Smiling Signals Intrinsic Motivation

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The nature of a person's motivation (whether it is intrinsic or extrinsic) is a key predictor of how committed they are to a task, and hence how well they are likely to perform at it. However, it is difficult to reliably communicate and make inferences about such fine nuances regarding another person's motivation. Building on the social functional view of emotion and the evolutionary and psychophysical characteristics of facial expression of emotions, this research suggests that displayed enjoyment, as evidenced by the size and type of someone's smile, can serve as a strong nonverbal signal of intrinsic motivation. Taking the perspective of both actors and observers, five studies show that people infer greater intrinsic motivation when they see others display large Duchenne (vs. small) smiles, and that actors intuit this relationship, strategically displaying larger and more Duchenne-like smiles if they have an accessible goal to signal intrinsic (vs. extrinsic or no specific) motivation.

Keywords: smile, intrinsic motivation, facial expression, emotion, Duchenne smile

Imagine you need to hire a real estate agent, and one agent has images accompanying some favorable customer testimonials on her website. What would you infer—were these testimonials willingly provided or not? Alternately, imagine a photograph of two smiling celebrities getting married. Is it a marriage of convenience, or do they truly love each other? People often ask themselves questions like these because as social animals we care about why others do what they do, and thus whether their motivation is intrinsic or extrinsic (Ryan and Deci 2000a). Making inferences about the nature of other people's motivation is important because it helps us to predict their future behaviors (Jones and Davis 1965), which influences our decisions, choices, and investments in relationships, be they social or commercial, relational or transactional. The real estate agent whose testimonials were willingly provided by her past customers is probably the one you are more likely to choose.

However, making inferences about the finer nuances of other people's motivation is an enterprise riddled with potential pitfalls, because a given behavior (e.g., providing a testimonial, or getting married) often looks exactly the same to an observer, regardless of whether the motivation underlying the behavior is intrinsic (e.g., out of gratitude, or for love) or extrinsic (e.g., for payment, or for the person's wealth). Moreover, verbal claims regarding motivation may simply be cheap talk. So, behaviors and proclamations aside, what other signals may help to assess the nature of other people's motivation? From one of the most viewed TED talks by Pamela Meyer to the highly rated hit show *Lie to Me*, it appears that nonverbal cues

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Editors: Eileen Fischer and Margaret C. Campbell

Associate Editor: Zeynep Gürhan-Canli

Advance Access publication June 4, 2019

 • Vol. 46 • 2020
DOI: 10.1093/jcr/ucz023

may be a good candidate. The current research focuses on a specific type of nonverbal cue—the facial expression of emotion—and specifically on an individual's smile as a signal of internal motivation. Building on the social functional view of emotions (Keltner and Haidt 1999; Keltner and Kring 1998; Van Kleef et al. 2011) and the evolutionary and psychophysical characteristics of facial expressions of emotion (Ekman 1993; Tracy, Randles, and Steckler 2015), we propose that a person's large Duchenne smile while engaging in an activity may communicate his or her intrinsic motivation for that activity. Because all communications are two-sided in nature, our prediction is also twofold. On one hand, observers may use other people's displayed smiles to make inferences about their intrinsic motivation. Correspondingly, actors may proactively display large Duchenne smiles to signal their intrinsic motivation to observers.

Previous literature on the social functional view of human emotions (Keltner and Haidt 1999) has shown that other people's emotions signal not only their affective states, but also their traits (Barasch et al. 2014; Feinberg, Willer, and Keltner 2012; Harker and Keltner 2001; Wang et al. 2017), attitudes (Ames and Johar 2009), and expectations (Van Kleef, De Dreu, and Manstead 2006). Extending this stream of research, the current investigation is the first to show that the emotions that people display (e.g., enjoyment) can also signal fine nuances about the nature of their motivation to observers. Moreover, limited experimental research has directly tested whether actors proactively and strategically display certain emotions to observers during social interactions, with existing research being limited to verbally stated negative emotions (e.g., stated anger, Andrade and Ho 2009). We show that actors strategically and nonverbally display positive facial emotions to signal the nature of their motivation to others.

We begin by reviewing literature on intrinsic versus extrinsic motivation, the social functional view of emotions, and Duchenne smiles; we then develop our hypotheses and present five studies that test them. The first three studies show that observers infer greater intrinsic motivation from individuals who display larger and more Duchenne-like smiles, if the nature of an actor's motivation is ambiguous. The next two studies then show that communicators seem to intuit how their facial expressions are perceived by others, and thus strategically display larger and more Duchenne-like smiles to signal intrinsic motivation to potential observers. We conclude with a discussion of the contributions, limitations, and implications of this research.

THEORETICAL FRAMEWORK

Intrinsic Motivation as Intrapersonal State

Motivation not only varies in level but also in its nature (Ryan and Deci 2000a), which can range along a continuum from intrinsic to extrinsic. As Ryan and Deci (2000b) put it, "The most basic distinction is between intrinsic motivation, which refers to doing something because it is inherently interesting or enjoyable, and extrinsic motivation, which refers to doing something because it leads to a separable outcome." At one extreme, purely intrinsic motivation refers to doing something because of its own inherent characteristics, whereas extrinsic motivation refers to doing something to achieve a separable outcome, such as money or fame (Deci, Benware, and Landy 1974). This distinction is important because relative to extrinsic motivation, intrinsic motivation is better predictive of desirable outcomes such as enhanced performance, persistence, creativity (Deci and Ryan 1991; Sheldon et al. 1997), heightened vitality (Nix et al. 1999), self-esteem (Deci and Ryan 1995), and better general well-being (Kasser and Ryan 1993, 1996).

Apart from studying the outcomes of intrinsic motivation, classic intrinsic motivation research has been taken a behavioral approach and focused on examining the social conditions that enhance or undermine intrinsic motivation. A meta-analysis of 128 studies found that contingent rewards undermined intrinsic motivation (Deci, Koestner, and Ryan 1999). Another meta-analysis of 41 studies found that giving people choice and autonomy increased intrinsic motivation (Patall et al. 2008), whereas different forms of controlling undermined intrinsic motivation (Ryan and Deci 2000a). In most of this research, intrinsic motivation has been measured in two ways—through self-report of how enjoyable the task is, or through the behavioral measure of free choice of or the amount of time engaged with the task when extrinsic incentives are absent.

Whether focused on outcomes or antecedents, using behavioral measures or self-reports, most research studies intrinsic motivation as an intrapersonal state that arises within a person and governs his or her behavior. Limited research has discussed the social communication (e.g., inference and signaling) of intrinsic motivation at the interpersonal level. Do people care about the nature of others' motivation? If so, how do they assess it?

Intrinsic Motivation as Important Interpersonal Information

The nature of a person's motivation has important implications not only for themselves, but also for other people who interact with them, because joint outcomes of interactions, be they commercial or social, can depend on whether the other party's motivation is intrinsic or extrinsic. For example, a potential customer may wonder if a testimonial from a previous customer was sincerely given or was paid for, and an investor may wonder if an entrepreneur is intrinsically motivated and will stay passionate and persevere in the face of potential challenges.

Besides the objective benefits associated with it, intrinsic motivation is also generally perceived as more socially

desirable than extrinsic motivation. Pelletier and Vallerand (1996) found that even though the actual performances of subordinates were not different, superiors evaluated performance more positively if they were led to believe that their subordinates were intrinsically (vs. extrinsically) motivated to perform the task. Yoon, Gürhan-Canli, and Schwarz (2006) found that attributions of sincere versus insincere motives qualified the effectiveness of corporate social responsibility (CSR) activities on consumer attitude toward the company. Fuchs, Schreier, and van Osselaer (2015, 109) also found that handmade products were evaluated higher only for producers having intrinsic (vs. extrinsic) motivation.

The Challenge of Assessing the Nature of Someone Else's Motivation

Because the nature of one's motivation reveals such important information for social and commercial interactions, it is important to be able to assess another person's intrinsic motivation. However, as mentioned, the nature of one's motivation is a fine internal state whose nuances observers might find difficult to accurately assess (Heath 1999). Little research has specifically examined how observers assess the nature of other people's motivation (Heath 1999). One such endeavor asked participants to consider college students who spent three hours coloring pictures for either high or low reward that was either contingent on their performance or not (Deci et al. 1974). Results showed that participants inferred lower intrinsic motivation for the picture-coloring task if a resulting reward was high (vs. low) and contingent (vs. not contingent) on performance. In many situations, however, observers do not have the opportunity to manipulate rewards and contingencies and then observe an actor's responses in order to infer motivation. Therefore, how do observers assess the nature of other people's motivation? We suggest that one way is to infer it from other people's emotions displayed while engaging in an activity.

The Social Functional View of Emotions

Emotions not only influence intrapersonal judgments (e.g., affect as information, Schwarz and Clore 1983), but also serve to coordinate interpersonal interactions (Keltner and Haidt 1999). They guide social interactions through three major functions: evocative, incentive, and informative (Keltner and Kring 1998). A person's emotion can influence other people's behavior by evoking assimilative or complementary emotions—the evocative function. For example, a child's featured sadness in an advertisement for a charitable organization facilitates donation by inducing sadness and sympathy in the viewer (Small and Verrochi 2009). Displayed emotions can also condition an observer's response—the incentive function. For example, displaying anger in an ultimatum game or negotiation can induce the counterpart to make concessions (Andrade and Ho 2009; Van Kleef, De Dreu, and Manstead 2004). Finally, emotions can signal information about the actor via the observers' inference-making process—the informative function. This research focuses on the informative function of expressed emotions.

There are many examples of this informative function of emotions. Embarrassment in response to a compliment may signal prosocial traits (Feinberg et al. 2012). Positive or negative expressed emotion accompanying a prosocial or antisocial action may signal the actor's true attitude (Ames and Johar 2009). A negotiator tends to make larger concessions to a counterpart who feels disappointed rather than guilty, because disappointment signals that the other party is close to the highest he or she could possibly offer (Van Kleef et al. 2006). The current research builds on this emerging research on the social informative function of emotions. We also extend this stream of research by showing, for the first time, that the facial expression of emotion (e.g., smile) can signal the nature of one's motivation to others (e.g., intrinsic motivation).

The Characteristics of Facial Expression of Emotions in Communication

We focus on facial expressions of emotion not only because they are highly accessible in social interactions, but also because they are usually perceived as diagnostic sources for social inference making due to their hardwired nature and spontaneity (Ekman 1993). First, emotional expressions facilitate survival, and hence are selected by evolution (Darwin 1872). For example, fear makes primates open their eyes wider, allowing them to see more threats and thereby avoid danger (Lee, Susskind, and Anderson 2013), Second, the basic emotions have unique facial configurations and are universally recognized across cultures (Ekman and Friesen 1971; Ekman, Sorenson, and Friesen 1969; Ekman et al. 1987; Elfenbein and Ambady 2002). Third, even infants who have not developed language skills react to adults' emotional expressions (Sorce et al. 1985). Because the display, recognition, and reaction to facial expression of emotions are so hardwired, emotional expressions are likely to be used as a reliable source of social communication and social inferences.

The diagnosticity of expressed emotions in social inference also arises from their relative spontaneity and irrepressibility (Ekman 1993). First, basic emotions are characterized by their quick onset, automatic appraisal, and unbidden occurrence (Ekman 1992); hence, people may spontaneously display them even before they are aware of them and try to suppress them. Second, because people usually cannot see their own faces the way observers do, they are to some extent deprived of online feedback regarding their own facial expressions. This makes it difficult for

them to regulate their emotional expressions on a moment-to-moment basis (DePaulo 1992). As Schneider, Hastorf, and Ellsworth (1979) suggested, although observers are not totally naïve to the possibility that nonverbal behaviors can be deliberately regulated, they seem to be generally more "taken" by the spontaneity and trustworthiness of such behaviors.

Smiling as a Signal of Intrinsic Motivation

Given that emotions convey rich social information, and facial expressions of emotion are perceived as diagnostic, how do they inform us regarding the nature of another person's motivation? Previous literature suggests that intrinsic motivation arises from basic psychological needs for competence, autonomy, and relatedness, which are principal sources of enjoyment and vitality throughout life (Ryan and Deci 2000a). Deci (1975) argues that if an activity is internally rewarding, the end state should be positive affect. Indeed, intrinsic motivation is sometimes defined as doing something for its inherent enjoyment or satisfaction (Ryan and Deci 2000b). Therefore, we suggest that observers may use another person's displayed enjoyment (e.g., smile) while engaging in an activity as a signal to infer that person's intrinsic motivation.

