

A Winning Smile? Smile Intensity, Physical Dominance, and Fighter Performance

Michael W. Kraus
University of Illinois, Urbana–Champaign

Teh-Way David Chen
University of California, Berkeley

The smile is perhaps the most widely studied facial expression of emotion, and in this article we examine its status as a sign of physical dominance. We reason, on the basis of prior research, that prior to a physical confrontation, smiles are a nonverbal sign of reduced hostility and aggression, and thereby unintentionally communicate reduced physical dominance. Two studies provide evidence in support of this prediction: Study 1 found that professional fighters who smiled more in a prefight photograph taken facing their opponent performed more poorly during the fight in relation to their less intensely smiling counterparts. In Study 2, untrained observers judged a fighter as less hostile and aggressive, and thereby less physically dominant when the fighters' facial expression was manipulated to show a smiling expression in relation to the same fighter displaying a neutral expression. Discussion focused on the reasons why smiles are associated with decreased physical dominance.

Keywords: emotion, physical dominance, smiles, aggression

Supplemental materials: <http://dx.doi.org/10.1037/a0030745.supp>

War is a game played with a smiling face.—*Winston Churchill* (1943)

Expressions of emotion organize social life by communicating the intentions of the individuals who experience them (Frank, 1988; Keltner & Haidt, 2001; Keltner & Lerner, 2010). Of these expressions, perhaps the most widely studied is the smile (Ekman, 1992; Hall, Coats, & Smith LaBeau, 2005). Research indicates that smiles with differing morphological characteristics can have distinct meanings (e.g., Tracy & Robins, 2004; Ekman & Friesen, 1982), and are interpreted in different ways depending on the context in which they are expressed (Barrett, Mesquita, & Gendron, 2011; Gruber, Mauss, & Tamir, 2011; Mehu & Dunbar, 2008b).

In the present research, our primary goal was to better understand the meaning behind smiles that are expressed in dominance-relevant settings—prior to a physical confrontation. Drawing on the extensive smile literature and on recent advances in nonverbal expressions related to dominance (e.g., Tiedens & Fragale, 2003), we expected that smile intensity prior to a physical confrontation would unintentionally leak information about the reduced hostility and aggression of expressers, and thereby act as a sign of reduced

physical dominance. To test this overarching prediction, we examined the smile intensity of professional mixed martial artists one day prior to an actual fight.

The Meaning of a Smile

The smile can be a powerful predictor of both a person's current emotion experience (Ekman, Levenson, & Friesen, 1983; Tracy & Robins, 2004), and a host of downstream life outcomes (Bonanno & Keltner, 1997). In one classic example, participants who placed a pen in their teeth, causing the contraction of the muscles associated with genuine Duchenne smiles—the zygomatic major muscle that elevates the lips to form a smile, and the orbicularis oculi muscles that surround the eyes—reported that cartoons were more humorous than those who placed a pen in their lips, causing no facial muscle movement (Strack, Martin, & Stepper, 1988). More recently, high school students who exhibited more intense contraction of the muscles associated with smiling in their yearbook photos tended to report elevated subjective well-being years later in relation to those with less intense smiles (Harker & Keltner, 2001).

The above research is suggestive of the possibility that intense smiles increase positive emotion and are a sign of an individual's overall well-being. However, in a context where two individuals intend to compete for physical dominance, increased smile intensity might suggest one's reduced capacity or intent to behave in a hostile or aggressive manner. Thus, more intense smiles in this context may be a sign—that is, an unintended or leaked nonverbal expression (e.g., Ekman, Friesen, & Ancoli, 1980)—of reduced physical dominance, whereas neutral expressions may be a sign of increased dominance. Research on nonhuman primates and other social living mammals provides some initial support in favor of this assertion: Across studies, bared teeth displays are typically

This article was published Online First January 28, 2013.

Michael W. Kraus, Department of Psychology, University of Illinois, Urbana–Champaign; Teh-Way David Chen, Department of Psychology, University of California, Berkeley.

We thank Wendy Berry Mendes for helpful comments on an earlier version of this article.

Correspondence concerning this article should be addressed to Michael W. Kraus, Department of Psychology, University of Illinois, Urbana–Champaign, 603 East Daniel Street, Champaign, IL 61820. E-mail: mwkraus@illinois.edu

used by individuals to indicate submissive status, subordination, or to communicate nonaggressive intentions to avoid potentially harmful and aggressive physical status confrontations (De Waal, 1989; Hecht & LaFrance, 1998; Preuschoft, 1992; Preuschoft & van Hooff, 1997; Ramachandran, 1998; Sapolsky, 2004).

Among humans, research on basal testosterone—a hormone associated with increased physical and social dominance among men (for a review, see Mazur & Booth, 1998)—also suggests that elevated smile intensity is a sign of reduced physical dominance. For instance, men with elevated basal testosterone levels tend to have more masculine facial features, and to smile less in posed yearbook photos, in relation to men with lower basal testosterone levels (Dabbs, 1997; Mazur & Booth, 1998). Other work in naturalistic settings suggests that people tend to smile more when they are lower in social status (e.g., younger of age) than their interaction partners (Mehu & Dunbar, 2008a, 2008b).

Research on the emotion expression of embarrassment also suggests that in contexts with the potential for confrontation, the smile is a sign of appeasement, rather than aggression or hostility. Embarrassment is a self-conscious emotion typically expressed following a social transgression. People tend to express embarrassment by touching the face, averting the eyes, bowing the head, and expressing a controlled smile involving contraction of the zygomatic major muscle (Goldenthal, Johnston, & Kraut, 1981; Keltner, 1995). Theoretical accounts contend that expressions of embarrassment evolved to help individuals avoid conflict and to repair social relationships (Goffman, 1967; Keltner, 1995). Moreover, people who tend to spontaneously display embarrassment also tend to engage in social actions—such as prosocial behavior and altruism—that are meant to repair relations rather than to dominate others (Feinberg, Willer, & Keltner, 2012). Overall, the literature we have reviewed thus far suggests that prior to a physical confrontation, increases in smile intensity are associated with decreases in physical dominance.

