruitment video that highlights the accomplishments of ASU students and faculty (to induce pride). When individuals experienced the "emotion together" condition this was played on a wall-mounted TV both could see. In the "emotion separate" condition this was played on separate laptops with a divider between the participants.

A secondary "emotion booster" was also included in this study. After watching the videos, participants wrote for two minutes about a related emotional experience. They were told to relive the experience as they wrote. The emotion booster always matched the video. The writing prompts were (1) an instance when you did your laundry (neutral); (2) an instance when you heard a funny story (amusement); (3) an instance when you saw a beautiful natural scene (awe); and (4) an instance when you achieved something important to you (pride).

Getting to Know You Conversation

Participants were then given the following instructions: "You will now have 5 minutes to have a 'getting to know you' conversation. During this time, the two of you can discuss anything you want. Later, you will be asked questions about your impressions of each other, so please try to get to know each other as best you can in this time." During the emotion induction and subsequent conversation, participants were video recorded.

Questionnaires

After the conversation, a divider was placed between participants, where they completed questionnaires to assess their perception of their partner as complex; liking of

the partner; demographic questions; a manipulation check form; and other scales to be used in future exploratory analyses. After completing the questionnaires, participants completed the prisoner's dilemma and another cooperation game not considered here.

Prisoner's Dilemma

The prisoner's dilemma is a well-studied model of a cooperative dilemma (Axelrod, 1984; McElreath & Boyd, 2008). In this economic decision-making game, two individuals make a choice to either cooperate or defect (labeled "compete" on my materials). These decisions are made separately and simultaneously, so that participants cannot coordinate and do not know what their partner will choose at the time they are deciding. Each player is paid based on the combination of their own and their partner's decision. The payoff matrix is given in Table 4.

Table 4: Prisoner's Dilemma Payout

	B Cooperates	**B Competes**
A Cooperates	A: $3, B: $3	A: $0, B: $5
A Competes	A: $5, B: $0	A: $1, B: $1

The dilemma comes in the structure of the payoffs. The best outcome for an individual is to compete when their partner cooperates; however, if both people compete, they are both worse off than if they had both cooperated. Thus it only makes sense strategically to cooperate if you believe your partner will also cooperate.

Participants in this study did not have the game explained to them until after completing their conversation, so they did not have an opportunity to coordinate their actions. Instead, their decisions could only have been based on their judgments of their partner from the conversation or outside factors (such as their beliefs about the baseline cooperativeness of others).

Questionnaire Measures

Manipulation check.

At the end of the experiment, participants completed an emotion rating form common in previous research paradigms (Griskevicius, Shiota, Neufeld, 2010; Griskevicius, Shiota, Nowlis, 2010), to ensure that the proper emotion was elicited. The form asks participants to report how much of 12 different emotions they felt during the induction task, as well as their general feelings of valence and arousal.

Several key comparisons are useful here. Amusement led to a significantly higher amusement rating than all other conditions; awe led to a significantly higher awe rating than all other conditions; and pride led to a significantly higher pride rating than all other conditions. These indicate that the proper emotion was elicited by each video.

Perception of Others as Complex

The scale for measuring perception of others as complex was used by Waugh and Fredrickson (2006) in the context of research on positive emotions, but they adapted it from research by Sande and colleagues (1988). This scale presents pairs of opposite personality traits and asks participants to rate whether their partner has one, the other, both, or neither. For example, participants would be shown the pair serious-carefree, and asked to indicate whether their partner is (a) serious, (b) carefree, (c) both, or (d) neither. Complex understanding is operationalized as rating of an individual as having both traits, reflecting the participant's understanding that an individual is capable of opposite extremes of behavior (i.e. being, at turns, both serious and carefree). This study used the scale originally published by Sande and colleagues with a few minor changes in wording to more clearly delineate the opposite personality characteristics. For example, the

opposite of conscientious has been changed from happy-go-lucky to careless. The total instances when a partner was rated as having both of two opposing traits were summed to give an individual score for perception of the other as complex.

Liking of Partner

Five questions were used to assess liking of partner. These questions were answered on a scale of 1 (*not at all*) to 5 (*very much*). The Cronbach's alpha for this scale was 0.84. The items are presented below.

1. How much did you like interacting with your partner?
2. How much do you like your partner as a person?
3. How much would you like to see your partner again?
4. How much did you respect your partner?
5. How close did you feel to your partner?

I also included the inclusion of the other in the self (IOS) scale, which uses a pictorial representation of overlapping circles to assess how close to individuals feel (Aron, Aron, & Smollan, 1992). This is an alternate, single-item measure of liking that has been used in previous research.

Behavioral Measures

Smiling

Smiling for each individual was coded using Ekman and Friesen's Facial Action Coding System (FACS; 1978). Smiling was assessed using two criteria: amount of time smiling and intensity of smiling. These were combined into a single code. Smiling intensity was measured by examining whether smiles were Duchenne or non-Duchenne. Duchenne smiles involve activation of two sets of facial muscles, the zygomatic major

muscle, which raises the corners of the mouth, and the orbicularis oculi muscle, which raises the cheeks and causes crinkling around the eyes. Non-Duchenne smiling only involves activation of the zygomatic major. Duchenne smiles are referred to as genuine smiles because the added action of the orbicularis oculi is a difficult-to-fake cue to enjoyment (Ekman, Davidson, & Friesen, 1990; Ekman, Friesen, & O'Sullivan, 1988).

Coders examined smiling in 10-second segments of the recorded conversation, coding for the action of these two muscles. In each segment, smiling was rated on a scale of 0 (not present) to 3 (consistent presence with high intensity). Scores were averaged across each bin to form individual-level smiling scores.

Because this study stretched across several semesters, five coders in several different groups were used. Three primary coders completed the majority of the coding, and all three coded certain segments of the data in order to assess reliability. The intraclass correlation (ICC) for these coders was 0.86. This measure is typically read as an index of the amount of variability in the measure pertaining to the construct, as opposed to pertaining to random noise (i.e. 86% of the variability in the smile score was due to measurement of the construct, while 14% was due to random variability among coders). The version of the ICC reported here—and throughout this document—is ICC2, which represents a random sample of coders being used to rate each target (Hallgren, 2012). This is distinct from average reliability measures, ICCk, which assesses the reliability if a behavior were to be coded as the average of a group of k coders' scores. The ICC2 is more conservative than average reliability.

The fourth and fifth coders completed missing segments of the data, and some sections that had been previously coded by the primary three in order to assess reliability.

However, no segment of the data was completed by both coders four and five. Thus I was able to calculate the ICC for coders 1, 2, 3, and 4 (0.68), and the ICC for coders 1, 2, 3, and 5 (0.78), but not the ICC for all five coders. I also calculated the Pearson correlations between each pair of coders (except 4 and 5) in Table 6.

Table 5: Correlations Between Smile Ratings Among Coders

	Correlation
1-2	0.85
1-3	0.91
1-4	0.81
1-5	0.71
2-3	0.85
2-4	0.68
2-5	0.95
3-4	0.79
3-5	0.91
4-5	NA
Average:	0.83

Values of the ICC between 0.60 and 0.74 are considered good reliability, while 0.75 and above is considered excellent (Cicchetti, 1994). Overall, the smile coding was highly reliable.

In the analyses run below, smile scores for each participant were calculated by averaging ratings from all available coders. If a participant was part of the reliability check segments, that person's score represents the average of several coders' ratings. But if a participant was not part of the reliability check segment, that person's score was given by just one coder. A more traditional approach is to use one coder as the primary coder, and use that person's ratings for all sections tested for reliability. However, because coding spanned so many individuals, I felt that it made more sense to average across raters for the sections that were coded by multiple individuals. This maximizes the

use of the available data, since every rating given is used, and also avoids the problem of deciding how to prioritize certain coders' ratings. This approach of averaging multiple ratings where they were available was used for all behavioral coding.

Laughter

Coders were asked to mark every occurrence of laughter in a conversation by either participant. Some early, exploratory coding also included length of bouts of laughter, but there was very little variability in that—instances of laughter typically were short-lived, lasting only 1-2 seconds. Therefore the codes used in these analyses reflect simply instances of laughter—not total duration of laughing.

