



Original Article

Are smiles a sign of happiness? Spontaneous expressions of judo winners[☆]



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ABSTRACT

Which is the strongest predictor of Duchenne smiles? Is it emotion or sociality? Two field studies on the production of facial behavior by winning judo fighters ($N = 174$) are presented, testing if judo fighters smiled while being happy or while they were engaged in social interaction with the audience. Our studies simultaneously meet important methodological requirements: intense emotions; precise moment-to-moment coding of facial expressions; behavioral records long enough to allow smiles to unfold; discrimination between records of interactive and non-interactive behavior, and self-reports of emotional experience after winning a medal. We found that Duchenne smiles were not a necessary sign of happiness. Although all the judo fighters won their respective matches, they displayed a very low proportion of Duchenne smiles (.15 in Study 1, and .21 in Study 2). Being engaged in social interaction (communicative gestures with arms and hands while facing the audience) was found to be the strongest predictor for the occurrence of Duchenne smiles. Our studies provide support for the view that facial expressions are tools for social interaction (Behavioral Ecology Theory), rather than read-outs of basic emotions (Facial Expression Program).

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1. Introduction

When does a person smile? An answer to this question is needed to decide between two accounts of facial expression of *emotion*. According to Facial Expression Program (FEP, Ekman, 1972; Izard, 1971; see Russell & Fernández-Dols, 1997), smiles – specifically Duchenne smiles – are produced when the person is happy. Conversely, according to Behavioral Ecology Theory (BET, Fridlund, 1994), smiles, including Duchenne smiles, are tools the person uses during social interaction. Thus, according to FEP, a smile has a fixed emotional meaning, whereas according to BET, smiles can mean different things in different contexts, such as a greeting, solidarity, reassurance, embarrassment, and so on. The specific prediction that differentiates the two theories is that FEP predicts the occurrence of Duchenne smiles when the person is happy, regardless of the situation's sociality (Ekman, 2003). On the other hand, BET predicts that the likelihood of a Duchenne smile varies with the sociality of the situation, even when a person is happy (Fridlund, 1991). From the signaler's point of view, the production of a signal that has the potential to convey highly specific information is independent from the underlying mechanism that produced it (e.g., an affective state). Thus, whereas FEP assumes that facial expressions are indexes of basic emotion, BET considers that facial expressions

and emotions are not necessarily related; knowing that the production of a signal is due to some affective mechanism does not inform us on its potential to serve as a referential signal (Seyfarth & Cheney, 2003).

1.1. The ethological approach to the social and emotional messages of smiling

A landmark in the study of the social and emotional causes of smiling is Kraut and Johnston's (1979) pioneering naturalistic observation of bowlers making a strike, ice hockey fans cheering their team, and pedestrians on a sunny day. The probability of detecting a smile during interactive times was significantly higher than during non-interactive times (.42 vs. .04 for bowlers, .27 vs. .12 for ice hockey fans, and .62 vs. .12 for pedestrians). In their conclusion, Kraut and Johnston emphasized that an ethological approach would help in the study of not only the causes but also the effects of facial expression on subsequent social interaction. Despite the importance of studying human facial displays through a careful description of spontaneous facial behavior, Kraut and Johnston's work was mainly ignored by mainstream research on facial expression. Observational approaches to facial behavior have been practically non-existent for decades (Fernández-Dols & Crivelli, 2013). Even experimental studies on the actual production of facial expression have been rare compared to the large amount of paper-and-pencil recognition studies (Reisenzein, Studtmann, & Horstmann, 2013).

Fridlund's (1994) approach to facial expression in the framework of BET revived Kraut and Johnston's proposal. Fernández-Dols and Ruiz-Belda (1995) followed Kraut and Johnston's ethological approach by observing Olympic Games gold-medalists during the awards ceremony. Olympic gold-medalists on the podium smiled up to 76% of the

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time during the interactive periods (i.e., when receiving the medals from the authorities, when greeting the spectators), but only 10% and 3% of the time when waiting behind the podium and listening to the national anthem—i.e., during non-interactive periods. Fernández-Dols and Ruiz-Belda improved upon Kraut and Johnston's method by obtaining retrospective emotional reports from a sub-sample of gold-medalists. Reports of happiness across the ceremony were similar during the interactive and the non-interactive periods, which strongly suggest that smiles are not necessarily present when happiness occurs. In the same vein, Ruiz-Belda, Fernández-Dols, Carrera, and Barchard (2003) recorded facial expressions of bowlers after scoring a strike and soccer fans when their team scored. They found that, for the interactive records, the mean probability of a smile for bowlers and soccer fans was .78 and .70 respectively, whereas it decreased significantly to .09 and .07 when observing non-interactive records. All in all, these studies supported a BET interpretation of smiles. On this view, smiles are flexible, adaptive tools displayed within strategic social games aimed at obtaining some physical or psychological resources (Fridlund, 1994).