Smiling in Dominance Contexts

There are several potential reasons why a person may smile prior to a physical confrontation, and thereby express a nonverbal sign of reduced physical dominance: For instance, given associations between smiling and testosterone levels (Dabbs, 1997), it is possible that a person will smile more prior to a physical confrontation because they are dispositionally lower in testosterone or trait-level aggressive tendencies, and the smile simply reflects this disposition. It is also possible that a person is likely to smile prior to a physical confrontation because they are self-conscious or nervous, and research linking smiling to self-conscious emotions like embarrassment is suggestive of this possibility (Keltner, 1995). Likewise, it is possible that smiling before a physical confrontation is either an automatic tendency to take on a submissive nonverbal posture in dominance-relevant settings (e.g., Dryer & Horowitz, 1997; Tiedens & Fragale, 2003; Tiedens, Unzueta, & Young, 2007) or an intentional sign of subordinate status, used as a sign of appeasement to engender reduced aggression during a conflict (e.g., Mehu & Dunbar, 2008b).

We contend that smile intensity prior to a physical confrontation represents a context-specific leaked behavior that unintentionally communicates reduced physical dominance prior to a physical confrontation. More specifically, elevated smile intensity predicts re-

duced physical dominance prior to a physical confrontation because the nonverbal expression reveals an individual's lower levels of physical dominance in relation to a specific opponent. Thus, the intensity of a prefight smile is likely to predict a fighter's poorer performance in an upcoming fight against a specific opponent.

Also, given our analysis suggesting that smile intensity is a sign of reduced physical dominance, a fighter who perceives an intense prefight smile exhibited by his opponent may actually show enhanced performance in the upcoming fight. This improvement in performance may occur because the physical dominance information contained in the opponent's smiling expression might allow the fighter to gain an advantage in the actual match—by informing a more aggressive strategy or by boosting the fighter's confidence in his own dominance during the match. In the present research, we sought to provide evidence in support of both of these accounts of the effect of smile intensity on physical dominance by examining the influence of both expressing and perceiving smiles prior to a physical confrontation.

The Present Research

Across two studies, we tested our overarching hypothesis that smile intensity is a nonverbal sign of reduced physical dominance prior to physical confrontation: In Study 1, posed photographs of two professional fighters facing each other one day prior to a professional mixed martial arts contest were coded for smile intensity. We expected that exhibiting a more intense smile would predict poorer fighter performance, and that perceiving the elevated smile intensity of an opponent would predict enhanced fighter performance in the fight one day later. In Study 2, we examined untrained-observer perceptions of the personal characteristics of the same fighter either displaying a smiling or neutral expression. We expected untrained observers to rate the smiling fighter as lower in physical dominance relative to the neutral fighter, and that observer estimates of fighter hostility and aggression would account for this association. Throughout both studies, we sought to provide evidence suggesting that smile intensity provides unique information about fighter physical dominance over that provided by expert opinions of fighter ability or the physical size of fighters. We also conducted analyses that examined the effect of prefight smile intensity on performance in future fights to determine if prefight smiles are signs of context-specific physical dominance, as we expect, or if they reflect broader dispositions.

Study 1: Smile Intensity and Fighter Performance

In Study 1, we examined the posed facial expressions of fighters one day prior to a professional mixed martial arts contest. The fighters' expressions were coded for smile intensity, and were then compared to performance statistics from the actual fight occurring the next day. We expected that increased smile intensity would predict a fighter's poorer performance, whereas the elevated smile intensity of an opponent would predict a fighter's enhanced performance during the actual fight. Moreover, we expect that these effects would hold even after controlling for the betting odds for the fight, and while holding constant the physical size of the fighters. We controlled for these latter effects because we expected that prefight smiles would provide additional information about a

fighter's physical dominance relative to an opponent (e.g., overall health, mental state, current physical conditioning) beyond that publically known by experts or explained by the actual size of the fighters. Moreover, we expected that smiles would act as a context-specific sign of reduced physical dominance that would predict performance only within the current contest, and not in subsequent fights.

Method

Fighters. We obtained data for 152 unique mixed martial artists competing in the Ultimate Fighting Championships (UFC)—the premier international mixed martial arts organization in the world. The photographs, obtained from the UFC's website (www.ufc.com), displayed profile views of two fighters facing each other, posed in a fighting stance (typically with their arms raised and fists clenched; see [Appendix A](#) for an example) across from their opponent, one day prior to the actual contest. The photographs were taken in fights between 2008 and 2009. No fighter appeared more than once in any of the photographs. The UFC uses weight classes to ensure that fights occur between two people of equal size. Thus, the fighters in the photographs were separated by no more than 5 pounds at the time the photograph was taken, thereby serving as a control for fighters' physical size within each fight.

Smile coding procedure. Coding of smile intensity followed prior research ([Harker & Keltner, 2001](#)). Careful examination of the photographs revealed that the fighters primarily displayed smiles using the lips (zygomatic major muscle) and rarely using the muscles surrounding the eyes (obicularis oculi muscles). Therefore, our smile intensity codes focused exclusively on the zygomatic major muscle. Smiles were coded into three categories representing ascending levels of smile intensity: (0) a neutral expressionless facial configuration showing no contraction of the zygomatic major muscle, (1) a toothless smile expression showing moderate contraction of the zygomatic major muscle, and (2) a teeth-baring smile showing intense contraction of the zygomatic major muscle.

