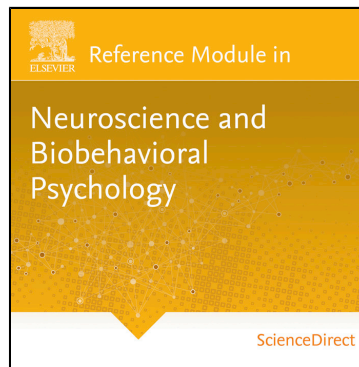


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Subjective Experience and the Expression of Emotion in Humans[☆]

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Glossary

Culture A meaning and information system, shared by a group of individuals and communicated from one generation to the next.

Cultural display rules Rules learned early in life that dictate the management and modification of emotional displays depending on social circumstances.

Emotion A transient, bio-psycho-social reaction designed to aid individuals in adapting to and coping with events that have implications for survival and well being.

Microexpressions A fleeting, transient facial expression of emotion that is a form of nonverbal leakage. They are signs of concealed emotions, and are characterized by their speed, subtlety, and often fragmentary nature.

Schadenfreude A German word referring to the pleasure one feels in the misfortunes of others.

Affect and Emotion

In psychological science, affect refers to the various feeling states humans, and perhaps other animals, experience. Affect plays an important role in our lives, serving as a mechanism of self-information about one's internal states, events that occur, and our relationship with others and our environment. Humans experience a wide range of affective phenomena, such as being tired, bored, sleepy, excited, hungry, angry, afraid, sad, ashamed, proud, embarrassed, happy, or jealous. Affect motivates our behavior, directs our goals, changes our ways of thinking, and colors all of life's experiences in meaningful, relevant, and important ways. Feeling hungry motivates us to find food, just as feeling tired motivates us to rest.

One of the problems that plagues our understanding of the subjective experience and communication of emotion is that emotion is often equated with affect, and this should not necessarily be the case. The universe of affective phenomena includes all feeling states, which includes emotion, but also moods, affect-related personality traits, some psychopathologies, and well-being. Our affective world also encompasses physiological need states – hunger, thirst, tiredness, sleepiness, and boredom.

Moreover, affect and emotion are aspects of psychology that all humans have a lifetime of access to, and a lifetime of contemplating the proper words to describe nuances of an inner physiological state or sensation. Thus it is difficult to arrive at a consensual definition of emotion that encompasses all the possible types of emotion, and at the same time differentiates it from affect. Still, it is important to adopt a working definition of emotion so that readers can understand what part of the affective world we call emotion.

While most people are in some kind of affective feeling state most of the time, emotions are specific types of reactions that involve affect, and other cognitive and physiological responses. We define emotion as transient, bio-psycho-social reactions that aid individuals in adapting to and coping with events that have implications for survival and well being. They are biological because they involve bodily responses. They are psychological because they involve specific mental processes required for elicitation and regulation of response, as well as affect. And they are social because they are often elicited in interactions, and have meaning to those interactions. (We use the word "social" here in the broadest sense in relation to our evolutionary history, which includes interactions not only with other humans, but also other living beings, such as snakes, bears, wild pigs, etc.)

[☆]*Change History:* March 2016. David Matsumoto, Hyisung C. Hwang and Paul Ekman made some changes to the text and updated the Further reading section.

Emotion, therefore, is a special class of affective phenomena. They are unique, evolved, higher-order information processing systems that allow humans to regulate and modulate all the other evolved cognitive, motivational, and motor-behavioral systems to facilitate survival. When emotions occur, they turn on some systems and turn off others so that humans are not overloaded with sensory and cognitive stimuli when dealing with events that have import and require a response. Emotions prevent internal chaos and provide humans with a rapid, unconscious, and automatic system of processing information to facilitate goals, and a mechanism to deal with events, ultimately promoting survival. Emotions evolved to help us cope with events and situations that may have potential consequences for our *immediate* welfare. If humans didn't have emotions, they wouldn't know when to attack, defend, flee, care for others, reject spoiled food, or approach something useful, all of which were helpful in our evolutionary histories (as they are today). Thus emotions helped humans adapt to immediate needs in their environments, and were instrumental in our survival as a species.

How are Emotions Triggered?