Duchenne Smile. People smile for a variety of reasons (e.g., being polite, masking misery, feeling embarrassed, pleasing others), and not all types of smiles reflect enjoyment. Prior literature has shown that smiles related to true enjoyment comprise unique facial muscle movements (Ekman, Davidson, and Friesen 1990). While a nonenjoyment smile involves only the lip corners being pulled upward (zygomatic major muscle), an enjoyment smile (e.g., a Duchenne smile) also involves raising the cheeks and contracting the external corners of the eyes (orbicularis oculi muscle; please see the illustration in web appendix A). Extensive research has shown that compared to other types of smiles, Duchenne smiles are a more reliable indication of enjoyment (Ekman 1992; Gunnery and Ruben 2016). Hence, a Duchenne smile displayed while engaging in an activity should be a better signal of the intrinsic motivation for this activity compared to other types of smiles. It is important to note that although much psychological research has investigated the mapping between facial expressions (e.g., Duchenne smile) and felt emotions (e.g., enjoyment), the current research is the first to study the relationship between facial expression and the nature of motivation.

Size of Smile and Duchenne-ness. Although the size of a smile and its Duchenne-ness are conceptually distinct, in daily expressions, they are often naturally correlated (Gunnery, Hall, and Ruben 2013). Duchenne smiles are usually large smiles. Correspondingly, when smiles are large enough, they look Duchenne-like. As Frank, Ekman, and Friesen (1993) put it, "smiles of high zygomatic major intensity raise the cheek high enough to create many of the same bulges and wrinkles associated with orbicularis oculi action." Given this natural correlation of smile size and Duchenne-ness, we develop our main hypothesis comparing large Duchenne smiles with small smiles, and propose that observers infer greater intrinsic motivation underlying an activity if they see actors display large Duchenne (vs. small) smiles while engaging in that activity.

That said, it is still theoretically interesting to disentangle the size of a smile and its Duchenne-ness. Although the size of a smile usually correlates with Duchenne-ness, our effect is predicated on the link between Duchenne-ness and true enjoyment. Therefore, the size of a smile, absent Duchenne-ness, may not be sufficient to signal intrinsic motivation all on its own. Therefore, we propose that observers may infer greater intrinsic motivation from large Duchenne smiles than from large non-Duchenne smiles. Further, we propose that observers infer no more intrinsic motivation underlying an activity if they see actors display large non-Duchenne smiles versus small smiles. We test these predictions in studies 2a and 2b.

Ambiguity of Motivation. Inference making usually occurs when there is uncertainty in the context. This is true of inference making based on emotions as well. For example, anger enhances the credibility of a complaint only when the rationale for the complaint leaves room for doubt, but not when complaints are already highly justifiable (Hareli et al. 2009). Similarly, smiles should be used as cues to infer intrinsic motivation only if there is ambiguity regarding the motivation. Most communication contexts are fairly benign and people do not automatically question others' motives (Campbell and Kirmani 2000). In these contexts, we suggest that observers are relatively less likely to rely on the size or type of an actor's smile to make inferences about their motivation. However, when ambiguity about the nature of a person's motivation is brought to mind, an observer may make a closer assessment, and, in the absence of other information, use his/her smile to make an inference about the nature of his/her motivation.

> **H1:** When the nature of an actor's motivation for engaging in a given activity is ambiguous. . .
>
> **H1a:** . . .observers infer greater intrinsic motivation if they see the actor displays a large, Duchenne smile (compared to a small smile) while engaging in the activity, and. . .
>
> **H1b:** . . .observers may infer greater intrinsic motivation from large Duchenne smiles than from large non-Duchenne smiles. They do not infer greater intrinsic motivation from large non-Duchenne smiles compared to small smiles.
>
> **H2:** When the nature of an actor's motivation for engaging in a given activity is unambiguous, observers do not rely on the size or type of the actor's smile to infer intrinsic motivation.

Signaling. As argued earlier, not only do observers have the incentive to infer the nature of actors' motivation,

actors may also have the incentive to communicate or signal the nature of their motivation to observers (particularly if it is intrinsic). Some research has suggested that people may proactively and strategically use their emotions to influence other people's behaviors, but little research has directly tested this. For example, a qualitative study found that bill collectors were trained to display urgency emotions to debtors (Sutton 1991). Another interview-based investigation suggested that bosses sometimes deliberately displayed anger at work to intimidate their subordinates (Fitness 2000). Andrade and Ho (2009) showed that game players strategically disclosed stated anger to influence a counterpart's concession in the subsequent round. Each of these examples suggests that although emotions are mostly spontaneous and thus diagnostic, people understand the social functions of emotions (Keltner and Kring 1998) and strategically leverage these functions to their advantage (Gneezy and Imas 2014). Because signaling internal states—including motivation—is one of the three main social functions of emotion, people may strategically display emotions to signal motivation.

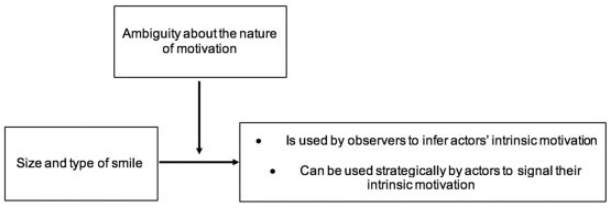
In the current context, actors may at times wish to signal intrinsic motivation. However, they can never be fully confident that observers will perceive them as intrinsically motivated, and hence their best strategy is to assume that observers will experience some ambiguity in making assessments about the nature of their motivation. Consequently, a communicator who has a goal to signal intrinsic (vs. extrinsic or no specific) motivation for engaging in an activity may proactively and strategically display larger and more Duchenne-like smiles to potential observers. We test this hypothesis in studies 3 and 4.

> **H3:** Actors display larger and more Duchenne-like smiles if they want to signal their own intrinsic (vs. extrinsic or no specific) motivation to observers.

It is worth noting that we do not hypothesize that actors are perfectly able to strategically display large Duchenne smiles at will, because there exist substantial individual differences in the ability to manipulate one's own facial expressions (Ekman 1993). Moreover, although most people can deliberately contract the medial portion of the orbicularis oculi, most cannot deliberately contract its lateral portion (Ekman 1993). We hypothesize only that actors strategically display *relatively* more Duchenne-like smiles if they wish to signal intrinsic *as opposed to* extrinsic or no specific motivation. To what extent their strategic displays fully satisfy the Duchenne criteria is beyond the investigation of this current research. Figure 1 visualizes the overall conceptual framework.

FIGURE 1

CONCEPTUAL FRAMEWORK



Overview of Current Research

We now present five studies that test the effect of displayed smiles in communicating intrinsic motivation. Studies 1–3 test the hypotheses in the context of customer testimonials. Study 1 tests whether observers infer greater intrinsic motivation underlying customer testimonials if the endorsing customers display large Duchenne (vs. small) smiles, when the ambiguity of the endorser's motivation is brought to mind. Studies 2a and 2b test whether the largeness of a smile is sufficient to signal intrinsic motivation, or alternatively, Duchenne-ness is necessary. Study 2b also tests whether smiling has downstream consequences on consumer judgment and intention, and whether this is mediated by inferred intrinsic motivation. Study 3 shifts the examination to the actor side, testing whether customer endorsers given a goal to signal intrinsic (vs. extrinsic or no specific) motivation proactively display larger and more Duchenne-like smiles in self-taken photos that accompany testimonials. Study 4 provides additional process evidence for the consciousness of display, in the context of online fundraising.

STUDY 1: OBSERVERS' INFERENCE OF INTRINSIC MOTIVATION AS A FUNCTION OF SMILE TYPE AND AMBIGUITY PRIMING

Method

Undergraduate students ($N = 141$) from a major Asian university participated in this study for course credit. Eight participants who failed an attention check at the beginning of the study, and two who had previously participated in a pilot study for stimulus development, were dropped from the analysis, leaving 131 participants (47% female, median age = 20).

Study 1 had a 2 (ambiguity of motivation: primed vs. not primed) × 2 (smile type: small vs. large Duchenne) between-subjects design, consisting of two parts. In the first part, participants were randomly assigned to either an ambiguity priming condition or a control condition. In the ambiguity priming condition, participants read a short paragraph about "customer endorsements" and then answered two questions based on the paragraph. The paragraph read,

"Companies often show their prospective customers endorsements from previous satisfied customers. Such customer endorsements can be very informative. However, there have been cases in the past when companies have gotten customers to endorse them even though the customers were not sincerely willing to do so." The two questions asked them how they felt about customer endorsements (1 = Most customer endorsements are unreliable/insincere, 4 = There are equal numbers of reliable and unreliable / sincere and insincere endorsements, 7 = Most customer endorsements are reliable/sincere). In the control condition, participants were not given any paragraph or questions and they directly entered the second part of the study.

In the second part, all participants imagined going to Phoenix, Arizona, for a six-month exchange study. Due to limited housing capacity, they needed to hire a real estate agent to find an off-campus place for them to live. They imagined visiting the websites of real estate agents and randomly opening one. We presented participants with a snapshot of a website (see appendix A). The website contained the real estate agent's name (Kelly Robinson), address, phone number, a welcome message, a picture of the downtown area, and a few navigation buttons. In the lower part of the website, two customer testimonials were presented along with each endorser's first name and headshot. One testimonial read, "Kelly provides the best service" and the other read, "She is the person you are looking for." All information and images were identical across conditions except for the smiles (large Duchenne vs. small) in the two headshots.

After viewing the website, participants completed measures to assess their inferred motivations underlying the customer testimonials, indicating their agreement (1 = strongly disagree, 7 = strongly agree) with six statements, three corresponding to intrinsic motivation (Q1, "They really want to endorse this agent with no reservations"; Q2, "They sincerely think this agent is worth endorsing"; Q3, "Even if the agent didn't ask, these previous customers would voluntarily give positive word-of-mouth of this agent among their family and friends"), and the other three corresponding to extrinsic motivation (Q4, "The agent probably paid them to provide the positive endorsement"; Q5, "The agent asked them to say good things about her service"; Q6, "If the agent hadn't asked, these previous customers would not have provided recommendations"). The order of the six questions was randomized for each participant.

Whereas prior research often measured intrinsic motivation in a unidimensional fashion, and regarded higher intrinsic motivation as automatically implying lower extrinsic motivation (Isen and Reeve 2005; Ryan and Deci 2000a; Sen, Bhattacharya, and Korschun 2006), we measured intrinsic and extrinsic motivation with separate questions. We did so to examine whether the patterns on the extrinsic motivation questions would be the exact reverse of those on the intrinsic motivation questions. This choice creates some other limitations, particularly because extrinsic motivation can be driven by a wider array of factors than intrinsic motivation (Ryan and Deci 2000a). Whereas intrinsic motivation refers to doing something for its own sake, extrinsic motivation refers to doing something for any other separable outcome—this may include money, fame, image, status, social pressure, avoidance of punishment, social norms, and others. Because of the many drivers of extrinsic motivation, it may be difficult to capture with only three discrete questions. For example, a participant may agree that the endorser provided a testimonial because she did not want to upset the agent (Q5). However, this participant may not necessarily feel that the testimonial was provided because it was paid for (Q4). In contrast, those who agree with Q1 are very likely to also agree with Q2 and Q3 because these questions coherently unite under the intrinsic motivation construct. As a result, it is possible that the extrinsic motivation results may not be the exact opposite of the effect on intrinsic motivation. Consistent with the method used in prior literature, we rely upon the intrinsic motivation questions more in testing our hypotheses. Nonetheless, we report both results, as they are intriguing and potentially informative regarding the complex nature of extrinsic motivation. In subsequent studies, we measure extrinsic motivation differently.

Is it possible that larger and more Duchenne-like smiles simply cause participants to like the endorsers or the website more, and might these positive feelings carry over to any subsequent judgments, rather than our proposed theory? Such an explanation would predict a main effect of smiling rather than an interactive effect with motivation ambiguity. To further test this alternative explanation, participants answered several questions that measured variables such as mood ("How are you feeling at this moment?" 1 = very bad, 4 = neither good nor bad, 7 = very good), liking of the endorsers ("How much did you like these endorsing customers?" 1 = I liked them very much, 4 = I neither liked nor disliked them, 7 = I disliked them very much), and liking of website design ("How good or bad is the design of this website?" 1 = very bad, 7 = very good). Finally, participants completed manipulation-check questions regarding displayed enjoyment ("How happy did the endorsing customers look on the website?" 1 = very unhappy, 4 = neither happy nor unhappy, 7 = very happy), and reported their gender and age.