Four coders, naïve to the hypotheses of the study, independently viewed the fighters' facial expressions and coded the expressions as having one of these three facial configurations. Correlations between coders demonstrated high consistency in the coding of smile intensity ($r_s = .63$ to $.89$, $p_s < .001$; $M = 0.30$, $SD = 0.46$; $\alpha = .91$).

Fighter performance. To objectively track fighter performance in the contest, we used statistics from FightMetric (www.fightmetric.com). FightMetric is the official statistics provider to the UFC, and assesses fight performance using two facets: effective striking (e.g., punches and kicks) and effective grappling (e.g., wrestling and submission). For effective striking, we examined significant strikes, which are defined as strikes of any kind (e.g., kicks, punches) that are thrown with power ([Fightmetric Statistics, n.d.](#)). We obtained statistics for both the significant strike percentage accuracy ($M = 0.44$, $SD = 0.19$), and the total number of significant strikes landed against an opponent ($M = 25.89$, $SD = 23.56$). We also assessed the number of times a fighter was able to knock down his opponent with strikes during the fight ($M = 0.27$, $SD = 0.66$).

For effective grappling, we obtained statistics indicating success in wrestling an opponent to the ground (i.e., takedowns) both in terms of the total number of takedowns ($M = 1.20$, $SD = 1.82$) and the percentage of successful takedowns ($M = 0.47$, $SD = 0.37$) per attempts during the fight. In addition to takedowns, we also computed the total number of effective grappling techniques used during the fight. Effective grappling techniques include advancing to a dominant position (e.g., being on top of an opponent), reversing a bad position (e.g., getting out from underneath an opponent), or attempting a submission (e.g., a technique in which a fighter attacks a joint or limb with the intention of forcing an opponent to give up during a fight). These grappling techniques were summed to indicate total effective grappling ($M = 2.03$, $SD = 3.37$).

In addition to measuring fighter performance statistics, we also examined outcomes of the actual match, including whether the fighter won or lost the match. Given that match outcome is sometimes decided by judging scorecards at the end of the fight, and as a result, may be subject to judging biases or other errors in perception, another way to measure dominance in match outcome is by whether a fighter won the match in dominant fashion—by knocking his opponent unconscious, or by forcing his opponent to give up during the fight (i.e., submission; $n = 43$). Given the decisive nature of victory by knockout or submission, such match outcomes clearly indicate one fighter's physical dominance over his opponent. Finally, we also collected data on each fighter's winning percentage in matches since the fight for which the photographs were taken ($M = 52.7$, $SD = 31.6$).

Fighter height. We collected data on the height of each fighter in inches from the UFC's website (www.ufc.com; $M = 71.71$, $SD = 2.60$).

Fighter ability. To control for expert perceptions of fighter ability, we used actual gambling statistics for the fights from [Sportsbook.com \(n.d.; www.bestfightodds.com\)](#). Gambling odds ranged from -675 to 475 ($M = -0.39$, $SD = 237.35$). Positive numbers indicate the amount of money earned betting on a winning fighter with a wager of \$100. Negative numbers indicate the amount of money needed to wager on a winning fighter to earn \$100. Thus, negative numbers indicate that a fighter is favored to win the match. In this sample, fighters who lost had significantly higher betting odds ($M = 94.93$) relative to those that won the fight ($M = -173.75$), $t(150) = -8.45$, $p < .001$.

Results and Discussion

Our predictions held that fighter prefight smile intensity would predict decreased performance of the fighter, whereas the elevated smile intensity of an opponent would predict increased fighter performance in the actual contest one day later. We first tested these predictions by conducting an independent samples t test comparing the smile intensity of fighters who either won or lost the match. This analysis yielded a result consistent with our central prediction: Winning fighters displayed less intense smiles than losing fighters, $t(150) = -2.69$, $p < .01$ (see [Figure 1](#), top panel). In a similar analysis, we also compared fighters who won the match in dominant fashion (i.e., winning by knockout or submission) to all other fighters. Again, this analysis yielded the predicted pattern of results: Fighters who won the match by knockout or submission tended to show less intense smiles than all other fighters, $t(150) = -2.08$, $p < .05$ (see [Figure 1](#), bottom panel).