Emotions are triggered when we evaluate (or appraise) an event that may potentially be important to us and/or our welfare, and that may require a behavioral response. This system originally evolved to deal with species-constant problems that could occur in interactions with nature or other beings, and is related to survival in a time-tested, predictable, and automatic fashion. The emotion system is hard-wired, fairly impermeable to modification by experience, and relatively unchanged throughout the lifespan (although the inputs to the system – ie, the triggers of emotion – are constantly learned throughout the lifespan).

Perceptions of sensory information are represented as schemas in the mind. These are mental representations of the situations or events being perceived. These schemas consist of at least two components – one referring to the physical characteristics of the sensory information associated with the perceived event stimulus, the other referring to psychological meanings or themes associated with the stimulus. In other words, perceived schemas may describe what the events are and/or what they mean. These schemas are evaluated in an appraisal process, which is immediate, unbidden, opaque, unconscious, and automatic. In that process, perceived schemas must be compared to a known set of emotionally-relevant schemas, that is, schemas that when matched should initiate an emotional response. These latter schemas are likely held in an “emotion schema database.” For example, the perception of a coiled, cylindrical object that is hissing may match the schema of a snake in the emotion schema database, triggering the emotion of fear. The perception of the smell of feces may match the schema of contamination in the emotion schema database, triggering the emotion of disgust.

Some schemas in the emotion schema database have been learned in our evolutionary history and are hard-wired into the emotion system, so that individuals need not re-learn them in their lifetime. The learning of these schemas has already occurred, and one of the beauties of the emotion system is that events associated with these hard-wired schemas will trigger emotional responses with no learning, allowing individuals to rapidly respond to the event triggers automatically and unconsciously. Indeed, if humans had to learn about schemas for fear and then consciously think about the appropriate responses, we may not be alive today. But because we have learned them in our evolutionary past, or because these schemas remain through a process of natural selection, we don't have to relearn them in each and every new lifetime, which is a considerable survival advantage.

At the same time, the schemas stored in the emotion schema database are not fixed. Humans spend a lifetime of learning new schemas to associate different events with different emotions that go well beyond those at birth. The system, therefore, is open and flexible, not closed and fixed. This allows for a myriad of cultural and individual differences in emotional responses, as well as pan-culturally universal ones.

Although the speed of the sensory – perception – evaluation/appraisal process has never been timed empirically, research has shown that the total amount of time from stimulus presentation (which occurs before sensation and perception) to the first observable motoric emotional response (which occurs after evaluation/appraisal) has been clocked as fast as 50 msec. This means that the sensation-perception-appraisal process must occur more quickly than that. As such it is immediate, unbidden, and outside of conscious awareness.

If the perceived schemas do not match those in the emotion schema database, no emotion is elicited and the individual continues to scan the environment. A match, however, initiates a group of responses that are coordinated, integrated, and organized, and constitute what is known as an emotion. The term “emotion” is a metaphor that refers to this group of coordinated responses.

The Emotion Response System

Emotions aid in adaptation because they recruit programs that coordinate and orchestrate other evolved systems, such as perception, attention, inference, learning, memory, goal choice, motivational priorities, physiological reactions, motor behaviors, and behavioral decision making. We group these responses into four categories – cognitions, physiology, expressive behavior, and subjective experience. Their engagement allows for the simultaneous activation of certain evolved systems and deactivation of others in order to prevent the chaos of multiple, competing systems being activated at the same time, allowing for coordinated, orchestrated responses to environmental stimuli. Thus, anger prepares the body to fight and fear prepares for flight. To be sure, not everyone who is angry actually does fight, nor does everyone who is afraid actually flee. In these cases, anger and fear *prepare*

the individual to do so; engaging in such motor behaviors, however, depends on a host of other factors, including cultural, contextual, and individual influences.

The Subjective Experience of Emotion

One of the major components of emotional responses involves affect. The subjective experience of emotion refers to the affective feeling states associated with the arousal or elicitation of emotion. These experiences are most likely heavily influenced by the physiological reactions that occur when emotions are aroused, and the sensations that are associated with those physiological reactions. Research has demonstrated that emotions such as anger, disgust, fear, joy, sadness, and surprise are associated with distinct physiological signatures in both the autonomic and central nervous systems. These physiological changes help prepare individuals to respond to the eliciting stimulus immediately and effectively by initiating and maintaining whole body activity. Anger, for instance, produces vasodilation, pupil constriction, foaming, and piloerection, each of which prepares the individual to fight. Fear, however, produces vasoconstriction, pupil dilation, and bulging eyes, preparing the individual to flee. The same physiological signatures have been found in people of very different cultures, and thus are strongly suggestive of a biologically-innate, universal program for emotional responding that is unique for each emotion.