There were four laughter coders. Correlations between them are given in table 7. The ICC for sections coded by more than two individuals was 0.85.

Table 6: Correlations Among Laughter Ratings

Raters	Correlation
1-2	0.94
1-3	0.87
1-4	0.84
2-3	0.90
2-4	0.86
3-4	0.90
Average:	0.88

Mimicry

Behavioral mimicry is a broad construct, with many possible indicators. Previous research has often operationally defined mimicry as repeating of certain pre-set behavioral tics, such as shaking one's foot, touching one's face, or moving one's lip (van Baaren, Horgan, Chartrand, & Dijkmans, 2004); however, these methods often used a confederate and so are ill-suited for current purposes. The present approach focused on

one particular code measured in spontaneous behavior (as opposed to confederate-initiated behavior): touching of the face. Coders were told to code every time one participant touched his or her face within 3 seconds of the other participant touching their face. Previous coding schemes that tried to account for all possible types of mimicry suffered from low reliability, but they did suggest that mimicry of face touching was one of the most frequent forms observed.

Three coders completed mimicry coding. The correlation of rater one with two was 0.86, one with three was 0.91, and two with three was 0.73, for an average of 0.84. The ICC of segments that all three rated was 0.64, which is considered good reliability.

Asking Questions

Three coders viewed all the videos and recorded each time one participant asked the other a question. They were instructed to specifically look for information seeking in statements, so sentences that might not naturally be phrased as questions—such as "so you're a psychology major"—but that were clearly designed to elicit information about the partner—were counted. The correlations between the first and second coders was 0.96, between first and third was 0.96, and between second and third was also 0.96 (quite by coincidence). The ICC for sections coded by all three was 0.96.

RESULTS

I conducted my analyses in several steps. First I conducted regression-based analyses with dummy codes comparing each condition to all other conditions, then I created more specific dummy codes based on my hypotheses. Finally, I conducted mediation analyses predicting the relationship outcomes from emotion condition through

the affiliative mechanisms. In each model I only used one relationship outcome and one affiliative mechanism. Additionally, I trimmed all data points three standard deviations away from the mean.

Manipulation Check

Before conducting my main analyses, I conducted a manipulation check based on self-reported emotion during the emotion induction. All the emotion manipulations elicited the intended emotions, correcting for multiple comparisons with Tukey's Honestly Significant Difference (HSD) test within each measure. The mean scores on these manipulation checks are given in Table 7; they are divided by sex in Table 8.

Table 7: Manipulation Check by Emotion Conditions

	Amu	**Awe**	**Pri**	**Neu**
1 Valence	6.06	6.34	7.17	5.28
2 Intensity	4.78	4.97	5.21	3.29
3 Amusement/Humor	6.06	3.61	3.57	4.36
4 Anger/Annoyance	2.60	1.54	1.79	2.09
5 Awe/Wonder	2.17	6.17	5.21	2.45
6 Contentment/Fulfillment	3.29	4.41	5.54	2.40
7 Disgust/Revulsion	2.44	1.48	1.52	1.52
8 Enthusiasm/Excitement	1.63	2.45	2.81	1.50
9 Love/Intimacy	1.56	1.69	1.78	1.45
10 Sadness/Despair	1.59	3.10	3.54	1.53
11 Tenderness/Compassion	1.62	3.33	6.54	1.93
12 Pride	3.77	4.52	6.24	2.31

Table 8: Manipulation Check by Emotion and Sex

	Male				Female			
	Amu	**Awe**	**Pri**	**Neu**	**Amu**	**Awe**	**Pri**	**Neu**
1 Valence	6.41	6.47	7.17	5.29	6.52	6.26	7.26	5.11
2 Intensity	5.50	4.95	5.26	3.00	4.67	4.42	5.21	2.95
3 Amusement/ Humor	6.23	4.39	3.83	4.86	5.86	3.42	3.84	3.16
4 Anger/ Annoyance	2.50	1.78	1.74	2.05	2.14	1.32	1.68	2.21
5 Awe/Wonder	2.86	6.42	5.04	2.76	2.25	5.21	5.79	1.63
6 Contentment/ Fulfillment	4.48	4.11	5.48	2.86	2.67	3.89	6.11	1.79
7 Disgust/ Revulsion	2.45	1.63	1.65	1.71	2.50	1.11	1.26	1.63
8 Enthusiasm/ Excitement	4.86	5.11	6.00	2.57	3.15	4.06	6.42	1.68
9 Love/ Intimacy	2.14	2.56	2.87	1.71	1.90	1.95	2.79	1.32
10 Sadness/ Despair	2.05	1.39	1.57	1.48	1.30	1.58	2.11	1.26
11 Tenderness/ Compassion	2.27	2.79	3.65	1.62	1.52	2.53	3.89	1.32
12 Pride	1.86	4.26	6.26	2.29	1.62	2.79	6.95	1.84

Additionally, the liking scale used for this study was reliable. All questions were highly correlated, with a Cronbach's alpha equal to 0.84.

Descriptive Statistics

I also examined descriptive statistics for all measures included in these analyses, including outcomes on the prisoner's dilemma. The distribution of outcomes for the prisoner's dilemma are given in Table 9.

Table 9: Prisoner's Dilemma Results

	Amu	***Awe***	***Neu***	***Pri***	***Total***
Coop	47	43	43	47	180
Comp	15	9	11	11	46
Total	62	52	54	58	226

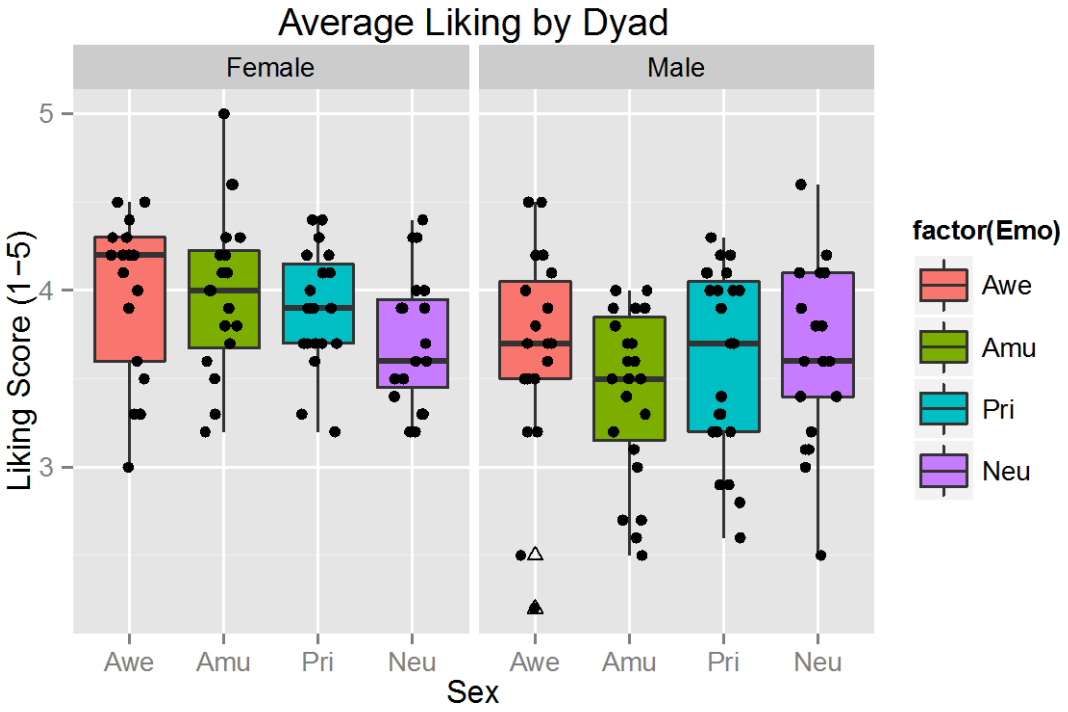
The descriptive statistics for the measures of liking and all the affiliative mechanisms are given in Table 10.

