

Asymface6pap

Running Head: FACIAL EMOTIONS

High frequency of “non-standard emotions,” especially confusion, in reference to naturallyk
occurring facial expressions of Americans

Paul Rozin

University of Pennsylvania

and

Adam B. Cohen

Dickinson College

Send correspondence to:

Paul Rozin

Russell Sage Foundation

112 E. 64th St.

New York, NY 10021

rozin@rsage.org

1-212-688-3433

Abstract

College students in a large introductory psychology class, naive to the hypotheses under test, were instructed to observe symmetric and asymmetric facial expressions over a one-week period, and to report, among other things, a) the more expressive side, b) a judgment of the “emotion” being expressed, and c) the facial movements involved. For both asymmetric and symmetric “emotions,” some of the most common “emotions” reported are not included in standard taxonomies of emotion. Confusion is the most common descriptor reported for asymmetric expressions, and is commonly reported for symmetrical expressions as well. Other frequent descriptors were think/concentrate and worry. Confusion seems to be characterized principally by facial movements around the eyes, and has many properties usually attributed to emotions, although it has not been included in lists of emotions, and has been essentially unstudied.

There was no evidence for positive, asymmetric emotions to be biased to the right face, and negative to the left face, in right-handers. There was some evidence that symmetric expressions disproportionately express positive emotions in comparison to asymmetric expressions.

There is much evidence suggesting that there is a set of basic emotions, as defined and evidenced by a number of investigators (Ekman, 1992; Ekman & Friesen, 1975; Izard, 1971, 1979). A cornerstone of this work is evidence for recognition and expression of the “basic” six emotions (anger, disgust, fear, happiness, sadness and surprise) by people in a number of cultures. Because of the distinctly different facial expressions for each of the “basic emotions,” and the capability of scoring these expressions in an objective, reliable and quantitative way with the Facial Action Coding System system (FACS; Ekman & Friesen, 1975), facial expressions have become the gold standard in emotion research. They occupy a central role in both Izard’s (1971, 1979) and Ekman’s (1992) emotion taxonomies. The main consequence of the present study, though not its intended purpose, is to note that some of the most common facial expressions do not correspond to the “standard set” of emotions.

Ironically, while Paul Ekman, more than anyone else, is responsible for the importance of facial expression in the conception and measurement of emotion as studied by psychologists, he has also emphasized that many facial expressions do not correspond to emotions (e.g., Ekman, 1978, 1979). Ekman (1978) lists 18 types of information conveyed by facial expressions, of which emotion is only one. With respect to one set of facial expressions, brow movements (Ekman, 1979), he has analyzed in detail the different types of information conveyed, with emphasis on the use of facial expressions as conversational enhancers, and to explicitly convey certain types of information outside of conversational contexts (emblems). In spite of this, facial expression, in the literature, is almost always studied as a manifestation of emotion. Since almost all work on affect is done under the umbrella of “emotion,” affective states (except for pain) and facial expressions that do not classify as “emotions” have received little scholarly

attention. The study we are about to describe originated in this framework, and this accounts for our use of the problematic term, “non-standard emotions.”

The study began in the context of lateralization of emotional valence in the cerebral hemispheres. Facial expressions are the principal output measure used to test many hypotheses about this specialization. For right-handers, there are suggestions that the right hemisphere dominates in expression and recognition of negative emotions, and the left hemisphere dominates in the expression (but not recognition) of positive emotions, but the evidence is mixed, as indicated in two recent reviews (Borod, Haywood & Koff, 1997; Skinner & Mullen, 1991). The issue is more complex than it appears because, among other things, there is a notably greater tendency for posed as opposed to spontaneous emotions to be asymmetrical (Hager & Ekman, 1985), and this distinction is often not made in the relevant studies. Evidence for localization of affect in accordance with valence is not limited to studies of facial expression; there are a number of lines of evidence, including differential activation of the two hemispheres by opposite valenced stimuli, or what may be a more appropriate distinction, by stimuli that tend to elicit approach versus avoidance (Davidson, 1992).