Because these physiological changes occur, they produce sensations that are felt as part of the subjective experience of emotion. Thus, anger produces feelings of pressure and heat in a container, especially in the upper half of the body, the head, and the face, while disgust produces feelings of revulsion in the mouth. Fear feels cold and constricted because of the flow of blood to the lower extremities, sadness brings about loss of muscle tone and aching in the eyes, and joy brings about tingling. All of these sensations are experienced precisely because of the physiological changes that occur when emotions are aroused.

Emotions also recruit a host of cognitive processes that support the action preparedness of the individual. Two types of basic-level cognitive processes are associated with this arousal. One is the perceptual/attentional system, which maximizes attention to the elicitor and minimizes attention to distractors. The other is the gating of higher mental processes, which limits the novelty of the response and aids in the accessing of memories and other knowledge stores helpful in determining the appropriate subsequent behavioral response. This is why when one is angry, it's easier to think about aggressive thoughts, and to remember previous anger-eliciting episodes. One's senses are heightened to perceive anger in others. All of these cognitive reactions are part and parcel of emotional responses, and contribute to emotional experiences.

Because each emotion recruits a different physiological and cognitive response, each is associated with a unique subjective experience; thus, anger feels qualitatively different than disgust or fear or jealousy. Sadness feels different than shame or guilt. Even positive emotions such as pride, amusement, awe, gratitude, excitement, relief, wonder, or *schadenfreude* (see glossary) feel different from each other. Moreover, each of these emotions is elicited by different types of events, turn on different physiological and cognitive responses, and leads to different potential behavioral outcomes.

Like all affective responses, the subjective experience of emotion serves a function. Feelings of anger, joy, jealousy, or disappointment tell us important information about our internal states, and whether we are cognitively or physiologically prepared to run, fight, jump with joy, or just sit and recoup. Subjective feelings tell us about our relationships with others or the environment. The thrill of victory and the agony of defeat would not occur if competition and its associated outcomes were not important to us, just as are many other matters, such as birth, battle, seduction, and just plain getting along. And, our subjective experiences motivate our future behavior. Success breeds success, or more pointedly, the joy associated with success leads one to want more, just as the disgust that occurs when tasting spoiled milk assures that we don't want to drink it again in the future.

It is useful to distinguish between the affective component of emotion, conscious awareness of it, and the labeling of it. Although affect is aroused as part of the emotion response system, sometimes individuals are not consciously aware that an emotion has been elicited and that their bodies and minds are reacting; it is possible to have an emotion but not be aware of it. Even when one is consciously aware of one's feelings, one may label them in a variety of ways or attribute their causes to different things. Because emotions and their response components are universal, there are great degrees of similarity around the world in how emotional reactions are labeled and interpreted. But, both labeling and the causal attributions about emotions can be dependent on cultural and individual differences. Thus it is entirely possible for anger to be triggered in two people with very different backgrounds, for one to label and interpret their reactions as anger, and for the other to label and interpret reactions differently, even though the reactions themselves are quite similar.

The Communication of Emotion

Darwin suggested that expressive behaviors associated with emotion are the residual actions of more complete behavioral responses. Facial and vocal expressions are part of those actions, and occur in combination with other bodily responses – postural, gestural, skeletal muscle movements, and physiological responses. This perspective suggests that different emotions are associated with specific, unique facial configurations, and that each facial configuration occurs because it complements the behavioral responses associated with the aroused emotion. We express anger in our faces by furrowing the brow and tightening the lips with teeth displayed because these actions are part of an attack response; we express disgust with an open mouth, nose wrinkle,

and tongue protrusion as part of a vomiting response. Facial expressions are part of the coordinated response involving multiple systems.