Table 10: Descriptive Statistics for Affliative Mechanisms

		Amu	Awe	Neu	Pri
Laughter for Person A	***M***	8.53	6.66	6.76	7.06
	SD	6.05	5.23	5.47	4.85
Laughter for Person B	***M***	7.56	6.15	6.93	5.82
	SD	7.14	4.52	4.76	4.85
Questions A	***M***	9.78	9.93	8.74	9.84
	SD	4.78	4.62	4.83	4.07
Questions B	***M***	9.41	8.85	9.1	8.84
	SD	5.81	4.55	4.13	3.53
Smile Score A	***M***	1.61	1.51	1.37	1.4
	SD	0.73	0.74	0.65	0.8
Smile Score B	***M***	1.49	1.42	1.39	1.58
	SD	0.79	0.65	0.75	0.69
Mimicry A	***M***	1.61	0.72	1.4	1.16
	SD	3.8	1.22	2.08	1.64
Mimicry B	***M***	0.73	1.43	1.97	0.78
	SD	1.35	2.41	3.7	1.41
Perceiving Other as Complex A	***M***	0.32	0.3	0.29	0.33
	SD	0.26	0.18	0.29	0.27
Perceiving Other as Complex B	***M***	0.31	0.33	0.27	0.3
	SD	0.22	0.18	0.2	0.2
Liking of Other A	***M***	3.72	3.89	3.61	3.87
	SD	0.63	0.77	0.64	0.52
Liking of Other B	***M***	3.58	3.72	3.70	3.60
	SD	0.69	0.69	0.57	0.68
IOS A	***M***	2.88	3.41	3.19	3.26
	SD	1.39	1.45	1.17	1.40
IOS B	***M***	2.85	3.55	3.09	2.97
	SD	1.37	1.55	1.00	1.09

For ease of visualization, values on each of these variables divided by emotion condition and sex are given below.

Figure 2: The Effects of Emotion and Sex on Liking[2]



[2] I present my results throughout as boxplots, as opposed to bar graphs. The central line in the boxplot is the median; the enclosed portion is the distance of the first to third quartile; the lines extending out are 1.5 times the middle range with outliers appearing as open triangles beyond that. In cases where there are no outliers, the lines simply extend to maximum and minimum values. The raw data points are presented over the bars as filled circles, with a jitter so points do not directly overlap one another. I present the boxplot because it gives more clear information about the amount of variability in a measure than a traditional bar graph.