The present study was motivated originally as an introductory psychology class observation study, carried out by the students, to test the valence lateralization hypothesis. Students, blind to the hypothesis (before the issues were discussed in class) were asked to record up to five instances of spontaneous, asymmetric, facial expressions, and indicate, among other things, the emotion expressed, when possible the “emotion” reported by the subject, handedness of the subject, and the more expressive side. The term “emotion” was almost certainly taken by the participants in a non-technical sense, to refer to whatever they thought was going on “inside” when the expression was occurring. The results, based on over 2000 observations, provided no

evidence for lateralization of valence. But, more surprisingly, a few of the most common reported “emotions” were from neither the standard basic emotions or the most frequently cited, other, more complex emotions (e.g., shame). In the following year, the study was repeated, using greater care in listing a set of emotion terms to prompt designations from the students (the list of possible “emotions” came directly from the most frequently mentioned emotions in the first study), and including symmetric facial expressions as well as asymmetric expressions. The results reported here come from this second, better balanced and better designed study.

Method

Data collection. Data collection was performed as a class project by students (n = 255) in an Introduction to Psychology class at the University of Pennsylvania. Their instructions were as follows:

“During the next two days, try to observe 5 cases of asymmetric facial expressions, where one side of the face is more expressive than the other. Asymmetric facial expressions may be hard to observe, and you may not find five to report, but get as close to five as you can. Also try to observe 5 cases of symmetric facial expressions, where both sides of the face are equally expressive.

“We are referring to expressions, facial actions that last seconds. These are active expressions; we are not interested in the fact that an individual has a “resting” face in which one side (for example, one lip or eye), is lower than the other. Do not use an expression of the same person more than once. And do not record more than one expression in the same situation. That is, if you are sitting around watching TV with some friends, that would count as one situation, and would generate at most one expression. These rules hold only within type (symmetric or

asymmetric). You may record symmetric and asymmetric expressions in the same situation (one of each in the same situation).

“When you observe a facial expression in another person, write down the following information, whenever possible. Use separate charts for the symmetric and asymmetric expressions. [a chart was provided]

“I. Which side of the face is more expressive. [for asymmetric expressions]

”II. The handedness of the person (right, ambidextrous, left, or undetermined).

You may not be able to get this information, since you may not be able to speak to the person. That is OK. Then just leave this blank.

“III. The “emotion” that you believe the person is expressing. MAKE SURE YOU MAKE THIS JUDGMENT BEFORE ASKING THE PERSON (IV below). The following is a list of possible emotions you might note, but you are free to include other words that are more appropriate than any on the list. “afraid (fearful, anxious, apprehensive, scared), agreement, amused (giddy, humor, silly, joke, laugh, mischievous, secretive, sly, teasing), anger (annoyed, insult, irritated), ashamed (embarrassed, sheepish, shy, timid), attracted, awed, awkward, bored (indifferent), concentration, concerned (worried), confident (proud), confused (consternation, puzzled, uncertain), content (fulfilled, pleased, relaxed, satisfied), pensive (contemplative, thoughtful), contempt (disdain), cool, curious (inquisitive, interested, intrigued), desperate, disappointed, sad (unhappy), disapproving (dislike), discomfort (pain), disgust (grossed out), envious (jealous), excited, flirtatious (sexy, coy), frustrated, guilty, happy (joyful), sarcastic (wry), surprised (shocked), skeptical, sympathetic, tired, upset, and worried (upset, nervous).” (This list was derived from the most common words generated in a previous study of the same general design, with a class of similar size, but with free report of the emotion terms.)

“IV. The 'emotion' that the PERSON claims to be expressing. Depending on the situation, you may not be able to interview the person. That is OK. Then just leave this blank. “

[The target person was NOT given the emotion list]

“V. Your description of the nature of the facial expression.

“VI. Description of the situation in which the expression occurs.

“VII. Your judgment of whether the emotion is positive, negative, or neutral.”

In the charts provided to the students for data reporting, a sample row was filled in the separate charts for symmetric and asymmetric emotional expressions. The emotion in both cases was happiness, and the expression was “smile.”

Data analysis. The emotion reports of both the observer and the participant were categorized before analysis, in accordance with the groupings presented on the list, above. Although students were not always able to obtain the observed persons' judgment of the emotion, the large n provided us with a sufficient sample size to perform our analysis on the participant's judgment, as a more direct indicator of affective state.