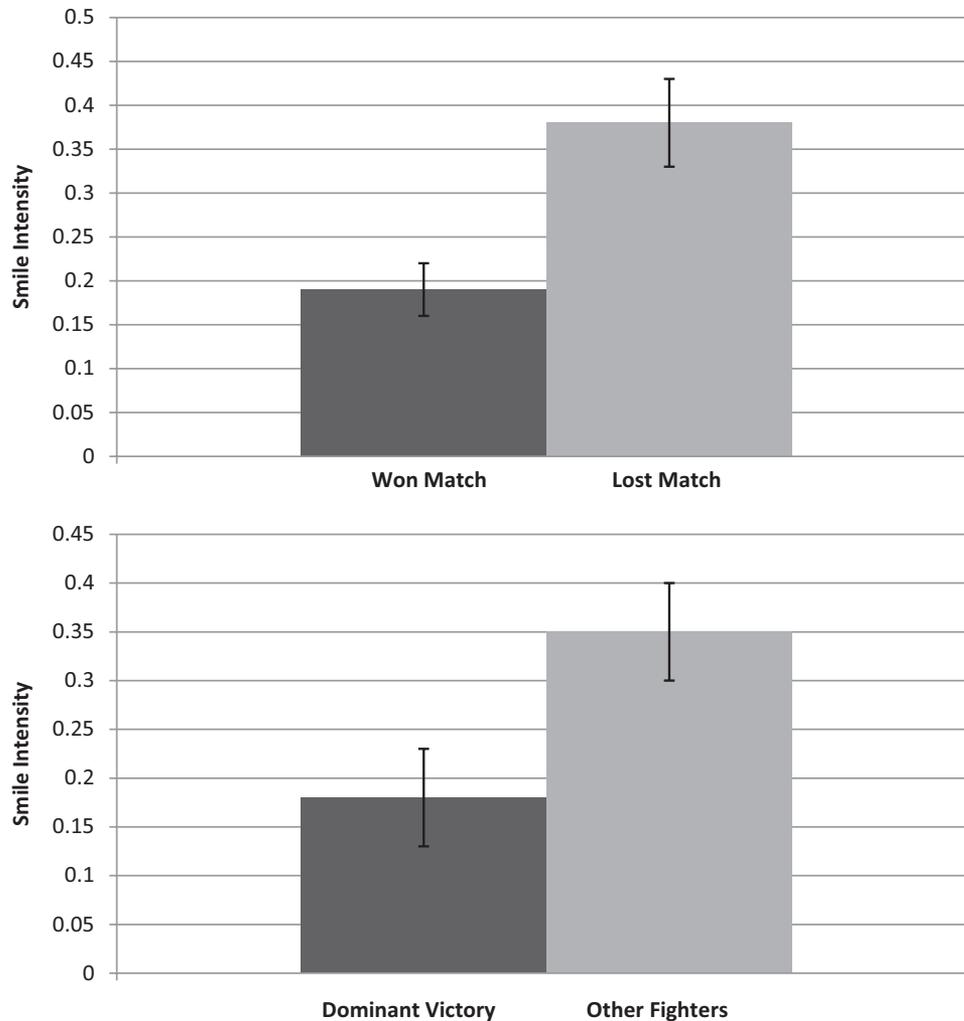


Figure 1. The top panel shows fighter smile intensity for fighters who won their match compared with fighters who lost their match. The bottom panel displays fighter smile intensity for fighters who won by knockout or submission in comparison with all other fighters. Error bars indicate standard errors of the mean.

We also conducted the fight outcome analysis using betting odds and fighter height as covariates. Once again, fighters who won tended to show less-intense smiles than their less effective counterparts, even after controlling for expert assessments of fighter ability and height, $F(1, 148) = 5.17, p < .05$.

Interestingly, though prefight smile intensity was significantly related to winning in the match directly after the photograph was taken, even after accounting for betting odds and fighter height, it was unrelated to fighter winning percentage in subsequent matches, $r(150) = .02, ns$. This pattern is consistent with our expectation that prefight smiles were context-specific behaviors related to reduced physical dominance in the present match, rather than an indication of trait-level aggressive tendencies.

We also examined effectiveness statistics from the actual fights to determine if smile intensity predicted fighter and opponent performance during the match. Because fights occur in dyads, both smile intensity and performance indicators are dependent on a fighter's opponent. For example, fighter and opponent smile in-

tensity were significantly intercorrelated ($r = .30, p < .05$). To account for this dyadic dependence in the data all subsequent analyses were conducted using the actor-partner interdependence model (e.g., Kenny, Kashy, & Cook, 2006). All statistics for this analysis, including effect size estimates (Cohen, 1992), are displayed in Table 1.

We examined effective striking statistics first (see Table 1, the first column from the left), predicting the percentage of significant strikes landed with standardized fighter and opponent scores for smile intensity and betting odds, which were added to control for expert estimates of performance. This analysis yielded a significant effect of fighter smile intensity that aligned with our predictions: Fighters who showed less smile intensity landed a higher percentage of significant strikes relative to fighters showing more intense smiles. Effects for opponent smile intensity and fighter and opponent betting odds were not significant in this analysis.

We used the same model to predict total significant strikes landed (Table 1, second column from the left). In this analysis,

Table 1

Actor–Partner Interdependence Model Analyses of Fighter Performance Predicted by Fighter and Opponent Smile Intensity and Betting Odds

Variable	Significant striking percentage			Total significant strikes			Knockdowns			Takedowns landed			Takedown percentage		
	B	<i>t</i>	<i>d</i>	B	<i>t</i>	<i>d</i>	B	<i>t</i>	<i>d</i>	B	<i>t</i>	<i>d</i>	B	<i>t</i>	<i>d</i>
Fighter smile	-.03	-2.00*	.32	-0.67	-0.35	.06	-.08	-1.50	.24	-.31	-2.05*	.33	-.08	-2.42*	.39
Opponent smile	.02	1.42	.23	4.54	2.33*	.38	.15	2.72*	.44	.39	2.62*	.43	.08	2.27*	.37
Fighter odds	-.01	-0.23	.03	-11.02	-1.68	.27	.14	0.77	.12	.50	0.98	.16	.07	0.60	.10
Opponent odds	.03	0.68	.11	-4.94	-0.75	.12	.24	1.32	.21	.94	1.86†	.30	.24	1.99*	.32

Note. B = unstandardized effect estimate; *t* = *t* value test statistic; *d* = Cohen's *d* effect size measure.

† $p < .10$. * $p < .05$.

opponent smile intensity emerged as a significant predictor of significant strikes landed. More specifically, fighters tended to land more significant strikes against opponents who showed more intense prefight smiles. Fighter betting odds emerged as a marginally significant predictor of significant strikes landed in this analysis, with lower odds associated with more significant strikes landed. Fighter smile intensity and opponent betting odds were not significant predictors in this analysis.

When examining knockdowns (Table 1, center column), a similar opponent effect of smile intensity emerged such that fighters scored more knockdowns if their opponent showed a more intense prefight smile. Fighter smile intensity and fighter and opponent betting odds were not significant predictors in this analysis.