Figure 3: The Effects of Emotion and Sex on IOS

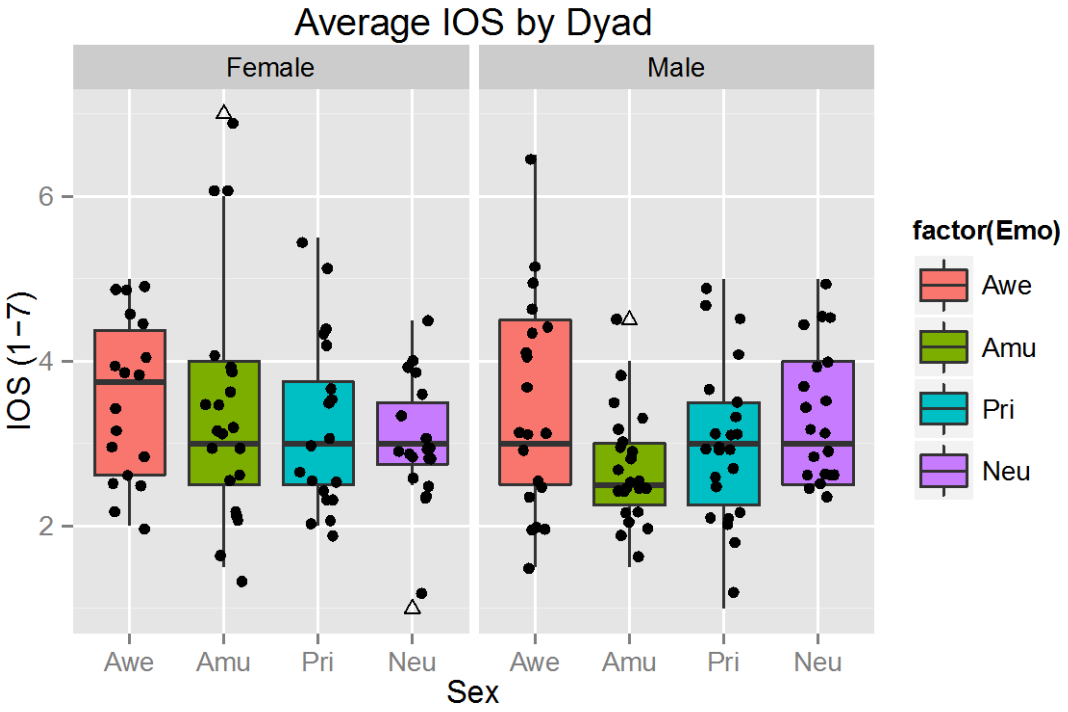


Figure 4: The Effects of Emotion and Sex on Laughter

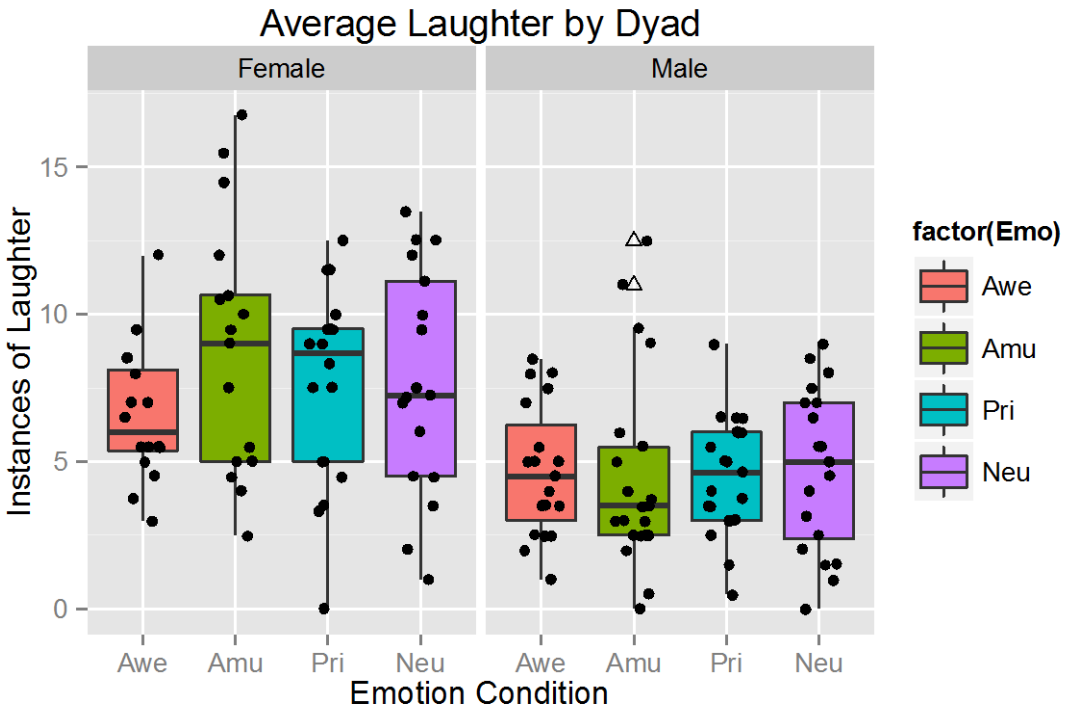


Figure 5: The Effects of Emotion and Sex on Smiling

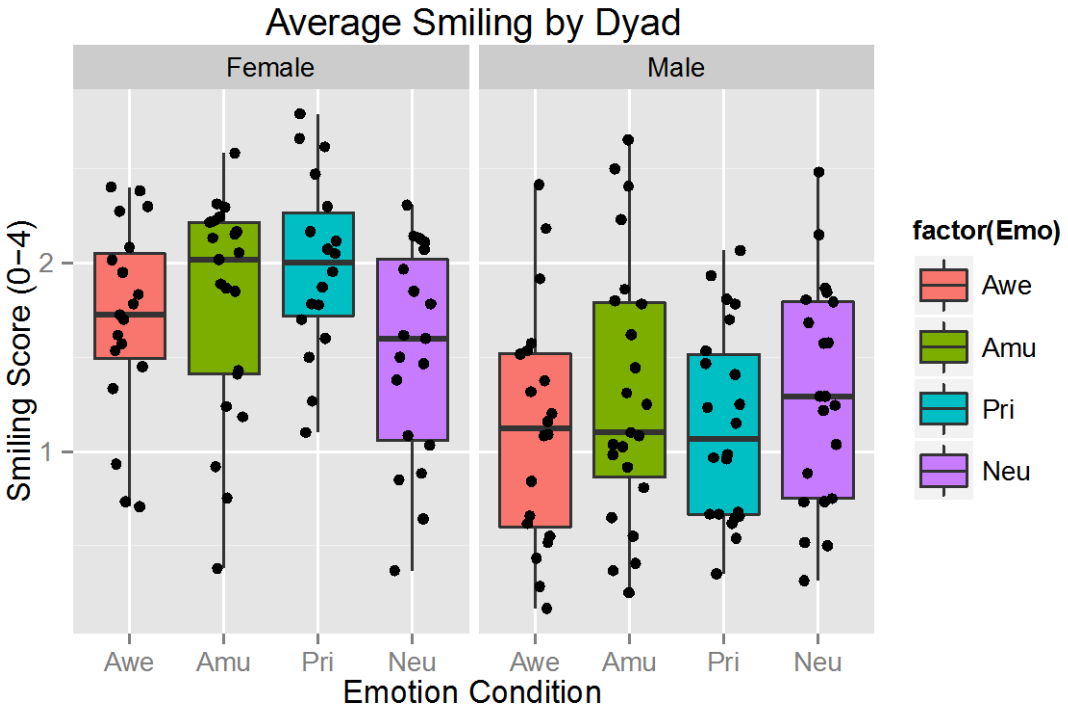


Figure 6: Effects of Emotion and Sex on Mimicry

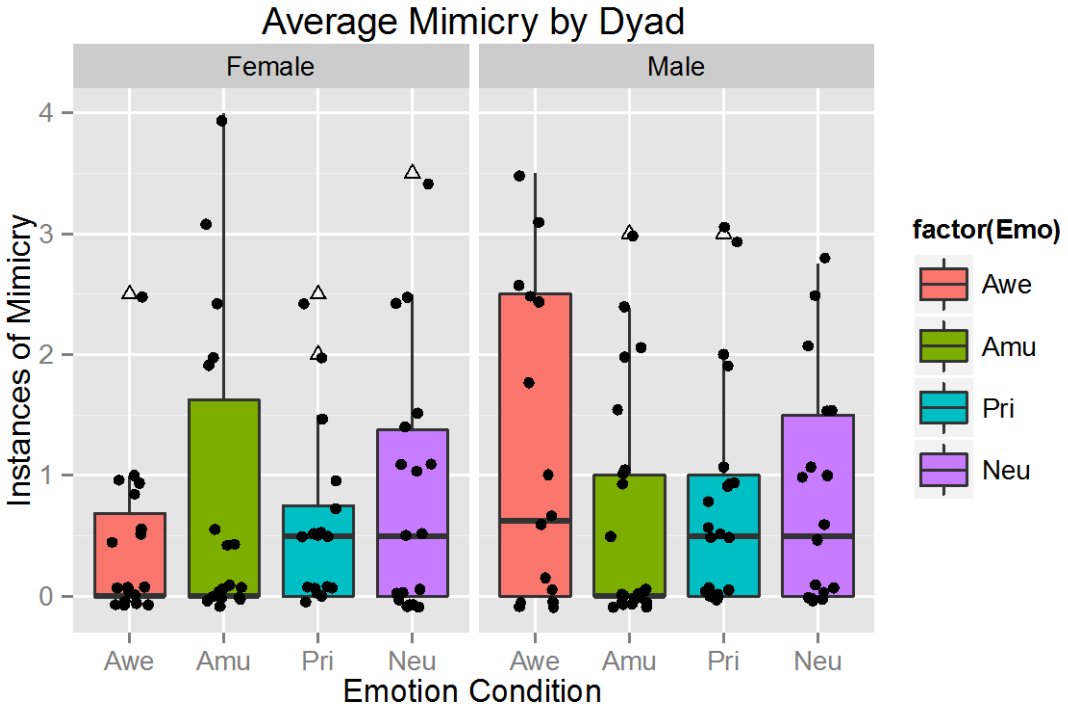


Figure 7: Effects of Emotion and Sex on Questions Asked

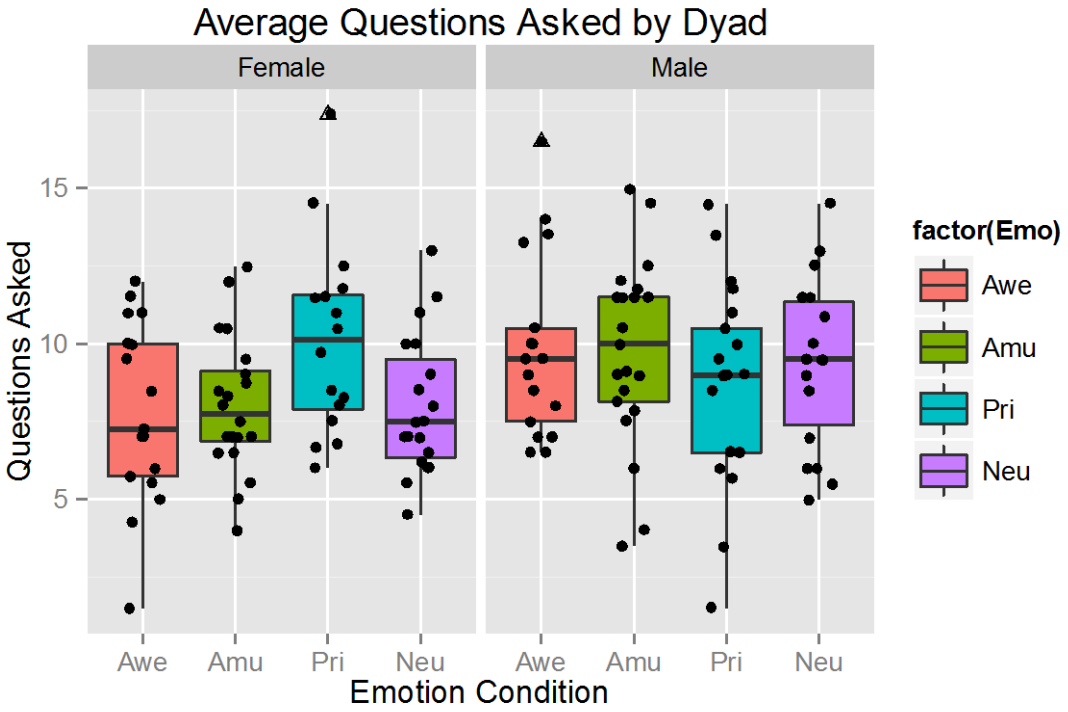
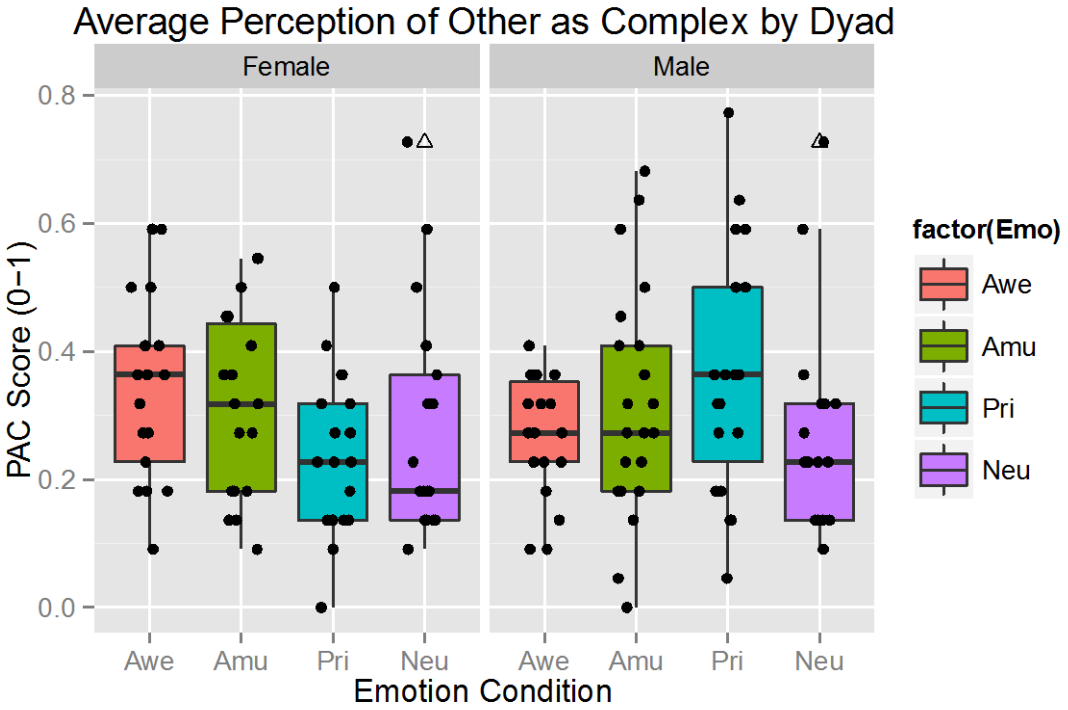


