Appraisal Inference from Synthetic Facial Expressions

Ilaria Sergi, Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland
Chiara Fiorentini, Swiss Center for Affective Sciences, Faculty of Psychology and Educational Sciences, University of Geneva, Geneva, Switzerland
Stéphanie Trznadel, Swiss Center for Affective Sciences, University of Geneva, Geneva, Switzerland
Klaus R. Scherer, Swiss Center for Affective Sciences, Faculty of Psychology and Educational Sciences, University of Geneva, Geneva, Switzerland

ABSTRACT

Facial expression research largely relies on forced-choice paradigms that ask observers to choose a label to describe the emotion expressed, assuming a categorical encoding and decoding process. In contrast, appraisal theories of emotion suggest that cognitive appraisal of a situation and the resulting action tendencies determine facial actions in a complex cumulative and sequential process. It is feasible to assume that, in consequence, the expression recognition process is driven by the inference of appraisal configurations that can then be interpreted as discrete emotions. To obtain first evidence with realistic but well-controlled stimuli, theory-guided systematic facial synthesis of action units in avatar faces was used, asking judges to rate 42 combinations of facial actions (action units) on 9 appraisal dimensions. The results support the view that emotion recognition from facial expression is largely mediated by appraisal-action tendency inferences rather than direct categorical judgment. Implications for affective computing are discussed.

KEYWORDS

Appraisal Inference, Appraisal Theories of Emotion, Avatar Expression, Emotion Recognition, Facial Expression, Facial Synthesis

INTRODUCTION

In the field of affective computing there is a strong emphasis on automatic recognition of emotion via facial expression (Gunes, 2010; Valstar, Mehu, Jiang, Pantic, & Scherer, 2012). This mirrors a longstanding interest in psychological work on the recognition of emotion, mostly in the face but also in voice, gestures, or movement. In general, actor portrayals of prototypical emotional expressions are used for recognition studies with lay observer-raters. The analyses are mostly performed by determining the percentage accuracy and/or computing confusion matrices for discrete basic emotions identified with emotion words such as sad, angry, fearful, or joyful (or in some cases, using a dimensional approach in terms of positive or negative valence or low vs. high arousal of the respective expression. In this article, a different approach is proposed, arguing that the emotion recognition process may be quite different from simple matching of faces with labels. Rather, it is suggested that it consists of a process of inference based on lower-level information. Concretely, the argument is that observers first infer the expressor’s appraisal (i.e., the evaluation of the significance of a given event and the potential for action) followed by the use this information to deduce the likelihood of particular emotions.
or emotion blends. The study reported here represents a first step in validating this notion, seeking to obtain evidence that judges can reliably infer appraisal from facial action patterns systematically produced via synthesis in avatar faces. The results of this work provide important information on the nature of the psychophysiological processes as well as for the attempt to develop automatic recognition and classification algorithms.

Facial expressions are an essential element in social interactions, allowing individuals to fine-tune their behavior with situational demands. A long-standing debate concerns the kind of information that individuals can gather from others’ expressions. So far, most of the research has focused on facial expressions as readouts of the expresser’s discrete emotions, identified by specific emotion labels. However, standard emotion words may be inadequate to fully capture the complex information conveyed by expressions (see Scherer, 1992; Scherer & Grandjean, 2008). Specifically, by focusing on the subjective emotional experience of an event, observers neglect other important cues carried by an expression, such as the cognitive evaluations (i.e., appraisals) that elicited the expresser’s reaction, the social messages the expresser wants to communicate, and the action tendencies associated with the emotion (Shuman, Clark-Polner, Meuleman, Sander, & Scherer, 2017). In contrast, componential emotion models suggest that individual elements of facial expressions are determined by appraisal results, and their effects on motor behavior are mediated by action tendencies. According to these models, emotion is a process that engenders cognitive activity, motor expression, physiological arousal, action tendencies, and subjective feeling states. Although not directly questioning the idea that different facial expressions mark different emotional states, componential models suggest that emotions have an emergent character based on the interaction of different components driven by the appraisal of an eliciting event. One major effort of componential theories is to render the link between the elicitation of emotion and the response patterning explicit. Componential theorists have thus tried to develop detailed predictions of the specific physiological, expressive, and motivational changes expected to occur as a consequence of specific appraisal results (Scherer, 1986, 1992, 2009; Smith & Scott, 1997). Scherer’s Component Process Model of emotion (CPM) provides a comprehensive framework for research on the mechanisms underlying emotion, in particular expression. The model suggests that there are four major appraisal objectives for adaptively reacting to a salient event: (a) How relevant is this event for me? Does it directly affect me or my social reference group? (relevance); (b) what are the implications or consequences of this event and how do they affect my well-being and my immediate or long-term goals? (implications); (c) how well can I cope with or adjust to these consequences? (coping potential); (d) what is the significance of this event for my self-concept and for social norms and values? (normative significance). To attain these objectives, the organism evaluates the event and its consequences on a number of criteria or stimulus evaluation checks (SECs; see Table 1 in Scherer, 2009), with the results reflecting the organism’s subjective assessment (which may well be unrealistic or biased) of consequences and implications on a background of personal needs, goals, and values.

The fundamental assumption of the CPM is that the appraisal results drive the response patterning in other components by triggering efferent outputs designed to produce adaptive reactions that are in line with the current appraisal results (often mediated by motivational changes). This principle is illustrated for facial expression in Figure 1. Thus, emotion differentiation is the result of the net effect of all subsystem changes brought about by the outcome profile of the SEC sequence (Scherer & Fontaine, 2013). These subsystem changes are theoretically predicted on the basis of a componential patterning model, which assumes that the different organismic subsystems are highly interdependent and that changes in one subsystem will tend to elicit related changes in other subsystems. This process, similar to appraisal, is highly recursive, which is what one would expect from the neurophysiological evidence for complex feedback and feedforward mechanisms between the subsystems. The result of each consecutive check is expected to differentially and cumulatively affect the state of all other subsystems (see Scherer, 2009, Figure 2). The CPM makes specific predictions about the effects of the results of certain appraisal checks on the autonomic and somatic nervous systems, indicating which
Experimental Investigations on the Contour Generation of a Reconfigurable Stewart Platform


[www.igi-global.com/article/experimental-investigations-contour-generation-reconfigurable/61158?camid=4v1a](http://www.igi-global.com/article/experimental-investigations-contour-generation-reconfigurable/61158?camid=4v1a)