When examining total takedowns (Table 1, fourth column from the left) and takedown percentage (Table 1, far right column), similar effects emerged: Fighters who showed higher smile intensity tended to score a reduced number and percentage of successful takedowns. In addition, fighters tended to score more takedowns and a higher percentage of takedowns if their opponent showed a more intense prefight smile. In both analyses, opponent betting odds was positively associated with number and percentage of successful takedowns. Smile intensity was not significantly related to total grappling effectiveness, $r(150) = -.06, ns$.¹

Taken together, the results from Study 1 provide evidence largely in support of our overarching hypothesis: Increased smile intensity prior to physical combat predicted poorer performance by the fighter exhibiting the smile, and enhanced performance for his opponent. More specifically, fighters showing more neutral prefight facial expressions in photographs standing opposite of their opponent were more likely to win the fight, more likely to end the fight by knockout or submission, more likely to land a higher percentage of significant strikes, and more likely to wrestle their opponent to the ground during the fight. Also aligning with our central prediction, fighters showing more intense smiles were more likely to be knocked down by their opponent, were more likely to have their opponent land more significant strikes on them (i.e., they were punched and kicked more), and were more likely to be wrestled to the ground by their opponent during the fight. Interestingly, these effects held when controlling for expert estimates of fighter performance and within fights comparing fighters of similar physical size, suggesting that smile intensity provides additional information about physical dominance beyond that provided by experts or by physical size cues. Finally, that prefight smiles did not predict future performance provides support for our prediction

that smile intensity is a context-specific nonverbal behavior that leaks information about a person's reduced physical dominance, rather than a broader indicator of trait-level aggressive tendencies.²

Study 2: Zero Acquaintance Judgments of Fighter Smiles

Study 1 provided ecologically valid evidence suggesting that in contexts prior to a physical confrontation, increased smile intensity predicts reduced physical dominance—measured in terms of fighter performance. Importantly, fighters in Study 1 performed better when their opponent had shown a more intense prefight smile—providing some initial evidence suggesting that perceiving an opponent's prefight smiling expression, and the reduced physical dominance it suggests, actually improves fighter performance. To extend this initial research, we sought to provide experimental evidence suggesting that perceiving intense prefight smiles might lead to inferences of reduced physical dominance. In Study 2, we presented a sample of untrained observers with either smiling or neutral photographs of a fighter and then asked these observers to rate the fighter on a number of personal characteristics. We hypothesized that smiling prior to a physical confrontation unintentionally communicates reduced hostility and aggression, and as a result, leads to inferences of reduced physical dominance. By presenting the same fighter expressing either a smiling or neutral expression, we controlled for other characteristics that may serve as cues of dominance (e.g., masculine facial features, physical size).

¹ Additional correlational analyses revealed that smile intensity was significantly negatively associated with fighter weight class (coded as 0 = *lightweight*, 1 = *welterweight*, 2 = *middleweight*, 3 = *light heavyweight*, 4 = *heavyweight*), such that fighters in smaller weight classes, who were smaller in stature, tended to exhibit more intense smiles than did their larger counterparts, $r(150) = -.20, p < .05$. As well, fighter height was marginally significantly correlated with smile intensity, $r(150) = -.14, p = .09$. These effects fit our broader theoretical argument linking smiles to physical dominance, in that smaller fighters smiled more and are presumably less physically dominant than their larger counterparts.

² We conducted a similar analysis also controlling for fighter and opponent height, and the results were identical to those reported in the results of Study 1 save one: When accounting for fighter and opponent height, the significant association between fighter smile intensity and the percentage of significant strikes landed became marginal, $B = -.02, t(143.24) = -1.83, p = .07$.

Method

Participants and procedure. One hundred seventy-eight participants accessed a survey online through the mechanical Turk Website (www.mturk.com; Buhrmester, Kwang, & Gosling, 2011). Participants were instructed that they would be viewing photographs displaying profile views of professional fighters' faces and that they would be making judgments about the fighters' personalities based solely on these photographs. Participants were instructed that the photographs were taken while the fighter was directly facing an opponent, one day prior to their fight. Participants were then shown photographs of 13 different fighters from Study 1. Twelve of the fighters displayed neutral facial expressions. To limit availability of potential signs of physical dominance other than smiles (e.g., muscle tone), we cropped the photographs so that only the profile view of a single fighter's head was visible (see Appendix B, e.g., stimuli).

Randomly distributed among these neutral fighter photographs was the face of a single fighter manipulated to show either a neutral facial expression or an intense smile. For this manipulation, we obtained two photographs of a single fighter facing his opponent. These photographs showed the fighter either expressing an intense smile or a neutral facial expression, and these expressions were confirmed by all of our Study 1 coders. Participants then rated the personalities of each of the 13 fighters based on these facial expressions. We were interested in mean differences in personality ratings for the fighter showing either a smiling or neutral expression.

After these personality ratings, participants completed demographic information about themselves, were thanked for their participation, debriefed regarding the hypotheses of the study, and received monetary compensation. Sixteen participants recognized some of the fighters by name, and were therefore excluded from analyses.

Judgments of fighter personality. Participants rated each fighter's personality with the five-item Big Five Personality Inventory using 9-point Likert scales (1 = *disagree strongly*, 9 = *agree strongly*; Gosling, Rentrow, & Swann, 2003). Additionally, participants rated the extent that the fighters were "physically dominant," "aggressive or hostile," and "trustworthy" using the same 9-point Likert scales.