Figure 8: Effects of Emotion and Sex on Perceptions of Other as Complex



Regression-Based Models

To analyze these data, I used a version of the Actor-Partner Interdependence Model (APIM), which was specifically designed to deal with dyadic data (Olsen & Kenny, 2006; Kenny, Kashy, & Cook, 2006). In this framework, I was able to use all the data by creating a single path model that included two separate regressions—one of person A's outcomes on the predictors and one person B's outcomes on the predictors. I then constrained the regression coefficients for A and B such that they needed to be equivalent. A and B referred simply to which chair individuals sat in; this was randomly assigned so there was no reason to believe there were systematic differences. Essentially this approach ran two regressions at the same time, but allowed the entire pool of data to create one set of estimated effects. I used data from dyads that experienced the emotion manipulation separately and those who experienced it together, but included a term in the model to control for differences among these groups.

Emotion versus Neutral Regressions

One potential difficulty in a regression-based approach is that differences between groups can only be tested using dummy codes. This means that one emotion group would need to be designated as a baseline group, to which all others would be compared. My preliminary set of regression analyses used this approach, testing whether the difference between neutral and each emotion, sex, and experiencing emotion together or separately affected relationship outcomes and affiliative mechanisms. In these analyses, I included eight predictors: one dummy code for the comparison of each positive emotion to neutral, a code for sex of the dyad members, a code for whether emotion was experienced together or separately, and a code for the interaction of each emotion with sex. Each

interaction term was coding for whether the change from that specific emotion to neutral was different among men versus women.

I also chose to estimate standard errors in this model using bootstrapping. Bootstrapping yields very similar results to parametric approaches, but is better suited to dealing with variables that are not normally distributed—as many of the behavioral variables were. Bootstrapping is also the recommended method for calculating standard errors in mediation, so using this approach for the regressions meant any further mediation analyses would be based on the same parameter estimation technique.

I began by analyzing the relationship outcome variables. Both liking variables—the liking scale score ($\beta = .612$, $p = .036$) and IOS ($\beta = .594$, $p = .046$)—were predicted by the interaction of amusement and sex. Among men, amusement led to less liking than neutral, but among women amusement led to more liking than neutral. The same pattern held for IOS. There were no significant predictors of cooperation.

To follow up on the significant emotion by sex interactions, I conducted analyses that looked at the effects of emotion within each sex. The analysis examining the liking scale score found that none of the predictors were significant for either males or females. Amusement predicted slightly higher liking in females ($\beta = .165$, $p = .125$) and slightly lower liking in males ($\beta = -.141$, $p = .153$); what made the original interaction significant was that these effects go in opposite directions, not that the effect is in present only in one sex. In contrast, the analysis of IOS found that amusement did not predict IOS in women ($\beta = .072$, $p = .534$), but did predict it in men ($\beta = -.204$, $p = .005$). The results split by sex are given in Tables 11 and 12.

Table 11: APIM Model Predicting Liking by Sex

Regression on Liking Scale Score

Female

	β	*Z*	*p*
Awe	0.173	1.611	0.107
Amusement	0.165	1.534	0.125
Pride	0.117	1.241	0.215
Together/Separate	0.051	0.554	0.58
R^2	0.030		

Male

	β	*Z*	*p*
Awe	0.001	0.011	0.991
Amusement	-0.141	-1.429	0.153
Pride	-0.017	-0.164	0.87
Together/Separate	0.084	1.072	0.284
R^2	0.025		

Table 12: APIM Model Predicting IOS by Sex

Regression on IOS

Female

	β	*Z*	*p*
Awe	0.125	1.378	0.168
Amusement	0.072	0.622	0.534
Pride	0.014	0.138	0.89
Together/Separate	0.075	0.729	0.466
R^2	0.020		

Male

	β	*Z*	*p*
Awe	0.030	0.291	0.771
Amusement	-0.204	-2.816	0.005
Pride	-0.112	-1.326	0.185
Together/Separate	0.076	0.947	0.344
R^2	0.056		

Among the affiliative mechanisms, only pride and the interaction of pride and sex were significant predictors. Smiling was predicted by both pride (β = .285, p = .005) and the pride by sex interaction (β = -.613, p = .009). Among women, pride led to more smiling than being in the neutral condition; among men, pride led to less smiling than

neutral. Asking questions was also predicted by pride (β = .229, p = .014) and the pride by sex interaction (β = -.586, p = .011). Pride led women to ask more questions compared to neutral, but it led men to ask fewer questions compared to neutral.

I followed up on these significant interactions by running models that split the parameter estimates by sex. In the model examining smiling, I found that pride had a significant effect on smiling in females (β = .316, p = .005), but not in males (β = -.088, p = .432). Similarly, pride had a significant effect on asking questions only in females (β = .207, p = .021), not males (β = -.169, p = .195). The regression models split by sex are in Tables 13 and 14.

Table 13: APIM Model Predicting Smiling by Sex

Regression on Smiling

Female

	β	*Z*	*p*
Awe	0.122	0.978	0.328
Amusement	0.166	1.247	0.212
Pride	0.316	2.828	0.005
Together/Separate	-0.082	-0.83	0.407
R^2	0.078		

Male

	β	*Z*	*p*
Awe	-0.100	-0.836	0.403
Amusement	-0.006	-0.052	0.958
Pride	-0.088	-0.786	0.432
Together/Separate	0.019	0.209	0.835
R^2	0.013		

Table 14: APIM Model Predicting Questions Asked by Sex

Regression on Questions Asked

Female

	β	*Z*	*p*
Awe	0.028	0.279	0.78
Amusement	0.066	0.787	0.431
Pride	0.207	2.301	0.021
Together/Separate	0.015	0.142	0.887
R^2	0.033		

Male

	β	*Z*	*p*
Awe	0.048	0.400	0.689
Amusement	-0.031	-0.240	0.811
Pride	-0.169	-1.295	0.195
Together/Separate	0.080	0.732	0.464
R^2	0.031		

All Positive Versus Neutral

Because much emotion research has discussed positive emotions as a single, unitary construct, an alternate analysis strategy would be to compare all the positive emotions as a single group to the neutral condition. This approach provides a comparison point for a differentiated approach, demonstrating what might be missed if differences between emotions are not accounted for. In these analyses, the three emotion dummy codes were collapsed into a single code that compares all the positive emotions to neutral. Sex, experiencing the emotion together or separately, and the interaction of sex and positive emotion were also included as predictors.

Among the relationship outcomes variables, the only significant effect was that of sex predicting liking (β = -.516, p = .004). Women tended to like each other more overall. A similar effect was seen for IOS, although this was marginally significant (β = -.339, p = .058). There were also marginally significant interactions of positive emotion by sex in

predicting IOS and cooperation. The tendency for women to rate each other as closer—that is, have a higher IOS score—was attenuated in the positive emotion conditions (β = .281, p = .092); there was less of a gender gap in IOS. In cooperation, there was a slight tendency in the neutral group for men to be more cooperative (β = .363, p = .189); this was eliminated—in fact tipped slightly in the other direction—in the positive emotion conditions (β = -.475, p = .084).