Result

Manipulation Check. An ANOVA of smile type and ambiguity priming on perceived enjoyment revealed a main effect of smile type ($M_{small} = 4.91$, $M_{large\ Duchenne} = 5.52$, $F(1, 127) = 15.50$, $p < .01$, $\eta_p^2 = .11$). Ambiguity priming had neither a main effect ($M_{prime} = 5.32$, $M_{control} = 5.11$, $F(1, 127) = 1.91$, $p = .17$, $\eta_p^2 = .02$) nor

moderating effect on perceived enjoyment in the photographs ($F(1, 127) = .04$, $p = .84$, $\eta_p^2 < .01$). Therefore, participants viewed the endorsing customers as having greater enjoyment if they displayed large Duchenne smiles versus small smiles, as intended. It is worth noting that endorsing customers looked happy even in the small smile condition ($M_{small} = 4.91$ vs. 4 = neither happy nor unhappy, $t(64) = 8.68$, $p < .01$, $d = 2.17$); hence, the results were not driven by the valence of the emotion (i.e., happy vs. unhappy).

Inferred Intrinsic Motivation. We first conducted exploratory factor analysis based on the principal components method of extraction and varimax rotation. Consistent with our prediction, the six questions regarding the nature of motivation loaded on two factors: intrinsic motivations (Q1, Q2, and Q3, eigenvalue = 1.96, 32.71% of variance explained, Cronbach's $\alpha = .74$) and extrinsic motivations (Q4, Q5, and Q6, eigenvalue = 1.49, 24.85% of variance explained, Cronbach's $\alpha = .46$). The low internal consistency of the three extrinsic motivation questions confirmed the multifaceted nature of the extrinsic motivation construct, and the limitation of this instrument. Nonetheless, we averaged the two sets of questions separately to generate one index of inferred intrinsic motivation and one of inferred extrinsic motivation.

An ANOVA on intrinsic motivation with smile type and ambiguity priming as between-subjects factors revealed neither a main effect of ambiguity priming ($M_{control} = 4.23$, $M_{prime} = 4.06$, $F(1, 127) = 1.15$, $p = .29$, $\eta_p^2 = .01$), nor a main effect of smile type ($M_{small} = 4.02$, $M_{large\ Duchenne} = 4.27$, $F(1, 127) = 2.45$, $p = .12$, $\eta_p^2 = .02$), but a significant interaction ($F(1, 127) = 4.50$, $p = .04$, $\eta_p^2 = .03$). To interpret the interaction, we looked at the simple effects of smile type in the different ambiguity conditions. When ambiguity of motivation was not primed, participants inferred similar levels of intrinsic motivation regardless of the type of smile ($M_{small} = 4.27$, $M_{large\ Duchenne} = 4.18$, $F(1, 127) = .16$, $p = .70$, $\eta_p^2 < .01$). In contrast, when ambiguity of motivation was primed, participants seemed to actively look for signals to help them make inferences. As a result, they inferred stronger intrinsic motivation from large Duchenne (vs. small) smiles ($M_{small} = 3.75$, $M_{large\ Duchenne} = 4.35$, $F(1, 127) = 6.74$, $p = .01$, $\eta_p^2 = .05$). To test the robustness of these findings and rule out alternative explanations, we performed an ANCOVA, controlling for mood ($F(1, 124) = .63$, $p = .43$, $\eta_p^2 < .01$), liking of the endorsers ($F(1, 124) = 3.48$, $p = .06$, $\eta_p^2 = .03$), and liking of the website design ($F(1, 124) = 17.00$, $p < .01$, $\eta_p^2 = .12$). All the above significant effects held robustly when these covariates were controlled for (interaction $F(1, 124) = 5.45$, $p = .02$, $\eta_p^2 = .04$; simple effect of smile type under ambiguity priming $F(1, 124) = 6.51$, $p = .01$, $\eta_p^2 = .05$). These effects held when gender ($F(1, 122) < .01$, NS, $\eta_p^2 < .01$) and age ($F(1, 122) = .85$, $p = .36$, $\eta_p^2 < .01$) were further statistically controlled for (interaction $F(1, 122) = 4.58$, $p = .03$, $\eta_p^2 = .04$; simple effect of smile type under ambiguity priming $F(1, 122) = 6.31$, $p = .01$, $\eta_p^2 = .05$).

Inferred Extrinsic Motivation. A similar ANOVA on inferred extrinsic motivation revealed directional effects of ambiguity priming ($M_{control} = 4.32$, $M_{prime} = 4.53$, $F(1, 127) = 1.82$, $p = .18$, $\eta_p^2 = .01$) and smile type ($M_{small} = 4.51$, $M_{large\ Duchenne} = 4.34$, $F(1, 127) = 1.07$, $p = .30$, $\eta_p^2 < .01$). However, neither effect was significant, nor was the ambiguity × smile type interaction ($F(1, 127) = .09$, $p = .77$, $\eta_p^2 < .01$). Although the effect of smiling on inferred extrinsic motivation was not exactly the reverse of that on inferred intrinsic motivation, we believe this was due to the empirical limitation of the measurement instruments as discussed earlier. Because extrinsic motivation is multiply determined and more broadly defined than intrinsic motivation (Ryan and Deci 2000a), it is more difficult to measure with a few discrete questions, as is also indicated by the lower Cronbach's α.

Discussion

Study 1 showed that when the motivation underlying customer testimonials was ambiguous (i.e., when ambiguity was primed), observers inferred greater intrinsic motivation driving the testimonial if the endorsing customers displayed large Duchenne smiles as compared to small smiles. When ambiguity was not primed, observers appeared to not use endorsers' smiles to make inferences about their motivation. We note that given the sample size, study 1 may have been underpowered, though the results are consistent with subsequent studies, which are not underpowered.

In this study, we compared large Duchenne smiles with small smiles because the size of a smile and its Duchenne-ness are often naturally correlated in daily expressions. Despite this natural correlation, size and Duchenne-ness are conceptually distinct, and it is theoretically intriguing and informative to study whether the above effect was driven by the size of the smile or its Duchenne-ness. Therefore, we try to disentangle these two components in study 2 by adding a condition featuring a large, non-Duchenne smile. If size is the key element, observers should infer the same level of intrinsic motivation from a large smile, regardless of its Duchenne-ness, compared with a small smile. However, if Duchenne-ness is the key element, observers should infer the same low level of intrinsic motivation from non-Duchenne smiles, regardless of their size, compared with a large Duchenne smile. We examine this question in the next two studies (2a and 2b).

STUDY 2A: THE RELATIVE ROLE OF SMILE SIZE VERSUS DUCHENNE-NESS

Study 2A used the same real estate agent website as in study 1 with a different set of endorser headshots. Two volunteers, one female and one male, were recruited as models and photographed expressing small smiles (pulling lip corners upward a bit), large non-Duchenne smiles (pulling lip corners upward a lot), and large Duchenne smiles (pulling lip corners upward a lot, raising cheeks, and contracting the external corners of the eyes). Pairs of photos displaying the same type of smiles were inserted in the realtor website to create three versions (see appendix B). We also included a no photo condition as a control condition. In this condition, the website did not present any headshots, but included the identical endorser verbal testimonials.

Method

Students from a major East Coast university ($N = 216$) participated in the study for course credit. Seven participants failed an attention-check question at the beginning of the study and were eliminated from analysis ($N = 209$, 147 females, median age = 20). This study followed a single-factor between-subjects design, with endorsers' smiles manipulated at four levels: no photo, small smiles, large non-Duchenne smiles, and large Duchenne smiles. As study 1 had found that observers used actors' smiling to infer intrinsic motivation only when actors' motivation was ambiguous, in this study, all participants read the ambiguity prime from study 1.

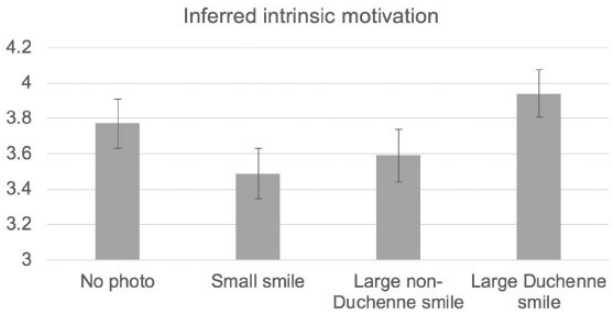
Participants first read the same paragraph in study 1 to prime the ambiguity of endorsers' motivation. Then they imagined going to Phoenix, Arizona, for a six-month internship and looking to hire a real estate agent to find a place to live. We presented participants with one of the four versions of the website snapshot (see appendix B) and measured their inferred intrinsic and extrinsic motivation underlying the testimonials, using the exact same questions as in study 1. To check the effectiveness of the smiling manipulation, participants in the three photo conditions responded to two questions that measured the size of smile ("How much of a smile did you see on the faces of the endorsing customers? 1 = No smile at all, 7 = A big smile) and Duchenne-ness ("How authentic or artificial are the smiles?" 1 = Very artificial, 7 = Very authentic). Participants in the no photo condition did not respond to these two questions because they did not see any faces. Covariates and demographics as in study 1 were measured at the end.

Results

Manipulation Check. Participants rated the small smiles ($M_{small} = 3.83$) as significantly smaller than the large non-Duchenne smiles ($M_{large\ non\text{-}Duchenne} = 5.65$, $t(153) = 7.75$, $p < .01$, $d = 1.43$) and the large Duchenne smiles ($M_{large\ Duchenne} = 6.00$, $t(153) = 9.35$, $p < .01$, $d = 1.80$). The two large smiles were rated similarly large ($t(153) = 1.51$, $p = .13$, $d = 0.32$). Participants rated the large Duchenne smiles ($M_{large\ Duchenne} = 4.64$) as significantly more authentic than the large non-Duchenne smiles ($M_{large\ non\text{-}Duchenne} = 3.73$, $t(153) = 3.25$, $p < .01$, $d = 0.63$) and the small smiles ($M_{small} = 3.19$, $t(153) = 5.16$, $p < .01$, $d = 1.04$). Large non-Duchenne smiles were rated marginally more authentic than small smiles ($t(153) = 1.88$, $p = .06$, $d = 0.37$) perhaps because a substantial lifting of the lip corners can also raise cheeks upward to some extent.

FIGURE 2

INFERRED INTRINSIC MOTIVATION AS A FUNCTION OF CONDITION (STUDY 2A)



Inferred Intrinsic Motivation. Factor analysis on the six questions that measured inferred motivation generated two factors as expected. The intrinsic motivation factor (Q1, Q2, Q3, Cronbach's $\alpha = .75$) explained 33.73% of the variance and the extrinsic motivation factor (Q4, Q5, Q6, Cronbach's $\alpha = .61$) explained 28.21%. Therefore, we averaged them separately to generate one index of inferred intrinsic motivation and one of inferred extrinsic motivation.

An ANOVA on intrinsic motivation with condition as the between-subjects factor revealed an omnibus effect of condition that approached significance ($F(3, 205) = 1.99$, $p = .12$, $\eta_p^2 = .03$; see figure 2). Further, an ANCOVA showed that condition indeed had a significant effect ($F(3, 202) = 2.75$, $p = .04$, $\eta_p^2 = .04$) when mood ($F(1, 202) = 4.26$, $p = .04$, $\eta_p^2 = .02$), liking of endorsers ($F(1, 202) = 5.52$, $p = .02$, $\eta_p^2 = .03$), and liking of web design ($F(1, 202) = 4.09$, $p = .04$, $\eta_p^2 = .02$) were statistically controlled for. This replicated the ANCOVA result in study 1. The ANCOVA result held ($F(3, 200) = 2.81$, $p = .04$, $\eta_p^2 = .04$) when gender ($F(1, 200) = .11$, $p = .74$, $\eta_p^2 < .01$) and age ($F(1, 200) = .89$, $p = .35$, $\eta_p^2 < .01$) were also controlled for. Planned contrasts without controlling for

these covariates confirmed the expected results. First, participants inferred greater intrinsic motivation underlying the testimonials when endorsers displayed large Duchenne smiles ($M_{\text{large Duchenne}} = 3.94$) versus small smiles ($M_{\text{small}} = 3.49$, $t(205) = 2.26$, $p = .03$, $d = .45$). This replicated the key finding of study 1. Importantly, participants did not infer greater intrinsic motivation from large non-Duchenne smiles ($M_{\text{large non-Duchenne}} = 3.59$) than small smiles ($t(205) = .50$, $p = .62$, $d = .10$), suggesting that large smiles by themselves do not signal intrinsic motivation if they are not Duchenne. Further, participants inferred marginally greater intrinsic motivation from large Duchenne smiles than large non-Duchenne smiles ($t(205) = 1.74$, $p = .08$, $d = .34$). This marginal result suggests that an extra dose of Duchenne-ness is important in signaling intrinsic motivation, but also that when a smile is large it may be at times difficult to fully disentangle from Duchenne (Frank et al. 1993; Gunnery et al. 2013).

