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# Biofeedback from an Other Perspective

## Fake It (or Face It) Till You Make It? Taking a Deeper Look

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The concept of "faking it" may seem foreign to psychologists. We talk about honesty, authenticity, and discovering the true self. If we do talk about "faking it," it's most likely in the context of sex therapy (remember the movie *When Harry Met Sally*). So, what is this all about?

We started writing this article when we were approached by an Israeli software company that develops products designed to modify people's moods and improve their well-being. One of their products attempts to determine the user's mood based on physiological indices and facial expressions. Can software train people to develop positive emotions by providing feedback and reinforcements while its users learn to develop these emotions?

Biofeedback clinicians are well aware that they can train people to reduce stress by providing them with feedback on physiological indices associated with arousal. Regarding mood and its valence, the picture is somewhat more complicated, yet there is a consensus that heart rate variability training can be linked to positive emotions such as compassion and appreciation.

Can we use facial expression software the same way? Can we use facial expression biofeedback as a method for generating emotions?

### Facial Expressions—Developmental Aspects

From a developmental perspective, the other's face plays a significant role in gaining self-knowledge. Infants learn to use the information delivered by their mothers' faces. An infant is cued by the mother's facial expressions and is able to monitor her mood. Porges (2011) assumes that facial expressions are used to regulate the infant's emotions. This assumption relies on a neurological basis. The complexity of facial innervation and its interlinks with the upper vagal complex triggers several feedback loops that correspond with neuroception of either safety or danger. The ventral vagus innervates face muscles. Therefore, it can be assumed that a smile or a calm expression will transmit relaxing messages to the vagal complex and vice versa.

Psychodynamic theorists recognized the mirroring aspect of the mother's face early on. Lacan (1949/2002), Winnicott (1967, 1971), and Kohut (1985) each formulated the role of the mother's face in quite similar ways, and then described its role in establishing the infant's self-concept. Basically, they stressed two major aspects of the mother's mirroring function: recognition and feedback. Infants identify themselves (recognition) in their mother's face and gather information about themselves (feedback). Each of these theorists used these concepts to define the therapist–patient relationship, which is based on internalization and symbolization.

Gergely and Watson's (1996, 1999) social biofeedback model of parental affect-mirroring serves as good example for symbolization and internalization of a relationship. This model hypothesizes that 5-month-old babies learn about their inner states through interactive dyadic processes. The parent plays the role of human biofeedback toward helping the infant become sensitive to his or her internal and visceral occurrence, bringing it to consciousness, and representing it as emotion. The infant, in turn, makes use of parental behavior to extract the information needed for mirroring internal states. Such mirroring is a building block in the development of inner sensitivity and emotional consciousness.

Fonagy, Gergely, Jurist, and Target (2002) developed this model even further to explain the repairing effect of a psychotherapeutic relationship. They described emotional mirroring as a central mechanism of therapeutic change in child psychotherapy as well as in adult psychotherapy (Fonagy, Gergely, Jurist, & Target, 2002, p. 199). They proposed that marked affective displays, such as exaggerated facial and tonal mimics, decouple real from pretended parental emotional display. Decoupling enables internalizing and symbolizing emotions and other inner states.

## Facial Expressions—Measurement

Can facial expressions be measured? Can we use them to measure human emotional responses?

Paul Ekman (Ekman & Friesen, 2003) is one of the most well-known researchers of the connection between emotions and facial expressions. Ekman's main theoretical argument is that the facial expressions identified among different cultures, gene pools, and ethnicities tend to resemble one another, meaning that they are not necessarily culture-dependent.

To test his theory, Ekman prepared a catalog of photos of people of Western origin expressing different emotions (disgust, contempt, anger, fear, surprise, pleasure, sadness, and satisfaction). He showed the photos to tribe members in New Guinea. Despite the cultural differences between them, the tribe members easily identified the facial expressions and were able to associate them with the intended emotions.

John Gottman (1999), a leading couples therapist, focused some of his interventions on teaching the couple to understand the importance of facial expressions. One of Gottman's unique interventions involves asking the couple to discuss a conflictual subject, while the therapist observes their facial expressions and body language. The therapist looks at the angle of their lips, the shape and position of their eyebrows, the angle of their chins, and more. This gives the therapist an indication of how close or distant the two are from one another.

## Technology

Researchers in MIT and specifically in Media Lab have been working for years on various psychophysiological sensors (Picard, 1997). Rana el Kaliouby, who completed her dissertation with Picard, followed up on Paul Ekman's work on the connection between various emotions and facial expressions. Rana, also a skilled programmer and successful entrepreneur, founded a company called Affectiva that uses artificial intelligence to identify emotions based on a consecutive series of photos of people's facial expressions.

Can a computer be taught to identify human emotions and facial expressions just by watching videos? The team at Affectiva collected more than four million video clips of people smiling, laughing, getting upset, accepting, being surprised, and more. Using the deep-learning approach, the engineers taught the computer to identify human emotions based on Ekman's catalog of facial expressions. The result of this extensive effort was an application that identifies basic emotions such as disgust, fear, happiness, surprise, anger, and sadness.

At the same time, the Israeli startup mentioned earlier attempted to combine information on facial expressions with heart rate data. This technology generates a valence and arousal index that is used to place the various types of emotions on a positive/negative spectrum, as well as on a spectrum of arousal. Their software enables the user to learn to create positive moods in a state of optimal arousal.