Table 15: Average Liking by Emotion Code and Sex

Average Liking	Male	Female
Positive Emotion	3.56	3.95
Neutral	3.65	3.71

Table 16: Average IOS by Emotion Code and Sex

IOS	Male	Female
Positive Emotion	3.01	3.37
Neutral	3.33	3.08

Table 17: Proportion of Defectors in Prisoner's Dilemma by Emotion and Sex

Percent Choosing "Compete"	Person A		Person B	
	Male	Female	Male	Female
Positive Emotion	21.9%	12.2%	18.8%	28.6%
Neutral	15.0%	22.2%	10.0%	38.9%

Among the affiliative mechanisms, only laughter and smiling were significantly predicted by any of the terms in the models; mimicry, asking questions, and perception of the other as complex were not. Laughter was predicted exclusively by sex (β = -.418, p = .023); women laughed more than men. Smiling was predicted by positive emotion (β = .179, p = .044), sex (β = -.719, p < .001), and the interaction of these (β = .389, p = .056). These results indicate that women tended to smile more and people in the positive

emotion condition tended to smile more, but the sex difference wasn't as big in the positive emotion condition.

Each Emotion Versus All

A further analysis strategy would be to create dummy codes comparing each positive emotion to all the other conditions. Because these analyses are being done in a regression framework, one group must always be designated as the baseline comparison group. Thus certain group comparisons—for example the comparison between awe and amusement or amusement and pride—are never tested. In order to explore the full set of comparisons possible in this design, I re-ran the analyses of each relationship outcome and affiliative mechanism using different sets of dummy codes. These dummy codes were like those used in the first set of models presented, where each emotion was compared to neutral, but they instead compared all conditions to each of the different emotions.

Awe Versus All

When awe was set as the baseline group, there was only one significant effect in the relationship outcome models: women liked each other more ($\beta = -.979$, $p = .011$). None of the comparisons of awe with other conditions—or their attendant sex interactions—were significant.

Among the affiliative mechanisms, there were several interesting effects. Sex was a marginally significant predictor of laughter ($\beta = -.648$, $p = .056$), with women laughing more than men. The comparison of pride to awe was a marginally significant predictor of smiling ($\beta = .179$, $p = .074$); individuals feeling awe smiled slightly more than those feeling pride, but there was a fair amount of variability in the estimate. With mimicry,

however, the interaction effects of sex with amusement vs. awe (β = .797, *p* = .026), pride vs. awe (β = -.524, *p* = .059), and neutral vs. awe (β = -.494, *p* = .060) were all significant or marginally significant, suggesting that awe had a different effect on mimicry among men and women. A follow-up analysis that estimated separate emotion effects for each sex found that none of the terms were significant in predicting mimicry in women, but mimicry in men was predicted by amusement vs. awe (β = -.288, *p* = .028) and marginally by pride vs. awe (β = -.225, *p* = .088). This suggests that awe leads to more mimicry than the other positive emotions, but only in men.

There were three significant terms predicting questions asked: sex (β = .226, *p* = .039), pride vs. awe (β = -.592, *p* = .016), and the interaction of the pride vs. awe and sex terms (β = .593, *p* = .040). I followed up on this by examining the sexes separately. Results indicated that the number of questions asked was only predicted by awe among women (β = .214, *p* = .046), not men. Perception of the other as complex was predicted by the pride vs. awe term (β = -.267, *p* = .011) and the pride vs. awe by sex interaction (β = .437, *p* = .050). Separating these effects by sex revealed that the pride vs. awe comparison was only significant among women (β = -.262, *p* = .010), not among men. Women in the pride condition saw their partners as slightly less complex than individuals in the awe condition, but there was no significant difference between these conditions for men.

Amusement Versus All

In the next set of analyses, amusement was set as the baseline group. In these models, liking was predicted by sex (β = -1.084, *p* = .028) and the interaction of sex and the neutral vs. amusement group (β = .459, *p* = .037). Women like each other much more

in the amusement group, but this was severely attenuated in men. Closeness, indexed by IOS, was also predicted by sex (β = -.955, p = .095) and the interaction of sex and the neutral vs. amusement group code (β = .446, p = .046). These results mirror what was seen in the first set of models, when the interaction of awe vs. neutral and sex was also significant in predicting these variables; for this reason I did not separate out the effects by sex.

As in previous models, laughter was predicted by sex (β = -1.148, p = .052). Mimicry was predicted by the interaction of sex and the awe vs. amusement term (β = .596, p = .026). As seen above, being in the awe condition as compared to the amusement condition predicted mimicking others more, but this was only true for men. Additionally, the number of questions asked was predicted by the pride vs. amusement comparison (β = .189, p = .050) and the interaction of this comparison and sex (β = -.509, p = .028). Examining the sexes separately revealed that being in the pride condition predicted asking more questions compared to amusement (β = .197, p = .038), but this was only true for women.

Pride Versus All

Finally, I compared all conditions to pride. In the analyses of relationship outcomes, only the gender effects previously seen were significant (or marginally significant): sex predicted liking (β = -.705, p = .021) and IOS (β = -.596, p = .081).

As in other analyses, laughter was predicted by sex (β = -.766, p = .028). Smiling was predicted by sex (β = -.711, p = .052), by the comparisons of pride and awe (β = -.178, p = .074) and pride and neutral (β = -.288, p = .005), and by the interaction of sex with the pride vs. neutral term (β = .607, p = .009). In order to better understand these

interactions, I again examined separate parameters for females and males. As in previous analyses, I found that being in the pride condition compared to the neutral condition led to more smiling—but only for women (β = -.331, *p* = .005). I also found that there was a marginally significant effect of awe vs. pride (β = -.202, *p* = .073), but again only among women. This marginal awe vs. pride effect predicting smiling was also seen in the analyses comparing awe to all other emotions.

Hypothesis-Specified Dummy Codes

An alternate approach would be to make a single emotion code that captured the specific predictions made by theory. To do this, I would code all the emotions predicted to increase the outcome as 1, and all the emotions predicted not to change or to decrease the outcome as 0. This would yield a single test of the theoretical predictions. In addition to the analyses with emotion versus neutral dummy codes, I also conducted these more theoretically targeted analyses. Prediction codes are included in Table 18.

Table 18: Emotion Prediction Codes for Path Models[3]

	Laughter	Smiling	Mimicry	Questions	PAC	Liking	IOS	Coop
Awe	0	0	1	1	1	1	1	1
Amu	1	1	1	0	0	1	1	1
Pri	0	0	0	0	0	1	1	1
Neu	0	0	0	0	0	0	0	0

These targeted analyses were all structured so that the specific emotion code, sex, the interaction of sex and emotion, and experiencing emotion together or separately were all predictors (4 terms total). Interactions of the together/separate term with other factors were not included, because these were not theoretically relevant.

[3] PAC represents perception of other as complex.

After specifying these targeted analyses in the codes, however, I found that some of them had already been run. For example, the codes specify that all positive emotions should improve relationship outcomes; results of analyses comparing all positive emotions to neutral were presented above. The findings were that positive emotion conditions increased liking and IOS among women, but decrease these among men. For the prisoner's dilemma, the opposite held: positive emotion increase cooperativeness among men, but decreased it among women.

In the affiliative mechanisms, both laughter (β = -.314, $p < .001$) and smiling (β = -.737, $p < .001$) were predicted by sex; as seen previously, women tended to laugh and smile more. Additionally, the emotion code was a marginally significant predictor of perception of the other person as complex (β = .177, p = .065). Being in the awe or amusement condition led to slightly greater perception of the other as complex than being in the pride or neutral condition.

Summary of APIM Regression Models

In the preceding sections I describe five different versions of the analyses performed. I summarize these in Table 19. The table includes only sex by emotion interaction terms that with p-values below .10 and the follow-up values of the males and females separately. All possible comparisons of emotion conditions are included, broken down according to the effects of these comparisons in men, in women, and the interaction term. All values reported are beta weights, and p-values are indicated using typical labeling conventions: + for p-values from .10-.05, * for .05-.01, ** for .01 to .001. No label means the p > .10. This illustrates where there are sex difference in specific emotion comparisons, and then whether these differences are due to there being an effect only in

men, only in women, or neither in men or women—just in the difference between the two. For example, men mimic each other more in when in the awe condition than in the amusement condition, but this is not true for women. On the other hand, women ask more questions when in the awe condition as compared to the pride condition, but this is not true for men.

