

The Psychological Study of Smiling

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A smile begins in our sensory corridors. The ear collects a whispered word. The eyes spot an old friend on the station platform. The hand feels the pressure of another hand. This emotional data funnels to the brain, exciting the left anterior temporal region in particular, then smolders to the surface of the face, where two muscles, standing at attention, are roused into action: The zygomatic major, which resides in the cheek, tugs the lips upward, and the orbicularis oculi, which encircles the eye socket, squeezes the outside corners into the shape of a crow's foot. The entire event is short — typically lasting from two-thirds of a second to four seconds — and those who witness it often respond by mirroring the action, and smiling back.

Other muscles can simulate a smile, but only the peculiar tango of the zygomatic major and the orbicularis oculi produces a genuine expression of positive emotion. Psychologists call this the “Duchenne smile,” and most consider it the sole indicator of true enjoyment. The name is a nod to French anatomist Guillaume Duchenne, who studied emotional expression by stimulating various facial muscles with electrical currents. (The technique hurt so much, it's been said, that Duchenne performed some of his tests on the severed heads of executed criminals.) In his 1862 book *Mecanisme de la Physionomie Humaine*, Duchenne wrote that the zygomatic major can be willed into action, but that only the “sweet emotions of the soul” force the orbicularis oculi to contract. “Its inertia, in smiling,”

Duchenne wrote, “unmasks a false friend.”

Psychological scientists no longer study beheaded rogues — just graduate students, mainly — but they have advanced our understanding of smiles since Duchenne’s discoveries. We now know that genuine smiles may indeed reflect a “sweet soul.” The intensity of a true grin can predict marital happiness, personal well-being, and even longevity. We know that some smiles — Duchenne’s false friends — do not reflect enjoyment at all, but rather a wide range of emotions, including embarrassment, deceit, and grief. We know that variables (age, gender, culture, and social setting, among them) influence the frequency and character of a grin, and what purpose smiles play in the broader scheme of existence. In short, scientists have learned that one of humanity’s simplest expressions is beautifully complex.

A True ‘Sign of Enjoyment’

Duchenne’s observations took some time to catch on with behavioral scientists. In 1924, Carney Landis, then a psychology student at the University of Minnesota, published a classic — and by today’s standards, ethically dubious — study of human facial expressions. Landis took pictures of study participants engaged in a series of activities that ranged from sacred to profane: listening to jazz music, reading the Bible, looking at pornography, and decapitating live rats. He evaluated the photographed reactions but found no evidence that certain expressions characterized certain emotions. As for smiles, Landis failed to connect them with satisfaction; in fact, smiling occurred so ubiquitously that Landis considered it an evergreen response — “typical of any situation,” he wrote in the *Journal of Comparative Psychology*.

For decades, many psychologists agreed that smiles reflected a vast array of emotions rather than a universal expression of happiness. This belief persisted until the 1970s, when Paul Ekman and Wallace Friesen, psychologists at the University of California at San Francisco, captured the precise muscular coordinates behind 3,000 facial expressions in their Facial Action Coding System, known as FACS. Ekman and Friesen used their system to resurrect Duchenne’s distinction, by that time forgotten, between genuine smiles of enjoyment and other types of smiles.

In subsequent research, conducted with Richard Davidson of the University of Wisconsin, Ekman and Friesen confirmed the unique link between positive emotion and the true Duchenne smile. The researchers attached electrodes to the heads of test participants and then showed them a series of short films. Two shorts, designed to produce positive emotions, displayed frolicking animals; two others, meant to evoke negative responses, came from a nurse training video depicting amputated legs and severe burns.

Using FACS, the researchers catalogued viewer reactions and found that Duchenne smiles correlated with the pleasant films. The neural data revealed that Duchenne smiles produced greater activity in the brain’s left anterior temporal region, an area with clear connections to positive affect. (They also recorded an increase in the left parietal region, typically stimulated by verbal activity.) All told, scientists were wrong to lump smiles together as a “single class of behavior,” the trio concluded in a 1990 issue of the *Journal of Personality and Social Psychology*. “Clearly the Duchenne smile...is a better sign of enjoyment than other kinds of smiles.”

A renewed appreciation for Duchenne and his unique sign of joy emerged. Mental health researchers

soon noticed that wherever positive emotions went, Duchenne smiles followed. Patients with depression brandished more Duchenne smiles on their discharge interviews than during their admissions, and Duchenne smiling alone — not other types of grins — was found to increase over the course of psychotherapy. Even casual, untrained observers could identify Duchenne-style faces, and based on these looks alone, assigned highly positive traits to the personality behind them.