Results

The class reported 1245 symmetric and 996 asymmetric expressions.

Lateralization and valence: Of the asymmetric expressions, 487 were left-side more expressive, and 509 were right-side more expressive, a non-significant difference. Our first question was whether there is a different valence distribution of asymmetric and symmetric emotions. We restricted the analysis to right-handed subjects. The results, presented in Table 1, indicate that 41% of symmetric expressions are positive (as opposed to negative or neutral), while only 31% of asymmetric expressions are positive (for the overall distribution, including neutral as a third category, $\chi^2 = 15.42$, $df = 2$, $p < .001$).

Next we tested the hypothesis that there is a relation between the more expressive side of the face and the valence of the emotion, for right handers. The results showed no significant relation, with 36 % negative for left side more expressive and 37 % negative for right side more expressive (data in table 1) chi square = 1.55, df = 2, p = .46).

A tabulation of the frequency of emotion categories for symmetric and asymmetric expressions (table 2) reveals no major differences (i.e., at least double relative incidence level for moderately common emotions) between asymmetric and symmetric expressions.

Occurrence of “non-standard emotions”: The types and categories of “emotions” reported, as was the case in our large prior pilot study, included a number of “non-standard” emotions. Table 2 reports the proportion of each type of “emotion” for both symmetric and asymmetric expressions, for the three most common non-standard emotion categories: confusion, worry, and concentration.

The most striking “nonstandard emotion” is confusion, scoring highest of all asymmetric emotions (14%), and ranking 7.5 among the symmetric “emotions.” Overall, a full 44 % of asymmetric and 32% of symmetric “emotions” fall into the “anomalous” or “non-standard” categories. (We judged that some emotion descriptors, while not using the “standard” emotion names, could be assimilated under the standard terms, as follows: joke/amusement under happiness, disappointment under sadness, and frustration under anger; these are not counted as non-standard emotions). Two other relatively common nonstandard “emotions” are: thinking/concentration and worry, and less common reports include excitement, skepticism, flirtacious, tired, indifferent and pain (Table 2). The most common “nonstandard emotion,” confusion, appeared 70% of the time in asymmetric expressions; worry and concentration were represented about equally frequently in symmetric and asymmetric forms.

We tabulated the facial movements described for the three most common “nonstandard emotions” (confusion, concentrate, and worry). Of course, the movements described by observers were in non-technical terms, such as “eyebrows raised,” “eyes squinted,” “frown,” “lips pursed,” or “bite lip.” We did not convert these to facial action units, but rather used the terms reported by observers. However, for ease in summarizing results, we combined a set of reports all amounting to “eyes narrowed” (eyebrow lower, furrowed, or scrunch, frown, and squint), even though some of these are produced by different facial actions with potentially different communicative significance. These reports are presented separately in Table 3, but we suspect that many participants confused these different actions. Across these three “non-standard emotions,” two types of expressions are much more common in the asymmetrical expression: eyebrow raise (11 cases in symmetrical expressions, 57 in asymmetric) and tongue protrude or lip bite (10 cases in symmetrical expressions, 29 in asymmetrical). The unilateral eyebrow raise is surely less common in incidence than bilateral/symmetric eyebrow raising in randomly sampled facial expressions, but strikingly not so for these three “non-standard emotions.” Single eyebrow raised seems to have a different meaning from both eyebrows raised. On the other hand, both tongue protrusion and lip biting would be expected to be more common in asymmetric form, simply because there are many locations along the lips where both can occur, and only one (midline) would qualify as symmetrical.

There was wide variation in the facial actions attributed by our amateur observers to the three nonstandard emotions (Table 3). For symmetrical confusion, the dominant expression was the combined category of narrowing of the eyes (23 out of 56 total expressions). For the 122 asymmetric expressions listed, one eyebrow raised was most common (41) followed by eye narrowing (32). For symmetrical worry, eye narrowing was the dominant report (14 of 46 total

expressions), while for asymmetrical worry, the most common response was biting the lip (16 of 48 reports). For symmetrical thinking/concentrating, the most common report was narrowing of the eyes (22/72) whereas for 79 asymmetrical expressions, most common were narrowing of the eyes (14) and raising of the eyebrows (13). It is notable that for asymmetrical concentration expressions, there were 6 cases of lip biting and 5 of tongue protrusion. Tongue protrusion has been reported in the prior literature as common in situations in which the expressor is concentrating or at a moment when a decision/choice is being made (Smith, Chase & Liebllich, 1974).