There is strong evidence for the universality of facial expressions of seven emotions. One such line of evidence comes from judgment studies, in which observers in different cultures are shown various facial expressions and are asked to judge which emotion is being portrayed. Observers around the world universally recognize the facial expressions of anger, contempt, disgust, fear, joy, sadness, and surprise across different stimulus sets, investigator ethnicities and sex, and response formats.

Even stronger evidence, however, comes from production studies, in which emotions are elicited and the resulting facial behaviors are measured. The most well-known of these is Friesen's classic study of Americans and Japanese college students. But since then, there have been many other studies that measured facial behaviors that occurred in reaction to emotionally-evocative situations, and reported that the facial configurations originally posited by Darwin, and verified and somewhat modified over the years, actually occur. These studies have involved a variety of emotion elicitation methodologies, and participants from many different countries and cultures, demonstrating the universality of facial expressions of emotion. Examples of the universal facial expressions of emotion are depicted in Fig. 1.

Moreover, the available evidence strongly suggests an evolved, biological basis of universal facial expressions of emotion. Ethologists have observed the universal facial expressions among humans in nonhuman primates for years. Methods to measure the facial expressions of nonhuman primates have been developed; studies show that nonhuman primates have the same facial musculature for emotion signaling as do humans, and that the same expressions occur in the same types of emotionally-evocative situations as with humans. Congenitally blind individuals spontaneously produce the same facial expressions as sighted individuals when emotion is aroused, and their expressions are more concordant with their kin than with strangers. Interestingly, congenitally blind individuals have difficulty posing expressions voluntarily when asked to do so; but when emotions are aroused spontaneously, they produce the same facial muscle movements as do sighted individuals. Facial expressions of emotion are also more concordant among monozygotic twin pairs than dizygotic twins. Each of these lines of evidence points to an evolved, biological source of universal facial expressions of emotion that does not have to be learned or recreated in ontogeny because the learning and selection has already occurred in our phylogeny.

An evolutionary perspective suggests that vocal expressions of emotion are universal as well, and the evidence for the universality of vocal expressions of emotion is growing. There is evidence to suggest that vocal expressions associated with anger, fear, and joy are reliable and universal. Anger produces voices with harsher, louder sounds, and with an edge to them; fear produces higher pitches, and joy produces enthusiastic and excited sounds. Evidence for the universality of vocal expressions of disgust, sadness, and surprise is weaker, but suggests that disgust is associated with yuck sounds, sadness with softer, labored sounds with longer pauses, and surprise with higher pitches and inhalations. It is no wonder that the face and voice are tied together, as there are some connections between the neural control of the facial musculature and the vocal chords. That is why one can hear another person smiling while talking on the phone, or why it is easier to speak in lower, harsher tones when one's brows are lowered.