Some researchers now believe that genuine smiles are not transient sparks of emotion but rather clear windows into a person's core disposition. University of California at Berkeley psychological scientists LeeAnne Harker and Dacher Keltner used FACS to analyze the college yearbook photos of women, then matched up the smile ratings with personality data collected during a 30-year longitudinal study. Women who displayed true, Duchenne-worthy expressions of positive emotion in their 21-year-old photo had greater levels of general well-being and marital satisfaction at age 52. "People photograph each other with casual ease and remarkable frequency, usually unaware that each snapshot may capture as much about the future as it does the passing emotions of the moment," Harker and Keltner wrote in a 2001 issue of the *Journal of Personality and Social Psychology*. A related study, published in a 2009 issue of *Motivation and Emotion*, confirmed a correlation between low-intensity smiles in youth and divorce later in life.

In a more recent study, published this year in *Psychological Science*, Ernest Abel and Michael Kruger of Wayne State University extended this line of research from emotional outcomes to a biological one: longevity. Abel and Kruger rated the smiles of professional baseball players captured in a 1952 yearbook, then determined each player's age at death (46 players were still alive at the time of the study). The researchers found that smile intensity could explain 35 percent of the variability in survival; in fact, in any given year, players with Duchenne smiles in their yearbook photo were only half as likely to die as those who had not.

A 'Vehicle for All Ambiguities'

Landis was correct about smiles in one regard: not all of them are genuine expressions of happiness. In addition to the Duchenne smile, Ekman described seventeen other types of smiles in his 1985 book, *Telling Lies*. Herman Melville understood this, once calling a smile "the chosen vehicle for all ambiguities." People smile when they're frightened, are flirting, horrified, or mortified. An embarrassed smile reveals itself through an averted gaze, a facial touch, and a tilt of the head down and to the left.

People also smile when they're lying, a fact not lost on Shakespeare: Hamlet marvels at how "one may smile, and smile, and be a villain." In the late 1960s, Ekman and Friesen theorized that a trained expert could discern a lying face from an honest one. To put this idea to the test, the researchers asked a group of young nurses to watch a disturbing video then tell an interviewer that they had actually seen a pleasant one. Their facial expressions during this lie were videotaped and FACS analyzed.

Compared to smiles taped during honest interviews, the nurses gave fewer genuine, Duchenne smiles when lying, Ekman and Friesen reported in a 1988 paper in the *Journal of Personality and Social Psychology*, coauthored with Maureen O'Sullivan of the University of San Francisco. The deceitful grins were betrayed by either a raised upper lip, revealing a hint of disgust, or lowered lip corners, displaying a trace of sadness. Ekman's work with lies later inspired the television show "Lie to Me," in which investigators solve criminal cases by interpreting facial expressions.

It's not unusual for moments of sadness, or even bereavement, to cause a smile. The world's best-known smile is intriguing precisely because it could indicate a range of moods; Bob Dylan described Mona Lisa as having the "highway blues." (Harvard neurobiologist Margaret Livingstone argued, in an article in *Science* from 2000, that La Gioconda's smile exists in your peripheral visual field, but vanishes when you look directly at her mouth, see sidebar.)

However, it seems that smiling through tough times does a body good. Keltner and George Bonanno of Catholic University have measured the facial expressions of people who discuss a recently deceased spouse. In a 1997 issue of the *Journal of Personality and Social Psychology*, the researchers reported lower levels of distress in those who displayed genuine, Duchenne laughter during the discussion, compared to those who did not.

The benefits of smiling through grief appear to occur on a biological level as well. Barbara Fredrickson and Robert Levenson once observed the facial expressions made by 72 people watching a funeral scene from the tear-jerker *Steel Magnolias*. Not only did fifty of the participants smile at least once during the clip, the authors reported in a 1998 paper in *Cognition and Emotion*, but those who did recovered their baseline cardiovascular levels more quickly than others who failed to crack a grin.

A 'Contingent Social Display'

Smiling certainly seems built into our nature. No less an authority than Darwin, whose 1872 book *The Expression of the Emotions in Man and Animals* is considered a foundational text of smiling research, proposed that facial expressions are universal products of human evolution rather than unique lessons of one's culture. The zygomatic major has a long evolutionary history, says expression researcher Jeffrey Cohn of the University of Pittsburgh, and facial muscles used for smiling are found in all humans. "There's good evidence that the motor routine involved in smiling is inborn," says Cohn. "The hardware is there."

No surprise, then, that newborns can dispense and interpret facial expressions with great precision. At just 10 months, for instance, an infant will offer a false smile to an approaching stranger while reserving a genuine, Duchenne smile for its mother. Decades ago, Cohn observed how 3-month-olds reacted to changes in their mother's expression. When mothers feigned depression, infants threw up their tiny fists in distress, and after just 3 minutes of smile-free interaction they became withdrawn.

As infants mature, their tendency to smile diverges along gender lines. The ability to produce Duchenne smiles is parceled out equally between the sexes, but men say they smile less than women and both sexes think this to be the case. So do behavioral scientists, who are nearly unanimous in their belief that women smile more than men. Broadly speaking, that seems to be true. But the differences in smiling behavior between men and women hinge on several key factors. A few years ago, a research team led by Yale psychologist Marianne LaFrance performed a massive meta-analysis of smiling research analyzing data from 162 studies and more than 100,000 participants in all, and isolated three variables that influence sex-smiling disparities.