Discussion

We report two different findings in this study. One is the lack of evidence for a bias (for right handers) for negative facial expressions to be more intense and frequent on the left side of the face (right hemisphere), and positive facial expressions to be more intense on the right side (left hemisphere). As indicated in the introduction, there is now a substantial and conflicted literature on the mapping of valence to the hemispheres and the face (Borod, et al., 1997; Skinner and Mullen, 1991). Our study is a minor contribution to this debate, adding one more voice suggesting that, under some conditions, the valence/hemisphere link does not appear. Given the mode of data collection that we employed, the data base includes both spontaneous and posed expressions, in proportions that we cannot estimate.

Our more interesting (though unexpected) finding is that many facial expressions do not correspond to basic emotions, or even anything usually called an emotion. This suggests either that facial expressions are used to a great degree to express things other than “emotions” or that we should expand our category of “emotions.” As we noted in the introduction, Ekman (1978, 1979) has clearly indicated that though he sees facial expressions as an integral part of emotions,

facial expressions often exist independent of emotion. Thus, our report of the high frequency of interpretations such as “confusion” for facial expression does not stand in conflict at all with Ekman’s view of emotion. Confusion, concentrating, and worry could just be non-emotional forms of expression. However, at least confusion and worry are clearly valenced states similar to emotions, and given the focus of the literature on affect, classification as something other emotion causes them, whatever their frequency and importance, to be ignored.

The second most common descriptor (“emotion” or “facial expression correlate”) reported by our observers (equally weighting asymmetric and symmetric displays, and combining happiness and joke/amusement into the single largest category) is confusion, a term that is virtually non-existent in the affect or emotion literature. Yet, in many respects, we believe “confusion” would qualify as an “emotion,” according to the criteria set out by Ekman (1992). It is surely valenced (negative), has a distinct facial expression, and a distinct internal state (“qualia”). It is, perhaps, under more voluntary control than the standard emotions.

A disproportionate number of instances of the three most common descriptors involve asymmetrical facial expressions. The canonical expressions of the six standard emotions are symmetrical, but a reasonable candidate for a seventh basic emotion, contempt (Ekman & Friesen, 1986), is principally asymmetrical. Indeed, there is a clear relation in terms of elicitors, meanings, and expression, between one of the less common descriptors our observers report, , skepticism, and contempt.

These results in no way question the important link between basic emotions and facial expressions; rather, they remind us, that as Ekman (1978, 1979) has pointed out, facial expressions should not be exclusively aligned with “basic emotions.” Of course, according to the position on facial expressions taken by Fridlund (1994), where facial expressions are framed

as indicators of likely action (Smith, 1975), the common responses we report, such as confused, and thinking, are indicants of likely inaction. The confusion expression might be designed to encourage social interaction, whereas the concentration expression may discourage such interaction (“Don’t bug me now, I’m thinking”). Ekman (1978) explicitly refers to this situation, and links it with lowering the brows and bringing them together (action unit 4). Ekman (1979) also mentions disbelief and skepticism as examples of non-emotional facial expression, and differentiates expressions of this sort from others that are signs of emotions on the grounds that emotions and their expression are more coherent, organized, occur earlier in life, are less under voluntary control, occur more frequently when not observed, have more complex meanings, and have a different time course (Ekman, 1979, see also Ekman, 1992). We believe that confusion might well qualify as an emotion under these criteria, and that a case might be made for concentrating, worry, and skepticism. Concentrating fits better under an information communication conception of emotion.