Table 19: Results of APIM Regression Models

		Liking	IOS	Coop	Laugh	Smiling	Ques.	Mimic	PAC
Awe v Amu	Male				-0.031			-0.288*	
	Fem				0.190			0.090	
	Diff.				.198+			0.797*	
Awe v Pri	Male				-0.022		-0.143	-0.225+	0.004
	Fem				0.030		0.214*	0.097	-0.262*
	Diff.				0.179+		0.226*	-0.524+	.437*
Awe v Neu	Male								
	Fem								
	Diff.								
Amu v Pri	Male						-0.122		
	Fem						0.197*		
	Diff.						0.189*		
Amu v Neu	Male	0.137	0.208**						
	Fem	-0.166	-0.073						
	Diff.	0.459*	0.446*						
Pri v Neu	Male					0.090	0.073		
	Fem					-0.331**	-0.227*		
	Diff.					0.607**	0.496*		

Notes: All values are beta weights. + indicates p from .10 to .05, * is p from .05 to .01, ** is p from .01 to .001.

Mediation Models

The models I tested above included some sex by emotion condition interactions for each of the affiliative mechanisms. I conducted follow-up mediation analyses wherever there was a significant predictor of an affiliative mechanism. Specifically, I tested whether the prediction of the affiliative mechanism by the emotion condition then

predicted one of the relationship outcomes I was interested in: liking, IOS, or cooperation. Because the effects of emotion on affiliative mechanism were all characterized by interactions with sex, I conducted all these mediation analyses grouped by sex.

Laughter as a Mediator

Laughter was predicted by the interaction of awe vs. amusement and sex and by the interaction of awe vs. pride and sex, but neither of these condition comparisons were significant when the sexes were considered separately. Therefore, I did not conduct any follow-up mediation analysis with laughter.

Smiling as a Mediator

Smiling was predicted by the interaction of pride vs. neutral and sex, so I conducted a mediation analysis using each emotion vs. neutral. Smiling was not a significant predictor of the liking scale. However, a partner's smiling was a marginally significant predictor of IOS among women ($\beta = .185$, $p = .062$); women who smiled more felt slightly closer to their partner. Also among women, one's own smiling predicted feeling closer to a partner, but this effect was smaller and non-significant ($\beta = .104$, $p = .260$). However, the combined mediated effects of pride on smiling in the actor and in the partner considered together was significant ($a*b = .302$, $p = .029$). Pride led to more smiling than neutral for women, and both a person's own increased smiling and their partner's increased smiling together predicted greater closeness. These effects were not significant among men. In fact, more smiling by a partner predicted lower feelings of closeness among men—albeit at a non-significant level ($\beta = -.142$, $p = .155$).

Smiling was also a significant predictor of cooperation. Among women, an individual's own smiling was a significant predictor of cooperation (β = .321, p = .018), and the partner's smiling was a marginally significant predictor of cooperation (β = .269, p = .069). Among men, an individual's own smiling was a marginally significant predictor of cooperation (β = .263, p = .060). These effects did not lead to any significant mediation, however.

Asking Questions as a Mediator

The significant sex interaction on the asking questions term came between the awe and pride term; among women only, pride led to more questions asked. Therefore I conducted the mediation analyses using the dummy codes comparing awe to all other emotions, because this captured the significant difference between awe and pride. Among women, being asked more questions by a partner predicted greater liking for that partner (β = .162, p = .052). This effect was again non-significant and in the opposite direction among men (β = -.087, p = .301). Although being in the pride condition as opposed to awe predicted an increase in question asking among women, the mediated effect was not statistically significant. Questions were not a significant predictor of IOS or cooperation among either sex.

Mimicry as a Mediator

Mimicry was predicted by the interaction of the awe vs. amusement comparison and sex and there was a significant sex difference for awe vs. pride, so I conducted mediation analyses for mimicry using awe as the baseline group. Results were that mimicry did not significantly mediate the effects of emotion on liking or IOS. In the case of liking and IOS, this was because mimicry did not predict either of these outcomes.

However, mimicry was a significant predictor of cooperation in men, but not women. Specifically, among men being mimicked predicted greater likelihood of cooperating on the prisoner's dilemma (β = .243, *p* = .035); mimicking the other person was a marginally significant predictor of one's own propensity to cooperate (β = .217, *p* = .083). As seen previously, the comparison of awe and amusement was a significant predictor of mimicry among men (in this model: β = -.279, *p* = .029). Thus being in the awe condition predicted increased mimicry among men, and increased mimicry in men led to a greater likelihood of cooperation. However, the formal tests of mediation using the product of the coefficients method was not significant, either for mediation through increased mimicry by a partner (β = -.067, *p* = .132) or increased personal mimicry (β = -.060, *p* = .163).

Perception of Other as Complex as a Mediator

The significant sex interaction for perception of the other as complex was with the awe vs. pride comparison. Among women, awe predicted more perception of the other as complex than pride. Therefore I used dummy codes that compared awe to all other emotions for the mediation analyses with perception of the other as complex.

Perception of the other as complex predicted higher liking scores among both men (β = .172, *p* = .046) and women (β = .242, *p* = .003). This did not lead to any significant mediated effects. IOS was only predicted by perception of the other as complex among men (β = .187, *p* = .010), although the effect was in the same direction. Again, this did not lead to any significant mediated effects. There were no effects of perception of the other as complex on cooperation.

DISCUSSION

In this study, positive emotion did alter affiliative behaviors, which in turn altered relationship outcomes. These effects were particular to the emotion, mechanism, and outcome. This is broadly in line with the theoretical perspective I used in designing the study. However, sex had a much larger role than I anticipated in influencing the relationship of emotion to affiliation and relationship formation. Sex was a significant predictor of both liking and closeness (as indexed by IOS), and sex interacted with at least one emotion comparison in predicting each affiliative mechanism.

I have reproduced my original hypotheses concerning affiliative mechanisms with information about whether the data support each one in Table 20. Support, in this case, was interpreted generously: if the emotion condition in question led to a predicted increase (or decrease) in the affiliative mechanism even in comparison to one other condition, this counted as support. This increase could be in either sex.

Table 20: Support for Original Hypotheses Regarding Affiliative Mechanisms

Emo	**Affiliative Mechanism**									
	Hyp.	*Data*	*Hyp.*	*Data*	*Hyp.*	*Data*	*Hyp.*	*Data*	*Hyp.*	*Data*
Pri	↓smiling	Opp.	↓laughter	No	↓ PAC	No	↓mimic	No	↓ques.	Opp.
Amu	↑smiling	No	↑laughter	No	↑ PAC	No	↑mimic	Yes (M)	↓ques.	No
Awe	↓smiling	No	↓laughter	No	↑ PAC	Yes (F)	↑mimic	Yes (M)	↑ques.	No

This table demonstrates that, even using very liberal criteria, only three of fifteen hypotheses were supported. In two cases, the opposite results were found. Additionally, I predicted that all positive emotions would improve relationship outcomes. Instead, it was only the case that amusement improved closeness scores among women.

However, by using an exploratory approach to data analysis, I found a number of interesting relationships in the data that bear further discussion. Among women, awe increased perceptions of the other as complex compared to pride. Among men, awe increased mimicry compared to pride and to amusement. I had predicted awe would increase perception of the other as complex, as was seen in women, because awe should facilitate the construction of a more complex internal knowledge structure about the other. I predicted awe would increase mimicry, as seen in men, because it should facilitate information gathering via an embodied simulation of the other person.

The differences seen between men and women cleave along the line of two functions of awe—information gathering and schema updating. It may be the case that the internal aspects of the awe experience are greater for women, such that the cognitive updating mechanism is more strongly activated, while for men the external aspects are greater, such that the knowledge seeking aspect is more strongly activated. This would connect with research on developmental disorders, which shows that girls tend to internalize more while boys tend to externalize more (Scaramella, Conger, & Simmons, 1999). This research is particularly relevant to a college sample, because the sex differences are pronounced in late adolescence (senior year of high school)—the time period often directly preceding participation in the psychology 101 research pool. Of course, this hypothesis suggests that the positive internalization related to awe is associated with the negative internalization many adolescent women experience, and that externalizing awe is similarly associated with negative externalizing symptoms. Further research would be necessary to test this.