One moderator is gender norms: When people know they're being watched, triggering this norm, sex differences in smiling are greater than when people believe they're alone. A second is situational constraint: When men and women share a task or role that follows rigid social rules — like those

requiring flight attendants to smile and funeral directors to remain somber — the grin gap diminishes. A third moderator is emotional climate: Embarrassing or socially tense situations cause females to smile more than males, but happy or sad situations have no such effect. Smiling, LaFrance and her collaborators concluded in a 2003 issue of *Psychological Bulletin*, “is a highly contingent social display.”

“If you ask people who smiles more, everyone will say, ‘Women, of course,’” says LaFrance, whose book on smiling research, *Lip Service*, is scheduled for publication by W.W. Norton next summer. “What people don’t consider as much — both within the field of psychology and outside of it, is how variable smiling is as a function of the context of a social situation.”

Part of this variability is the cultural background of the beholder. A study published in a 2007 issue of the *Journal of Experimental Social Psychology* highlights the different ways that Americans and Japanese perceive smiles. When viewing emoticons, Americans located expression at the mouth, seeing ☺ as happy and ☹ as sad, while Japanese found it in the eyes, seeing ^_^ as joyful and ;_; as tearful. The variation may reflect an American tendency to express emotions and a Japanese tendency to suppress them; after all, as Duchenne knew, the mouth can be manipulated into a smile more easily than the eyes (see photographs on facing page). A supporting study, published earlier this year, found that Japanese participants emphasized the upper half of a face when determining its trustworthiness, whereas Americans focused on the lower half.

The presence of those around us can influence our smiles as well. An experiment led by Robert Kraut, published in a 1979 issue of *Journal of Personality and Social Psychology*, reported that bowlers smiled more often when facing their friends in the pit than when facing the pins on the lane. Of course people do smile to themselves, but many believe that social context pulls more strongly at our lips than pure, isolated emotion. Alan Fridlund of University of California, Santa Barbara, has found that people smile more when they imagine others around them than when they’re alone — even when their overall levels of happiness remain the same.

Signifying Altruism and Attraction

It stands to reason that if social settings influence our smiles, then smiles probably serve a social purpose. One such function, recent evidence suggests, may be to indicate altruism. To test this notion, a team of researchers led by British behavioral scientist Marc Mehu observed the smiles of test participants told to share some of the fee they received from the study with a friend. When people were engaged in this sharing activity they exhibited more Duchenne smiles than during a neutral scenario. Perhaps people issue genuine grins as a way to “reliably advertise altruistic intentions,” Mehu and his collaborators concluded in a 2007 issue of *Evolution and Human Behavior*.

That Duchenne smiles would announce a cooperative nature makes sense. After all, one’s level of commitment has obvious social value, and genuine smiles are difficult to feign. The ability to identify a truly group-minded person would be particularly useful to those prone to social exclusion. With this in mind, a group of researchers from Miami University of Ohio recently asked test participants to rate various smiles as genuine or fake. Before the task, some were primed for exclusion through an essay task that required them to write about a time they were rejected. Compared with a control group and others primed for inclusion, the excluded participants showed an enhanced ability to distinguish

Duchenne smiles from false ones, the authors reported in *Psychological Science* in 2008.

Not only do people deduce useful information from smiles, they also use this knowledge to direct their own behavior. In a follow-up experiment, published in 2010 in the *Journal of Experimental Social Psychology*, the same researchers found that people primed for exclusion showed a greater preference to work with individuals displaying genuine Duchenne smiles than those bearing cheap grins. “Duchenne smiles are a signal of cooperation, altruism,” says Michael Bernstein, now at Penn State Abington, lead author of both papers. “Non-Duchenne smiling isn’t necessarily bad — it doesn’t mean you’re nefarious — but it’s not a great signal. [Socially rejected people] should be looking for the best signal, and Duchenne smiles offer a better one.”

Another function of smiling (and one that anecdotal evidence supports) is that it enhances our attractiveness. One of the most famous characters in American letters, F. Scott Fitzgerald’s Jay Gatsby, had an irresistible smile that “assured you that it had precisely the impression of you that, at your best, you hoped to convey.” For its part, science has identified part of the reason for a great smile’s allure. A recent fMRI study found that viewing attractive faces activated the brain’s orbitofrontal cortex, a region involved in processing sensory rewards. While this held true for all pretty mugs, the activity in this region was even stronger when the face in focus wore a smile. “The presence of a smile may provide an important signal that a reward is or is not attainable,” the researchers wrote in a *Neuropsychologia* (2003). Although some might argue that the brain, in seeing a smile, has already considered the reward attained.

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