Finally, the mean for inferred intrinsic motivation in the no photo condition ($M_{\text{no photo}} = 3.77$) lay between those in the small smile ($M_{\text{small}} = 3.49$, $t(205) = -1.41$, $p = .16$, $d = .28$) and large Duchenne smile conditions ($M_{\text{large Duchenne}} = 3.94$, $t(205) = .86$, $p = .39$, $d = .17$). Because neither contrast achieved statistical significance at the 90% confidence level, it is difficult to conclude whether the effect was due to the negative inferences from small smiles, or the positive inferences from large Duchenne smiles. Study 2B was conducted to further address this question.

Inferred Extrinsic Motivation. An ANOVA on inferred extrinsic motivation with condition as the between-subjects factor revealed a significant omnibus effect ($F(3, 205) = 2.97$, $p = .03$, $\eta_p^2 = .04$). Planned contrasts revealed that participants inferred significantly greater extrinsic motivation underlying the testimonial when the endorsers displayed large non-Duchenne smiles ($M_{\text{large non-Duchenne}} = 4.92$) than large Duchenne smiles ($M_{\text{large Duchenne}} = 4.35$, $t(205) = 2.65$, $p < .01$, $d = .526$) or in the no photo condition ($M_{\text{no photo}} = 4.41$, $t(205) = 2.36$, $p = .02$, $d = .45$). There were no other significant contrasts ($ps > .12$). Again, the effect of smiling on inferred extrinsic motivation was not the exact inverse of the effect on intrinsic motivation. We suspect this was again due to the extrinsic motivation instrument whose Cronbach's α once again fell below the conventional threshold of .70 (DeVellis 2012), albeit better than in study 1.

Discussion

Study 2a offers some important replications of the findings in study 1. When customer endorsers displayed large Duchenne smiles as compared to small smiles, participants again inferred greater intrinsic motivation underlying the testimonial. Importantly, we attempted to disentangle smile size and Duchenne-ness by introducing a large non-Duchenne smile condition. Participants did not infer greater intrinsic motivation from large non-Duchenne smiles than from small smiles. However, they inferred greater intrinsic motivation from large Duchenne smile than large non-Duchenne smiles, albeit marginally. This implies that for smiles to signal intrinsic motivation, simply being large is not enough; the element of Duchenne-ness is important. In study 2b, we test hypothesis 1b again with another sample of participants to see if the results replicate.

It is important to note that these findings do not suggest Duchenne-ness itself is sufficient, because we did not have a small Duchenne smile condition to compare with the small (non-Duchenne) smile condition. As discussed earlier, it is difficult to express a small Duchenne smile because Duchenne smiles are naturally more like large smiles. Additionally, we do not suggest that smile size is completely irrelevant. This is because the intensity of smiles may serve as a costly signal, provided that the authenticity of enjoyment is guaranteed in the first place (Gunnery et al. 2013; Mehu et al. 2012). Were we able to create small Duchenne smiles, participants may still have inferred greater intrinsic motivation from large Duchenne smiles as compared to small Duchenne smiles, because the former indicates a stronger degree of enjoyment in engaging in the activity. In short, our results indicate that neither size nor Duchenne-ness alone is sufficient, but Duchenne-ness seems to be necessary.

Although we replicated the significant difference in the inferred intrinsic motivation between small smiles and large Duchenne smiles, it is unclear whether the effect is driven by negative inferences from smaller smiles or positive inferences from large Duchenne smiles. It is possible that the effect was driven only by the negative inferences from the small smiles, because those actors could look "unhappy," thus signaling a lack of enjoyment and intrinsic motivation. Results from study 1 suggested otherwise because the manipulation check showed participants found the endorsing customers in the small smile condition significantly happier than a neutral state (4.91 vs. 4, $t(64) = 8.68$, $p < .01$). In study 2a, we included a no photo control condition to shed light on the source of the effect. Unfortunately, neither planned contrast against the control condition achieved statistical significance. Therefore, we conducted study 2b to address some of the possible limitations of study 2a as explained below, seeking to generate more conclusive evidence regarding the source of the effect.

STUDY 2B: SOURCE OF THE EFFECT AND DOWNSTREAM CONSEQUENCE

In study 2a, we were not able to confidently conclude whether the effect of large Duchenne smiles relative to small smiles was driven more by the positive inference

from the former, or the negative inference from the latter. We speculate there were two reasons. First, the questions we used to measure inferred intrinsic motivation might have been overly specific. Hence, in study 2b, we use a general and simpler question to measure inferred intrinsic motivation (Sen et al. 2006; Yoon et al. 2006). Specifically, we ask, "How genuine are the endorsements for this real estate agent?" (1 = Not genuine at all, 7 = Very genuine). Secondly, study 2a was conducted with business school students from an elite university. This sample may be more sophisticated or skeptical than the general public. This could possibly explain the negative inference from small smiles, which the general public might find quite benign. Echoing this speculation regarding the sample, the inferred intrinsic motivation in study 2a was below the scale midpoint across all four conditions. Therefore, we recruited American participants from Amazon Mechanical Turk (MTurk) for study 2b. These participants are more representative of the general public ($N = 209$, 52.6% female, ages 18 to 85 with mean of 37.06) than elite business school students.

Apart from an improved measure and a different sample, study 2b tested downstream consumer consequences in terms of anticipated service quality. Specifically, we asked three questions: "How confident are you that this real estate agent will provide good service to you?" (1 = Not confident at all, 7 = Very confident); "How sure are you that this real estate agent will find you a good place to live?" (1= Not sure at all; 7 = Very sure); "How likely are you to hire this real estate agent to find you a good place to live?" (1 = Very unlikely, 7 = Very likely).

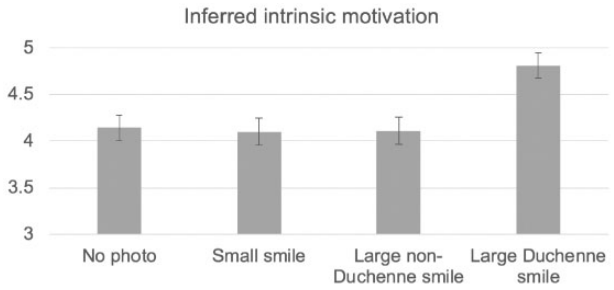
The rest of study 2b was the same as study 2a except that we did not measure mood, liking of endorsers, and liking of web design again, because controlling for these covariates did not change the results in either study 1 or study 2a. Also, we did not separately measure inferences of extrinsic motivation, as both study 1 and study 2a suggested a limitation of this instrument. Rather, following prior research, we measured only inferred intrinsic motivation in a unidimensional fashion and consider a higher score on this measure as implying lower extrinsic motivation (Isen and Reeve 2005; Ryan and Deci 2000a; Sen et al. 2006).

Results

Inferred Intrinsic Motivation. Omnibus ANOVA revealed a significant effect of experimental condition on inferred intrinsic motivation ($F(3, 205) = 2.76$, $p = .04$, $\eta_p^2 = .04$; see figure 3). This effect held ($F(3, 203) = 2.94$, $p = .03$, $\eta_p^2 = .04$) when gender ($F(1, 203) = 3.69$, $p = .06$, $\eta_p^2 = .02$) and age ($F(1, 205) < .01$, NS, $\eta_p^2 < .01$) were controlled for. Planned contrasts showed that participants who saw large Duchenne smiles inferred greater intrinsic motivation ($M_{\text{large Duchenne}} = 4.81$) than those who saw large non-Duchenne smiles ($M_{\text{large nonDuchenne}} = 4.11$, $t(205) = 2.38$, $p = .02$, $d = .50$), small smiles ($M_{\text{small}} = 4.10$, $t(205) = 2.41$, $p = .02$, $d = .47$), and the no photo condition ($M_{\text{no photo}} = 4.14$, $t(205) = 2.26$, $p = .03$, $d = .42$). The latter three conditions did not differ from one another ($|t|$s $< .14$, NS). These results provide convergent support for hypothesis 1b, that Duchenne-ness is a necessary element to signal intrinsic motivation, whereas largeness by itself is not. These results also suggest that the superior impact of large Duchenne smiles relative to small smiles was mainly driven by the positive inferences from the former rather than negative inferences from the latter.

FIGURE 3

INFERRED INTRINSIC MOTIVATION AS A FUNCTION OF CONDITION (STUDY 2B)



Anticipated Service Quality. The three questions loaded on a single factor that explained 83.75% of the total variance, and they were internally consistent (Cronbach's $\alpha = .90$). Hence, we averaged them to form an index of anticipated service quality. Omnibus ANOVA showed a marginal effect of condition on anticipated service quality ($F(3, 205) = 2.41$, $p = .07$, $\eta_p^2 = .03$; see figure 4), and this effect held ($F(3, 203) = 2.50$, $p = .06$, $\eta_p^2 = .04$) when gender ($F(1, 203) = .37$, NS, $\eta_p^2 < .01$) and age ($F(1, 203) = 1.60$, NS, $\eta_p^2 < .01$) were controlled for. Planned contrasts showed that participants in the large Duchenne smile condition anticipated better service quality ($M_{\text{large Duchenne}} = 4.93$) than those in the large non-Duchenne smile condition ($M_{\text{large nonDuchenne}} = 4.40$, $t(205) = 2.27$, $p = .02$, $d = .49$), small smile condition ($M_{\text{small smile}} = 4.40$, $t(205) = 2.24$, $p = .03$, $d = .45$), and no photo condition ($M_{\text{no photo}} = 4.44$, $t(205) = 2.06$, $p = .04$, $d = .38$). The latter three conditions did not differ from one another ($|t|$s $< .19$, NS).

Mediation. Two regressions tested whether the effect of smiling on anticipated service quality was mediated by inference of intrinsic motivation. Regressing the anticipated service quality index on three dummy variables, $\text{Dummy}_{\text{LargenonDuchenne}}$, $\text{Dummy}_{\text{Small}}$, $\text{Dummy}_{\text{Nophoto}}$, returned three significant effects that mirrored the planned

FIGURE 4

ANTICIPATED SERVICE QUALITY AS A FUNCTION OF CONDITION (STUDY 2B)

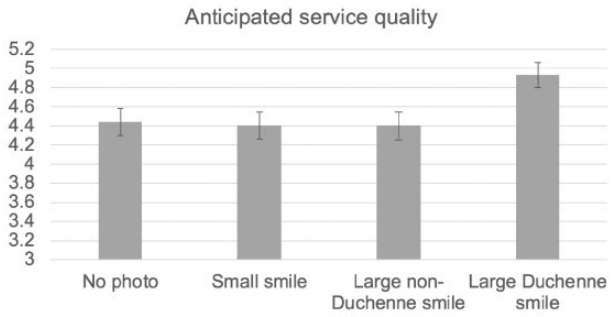
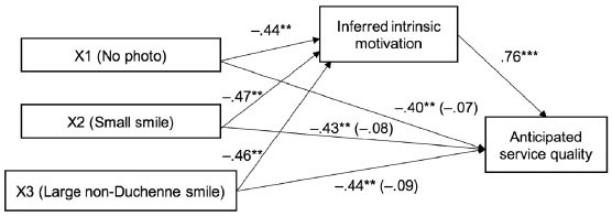


FIGURE 5

MEDIATION RESULTS USING PROCESS MODEL 4 WITH LARGE DUCHENNE SMILE AS THE REFERENT CONDITION (STUDY 2B)



Note.—The coefficients are standardized coefficients. ** indicates $p < .05$; *** indicates $p < .0001$.

contrasts ($ts = -2.06 \sim -2.27$, $ps < .04$). More importantly, adding inferred intrinsic motivation as the fourth predictor into the regression model rendered all three effects insignificant ($ts = -.53 \sim -.72$, $ps > .48$), while the effect of inferred intrinsic motivation remained significant ($t(204) = 16.39$, $p < .01$). This suggests that inferred intrinsic motivation fully mediated the effect of smiling on anticipated service quality. In other words, inferences of intrinsic motivation based on endorsers' facial expressions are not tangential, but rather are a key predictor of anticipated service quality. PROCESS model 4 (Hayes 2018) with multicategorical independent variable confirmed the same results (see figure 5). Detailed mediation results are reported in web appendix B.

Discussion

Study 2b replicated the main effect of smiling with a simpler measure of inferred intrinsic motivation, providing stronger support to the key role of Duchenne-ness as compared to smile size. In addition, results suggested that the difference between large Duchenne smiles and small smiles was mainly driven by the positive inference from the former rather than the negative inference from the latter. Further, this study showed the influence of smiling on consumers' anticipated service quality. Consumers had more favorable expectation of the service quality and were more likely to hire the agent when they saw large Duchenne smiles relative to other conditions, which was fully mediated by the inference of intrinsic motivation.