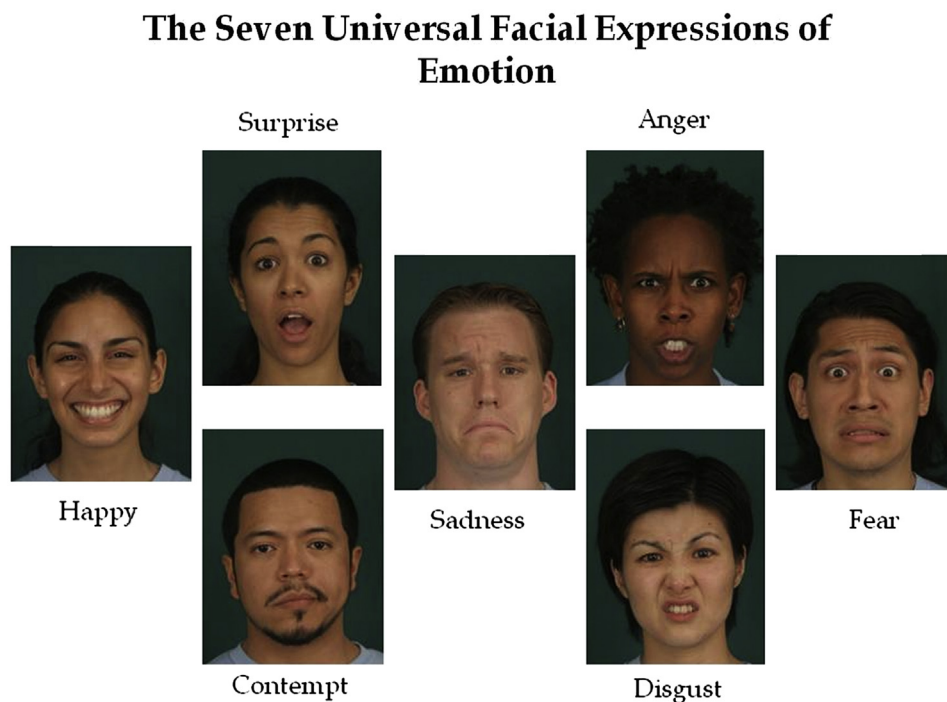


Figure 1 Seven prototypical facial expressions of emotion that occur regardless of race, culture, sex, religion, etc. Copyright David Matsumoto. Reprinted with permission.

Because emotions evolved in order to aid humans by preparing them to engage in action, the responses associated with emotion – physiology, expressive behavior, cognitions, and subjective experience – need to be organized and coordinated. This notion is referred to as “response system coherence” and has garnered empirical support over the last few decades, especially in studies that use facial expressions as markers to signal when an emotion is occurring. Facial expressions of specific emotions are correlated with feelings of the same emotion but not other emotions; thus, facial expressions of anger are correlated with the feelings of anger but not other emotions. Likewise, facial expressions of disgust, fear, joy, or sadness are associated with the subjective experiences of disgust, fear, joy, or sadness, respectively, but not with other emotions. Facial expressions are also linked to specific physiological changes in the body as well; these linkages are universal across cultures.

Cultural Influences on Universal Facial Expressions of Emotion

There are cultural differences in how universal facial expressions of emotion are displayed. Many years ago Ekman and Friesen coined the term “cultural display rules” to describe the rules that people learn, from early in their childhood and throughout their lives, to manage and modify their emotional expressions based on social circumstances. These rules are cultural norms that provide guidelines for what is appropriate to display and what not, depending on the context.

Display rules can act to moderate expressions in many ways. When experiencing emotion, for instance, individuals can express emotions as they feel them with no modification. But they can also amplify their expressions, displaying more than they truly feel (eg, laughing at your boss’s bad jokes); deamplify them, displaying less than they truly feel (downplaying your anger toward your children’s misbehavior); neutralize them, showing nothing when in reality something is felt (the poker face); qualify them, showing emotions in combinations with other emotions or signals that comment on the original feeling (smiling at the same time showing that one is miserable); or mask them (smiling instead of showing one is miserable). Display rules also allow individuals to simulate emotions (expressing them when not truly felt). Display rules, therefore, allow for a considerable range of individual and cultural variation.

In the first study to demonstrate the existence of cultural display rules conducted almost 40 years ago, American and Japanese participants viewed stressful films, first alone and then in the presence of a higher-status experimenter. When alone, both the Americans and Japanese displayed the same facial expressions of disgust, anger, fear, and sadness to the films, highlighting the universal nature of the expressions. In the presence of the experimenter, however, cultural differences emerged. While the Americans generally continued to display their negative feelings, the Japanese were much more likely to smile to hide their feelings. Interestingly, these were the very same participants who, just moments before in the first condition of the experiment displayed the very same expressions as did the Americans. These differences in expression were interpreted to have occurred because of a Japanese display rule to mask their negative feelings with smiles in the presence of a higher status individual. [Fig. 2](#) provides examples from this experiment. The two left photos show the Americans and Japanese displaying the same expressions of disgust when alone; the two photos on the right, however, depict their expressions when with the experimenter.