Pride increased the number of questions asked among women as compared to all other conditions. This was not predicted, but may be explained with reference to social norms. As reviewed in LaFrance, Hecht, and Paluck (2003), women often feel the need to smooth over social situations. When an individual feels like she is in a high status position—as might be the case after a pride prime—an individual might try to lead the conversation by asking questions. This hypothesis explicitly suggests that the functional goal of pride—to express status—interacts with a goal of social facilitation that females might hold due to cultural expectations.

Pride also led to more smiling among women, when compared to neutral. This also might be explained with reference to status effects. One study found that when in a high power position, positive emotion was positively correlated with smiling—but not when individuals were in a low power position (Hecht & LaFrance, 1998). This suggests that pride—which implicitly involves feeling powerful—might have given women permission to smile. This was likely to increase smiling, because the pride manipulation led to the highest levels of positive valence among all conditions.

Smile Mediation

There were also several mediated effects. Pride predicted smiling among women, and smiling, in turn, predicted cooperation on the prisoner's dilemma game among women. Pride also predicted a partner's smiling among women, which predicted one's own cooperation. Smiling has previously been shown to be a significant predictor of cooperation in a conversation about the prisoner's dilemma (Reed, Zeglen, & Schmidt, 2012), but this study has several important differences. In the previous study, participants knew they were going to play a prisoner's dilemma, and their facial expressions were

specifically coded in the interval before they made a verbal commitment to behavior—so the smile was considered an indicator of honest intent. In this study, smiling was coded throughout a conversation where individuals did not know they would be playing the prisoner's dilemma, so in this study smiling was an indicator of general personality and reaction to the partner—not a specific response to the prisoner's dilemma. This study is thus the first to demonstrate that spontaneous smiling in a conversation prior to playing the prisoner's dilemma predicts cooperativeness. An individual who smiles more is accurately signaling cooperative intent, even when the future cooperative context is not pre-specified.

This study is also the first one to demonstrate that a partner's smiling predicts one's own cooperativeness in a prisoner's dilemma. If smiling is an accurate cue to cooperativeness, it would make sense to use it to determine a partner's cooperativeness. My results support this; when an individual saw their partner smile, they were more likely to choose to cooperate.

This effect is also interesting because this reliable cue could easily be exploited. If smiling people are generally cooperative, then when playing a prisoner's dilemma with a social partner who smiles the optimal strategy is to defect. Assuming that a partner is going to cooperate, a player would receive $3 from also cooperating, but $5 from defecting. One explanation for this prosociality is that individuals anticipate repeated interactions with their partners; in repeated interaction, cooperating is adaptive. However, the game was explicitly explained as consisting of one decision, without a repetition. Instead, I suggest that this prosociality suggests that smiling may not only provide information, but it may also activate a cooperative psychology in people who view the

smile. Seeing another person smile may activate an internal mechanism that makes an individual feel cooperative.

Additionally, there was a significant mediated effect of pride on closeness via smiling for women. Being in the pride condition led to more smiling in both women in the dyad, and both an individual and their partner's smiling predicted closeness. These two effects combine to create a significant mediated effect. An analogous effect for liking was not present. Smiling therefore is a signal of cooperation and of closeness, but not of liking. This suggests that these processes are separable, and that smiling is an indicator more of general prosociality—not necessarily explicit liking. One can smile without liking, but smiling generally does mean that one feels close to and would help another person.

Mimicry Mediation

Awe led to more mimicry than amusement or awe in men; when I tested for mediation I found that this mimicry also led to greater cooperation. Being mimicked by and mimicking someone else both predicted increased likelihood of cooperation, with the effect of being mimicked by being stronger. Interestingly, the relationship between mimicry and cooperation also only held for men. Mimicry may be a particularly important cooperative cue for men because it implicitly includes a leader-follower dynamic. Some research on sex differences in communication suggests that males are particularly sensitive to dominance concerns (also termed "control") in communication, so having a partner explicitly following their lead may be a better signal of cooperative intent for men than other behaviors measured (Tannen, 1990). Although the overall test

of the mediated effect was not significant, some researchers would still characterize these two sequential, significant paths as evidence of mediation (MacKinnon, 2008).

Non-mediated Effects of Affiliative Mechanisms

My analyses also revealed two effects of affiliative mechanisms on relationship outcomes that were not affected by emotion condition. Among women, being asked more questions led to greater liking for the partner asking the questions. Only the number of questions being asked to a participant, not the number of questions that participant asks, predicts how much the participant likes their partner. This suggests that questions might be thought of as a proxy for being attentive to and interested in an interaction partner. Having someone pay closer attention to them was related to liking; paying more attention to another person was not related to liking—possibly because other factors such as status or hierarchy made people feel like they needed to pay attention. It is surprising, however, that this effect only held for women—and that, although it was non-significant, the trend was in the opposite direction for men. Perhaps women more readily interpret questions as positive attention, while men may sometimes view them as a challenge. More research would be needed to get a better understanding of sex differences in asking questions.

Additionally, perceiving the other person as complex predicted more liking of a partner among both men and women—and these effects were similar in IOS. This is what I would have predicted, based on previous literature: seeing the other person as complex is actually a way of seeing them as more like oneself. This means perceptions of the other as complex should be related to liking. One caveat about this measurement is that it was given in the same block of questionnaires as the liking questionnaires. Unlike the other affiliative mechanisms, which had distinct temporal precedence, this perception

measurement was essentially concurrent with the outcome—and so it may be the case that liking is actually causing perceiving the other person as complex or that a third variable is causing changes in both liking and perception as complex.

Limitations and Future Directions

The biggest limitation of this study was the cost of data collection. The lengthy procedures, the use of real payment, and the difficulty inherent in behavioral coding all led to a smaller sample size than would be optimal for testing many of the emotional effects I was interested in. A similar limitation is related to the use of statistical mediation. The mediator—for example, smiling during the conversation—was not randomly assigned, so I cannot make definitively say that smiling *caused* cooperation. Only the emotion condition was randomly assigned, so I can only make causal statements regarding the effect of emotion.

Also, by testing only same sex dyads, the sex of the actor and the sex of the partner are perfectly confounded. Thus when there are sex differences in the effects of affiliative mechanisms on relationship outcomes, it could be the case that these are due to either being male (or female) or interacting with a male (or female). That is, differences in mimicry across the sexes could be due to the fact that *being* a male leads to more mimicry—in which case a male interacting with a female would still mimic more—or due to the fact that *interacting with* a male leads to more mimicry—in which case a male interacting with a female would cause the female to mimic more.

Another source of variability is in the intensity of emotion aroused in men vs. women by the emotion manipulations. Ratings of manipulation checks yielded very similar results across men and women, particularly in the emotion being targeted in each

emotion. Yet there might have been subtle differences in level of emotion experienced—potentially even in the non-targeted emotions—that influenced the sex differences seen. For example, men in the awe condition reported feeling more pride, on average, than women in the pride condition (4.26 for men vs. 2.79 for women). Further analyses might tease apart the effects of subjective reports of emotion.

Finally, the unexpected sex interactions found in this study represent a potentially fruitful area of future inquiry. If identical emotional stimuli may lead to different behaviors in men versus women because of social norms in expressing behavior, future studies might measure these social norms explicitly. It may also be that emotions activate similar motivations in men and women, but that the sexes have different strategies for pursuing common goals. Just as women are thought to use a "tend and befriend" strategy in response to some threats where men use "fight or flight," women might be more outwardly expressive when presented with a social opportunity while men might be more receptive.

Overall, this study yielded several important results. First, it found that awe and pride have different social effects in men versus women. These may be related to how power and status differ across sexes in the U.S., or due to differing strategies for pursuing status across sexes. Second, it finds that emotion manipulations can increase several affiliative mechanisms, including smiling, mimicry, and asking questions. Third, it finds that some of these manipulated increases in affiliative mechanisms lead to improved social outcomes, such as greater likelihood of cooperation, greater liking, and greater closeness. These effects were specific to the combination of emotion and mechanism,

demonstrating that examining the broaden-and-build theory through the lens of positive emotion differentiation can yield more accurate predictions for behavior.

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