STUDY 3: ENDORSERS STRATEGICALLY DISPLAY LARGER AND MORE DUCHENNE-LIKE SMILES TO SIGNAL INTRINSIC MOTIVATION

Communication is two-sided in nature. Studies 1 and 2 demonstrated that observers infer greater intrinsic motivation from an actor's larger and more Duchenne-like smiles. As discussed earlier, it is likely that actors themselves may intuit this relationship (since they are observers in other situations), and hence may strategically display larger and more Duchenne-like smiles if they want to signal their own intrinsic motivation to observers. Past literature has shown that people strategically disclose stated anger to condition their game counterpart's responses (e.g., the incentive function of social emotion, Andrade and Ho 2009). However, to our knowledge, no extant research has shown that people strategically display facially expressed emotion as a social signal about the finer nuances of the nature of their motivation (e.g., the informative function of social emotions). We test this possibility in studies 3 and 4. Similar to studies 1 and 2, study 3 used the context of customer testimonials. Unlike previous studies, here participants were asked to play the role of an endorser (i.e., motivation communicators), and asked to provide a headshot for their testimonials of the agent. We manipulated the endorser's motivation and hypothesized that endorsers who were given a goal to signal intrinsic motivation (vs. extrinsic motivation or no specific goal) would display larger and more Duchenne-like smiles in their headshots.

Method

Students from a major East Coast university ($N = 170$, 69% female, median age = 20) participated in the study for course credit. This study followed a single-factor between-subjects design, with endorser's motivation manipulated at three levels—intrinsic versus extrinsic versus control.

Stimulus Interface. We developed a computer program that allowed participants to take and submit headshots using the built-in cameras in computers in a behavioral lab. The interface of the program contained instructions, a

camera view area, three buttons ("Take," "Delete & Reset," and "Submit") and a countdown timer. Within a specified time period, participants could take as many headshots as they wanted, but could ultimately submit only one. Upon arrival at the lab, participants first familiarized themselves with the program, completing a tutorial and submitting two practice headshots in a row. At the end of the tutorial, we asked them how easy or complicated this program was for them to use (1 = easy, 5 = complicated). Participants' responses were not different across motivation conditions ($M_{extrinsic} = 1.14$, $M_{control} = 1.14$, $M_{intrinsic} = 1.13$, $F(2, 167) = .03$, NS), and uniformly indicated high ease of use. After the tutorial, participants entered the main study named "Interaction Study."

Procedure. Participants imagined graduating and moving to another city to start a new job and new life, and asking a real estate agent to help them locate an apartment to rent. They were told that they found the agent to be very professional in helping them find an apartment. Six months had passed, and they were satisfied with this apartment, and they received an email from the agent asking for a favor. She was collecting photos of previous clients to promote her business. If they agreed to help, their photo and name would appear on the agent's website. Following this came the motivation manipulation, which was pretested (see web appendix C). In the control condition, participants read, "You decide to send a photo to the agent for her use." In the intrinsic motivation condition, participants read, "You decide to send a photo to the agent for her use. And you want potential clients who see your photo to believe that you really want to endorse this agent and have no reservation doing so." In the extrinsic motivation condition, participants read, "You decide to send a photo to the agent for her use. And you want potential clients who see your photo to believe that you feel an obligation to endorse this agent." Then participants saw the photo-taking program again and were asked to submit a headshot (the "Final Photo") within one minute. Within this minute, participants were given the option to take and retake as many photos as they wanted until they were satisfied with the one they had taken. The main response of interest was the smiling in the Final Photo, which was coded for analysis. Participants reported their gender and age, and were thanked and debriefed.

Results

Smiling. Following a manual (see web appendix A), two coders blind to hypotheses and conditions coded the Final Photos which participants submitted ostensibly for the agent's use. For each photo, coders rated two items that measured the size of the smile displayed in the photo (1 = There is no smile at all, 10 = There is a very intense smile), sincere happiness (1 = This person does not look sincerely happy at this moment, 10 = This person looks sincerely happy at this moment), and four items pertaining to facial muscle movements related to smiling (also on 10 point scales). Three of these were taken from Ekman and Friesen (1976, 1978)'s Facial Action Coding System—namely, pulling the corner of lips upward (zygomatic major), raising cheeks, and contracting the external corners of eyes (both belong to orbicularis oculi). Although Ekman and colleagues' research did not indicate that revealing one's teeth was a necessary element of enjoyment-related smiling, we included a question to test this as well.

Our main dependent variables were the coders' codes of the smiles in the Final Photo that participants submitted for the agent's use. The interrater reliability was high (ICC = .94) and disagreements were resolved by discussion. The six ratings of smiling (i.e., size of smile, sincere happiness, pulling lip corners, raising cheeks, contracting eye corners, revealing teeth), loaded on a single factor (72.51% variance explained), were averaged to form an overall index of smiling ($\alpha = .92$). Motivation condition significantly influenced smiling in the Final Photos ($F(2, 167) = 7.14$, $p < .01$, $\eta_p^2 = .08$), and the effect held when gender ($F(1, 164) = 5.98$, $p = .02$, $\eta_p^2 = .04$) and age ($F(1, 164) = .26$, $p = .61$, $\eta_p^2 < .01$) were controlled for ($F(2, 164) = 7.61$, $p < .01$, $\eta_p^2 = .09$; one participant did not report age, reducing the degrees of freedom by one). Specifically, endorsers in the intrinsic motivation condition ($M = 4.64$) displayed significantly larger and more Duchenne-like smiles than endorsers in the control ($M = 3.19$, $t(167) = 3.69$, $p < .01$, $d = .72$) or extrinsic motivation condition ($M = 3.63$, $t(167) = 2.57$, $p = .01$, $d = .47$). The control and extrinsic motivation conditions did not differ ($t(167) = -1.12$, $p = .26$, $d = .21$). This pattern held robustly when analyses were performed separately on size of smile, sincere happiness, pulling of lip corners, and raising cheeks (all omnibus effects at Fs = 4.05 ~ 7.22, ps = .001~ .019, $\eta_p^2 = .05 \sim .08$; see table 1 for planned contrasts). As a slight exception, contraction of the external corners of the eyes was only marginally greater in the intrinsic motivation ($M_{intrinsic} = 2.57$) than the extrinsic motivation condition ($M_{extrinsic} = 2.04$, $t(167) = 1.74$, $p = .08$, $d = .30$). This indicates that although actors who wished to signal intrinsic motivation tried to simulate Duchenne smiles and were able to achieve it partially by raising cheeks, it was apparently challenging to simulate it perfectly by also contacting the corners of their eyes (Ekman 1993). This challenge constitutes one of the reasons why Duchenne smiles remain largely reliable signals in the eyes of observers. It is worth noting that these results represented full support instead of partial support to hypothesis 3. Because Duchenne-ness is marked by the movement of the orbicularis oculi muscle, either raising cheeks (the medial part of orbicularis oculi) or contracting the external corners of the eyes (the lateral part of orbicularis oculi) means the smile is Duchenne-like.

TABLE 1

RATING OF THE FINAL PHOTO AS A FUNCTION OF ENDORSERS' MOTIVATION (STUDY 3)

	Extrinsic motivation	Control	Intrinsic motivation
Size of smile	4.74 (.39)[a]	4.07 (.33)[a]	5.79 (.33)[b]
Sincere happiness	4.18 (.38)[c]	3.70 (.34)[c]	5.48 (.34)[d]
Pulling lip corners	3.11 (.29)[e]	3.28 (.32)[e]	4.27 (.32)[f]
Raising cheeks	3.51 (.35)[g]	3.12 (.31)[g]	4.88 (.37)[h]
Contracting eye corners	2.04 (.21)[i*]	1.70 (.18)[i]	2.57 (.26)[j*]
Revealing teeth	4.23 (.41)[k*]	3.28 (.33)[l*]	4.86 (.40)[k]

NOTES.—Standard errors appear in parentheses.

Different superscripts indicate that the differences are significant at the 95% confidence level. The only exceptions are that contraction of eye corners is marginally different between the intrinsic and extrinsic motivation conditions, and the revelation of teeth is marginally different between the extrinsic motivation and control conditions.

Interestingly, the pattern on revealing teeth (our indicator) was somewhat different. Although endorsers in the intrinsic motivation condition revealed their teeth to a greater extent than those in the control condition ($M_{control} = 3.28$, $M_{intrinsic} = 4.86$, $t(167) = 2.92$, $p < .01$, $d = .58$), they did not do so more than those in the extrinsic motivation condition ($M_{extrinsic} = 4.23$, $t(167) = 1.17$, $p = .25$, $d = 21$). This supports Ekman et al.'s (1990) theory in that revealing teeth need not be a necessary element of Duchenne smiling.

STUDY 4: KICKSTARTERS STRATEGICALLY CHOOSE PROFILE PHOTOS WITH LARGER AND MORE DUCHENNE-LIKE SMILES TO SIGNAL INTRINSIC MOTIVATION

The aim of study 4 was to replicate the study 3 results demonstrating that individuals can use large Duchenne smiles to signal internal motivation states, with a different, more subtle manipulation of motivation. We also tested our hypothesis in another business context where the concern of intrinsic motivation matters—namely, that of entrepreneurs seeking funding from possible backers. More importantly, although participants who assumed intrinsic motivation displayed larger and more Duchenne-like smiles in study 3, it was unclear whether they did so consciously or unconsciously. Study 4 was designed to provide direct evidence regarding the consciousness of actors' behavior. Specifically, we manipulated the nature of motivation and asked participants (who played the role of Kickstarters) to choose between a profile photo featuring a large Duchenne smile and one featuring a small smile, to upload. We then asked them to explain their choice in an open-ended question. Our prediction was that participants who were asked to signal intrinsic motivation (vs. extrinsic motivation or no specific motivation) would be more likely to choose the profile photo with the large Duchenne smile, and they would be more likely to consciously explain their choice as being because large (Duchenne) smiles signal intrinsic motivation. Consequently, the open-ended explanations should mediate the effect of motivation on choice. In this study, participants were asked to choose among photos of another individual rather than to take photos of themselves, and specifically to choose the photo (with varying smiles) that best reflected an actor's intended motivational state.

Method

One hundred twenty US citizens (59% female, median age = 33) were recruited on MTurk to participate in a short study in return for $0.40. This study followed a 3 (Motivation: intrinsic vs. extrinsic vs. control) × 2 (Photo order counterbalancing: large Duchenne smile on the left vs. large Duchenne smile on the right) between-subjects design. Participants first read a brief description of Kickstarter.com. They were told that Kickstarter.com is a crowdfunding website on which individuals introduce themselves and their business ideas and ask for investments from the public. They were reminded that every investment was to some extent risky, and investors should examine the information on a business owner's Kickstarter page to decide whether it is worth investing in. We then described Barbara, an entrepreneur who makes mobile apps and wants to raise money on Kickstarter.com. As part of setting up her profile, Barbara needs to upload a profile photo. In the control condition, participants read, "Imagine that you are Barbara. Now please choose a photo to upload." Two headshots of Barbara (stimuli from study 1) were presented side-by-side, one displaying a small smile and the other a large Duchenne smile. The order of the two headshots was counterbalanced. All participants saw the same pair of photos and were asked to make the choice, except that in the intrinsic [extrinsic] motivation condition participants read, "Imagine that you are Barbara. You want to signal to potential investors that you are highly motivated to work on your apps because you genuinely want to make great apps [because you want to make a lot of money for yourself and your investors]. Now please choose a photo to upload." Participants chose one profile photo of the two, explained their choice in an open-ended question, and reported their gender and age.

Results

Choice of Photo. Three dummy variables were generated for analysis (Extrinsic = 0 or 1; Control = 0 or 1; Intrinsic = 0 or 1). First, a binary logistic regression was performed on photo choice (0 = small smile headshot, 1 = large Duchenne smile headshot) with five

predictors: Control, Extrinsic, Order (0 = large smile on the left, 1 = large smile on the right), Control × Order, and Extrinsic × Order. Order had no interactive effects (Wald's (1) < 1.35, *p*s > .25); hence, we collapsed the data across order conditions for the following analysis. The likelihood of choosing the large Duchenne smile headshot was significantly different across motivation conditions (χ^2 (2) = 9.29, $p < .01$, $\phi = .28$). Pairwise comparisons were performed with two logistic regressions. First, choice was regressed on Control and Extrinsic. Participants were more likely to choose the large Duchenne smile headshot as Barbara's profile photo if they were given the goal to signal her intrinsic motivation ($M = 82.5\%$) than extrinsic motivation ($M = 51.2\%$, B = –1.50, SE = .52, Wald (1) = 8.33, $p < .01$, Exp (B) = .22, 95% CI [.08, .62]) or in the control condition ($M = 59.0\%$, B = –1.19, SE = .53, Wald (1) = 5.05, $p = .03$, Exp (B) = .31, 95% CI [.11, .86]). Second, choice was regressed on Intrinsic and Extrinsic. The extrinsic motivation and control conditions were not different from each other (B = –.31, SE = .45, Wald (1) = .49, $p = .49$, Exp (B) = .73, 95% CI [.30, 1.77]) in terms of choice of photo. Neither gender nor age influenced choice and the above effects held robustly when gender (B = –.13, SE = .41, Wald (1) = .10, NS, Exp (B) = .88, 95% CI [.39, 1.99]) and age (B = –.02, SE = .02, Wald (1) = 2.21, NS, Exp (B) = .98, 95% CI [.95, 1.01]) were statistically controlled for (extrinsic vs. intrinsic, B = –1.54, SE = .53, Wald (1) = 8.43, $p < .01$, Exp (B) = .21, 95% CI [.08, .61]; control vs. intrinsic, B = –1.13, SE = .53, Wald (1) = 4.46, $p < .05$, Exp (B) = .32, 95% CI [.11, .92]).