Another example of cultural display rules came from a study of medalists of the Olympic Games. Athletes all around the world at this level of competition are under intense pressure to “be a good loser” or “be a good winner.” That is, they learn display rules of managing their emotional reactions after winning or losing matches. [Fig. 3](#) depicts three expressions shown in sequence by an athlete who just won the gold medal at the 2004 Athens Olympic Games. The first photograph was taken precisely when the match was over and the outcome was known. Here you can see a broad, strong expression of intense joy from having just won the gold

Examples of Cultural Display Rules

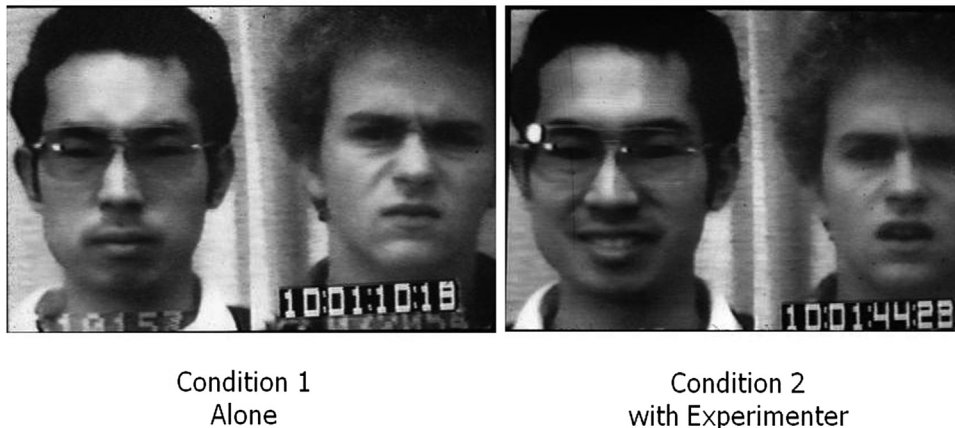


Figure 2 Photos depict American and Japanese participants displaying the same expressions of disgust when alone (left) and their culturally different expressions when with the experimenter (right).

An Example from the 2004 Athens Olympic Games

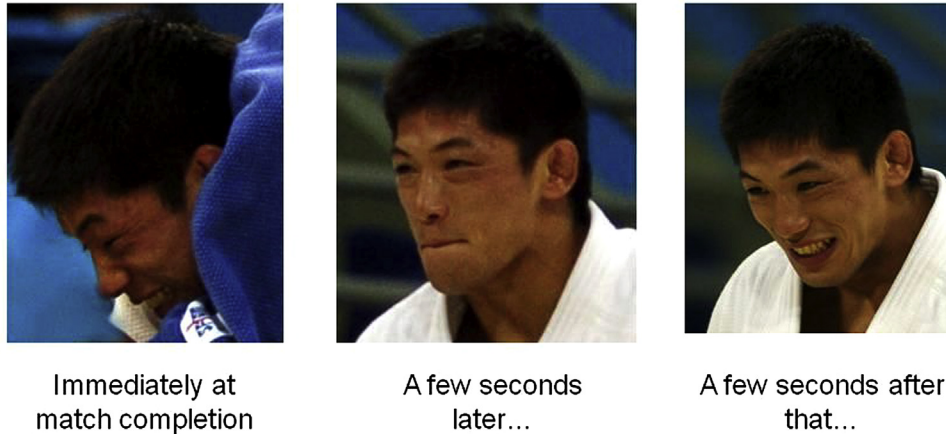


Figure 3 Photos shows Athlete's immediate reaction (smiling) when winning (left); Athlete's culturally-dependent expression trying to control his emotions within a second or two later (middle); and the smile bursting out on his face again a few seconds later (right). Copyright Bob Willingham. Reprinted with permission.

medal. In fact when observers around the world were shown this photograph and asked to make judgments about it, most people judged this person to be happy and to have won the match.

A few seconds later, however, the athlete displayed the expression in the second photograph, which shows him controlling his expression by rolling his lips in and pressing them together as he is smiling. Interestingly, when observers around the world are shown this photograph, most people judged this person to not be happy, and to have *lost* the match.

A few seconds after that, the athlete was unable to control his joy, and the smile re-emerged onto his face in the third photograph. Once again, most observers around the world judged him to be happy, and to have won the match.

These photos are interesting because they highlight the temporally dynamic nature of facial expressions of emotion. Universal facial expressions of emotion were displayed immediately at the end of the match, when outcomes were known. These expressions were universal, and there were no cultural differences in them. A second or two later, however, cultural influences kicked in, and expressions were modified according to culturally learned rules. Thus facial expressions of emotion are both universal and culturally-dependent. This example also highlights why we think cultural differences are so pervasive; when emotionally evocative events occur, we often focus our attention on the event, and not on the expressions of the people involved in the event. When we turn our attention to the people involved even a second later, cultural display rules may be operating, and what we see are culturally-modulated expressions. That is, we may have missed biologically-based, universal expressions that occur immediately, automatically, and unconsciously, because we often don't look at people right when they occur.