Results and Discussion

Before testing our central prediction, we sought to determine whether the smile manipulation was successful in shifting participant ratings of fighter personality. Thus, we conducted independent-samples *t* tests to examine differences in trait ratings for the fighter manipulated to show a smiling or neutral expression. We expected that if participants judged the fighters on the basis of the presence of a smile, then the smiling fighter would be judged as more trustworthy and agreeable than the same fighter showing a neutral expression (e.g., Oveis, Gruber, Keltner, Stamper, & Boyce, 2009). This is precisely what we found: Participants judged the smiling fighter as more trustworthy (smile $M = 5.50$; neutral $M = 4.78$), $t(160) = 3.10$, $p < .01$, and more agreeable (smile $M = 5.41$; neutral $M = 3.55$), $t(160) = 6.20$, $p < .01$, than the same fighter showing a neutral

expression. These results broadly suggest that participants used the smile to make inferences about the fighters' personality.

Our central prediction held that a fighter who showed an intense smile would be rated as less aggressive and hostile, and as a result would be seen as less physically dominant than when he was not smiling. To test this prediction, we compared untrained observer ratings of physical dominance for the fighter either expressing an intense smile or a neutral expression. The analysis yielded a significant effect of smiling on physical dominance that aligned with our hypothesis: The smiling fighter was judged to be significantly less physically dominant ($M = 6.29$) in relation to the same fighter showing a neutral expression ($M = 6.80$), $t(160) = -2.05$, $p < .05$. Moreover, the smiling fighter was seen as less aggressive or hostile (smile $M = 4.12$; neutral $M = 6.47$), $t(160) = -8.15$, $p < .01$, in relation to the neutral fighter.

Finally, we computed a mediational analysis to determine whether smiles predict judgments of reduced physical dominance because they are a sign of decreased aggression and hostility in relation to neutral expressions (Baron & Kenny, 1986). To conduct this analysis, we computed a series of linear regression analyses in which we predicted judgments of dominance with manipulated fighter facial expressions, and participant ratings of aggression and hostility as a mediator. As Figure 2 shows, the path linking fighters' facial expression to physical dominance perceptions was significant, $t(160) = -2.05$, $p < .05$, with smiling associated with reduced perceptions of physical dominance. The path linking the fighters' facial expression to perceptions of aggression or hostility was also significant, $t(160) = -8.15$, $p < .01$, with the smiling fighter perceived as less aggressive and hostile. Finally, when adding perceptions of aggression and hostility to the model predicting perceptions of physical dominance, $t(159) = 2.37$, $p < .05$, the originally significant relationship between fighters' facial expression and perceptions of physical dominance became nonsignificant, $t(159) = -0.49$, $p = .62$. Moreover, a bootstrapping procedure using 2000 resamples (Preacher & Hayes, 2004) revealed a significant indirect effect of fighters' facial expression on perceptions of physical dominance through

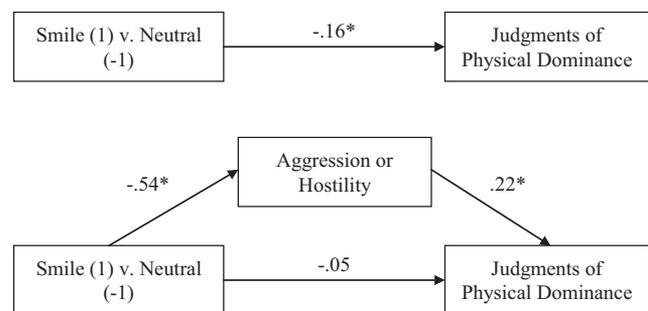


Figure 2. The top path model shows the relationship between smiling and untrained observer judgments of physical dominance. The bottom path model shows the relationship between smiling and judgments of physical dominance while controlling for observer-rated hostility or aggression. Numbers indicate standardized regression coefficients. * $p < .05$.

perceptions of aggression and hostility (95% confidence interval [CI], $-.37$ to $-.01$). Overall, these analyses suggest that smiles expressed prior to a physical confrontation are perceived as a sign of reduced physical dominance because they communicate reduced aggression or hostility.³

The results of Study 2 provide support for our central hypothesis, but one methodological limitation occurred along with the presentation of fighter faces: Given that the target fighter's face, displaying either a neutral or smiling expression, was presented alongside other nonsmiling fighters, it is possible that the uniqueness of the smiling fighter's facial expression could explain, in part, the resulting findings in Study 2. More specifically, it is possible that the uniqueness of the smiling fighter—rather than the smile itself—accounted for participant judgments of reduced physical dominance. This possibility would appear to require that participants keep track of the facial expressions of all the fighters they judged in Study 2, which we believe is unlikely. As well, we are unaware of prior research suggesting associations between uniqueness and judgments of reduced physical dominance. Nevertheless, future research would benefit from considering the influence of unique expressions on associations between smile intensity and judgments of physical dominance.⁴

General Discussion

The smile is perhaps the most widely studied nonverbal expression, and yet, the meaning of a smile may change depending on the type of smile expressed and the context in which that expression occurs. In the present research, we sought to determine the meaning of the intensity of smiles expressed prior to physical confrontations. We predicted that prior to a physical confrontation, smiles are an unintentional nonverbal sign of reduced physical dominance, and leak information about an individual's reduced intentions to engage in hostile and aggressive action. This prediction was based on research suggesting that smiles are a sign of appeasement and subordinate status (e.g., Dabbs, 1997; Mehu & Dunbar, 2008b).

Across two studies we found support for our central prediction: In Study 1, fighters who smiled more intensely—during a prefight confrontation with their opponent—tended to win less often and to perform worse during the actual fight than did their less intensely smiling counterparts. Also aligning with our hypothesis, fighters tended to perform better during the fight if their opponent had shown a more intense prefight smile. This latter result suggests that the elevated intensity of opponent smiles may actually have helped fighters by, for example, boosting their confidence in their own physical dominance during the actual match. In Study 2, naïve observer judgments of a fighter with a smiling or neutral expression showed a similar pattern: Smiling fighters were judged to be less physically dominant, presumably because smiles communicate reduced hostility and aggression, in relation to their neutral expression counterparts. Interestingly, these effects were observed even after accounting for expert judgments of fighter performance (Study 1), and while holding the size of fighters constant (Studies 1 and 2).