Evidence for Signaling. Two coders blind to motivation conditions coded the open-ended explanations of photo choice to a dummy variable named "signaling." They were instructed that signaling should be coded as 1 if participants articulated that they chose the large smile because it signaled Barbara was passionate, enthusiastic, genuine, motivated about her business, and/or enjoyed what she did (i.e., was intrinsically motivated), and 0 otherwise. Sample explanations included, "I love her smile. It makes her look like she enjoys what she does," "I like this photo because it looks like Barbara is excited about her work; she seems highly motivated to do a good job," and "She looks happy and enthusiastic which means maybe she has the enthusiasm needed to kickstart a great business." The two coders showed high interrater reliability (ICC = .92) and disagreements were resolved by discussion. Signaling was regressed on Control and Extrinsic. Participants given a goal to signal intrinsic motivation were more likely than those in the extrinsic motivation (B = –1.25, SE = .55, Wald (1) = 5.20, $p = .02$, Exp (B) = .29, 95% CI [.10, .84]) or control condition (B = –1.66, SE = .62, Wald (1) = 7.14, $p < .01$, Exp (B) = .19, 95% CI [.06, .64]) to consciously explain their choice as because large Duchenne smiles signal intrinsic motivation. Next, smile choice was regressed on Control, Extrinsic, and signaling. Signaling significantly predicted smile choice (B = 2.74, SE = 1.05, Wald (1) = 6.77, $p < .01$, Exp (B) = 15.46, 95% CI [1.96, 121.68]), while the effect of Control (B = –.82, SE = .55, Wald (1) = 2.19, $p = .14$; Exp (B) = .44, 95% CI [.15, 1.31]) and Extrinsic (B = –1.25, SE = .55, Wald (1) = 5.16, $p = .02$, Exp (B) = .29, 95% CI [.10, .84]) became either nonsignificant or less significant than before, indicating mediation effects.

Discussion

Study 4 replicated the pattern observed in study 3 in a different setting with a different task. Participants who role-played Kickstarter entrepreneurs were more likely to choose a large Duchenne (vs. small) smile profile photo for their crowdfunding web page, if they had a goal to signal intrinsic motivation (vs. extrinsic motivation vs. control) in their businesses. Importantly, open-ended explanations provided direct evidence that communicators did so consciously and strategically. It is possible that not all participants who strategically relied upon the smile to signal intrinsic motivation provided a written answer indicating so. As a result, our open-ended question had modest power in capturing the true degree of strategic signaling. Therefore, we believe the above mediation analysis was a conservative test. Even so, we found that participants consciously mentioned that they strategically used smiles to signal intrinsic motivation and their explanations at least partially mediated the effect of signaling goal on choice of smile.

Wang et al. (2017) found that Kickstarter projects with broad (vs. slight) smiles in the project creators' profile photos attracted fewer funds in total, and they speculated this was because Kickstarters' broad smiles signaled low competence. A closer examination of their findings reveals that Kickstarters with broad smiles drew disproportionally fewer large-scale contributions, and a relatively greater number of small-scale contributions. We believe their results are in line with ours, in that people use smile size to infer intrinsic motivation only when there is ambiguity. If we make the not-unreasonable assumption that people who make large contributions are more experienced investors, whereas those who make small contributions are small investors, these results align with ours. For the less experienced, small-scale retail investors, the Kickstarter investment domain is likely somewhat ambiguous. For them, larger smiles have a positive effect—probably by signaling intrinsic motivation. However, for the more professional, large-ticket investors, large smiles have the opposite effect. This is because the situation is not ambiguous for these people, and hence inferences of low competence dominate. We leave the question of when inferences of motivation and competence reinforce versus conflict with each other to future research.

GENERAL DISCUSSION

Summary of Findings

This research demonstrates that when the nature of an actor's motivation is ambiguous, observers infer greater intrinsic motivation from the actors' larger and more Duchenne-like smiles, and, correspondingly, actors strategically display larger and more Duchenne-like smiles if they want to signal intrinsic motivation to observers. In study 1, when ambiguity about endorsers' motivation was primed, participants inferred greater intrinsic motivation underlying the testimonials if they saw endorsers displaying large Duchenne smiles compared to small smiles. Such inferences disappeared when ambiguity of motivation was not primed. Study 2a decomposed the sizes of smiles and their Duchenne-ness by adding a large non-Duchenne smile condition. Results suggested that in order for smiling to signal intrinsic motivation, size alone is not enough; the Duchenne feature is necessary. Study 2b replicated these findings and showed that the effect was mainly driven by positive inferences from large Duchenne smiles. This study also demonstrated the consequences of smiling on anticipated service quality, mediated by inferred intrinsic motivation. In study 3, participants who role-played endorsers submitted headshots with larger and more Duchenne-like smiles if they were given a goal to signal intrinsic (vs. extrinsic or no specific) motivation. Similarly, in study 4, participants who role-played entrepreneurs chose a larger and more Duchenne-like smile profile photo for their crowdfunding web page if they were given a goal to signal intrinsic (vs. extrinsic or no specific) motivation. Open-ended explanations of their choice revealed that they did so consciously and strategically.

Theoretical Contributions

The current research makes several contributions. First, we contribute to the emotion literature by supporting and extending the social functional view of human emotions. This emerging stream of research has shown that other people's emotions signal not only their affective state, but also their traits (Feinberg et al. 2012; Harker and Keltner 2001; Wang et al. 2017), attitudes (Ames and Johar 2009), and expectations (Van Kleef et al. 2006). The current research, for the first time, shows that other people's emotions (e.g., enjoyment) signal the fine nuances of their nature of motivation (e.g., intrinsic motivation). Second, limited experimental research has directly tested whether actors proactively and strategically display certain emotion to observers during social interactions, though qualitative research has suggested this is so (Fitness 2000; Sutton 1991). Among the very few, Andrade and Ho (2009) showed that people faked verbally stated negative emotions (e.g., anger) in the current round of a game to condition their game counterpart's response in the next round. The current study extends this research by showing that communicators strategically display facially expressed positive emotion (e.g., enjoyment) to signal a fine internal state (e.g., intrinsic motivation) to potential observers (study 3 and study 4). Thirdly, Van Kleef et al. (2011) found that context-specific discrete emotions (e.g., happy vs. anger; guilt vs. disappointment) signaled social information. The current research shows that the detailed features of a single affective facial expression (e.g., the size and Ducheness of smiling) can also signal fine social information (Wang et al. 2017).

The current research focuses on facial expression of emotions rather than stated emotions, an area less studied in the consumer behavior literature. We believe, however, that facial expressions of emotion are important because they are readily visible to others, and the leakage in facial expressions is often more diagnostic than in verbally claimed emotions (Ekman 1993). Ekman and colleagues found that a Duchenne smile signals true enjoyment, but that the absence of the Duchenne marker signals otherwise (Ekman et al. 1990). However, the current research differs from Ekman's research. While extant Duchenne smile research focuses on mapping context-independent generic facial expressions (e.g., smile) with emotional states (e.g., enjoyment), the current research focuses on the relationship between a context-dependent emotional state (i.e., enjoyment as reflected by large Duchenne smile) and motivation for engaging in an activity (e.g., intrinsic motivation).

Our findings are robust across cultures (Asian sample in study 1 and Western samples in studies 2–4). This is consistent with previous research that shows that the basic emotions have unique facial configurations and are universally recognized across cultures (Ekman and Friesen 1971; Ekman et al. 1969; Ekman et al. 1987; Elfenbein and Ambady 2002). Extending previous research, we also find that the relationship between smiling and inferences of intrinsic motivation is shared by both Eastern and Western cultures.

Last but not least, this research contributes to the intrinsic motivation literature. Much research has focused on how a person's intrinsic motivation influences their own performance (see reviews by Ryan and Deci 2000a, 2000b), and what factors foster or undermine a person's own intrinsic motivation, such as rewards (Deci et al. 1999) or autonomy (Patall, Cooper, and Robinson 2008). However, the interpersonal role of intrinsic motivation has usually been overlooked. While other people's intrinsic motivation is often appreciated (Fuchs et al. 2015; Pelletier and Vallerand 1996; Yoon et al. 2006) and can be used to predict relationship performance (Jones and Davis 1965), effectively assessing it can be challenging because it is a fine internal state. The current research takes this interpersonal angle and examines intrinsic motivation as important social information. In so doing, it establishes that intrinsic motivation can be communicated between actors and observers via contextualized facial expressions.

Limitations and Boundary of Investigation

Extrinsic Motivation. Although extrinsic motivation has traditionally been conceptualized against intrinsic motivation in the literature, it is defined more broadly than intrinsic motivation. Self-Determination Theory further divides extrinsic motivation into several subcategories that span along a spectrum—External Regulation, Introjected Regulation, Identified Regulation, and Integrated Regulation—with each being more similar to intrinsic motivation than the former (Ryan and Deci 2000a, 72). Due to the multifaceted nature of extrinsic motivation, different extrinsic motives may be associated with different emotional responses, and the relationship between smiling and extrinsic motivation is not obvious. Indeed, in studies 1 and 2, we found a systematic relationship between smiling and intrinsic motivation inference but not between smiling and extrinsic motivation inference. Future research should examine these gradations in extrinsic motivation to glean insight about how smiles, or other outward social expressions, can be used to infer or signal the nuanced nature of the underlying motivational state.

Actors and Observers. A person can be an actor at one time and an observer at another time. If this person strategically displays larger and more Duchenne-like smiles as an actor, why does she not correct her inference when she is an observer? There are a few possible reasons. First, we found actors displayed *relatively* larger and more Duchenne-like smiles when they wanted to signal intrinsic motivation than extrinsic or no specific motivation. However, their deliberate Duchenne smiles to signal intrinsic motivation may still be far from perfect when it comes to fooling observers. According to Ekman (1993), orbicularis oculi, the muscle orbiting the eyes, has two parts. Most people can deliberately contract the medial part (e.g., raising cheeks) but not the lateral part (e.g., contracting eye corners). Indeed, study 3 showed the effect of motivation conditions was significant on pulling lip corners and raising cheeks, but only marginal on contracting eye corners. Because most people cannot perfectly fake Duchenne smiles, Duchenne smiles remain a largely reliable and diagnostic signal for observers.

Secondly, though faked Duchenne smiles may be achievable for certain people, such as professional performers (Ekman and Friesen 1982), research indicates it is still very difficult and costly to manipulate, and observers are likely aware of such cost. Even certified facial action coders who went through extensive training admitted lower controllability over orbicularis oculi than other facial muscles (Mehu et al. 2012). Much research on animal and human behavior posits that costliness of a signal is associated with its diagnosticity in the eyes of observers (Bradbury and Vehrencamp 1998; Zahavi and Zahavi 1997; here costliness means the difficulty in generating a signal). Therefore, the usefulness of Duchenne smiles cannot be fully discounted simply because a minority of people can perform it with substantial effort. It is also possible that observers' inferences observed in this research were already discounted. Were there no discounting, the effects may have been even stronger.

Thirdly, certain social cognitive biases may prevent observers from discounting the influence of large Duchenne smile. Fundamental attribution error research posits that observers tend to trust that what people do reflects who they really are (Jones and Harris 1967). As a result, they are likely to assume a Duchenne-like smile reflects an expresser's true emotional state rather than being strategically made. Egocentric bias also predicts that people are overly confident in their judgments (Chambers and Windschitl 2004). Hence, observers may believe they can beat the odds in distinguishing deliberate Duchenne smiles from spontaneous Duchenne smiles, even though they are not as good as they think.