Matsumoto and Willingham (2006; for a replication with blind judo fighters, see Matsumoto & Willingham, 2009) challenged these previous findings in a field study in which they analyzed 190 out of 2735 photographs of judo fighters taken by a professional photographer during the Athens Olympic Games. The authors reported that 29 out of 40 judo fighters displayed Duchenne smiles after winning a gold- or bronze-medal match. Matsumoto and Willingham concluded that sociality was not a variable related to the display of smiles, and previous findings supporting a link between smiling and social interaction (Fernández-Dols & Ruiz-Belda, 1995; Kraut & Johnston, 1979; Ruiz-Belda et al., 2003) were actually *nonfindings* because of methodological flaws. Matsumoto and Willingham (2006, p. 576) wrote:

"[Our] results contrast to the findings of previous field studies reporting nonfindings (Fernández-Dols & Ruiz-Belda, 1995; Kraut & Johnston, 1979; Ruiz-Belda et al., 2003). We contend that the methodology we used corrected methodological limitations of the previous studies. (...) Some may argue that the expressions were produced because the athletes were in a social situation.(...) We argue, however, that these factors probably did not affect the very first expressions displayed at match completion (which are the ones we analyzed) (Matsumoto & Willingham, 2006, p. 576)."

Matsumoto and Willingham's (2006) requirements for overcoming the limitations of previous field studies were (a) the use of intense emotions (i.e., emotions not produced in the middle of a task but on the final outcome), (b) a precise moment-to-moment measurement of the expressions, (c) discrimination between Duchenne and non-Duchenne smiles, and (d) the analysis of interactive and non-interactive behavioral records long enough to allow smiles to unfold. To these four requirements an obvious fifth can be added for a flawless test of the predictive weight of happiness and social interaction in the display of smiles: (e) an explicit discrimination between records of interactive and non-interactive behavior. Unfortunately, Matsumoto and Willingham's requirements have never been simultaneously accomplished by the published studies to date—including Matsumoto and Willingham's field studies (2006, 2009).

Requirement (a) was unfulfilled in the studies with happy bowlers, and – to some extent – to hockey and soccer fans' studies (Kraut & Johnston, 1979; Ruiz-Belda et al., 2003), but it was fulfilled in Fernández-Dols and Ruiz-Belda's (1995) study with gold medalists. Requirement (b) was unaccomplished by Kraut and Johnston's study, which was carried out in 1979 – when video recordings were unusual – but it was also ignored by Matsumoto and Willingham (2006, 2009), who based their findings on an unsystematic sample of still photographs taken by a sports photographer. Requirement (c) was unaccomplished by Kraut and Johnston (1979), who carried out their studies when researchers did not contemplated the theoretical distinction between

Duchenne smile and other kinds of smiles (see Ekman, Friesen, & Ancoli, 1980), and also by Matsumoto and Willingham (2006, 2009; in which the use of still photographs makes the checking of this requirement uncertain), but it was fulfilled by Fernández-Dols and Ruiz-Belda (1995), and Ruiz-Belda et al. (2003). Requirement (d) was not fully carried out by Ruiz-Belda et al. (2003) or maybe by Kraut and Johnston (1979), but the two non-interactive periods of the awards ceremony studied by Fernández-Dols and Ruiz-Belda (1995) had an average length of 18 and 22.6 s, representing plenty of time for the unfolding of smiles. Finally, requirement (e) was not considered in Matsumoto and Willingham (2006, 2009) due to the absence of an explicit differentiation between interactive and non-interactive periods, but it was fulfilled by Kraut and Johnston (1979), Fernández-Dols and Ruiz-Belda (1995), and Ruiz-Belda et al. (2003).

1.2. The present research

The studies reported are new tests of the predictive weight of happiness and social interaction when displaying Duchenne smiles. For comparison purposes, they are also focused on judo fighters and will fulfill the above-mentioned requirements.

1.2.1. Intense emotions

Study 1 data were obtained in one of the most important moments in the career of any young judo fighter: the victory in a junior national championship match. In order to check the intensity of judo fighters' emotional experience, we obtained – immediately after match completion – self-reports on a sample of gold and bronze medalists. In Study 2, we analyzed the expressions of judo fighters who performed *ippons*¹ – instant wins – in important international competitions. Instant wins constitute a powerful antecedent for eliciting intense happiness in these agonistic contexts.

1.2.2. Moment-to-moment measurement of facial expressions

In a complex setting like judo competitions, registering a clear and visible face in every single observation is not always possible. For this reason, an assessment of when judges were able to observe clear faces was needed. We divided behavioral records into different time intervals. This allowed us not only to show the distributions of frequencies related to different time intervals in which facial expressions were analyzed, but also the possibility of detecting outliers. Time intervals were previously selected as video frames, and then they were transformed into seconds. The first interval comprised of a very short and initial interval of only 10 frames (from second zero to 0.40 s). The second interval ranged from 0.44 to 2 s, whereas the third interval ranged from 2.04 to 4 s. With the first three intervals, we covered the generally accepted 4 s time span for facial expressions to unfold after the eliciting circumstance (Ekman, 2003; cf. Matsumoto & Willingham, 2006). An additional time interval was selected from 4.04 s until the end of each study's behavioral record (from 4.04 to 7 s in Study 1 and from 4.04 to 5 s in Study 2).

1.2.3. Discrimination between Duchenne and non-Duchenne smiles

The Facial Action Coding System (FACS, Ekman & Friesen, 1978) allows researchers to analyze facial muscle contractions (called "action units"). For every behavioral record, two independent FACS-certified judges systematically assessed action units in a frame-to-frame fashion. Coders' analyses were restricted to facial displays occurring

¹ An *ippon* provides an instant win when any of the next criteria are met (International Judo Federation, 2011): (a) throwing the opponent with control on his back with considerable force and speed, (b) holding the opponent while having his back, and at least one shoulder, in contact with the tatami for 25 s, (c) when the opponent gives up the fight (i.e., due to suffering an armlock or a strangling technique), or (d) when the opponent loses consciousness in strangling techniques and locks.

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