Notwithstanding the strength of the current findings, it is important to consider a few limitations of this research, along with the future directions they suggest. Importantly, as we did not have access to the fighters' internal states when the photographs were taken, we can only make inferences about why some fighters smiled prior to their fights. We contend that these smiles reflect unintentional nonverbal responses that leak information about a fighter's reduced physical dominance in relation to their specific opponent, and some of our data support this interpretation: For instance, that fighter smile intensity predicted the outcome of the current match, and not future fighter wins and losses, suggests that fighter smiling reflects context-specific physical dominance and does not reflect trait levels of hostility or aggression. Despite these initial results, it is also plausible, for example, that fighter smiles were based on the experience of self-conscious emotion in the prefight confrontation (e.g., Keltner, 1995), or stemmed from actual fighter perceptions of reduced fighting ability in relation to that of opponents. Future research is needed to more definitively rule out these possibilities.

Given our theoretical argument suggesting that prefight smiles unintentionally leak information about a fighter's reduced physical dominance, it is interesting to consider the role of emotion regulation in fighter performance (Gross, 2002). More specifically, fighters who can express or conceal their emotions on demand may be able to conceal their reduced physical dominance, and by implication, might perform better against opponents who appear more physically dominant. Future research is necessary to test this prediction.

It is also interesting to speculate regarding the intentional nature of the fighter smiles prior to the physical confrontation. It might be that fighters smiled on purpose to signal their pride and confidence, given that small smiles are part of a larger expression of pride (Tracy & Robins, 2004). Another possibility is that fighters intentionally smiled to appease their opponent, and were thus smiling in the hope that their opponent would behave less aggressively during the actual fight. The smile would then be used as a strategic nonverbal sign of appeasement (Preuschoft, 1992). Even if fighters did intentionally express smiles, it is clear that this nonverbal behavior had the opposite of the desired effect—fighters were more hostile and aggressive during the match (e.g., more knockdowns; Study 1) toward their more intensely smiling opponents. Future research is necessary to more precisely test what specific motives might guide the smile expressions observed in the current study.

³ We also tested a reverse mediational model with physical dominance as the mediator, and untrained observer estimates of aggression and hostility as the outcome variable. In this model, when accounting for physical dominance, the relationship between the smile manipulation and aggression and hostility remained significant, $\beta = -.51$, $t(159) = -7.66$, $p < .01$.

⁴ If uniqueness is associated with perceptions of reduced physical dominance, then we might expect smiling fighters shown later (vs. sooner) in the random distribution of neutral fighters to be perceived as lower in physical dominance. Contrary to this prediction, no correlation emerged linking the order of the presentation of the smiling faces to perceptions of physical dominance ($r = .02$, *ns*).

Future research should also consider the role of testosterone in this research. As we outlined earlier, people with higher levels of basal testosterone show more behavioral dominance, tend to behave more aggressively (Mazur & Booth, 1998), and tend to smile less in posed photographs (Dabbs, 1997). Given the present results, it is possible that smiles may serve as a potential barometer of a fighter's testosterone levels prior to the fight, and it is through testosterone, that smiling is a predictor of physical dominance. Future research is necessary to test this prediction.

Finally, the present findings were limited to the smile expressions of male fighters, and so there is a possibility of gender differences in the meaning of smiles expressed prior to physical confrontation. Some research is suggestive of potential gender differences in the expression of emotion: For instance, men who express anger in professional settings are seen as higher in status when compared with women who express anger (e.g., Brescoll & Uhlmann, 2008). Future research is necessary to examine potential gender differences in smiles prior to physical confrontation.

In the present research, smiles appear to play a unique role in physical confrontations, as a sign of a person's reduced physical dominance. In this fashion the smile, a seemingly inconsequential expression of emotion, appears to say a great deal about a person's behavior and internal states.