Finally, strategic displays are not necessarily deceptive or insincere. A Kickstarter may be truly intrinsically motivated, and she just wants to successfully communicate this to her potential investors by carefully selecting a large Duchenne smile photo. In such cases, even though the display is strategic and deliberate, it is a sincere reflection of the nature of her motivation. This is consistent with the notion that self-representation is not equivalent to deception (DePaulo 1992). As DePaulo (1992) put it, "It would be neither desirable nor useful to have a social system in which anyone could successfully claim any image at any time. Nor would it do to have a system in which no one could ever succeed at conveying anything other than their genuine feelings. As it is, it appears that people can succeed in claiming nonverbally many, though not all [. . .] There is much potential, throughout the life-span, for all interactants to develop and refine their abilities to regulate their own nonverbal behaviors and to discern others' attempts to do the same. This is part of the richness, flexibility, and intrigue of social life."

Alternative Constructs to Intrinsic Motivation. Is it possible that compared to small smiles, larger Duchenne smiles signal certain desirable traits or induce positive moods, which spill over to any subsequent judgments due to a halo effect (Nisbett and Wilson 1977), including intrinsic motivation inferences? In the present research, study 1 showed the effect of smile type was moderated by the ambiguity of the nature of motivation. If trait inferences or mood effects were more relevant than motivation inferences, we should not have seen this moderation by ambiguity of motivation. Further, we also find the effects hold robustly when mood, liking of the endorsers, and liking of the web design were statistically controlled for.

What is the relationship between intrinsic motivation and terms such as sincerity and genuineness? It is worth noting that when the extant literature shows "Duchenne smiles are perceived as more genuine/sincere than non-

Duchenne smiles," it mostly refers to the genuineness or authenticity of the happy emotional state, not intrinsic motivation. In other words, the Duchenne smile literature has been focused on the relationship between Duchenne smiles and (sincere) enjoyment, but not the intrinsic motivation underlying a particular activity. Hence, this research offers a meaningful extension to the Duchenne smile literature, linking it directly to inferences regarding motivation. In daily colloquial terms, people might sometimes use genuineness or sincerity to refer to intrinsic motivation. Indeed, we replicated the main findings in study 2b with a more colloquial measure of intrinsic motivation.

Boundary Conditions for Actors' Smiling. Our findings do not imply that it is always desirable for actors to display large Duchenne smiles. There are norms regarding what emotions should be felt or displayed in certain circumstances (Shields 2005). For example, large smiles may not be appropriate for funeral directors, no matter how strong their intrinsic motivation may be. Certain emotion norms are not only context-dependent but also culture-specific (Ekman 1993). For example, Japanese and American participants showed similar negative facial expressions while watching an unpleasant film alone. However, Japanese participants masked their negative expressions more than Americans with the semblance of smile when an authority figure was present (Ekman 1972; Friesen 1973). Further, large smiles may signal lower competence than small smiles (Wang et al. 2017); hence, actors may want to display small smiles when competence is more important than intrinsic motivation (e.g., for fund managers). There are of course many factors that jointly determine whether actors will display large Duchenne smiles, including emotion norms and the concern for competence. Our findings suggest that all else held constant, those who wish to signal intrinsic rather than extrinsic motivation are *more likely* to display larger and more Duchenne-like smiles. In other words, emotion norms or the goal to signal competence are more likely to be a boundary condition of whether people *will* display large Duchenne smiles, rather than a boundary condition of whether large Duchenne smiles *signal* intrinsic motivation. Does our finding hold when the large Duchenne smile comes from a salesperson instead of a customer? We conducted seven studies (see web appendix D) with a 2 (Smile type: large Duchenne vs. small) × 2 (Source of smile: another customer vs. a salesperson) between-subjects design. A meta-analysis revealed a positive main effect of large Duchenne smiles and a negative main effect of salesperson. However, there was no interaction, and hence the effect of large Duchenne smiles prevailed even in this context.

Future Research

Future research can be taken in many interesting directions. First, the characteristics of a smile can be studied in more detail. Apart from smile size and facial muscle classification, timing and duration also differ between enjoyment and nonenjoyment smiles. For example, Ekman and Friesen (1982) hypothesize that posed smiles appear either too early or too late compared to felt smiles. While felt smiles seldom last for more than four seconds, posed smiles may last longer. Apart from facial expressions, other nonverbal behaviors are also shown to leak emotional states, including head movement, body movement, and vocal cues other than words (DePaulo 1992; Ekman and Friesen 1967). Because prior research using video stimuli replicated the relationship between Duchenne smiles and authentic enjoyment (Frank et al. 1993; Krumhuber and Manstead 2009), future research may also use videos rather than static pictures to study the relationship between motivation inferences and a broader range of facial features and other nonverbal behaviors. Limited research has directly compared static smiles with videotaped smiles. Krumhuber and Manstead (2009, experiment 4) converted videotaped smiles into a sequence of static images with a mask between each frame. They found that presentation mode affected observers' ability to distinguish spontaneous Duchenne smiles from deliberate Duchenne smiles. However, presentation mode did not affect observers' ability to distinguish Duchenne smiles from non-Duchenne smiles. Therefore, we hesitate to predict whether the relationship between large Duchenne smiles and inferred intrinsic motivation would be stronger or weaker as a result of using videos. We suspect our findings might occur more strongly with videos, if other verbal and nonverbal information is congruent with smiling and not overly distracting. However, if observers receive inconsistent information or too much irrelevant information from videos, the effects could be weakened.

Besides positive emotions, negative emotions may also signal one's motivation. For example, different negative emotions may signal different subcategories of extrinsic motivation (Ryan and Deci 2000a). Whereas anxiety after failure may signal external regulation (e.g., motivated by avoidance of punishment), disappointment after failure may signal identified or integrated regulation (e.g., motivated by achievement). Does negative emotion signal intrinsic motivation, as people sometimes display serious faces when they are intrinsically motivated (e.g., a dedicated artist)? We believe that in most contexts, the "smiling–intrinsic motivation" association is stronger than the "serious face–intrinsic motivation" association. Indeed, in studies 3 and 4, actors who had total freedom in displaying emotions chose to display large Duchenne smiles if they wanted to signal intrinsic motivation. If the "serious face–intrinsic motivation" association was stronger, these participants should have displayed serious faces. Future research may explore contexts in which serious faces may more strongly indicate intrinsic motivation.

Finally, future research may examine whether characteristics of the observers may moderate their inference

making. For example, studies 2a and 2b found relatively weaker effects among elite business school students than the general public, suggesting the possible moderating role of skepticism or critical thinking. Other possible moderators include emotional intelligence (Salovey and Grewal 2005) and lay theories about emotions (Labroo and Mukhopadhyay 2009).

Managerial Implications

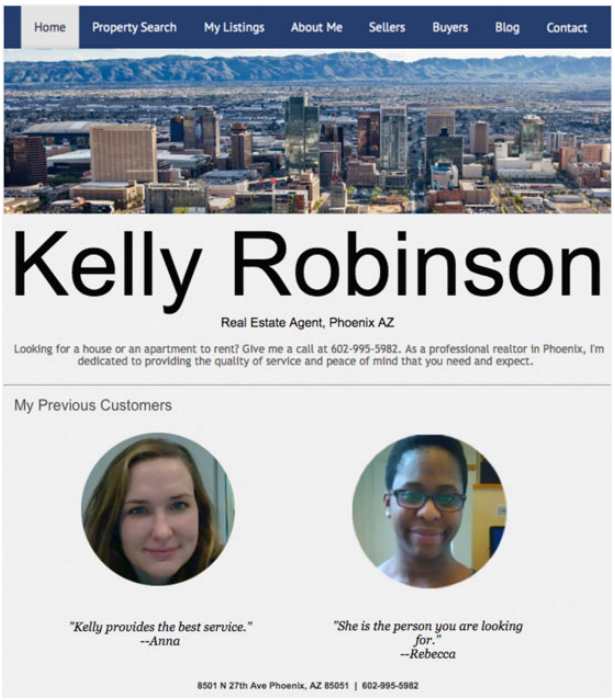
The current research also offers important managerial implications. There are many situations in which consumers have concerns regarding the intrinsic motivation of a marketing communication or business activity (e.g., customer testimonials, venture investment, salesmen's compliment, corporate social responsibility). Our findings suggest that firms can alleviate this concern by using large Duchenne smiles to signal intrinsic motivation. For example, it is well established that persuasion knowledge influences responses to marketing communication (Campbell and Kirmani 2000), but not much is known about solutions to this problem. Studies 1 and 2 showed that when there is ambiguity about the nature of motivation underlying customer testimonials, larger Duchenne smiles of the endorsers effectively communicate intrinsic motivation. Moreover, endorsers seemed to know this relationship and strategically displayed larger and more Duchenne-like smiles if they wanted to signal intrinsic motivation. Similarly, an entrepreneur who wanted to signal her intrinsic motivation for working on her startup may want to use a large Duchenne smile profile photo for fundraising, at least for novice investors. Firms who want to recruit talent may want to display very happy faces of their existing employees in the recruitment advertisements. Human faces are heavily utilized in marketing communications, and most facial expressions are easy to manipulate. Marketers can leverage our findings and facilitate their marketing communication by experimenting with the smiles portrayed in ads and by salespeople.

DATA COLLECTION INFORMATION

The first author collected data for study 1 at the HKUST Business School Behavioral Lab in April of 2016. The first and the third authors supervised the collection of data for study 2a by research assistants at the Wharton Behavioral Lab in January 2017. The first author collected data for study 2b using Amazon Mechanical Turk in July 2018. The first and the third authors supervised the collection and coding of data for study 3 by research assistants at the Wharton Behavioral Lab in March 2015. The first author collected data for study 4 using Amazon Mechanical Turk in April 2016 and supervised the coding of data by HKUST research assistants. The first author analyzed all the data.

APPENDIX A: STUDY 1 STIMULI

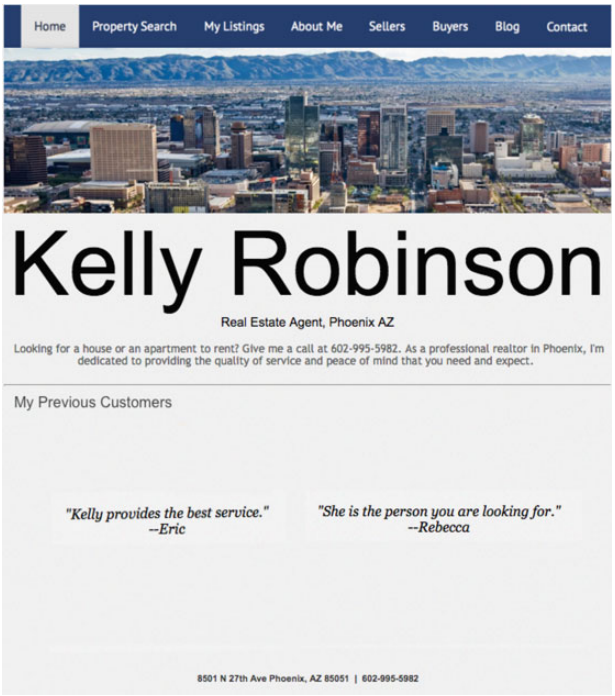
Small smile condition



Large Duchenne smile condition

APPENDIX B: STUDY 2A AND STUDY 2B STIMULI

No photo condition



Small smile condition

Large non-Duchenne smile condition

Large Duchenne smile condition

REFERENCES

Ames, Daniel R. and Gita V. Johar (2009), "I'll Know What You're like When I See How You Feel: How and When Affective Displays Influence Behavior-based Impressions," *Psychological Science*, 20 (5), 586–93.

Andrade, Eduardo B. and Teck-Hua Ho (2009), "Gaming Emotions in Social Interactions," *Journal of Consumer Research*, 36 (4), 539–52.

Barasch, Alixandra, Emma E. Levine, Jonathan Z. Berman, and Deborah A. Small (2014), "Selfish or Selfless? On the Signal Value of Emotion in Altruistic Behavior," *Journal of Personality and Social Psychology*, 107 (3), 393–413.

Bradbury, Jack W. and Sandra L. Vehrencamp (1998), *Principles of Animal Communication*, Sunderland, MA: Sinauer Associates.

Campbell, Margaret and Amna Kirmani (2000), "Consumers' Use of Persuasion Knowledge: The Effects of Accessibility and Cognitive Capacity on Perceptions of an Influence Agent," *Journal of Consumer Research*, 27 (1), 69–83.

Chambers, John R. and Paul D. Windschitl (2004), "Biases in Social Comparative Judgments: The Role of Nonmotivated Factors in Above-Average and Comparative-Optimism Effects," *Psychological Bulletin*, 130 (5), 813–38.

Darwin, Charles R. (1872), *The Expression of the Emotions in Man and Animals*, London: John Murray.

Deci, Edward L. (1975), *Intrinsic Motivation*, New York: Plenum.

Deci, Edward L., Carl Benware, and David Landy (1974), "The Attribution of Motivation as a Function of Output and Rewards," *Journal of Personality*, 42 (4), 652–67.