This brings us back to our original question: Can you fake it till you make it? Now that we have a tool that identifies positive moods and provides feedback on the client's emotional state, can willful training using emotional biofeedback also generate a subjective experience of happiness?

## The Smile Prescription

Charles and Elizabeth Stroebel taught us their Quieting Reflex method (Stroebel, 1982). One of the stages of this method is based on causing clients to relax by instructing them to smile inwardly. Several years later, a book called *The Smile Prescription* was published by Rich Castellano (2016). He described how people can improve their health by making an intentional decision to smile more often. This is based on Castellano's personal experience, as well as on research that he cites that shows the impact of a forced smile on a person's mood. One interesting series of studies that he quotes, in the context of his career as a plastic surgeon, focuses on the fact that women who receive Botox injections (a toxin used to relax facial muscles and smooth wrinkles) were shown to react less to emotional stimuli.

## The Facial Expression Hypothesis

While Rich Castellano's research focuses on smiles, a broader series of studies presents the Facial Expression Hypothesis, which claims that movement of the facial muscles can influence the emotional experience. For example, a person who is instructed to frown when meeting another person will likely have negative feelings toward that person.

In 1988, a study was published in the *Journal of Personality and Social Psychology* by a group of researchers (Strack, Martin, & Stepper, 1988) who tested this hypothesis in a rather sophisticated experiment in which they instructed three groups of participants to hold a pen in their mouths in three different ways:

- Members of the first group held the pen between their lips, which inhibits the muscular activity required to create a smiling expression.
- Members of the second group held the pen with their teeth, which facilitates creating a smile.
- Members of the third group held the pen in their hands.

The participants watched videos and were asked to rate how funny they were. The results showed that the group that held the pen in a manner that forced them to smile rated the videos as funnier than the other groups.

Once again, getting back to our original question—fake it till you make it? Can creating a happy face generate genuine happiness? We propose considering this question from a different angle, using an original experiment technique.

Many therapy methods are based on speech and insights. When treating a person with a tendency toward depression, we'll generally treat this condition by talking about it. However, if we understand that many of our emotions are activated by feedback from our bodies, why not activate facial expressions to generate positive emotions? Modern psychotherapists such as Pat Ogden (Ogden & Minton, 2000) talk about techniques that involve activating the body to generate positive emotions such as security, happiness, and playfulness. Ogden achieved this by asking her clients to think of a positive experience and to pay attention to the place in their body where they felt that experience. We suggest a similar experiment using the software mentioned above.

## The Experiment

Our participants will carry out the experiment while sitting in front of a home computer equipped with a camera. The camera will monitor the participants' facial expressions. We propose conducting this experiment with four groups of participants, using the software described earlier to study their facial expressions and state of arousal:

A. The first group will not receive any feedback on the state of their facial expressions.
B. The second group will be instructed to smile in order to influence the software readings.
C. The third group will be asked to form an internal positive emotion that will be reinforced by the software. This means that each time a positive emotion is created (and reflected in facial expressions), the client will receive an indication from the software that he or she is going in the right direction.
D. The fourth group will not be given any instructions except to cause the software to move in the direction of positive emotions (like classic trial-and-error biofeedback).

The participants in each of the groups will be asked to complete the trial over the course of 12 consecutive days, for 20 minutes each day. The next step will be to check the participants' moods based on self-report questionnaires.

Our hypothesis is that the participants in the three experimental groups will improve their moods following this process. The moods in the group that uses fake smiles (Group B) will improve less than in the other two groups that undergo a process of learning and conditioning (Groups C and D). If the results prove this hypothesis, we may have discovered a new type of biofeedback that is based on facial expressions as well as on physiological indices.

## Discussion

The social biofeedback model and biofeedback therapy share similar features. Both use an external medium for beaming internal information outward. The parent in the social biofeedback model serves the same function as the biofeedback instrumentation. The information beamed by the human or artificial instrument coincides with the infant's or client's inner correspondence between somatosensory cues and emotional experience. The information streams continuously in both cases. The mother changes her facial and vocal reflections in tandem with her infant's inner occurrences. Biofeedback instrumentation provides continuous feedback to the client.

By delineating the resemblance between the two, we can propose two inferences. First, biofeedback therapy relies on an innate biological mechanism developed in infancy that utilizes tripartite correspondence between somatosensory cues, emotional experience, and mirrored parental display. Therefore, biofeedback therapy is developmentally grounded therapy (Ehrenreich, 2018). Second, patient–therapist relations are an essential part of biofeedback therapy (Rolnick, Gal, Basset, & Barnea, 2017). Good therapy relationships can mobilize and ameliorate therapy outcome. On the other hand, a less sensitive relationship on the therapist's part will likely hinder the therapeutic process. If the results prove this hypothesis, we may have discovered a new type of biofeedback that is based on facial expressions as well as on physiological indices.

Let's return to our original question—fake it till you make it? We've reached several conclusions. On the practical level, we should consider using facial expressions as a new biofeedback modality. On the theoretical level, this may be an opportunity to broaden our horizons. Instead of a dichotomous distinction between "talking about it" (interpretation-based psychotherapy) and "doing it" (cognitive-behavioral therapy and biofeedback), combining the two methods may be a more integrative solution.

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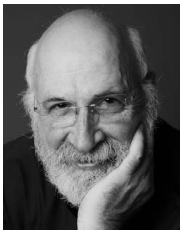

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