References

- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173–1182.
- Barrett, L. F., Mesquita, B., & Gendron, M. (2011). Emotion perception in context. *Current Directions in Psychological Science, 20*, 286–290.
- Bonanno, G. A., & Keltner, D. (1997). Facial expressions of emotion and the course of conjugal bereavement. *Journal of Abnormal Psychology, 106*, 126–137.
- Brescoll, V. L., & Uhlmann, E. L. (2008). Can an angry woman get ahead? Status conferral, gender, and expression of emotion in the workplace. *Psychological Science, 19*, 268–275.
- Buhrmester, M. D., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A new source of cheap, yet high-quality, data? *Perspectives on Psychological Science, 6*, 3–5.
- Churchill, W. (1941/1983). In W. Manchester, *The last lion: Winston Spencer Churchill: Visions of glory, 1874–1932* (p. 10) Boston: Little, Brown & Company.
- Cohen, J. (1992). *Statistical power analysis for the behavioral science* (2nd ed.). Hillsdale, NJ: Erlbaum.
- Dabbs, J. M., Jr. (1997). Testosterone, smiling, and facial appearance. *Journal of Nonverbal Behavior, 21*, 45–55.
- De Waal, F. (1989). *Peacemaking among primates*. Cambridge, MA: Harvard University Press.
- Dryer, D. C., & Horowitz, L. M. (1997). When do opposites attract? Interpersonal complementarity versus similarity. *Journal of Personality and Social Psychology, 72*, 592–603.
- Ekman, P. (1992). Are there basic emotions? *Psychological Review, 99*, 550–553.
- Ekman, P., & Friesen, W. V. (1982). Felt, false and miserable smiles. *Journal of Nonverbal Behavior, 6*, 238–252.
- Ekman, P., Friesen, W. V., & Ancoli, S. (1980). Facial signs of emotional experience. *Journal of Personality and Social Psychology, 39*, 1125–1134.
- Ekman, P., Levenson, R. W., & Friesen, W. V. (1983). Autonomic nervous system activity distinguishes among emotions. *Science, 221*, 1208–1210.
- Feinberg, M., Willer, R., & Keltner, D. (2012). Flustered and faithful: Embarrassment as a signal of prosocial behavior. *Journal of Personality and Social Psychology, 102*, 81–97.
- Fightmetric Statistics. (n.d.). Retrieved April 10, 2011, from <http://www.fightmetric.com/>
- Frank, R. H. (1988). *Passions within reason: The strategic role of the emotions*. New York, NY: Norton.
- Goffman, E. (1967). *Interaction ritual: Essays on face-to-face behavior*. Garden City, NY: Anchor.
- Goldenthal, P., Johnston, R. E., & Kraut, R. E. (1981). Smiling, appeasement, and the silent bared-teeth display. *Ethology and Sociobiology, 2*, 127–133.
- Gosling, S. D., Rentrow, P. J., & Swann, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality, 37*, 504–528.
- Gross, J. J. (2002). Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology, 39*, 281–291.
- Gruber, J., Mauss, I. B., & Tamir, M. (2011). A dark side of happiness? How, when, and why happiness is not always good. *Perspectives on Psychological Science, 6*, 222–233.
- Hall, J. A., Coats, E. J., & LeBeau, L. S. (2005). Nonverbal behavior and the vertical dimension of social relations: A meta-analysis. *Psychological Bulletin, 131*, 898–924.
- Harker, L. A., & Keltner, D. (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*, 112–124.
- Hecht, M. A., & LaFrance, M. (1998). License or obligation to smile: The effect of power and sex on amount and type of smiling. *Personality and Social Psychology Bulletin, 24*, 1332–1342.
- Keltner, D. (1995). The signs of appeasement: Evidence for the distinct displays of embarrassment, amusement, and shame. *Journal of Personality and Social Psychology, 68*, 441–454.
- Keltner, D., & Haidt, J. (2001). Social functions of emotions. In T. Mayne & G. Bonanno (Eds.), *Emotions: Current issues and future directions* (pp. 192–213). New York, NY: Guilford Press.
- Keltner, D., & Lerner, J. S. (2010). Emotion. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (5th ed., pp. 317–352). New York, NY: Wiley.
- Kenny, D. A., Kashy, D. A., & Cook, W. L. (2006). *Dyadic data analysis*. New York, NY: Guilford Press.
- Mazur, A., & Booth, A. (1998). Testosterone and dominance in men. *Behavioral & Brain Sciences, 21*, 353–397.
- Mehu, M., & Dunbar, R. I. M. (2008a). Naturalistic observations of smiling and laughter in human group interactions. *Behaviour, 145*, 1747–1780.
- Mehu, M., & Dunbar, R. I. M. (2008b). Relationship between smiling and laughter in humans (*Homo sapiens*): Testing the power asymmetry hypothesis. *Folia Primatologica, 79*, 269–280.
- Oveis, C., Gruber, J., Keltner, D., Stamper, J. L., & Boyce, W. T. (2009). Smile intensity and warm touch as thin slices of child and family affective style. *Emotion, 9*, 544–548.
- Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, and Computers, 36*, 717–731.
- Preuschoft, S. (1992). "Laughter" and "smile" in Barbary macaques (*Macaca sylvanus*). *Ethology, 91*, 200–236.
- Preuschoft, S., & van Hooff, J. A. (1997). The social function of "smile" and "laughter": Variations across primate species and societies. In U. C. Segerstrale & P. Molnar, (Eds.), *Nonverbal communication: Where nature meets culture* (pp. 171–190). Mahwah, NJ: Erlbaum.

- Ramachandran, V. S. (1998). The neurology and evolution of humor, laughter, and smiling: The false alarm theory. *Medical Hypotheses*, *51*, 351–354.
- Sapolsky, R. M. (2004). Social status and health in humans and other animals. *Annual Review of Anthropology*, *33*, 393–418
- Sportsbook.com. (n.d.). *Betting odds*. Retrieved April 13, 2011, from <http://www.bestfightodds.com>
- Strack, F., Martin, L. L., & Stepper, S. (1988). Inhibiting and facilitating conditions of the human smile: A nonobstrusive test of the facial feedback hypothesis. *Journal of Personality and Social Psychology*, *54*, 768–777.
- Tiedens, L. Z., & Fragale, A. R. (2003). Power moves: Complementarity in dominant and submissive nonverbal behavior. *Journal of Personality and Social Psychology*, *84*, 558–568.
- Tiedens, L. Z., Unzueta, M. M., & Young, M. J. (2007). An unconscious desire for hierarchy? The motivated perception of dominance complementarity in task partners. *Journal of Personality and Social Psychology*, *93*, 402–414.
- Tracy, J. L., & Robins, R. W. (2004). Show your pride: Evidence for a discrete emotion expression. *Psychological Science*, *15*, 194–197.
- UFC.com. (n.d.). *Photographs*. Retrieved from <http://www.ufc.com/media/latest/photos>

Appendix A

Example Stimuli for Study 1

Posed photograph of the typical body position and smiling (person on the left) or neutral (person on the right) facial expression of two fighters during a prefight faceoff (Study 1). Example photograph of J. Hepler (left) and N. Segal (right) taken by M. W. Kraus.



(Appendices continue)

Appendix B**Example Stimuli for Study 2**

Example photographs showing the manipulated facial expression of a single fighter to show a smiling expression (top panel) or a neutral expression (bottom panel). Photographs of J. Hepler taken by M. W. Kraus.



Received January 5, 2012
Revision received July 16, 2012
Accepted July 18, 2012 ■