Deci, Edward L., Richard Koestner, and Richard M. Ryan (1999), "A Meta-Analytic Review of Experiments Examining the Effects of Extrinsic Rewards on Intrinsic Motivation," *Psychological Bulletin*, 125 (6), 627–68.

Deci, Edward L. and Richard M. Ryan (1991), "A Motivational Approach to Self: Integration in Personality," in *Nebraska Symposium on Motivation, Vol. 38*, ed. R. A. Dienstbier, Lincoln: University of Nebraska Press, 237–88.

—— (1995), "Human Autonomy: The Basis for True Self-Esteem," in *Efficacy, Agency, and Self-Esteem*, ed. Michael H. Kernis, New York: Plenum, 31–49.

DePaulo, Bella M. (1992), "Nonverbal Behavior and Self-Presentation," *Psychological Bulletin*, 111 (2), 203–43.

DeVellis, Robert F. (2012), *Scale Development: Theory and Applications*, Los Angeles: Sage.

Ekman, Paul (1972), "Universals and Cultural Differences in Facial Expressions of Emotion," in *Nebraska Symposium on Motivation, Vol. 19*, ed. James K. Cole, Lincoln: University of Nebraska Press, 207–83.

—— (1992), "An Argument for Basic Emotions," *Cognition and Emotion*, 6 (3–4), 169–200.

—— (1993), "Facial Expression and Emotion," *American Psychologist*, 48 (4), 384–92.

Ekman, Paul, Richard J. Davidson, and Wallace V. Friesen (1990), "The Duchenne Smile: Emotional Expression and Brain Physiology II," *Journal of Personality and Social Psychology*, 58 (2), 342–53.

Ekman, Paul and Wallace V. Friesen (1967), "Head and Body Cues in the Judgment of Emotion: A Reformulation," *Perceptual and Motor Skills*, 24 (3), 711–24.

—— (1971), "Constants across Cultures in the Face and Emotion," *Journal of Personality and Social Psychology*, 17 (2), 124–9.

—— (1976), "Measuring Facial Movement," *Environmental Psychology and Nonverbal Behavior*, 1 (1), 56–75.

—— (1978), *The Facial Action Coding System*, Palo Alto, CA: Consulting Psychologists Press.

—— (1982), "Felt, False, and Miserable Smiles," *Journal of Nonverbal Behavior*, 6 (4), 238–52.

Ekman, Paul, Wallace V. Friesen, Maureen O'Sullivan, Anthony Chan, Irene Diacoyanni-Tarlatzis, Karl Heider, Rainer Krause, William Ayhan LeCompte et al. (1987), "Universals and Cultural Differences in the Judgments of Facial Expressions of Emotion," *Journal of Personality and Social Psychology*, 53 (4), 712–7.

Ekman, Paul, E. Richard Sorenson, and William V. Friesen (1969), "Pan-Cultural Elements in Facial Displays of Emotion," *Science*, 164 (3875), 86–8.

Elfenbein, Hillary Anger, and Nalini Ambady (2002), "On the Universality and Cultural Specificity of Emotion Recognition: A Meta-Analysis," *Psychological Bulletin*, 128 (2), 203.

Feinberg, Matthew, Robb Willer, and Dacher Keltner (2012), "Flustered and Faithful: Embarrassment as a Signal of Prosociality," *Journal of Personality and Social Psychology*, 102 (1), 81–97.

Fitness, Julie (2000), "Anger in the Workplace: An Emotion Script Approach to Anger Episodes between Workers and Their Superiors, Co-Workers and Subordinates," *Journal of Organizational Behavior*, 21 (2), 147–62.

Frank, Mark G., Paul Ekman, and Wallace V. Friesen (1993), "Behavioral Markers and Recognizability of the Smile of Enjoyment," *Journal of Personality and Social Psychology*, 64 (1), 83–93.

Friesen, Wallace V. (1973), "Cultural Differences in Facial Expressions in a Social Situation: An Experimental Test on the Concept of Display Rules," *Dissertation Abstracts International*, 33 (8-B), 3976–7.

Fuchs, Christoph, Martin Schreier, and Stijn M. J. van Osselaer (2015), "The Handmade Effect: What's Love Got to Do with It?" *Journal of Marketing*, 79 (2), 98–110.

Gneezy, Uri and Alex Imas (2014), "Materazzi Effect and the Strategic Use of Anger in Competitive Interactions," *Proceedings of the National Academy of Sciences*, 111 (4), 1334–7

Gunnery, Sarah D., and Mollie A. Ruben (2016), "Perceptions of Duchenne and Non-Duchenne Smiles: A Meta-Analysis," *Cognition and Emotion*, 30 (3), 501–15.

Gunnery, Sarah D., Judith A. Hall, and Mollie A. Ruben (2013), "The Deliberate Duchenne Smile: Individual Differences in Expressive Control," *Journal of Nonverbal Behavior*, 37 (1), 29–41.

Hareli, Shlomo, Raveh Harush, Ramzi Suleiman, Michel Cossette, Stephanie Bergeron, Veronique Lavoie, Guillaume Dugay, and Ursula Hess (2009), "When Scowling May Be a Good Thing: The Influence of Anger Expressions on Credibility," *European Journal of Social Psychology*, 39 (4), 631–8.

Harker, LeeAnne and Dacher Keltner (2001), "Expressions of Positive Emotion in Women's College Yearbook Pictures and Their Relationship to Personality and Life Outcomes across Adulthood," *Journal of Personality and Social Psychology*, 80 (1), 112–24.

Hayes, Andrew F. (2018), *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-based Approach*, New York: Guilford.

Heath, Chip (1999), "On the Social Psychology of Agency Relationships: Lay Theories of Motivation Overemphasize Extrinsic Incentives," *Organizational Behavior and Human Decision Processes*, 78 (1), 25–62.

Isen, Alice M. and Johnmarshall Reeve (2005), "The Influence of Positive Affect on Intrinsic and Extrinsic Motivation: Facilitating Enjoyment of Play, Responsible Work Behavior, and Self-Control," *Motivation and Emotion*, 29 (4), 295–323.

Jones, Edward E. and Keith E. Davis (1965), "From Acts to Dispositions the Attribution Process in Person Perception," in *NA–Advances in Experimental Social Psychology, Vol. 2*, ed. Leonard Berkowitz, Cambridge, MA: Academic Press, 219–66.

Jones, Edward E. and Victor A. Harris (1967), "The Attribution of Attitudes," *Journal of Experimental Social Psychology*, 3 (1), 1–24.

Kasser, Tim and Richard M. Ryan (1993), "A Dark Side of the American Dream: Correlates of Financial Success as a Central Life Aspiration," *Journal of Personality and Social Psychology*, 65 (2), 410–22.

—— (1996), "Further Examining the American Dream: Differential Correlates of Intrinsic and Extrinsic Goals," *Personality and Social Psychology Bulletin*, 22 (3), 280–7.

Keltner, Dacher and Jonathan Haidt (1999), "Social Functions of Emotions at Four Levels of Analysis," *Cognition and Emotion*, 13 (5), 505–21.

Keltner, Dacher and Ann M. Kring (1998), "Emotion, Social Function, and Psychopathology," *Review of General Psychology*, 2 (3), 320–42.

Krumhuber, Eva G. and Antony S. Manstead (2009), "Can Duchenne Smiles Be Feigned? New Evidence on Felt and False Smiles," *Emotion*, 9 (6), 807–20.

Labroo, Aparna A. and Anirban Mukhopadhyay (2009), "Lay Theories of Emotion Transience and the Search for Happiness: A Fresh Perspective on Affect Regulation," *Journal of Consumer Research*, 36 (2), 242–54.

Lee, Daniel H., Joshua M. Susskind, and Adam K. Anderson (2013), "Social Transmission of the Sensory Benefits of Eye Widening in Fear Expressions," *Psychological Science*, 24 (6), 957–65.

Mehu, Marc, Marcello Mortillaro, Tanja Bänziger, and Klaus R. Scherer (2012), "Reliable Facial Muscle Activation Enhances Recognizability and Credibility of Emotional Expression," *Emotion*, 12 (4), 701–15.

Nisbett, Richard E. and Timothy D. Wilson (1977), "The Halo Effect: Evidence for Unconscious Alteration of Judgments," *Journal of Personality and Social Psychology*, 35 (4), 250–6.

Nix, Glen A., Richard M. Ryan, John B. Manly, and Edward L. Deci (1999), "Revitalization through Self-Regulation: The Effects of Autonomous and Controlled Motivation on Happiness and Vitality," *Journal of Experimental Social Psychology*, 35 (3), 266–84.

Patall, Erika A., Harris Cooper, and Jorgianne Civey Robinson (2008), "The Effects of Choice on Intrinsic Motivation and Related Outcomes: A Meta-Analysis of Research Findings," *Psychological Bulletin*, 134 (2), 270–300.

Pelletier, Luc G. and Robert J. Vallerand (1996), "Supervisors' Beliefs and Subordinates' Intrinsic Motivation: A Behavioral Confirmation Analysis," *Journal of Personality and Social Psychology*, 71 (2), 331–40.

Ryan, Richard M. and Edward L. Deci (2000a), "Self-Determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being," *American Psychologist*, 55 (1), 68.

—— (2000b), "Intrinsic and Extrinsic Motivations: Classic Definitions and New Directions," *Contemporary Educational Psychology*, 25 (1), 54–67.

Salovey, Peter and Daisy Grewal (2005), "The Science of Emotional Intelligence," *Current Directions in Psychological Science*, 14 (6), 281–5.

Schneider, David J., Albert H. Hastorf, and Phoebe Ellsworth (1979), *Person Perception*, Reading, MA: Addison-Wesley.

Schwarz, Norbert and Gerald L. Clore (1983), "Mood, Misattribution, and Judgments of Well-Being: Informative and Directive Functions of Affective States," *Journal of Personality and Social Psychology*, 45 (3), 513–23.

Sen, Sankar, C. B. Bhattacharya, and Daniel Korschun (2006), "The Role of Corporate Social Responsibility in Strengthening Multiple Stakeholder Relationships: A Field Experiment," *Journal of Academy of Marketing Science*, 34 (2), 158–66.

Sheldon, Kennon M., Richard M. Ryan, Laird J. Rawsthorne, and Barbara Ilardi (1997), "Trait Self and True Self: Cross-Role Variation in the Big-Five Personality Traits and Its Relations with Psychological Authenticity and Subjective Well-Being," *Journal of Personality and Social Psychology*, 73 (6), 1380–93.

Shields, Stephanie A. (2005), "The Politics of Emotion in Everyday Life: 'Appropriate' Emotion and Claims on Identity," *Review of General Psychology*, 9 (1), 3–15.

Small, Deborah A. and Nicole M. Verrochi (2009), "The Face of Need: Facial Emotion Expression on Charity Advertisements," *Journal of Marketing Research*, 46 (6), 777–87.

Sorce, James F., Robert N. Emde, Joseph Campos, and Mary D. Klinnert (1985), "Maternal Emotional Signaling: Its Effect on the Visual Cliff Behavior of 1-Year-Olds," *Developmental Psychology*, 21 (1), 195–200.

Sutton, Robert I. (1991), "Maintaining Norms about Expressed Emotions: The Case of Bill Collectors," *Administrative Science Quarterly*, 36 (2), 245–68.

Tracy, Jessica L., Daniel Randles, and Conor M. Steckler (2015), "The Nonverbal Communication of Emotions," *Current Opinion in Behavioral Sciences*, 3 (June), 25–30.

Van Kleef, Gerben A., Carsten K. W. De Dreu, and Antony S. R. Manstead (2004), "The Interpersonal Effects of Anger and Happiness in Negotiations," *Journal of Personality and Social Psychology*, 86 (1), 57–76.

—— (2006), "Supplication and Appeasement in Conflict and Negotiation: The Interpersonal Effects of Disappointment, Worry, Guilt, and Regret," *Journal of Personality and Social Psychology*, 91 (1), 124–42.

Van Kleef, Gerben A., Evert A. Van Doorn, Marc W. Heerdink, and Lukas F. Koning (2011), "Emotion Is for Influence," *European Review of Social Psychology*, 22 (1), 114–63.

Wang, Ze, Mao Huifang, Li Yexin Jessica, and Liu Fan (2017), "Smile Big or Not? Effects of Smile Intensity on Perceptions of Warmth and Competence," *Journal of Consumer Research*, 43 (5), 787–805.

Yoon, Yeosun, Zeynep Gürhan-Canli, and Norbert Schwarz (2006), "The Effect of Corporate Social Responsibility (CSR) Activities on Companies with Bad Reputations," *Journal of Consumer Psychology*, 16 (4), 377–90.

Zahavi, Amotz and Avishag Zahavi (1997), *The Handicap Principle: A Missing Part of Darwin's Puzzle*, Oxford, UK: Oxford University Press.