Macro Versus Microexpressions

When individuals experience an emotion and there is no reason to modify or conceal their feelings, the facial expressions that occur have certain characteristics. They are likely to have smooth onsets and offsets, last between 0.5 and 4 s, and be symmetrically displayed on the face (with the exception of contempt, which is depicted by a unilateral or one-sided tightening of the lip corners, giving the impression of a smirk). These kinds of expressions occur in normal discourse, are easily seen, and form the basis of emotional sharing that occurs among friends, colleagues, and many interactants. These are known as "macro-expressions."

There is a special case of facial expressions of emotion, however, called "micro-expressions." The major characteristic of these microexpressions is their speed; they can occur as quickly as 1/15th or even 1/30th of a second. Because they are so fast, it is easy to miss them. Indeed, if you blink you won't see them.

Microexpressions are signs of concealed emotions, that is, when the expresser does not wish for his true feelings to be known to others (or him or herself). The idea that microexpressions exist has its roots in Darwin's (1872) inhibition hypothesis, which suggested that facial actions that cannot be controlled voluntarily may be produced involuntarily even if the individual is trying to control his or her expressions. Microexpressions were first observed by Haggard and Isaacs almost half a century ago in their review of clinical interviews. After their discovery, Ekman and Friesen studied them when examining films of psychiatric patients who had lied during a clinical interview and who had concealed either hallucinations or plans to commit suicide. Since then, a growing literature has demonstrated that microexpressions are reliably associated with lying, especially about emotions (eg, saying that one is feeling pleasant when in fact one is outraged).

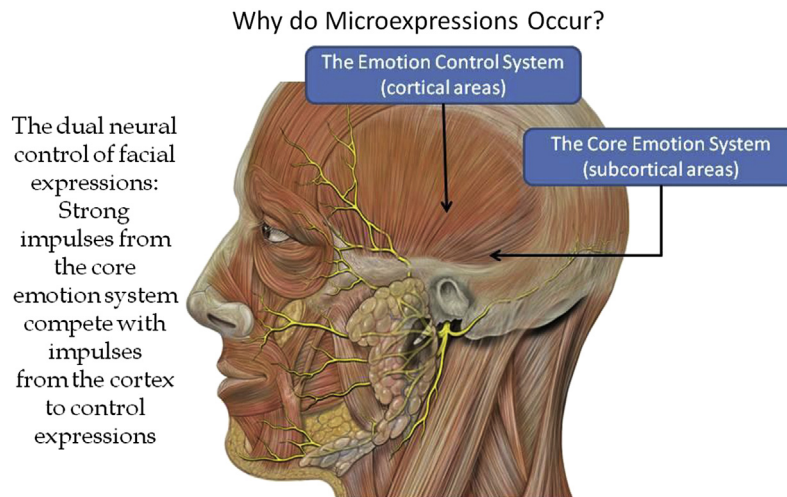


Figure 4 Facial expressions are under dual neural control from two areas of the brain. Microexpressions occur as leakage when the two areas of control compete against each other. By Lynch, Patrick J., Jaffe, C. Carl, MD. Reprinted by Permission.

Microexpressions of emotion occur because of the dual neural control of facial expressions of emotion. The processing centers of emotion are widely believed to exist in certain subcortical areas. When emotions are elicited, neural impulses emanating from these areas trigger the emotion response system, turning on the physiological, cognitive, and expressive systems. Direct impulses from these areas to the facial nerve tell the face to fire the facial muscles in the configurations associated with the emotion aroused. At the same time, however, display rules and other culturally-learned norms are widely believed to be stored in the cortex, and the cortical areas of the brain control voluntary behavior. Thus, if an individual experiences an intense emotion but at the same time is in a context in which he or she does not wish to display his or her feelings, the facial nerve will receive dual, competing impulses, one from the subcortical areas saying to fire, the other from the cortex saying to neutralize the expression (Fig. 4). The result is what is known as emotional or nonverbal “leakage” in the form of a microexpression.

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