We suggest that, as valuable as the basic emotions idea has been and continues to be, we should extend the study of affect and expression to some of the most common situations/faces/elicitors that have been previously ignored. A beginning has been made in this regard by research on emotions that are common and taxonomized in non-Western cultures (see reviews by Kitayama and Markus, 1994; Mesquita and Frijda, 1992). As an example, the Hindu emotion taxonomy is somewhat broader than the Western, and more differentiated on the positive side (Hejmadi, 2000). Furthermore, it is closely tied to expressive gestures, of the hands and body as well as the face. Recent work suggests that some of the distinctively Hindu expressions are accurately recognized by Americans (Hejmadi, Davidson, and Rozin, 2000). Some affective states, not typically categorized as emotions, such as pain, have frequently

associated facial expressions, but in any case, pain is the subject of a great deal of scholarly attention. What characterizes the affective/signaling states that we refer to, particularly concentrating and confusion, is that they are very common and almost unstudied.

The results we report are subject to criticism because the data were collected by untrained undergraduate students, and hence were almost certainly less accurate and reliable than judgments made by trained observers. However, there is absolutely no reason to think the results are biased in any way. It would certainly be important to do this sort of study with experienced observers. We consider our main contribution of this study to be to call attention to some relatively ignored but quite common facial displays that have affective content. At least one of these, confusion, has many of the properties of an emotion. But whether or not they are “emotions,” their high frequency suggests that they are deserving topics for further research.

Authors' note

Adam B. Cohen and Paul Rozin. Department of Psychology and Solomon Asch Center for the Study of Ethnopolitical Conflict, University of Pennsylvania, 3815 Walnut St., Philadelphia, PA 19104-6196. Email: rozin@psych.upenn.edu. Fax (215) 898-1982. Adam Cohen's current address is Department of Psychology, Dickinson College, PO Box 1773, Carlisle, PA 17013. This research was supported by funds from the Edmund J. and Louise W. Kahn Chair for Faculty Excellence, at the University of Pennsylvania.

References

Borod, J.C., Haywood, C.S., & Koff, E. (1997). Neuropsychological aspects of facial asymmetry during emotional expression: A review of the normal adult literature. Neuropsychology Review, 7(1), 41_60.

Davidson, R.J. (1992). Emotion and affective style: Hemispheric substrates. Psychological Science, 3(1), 39-43.

Ekman, P. (1978). Facial signs: facts, fantasies and possibilities. In T. Sebeok (ed.) Sight, sound, and sense pp. 124-156. Bloomington, Indiana: Indiana University Press.

Ekman, P. (1979). About brows: emotional and conversational signals. In: M. von Cranach, K. Foppa, W. Lepenies, & D. Ploog, Human ethology. London: Cambridge University Press.

Ekman, P. (1992). An argument for basic emotions. Cognition and Emotion, 6(3-4), 169-200.

Ekman, P. & Friesen, W.V. (1975). Unmasking the face: A guide to recognizing emotions from Facial Clues. Englewood Cliffs, NJ: Prentice-Hall. [FACS??]

Ekman, P. & Friesen, W.V. (1986). A new pan_cultural facial expression of emotion. Motivation & Emotion, 10(2), 159-168.

Fridlund, A.J. (1994). Human facial expression: An evolutionary view. San Diego: Academic Press

Hager, Joseph C., & Ekman, Paul (1985) The asymmetry of facial actions is inconsistent with models of hemispheric specialization. Psychophysiology, 22, 307-318

Hejmadi, A., Davidson, R., & Rozin, P. (2000). Exploring Hindu Indian emotion expressions: Evidence for accurate recognition by Americans and Indians. Psychological

Science, 11, 183-187.

Hejmadi, A. (1999). The ancient Hindu emotion taxonomy from the Natyasastra.

Unpublished manuscript.

Izard, C.E. (1971). The face of emotion. New York, NY: Appleton_Century_Crofts

Izard, C.E. (1979). (Ed). Emotions in personality and psychopathology. New York, NY: Plenum.

Kitayama, S. & Markus, H.R. (Eds.). (1994). Emotion and culture: Empirical studies of mutual influence. Washington, DC: American Psychological Association.

Mesquita, B. & Frijda, N.H. (1992). Cultural variations in emotions: a review. Psychological Bulletin, 112, 179-204.

Rozin, P., Lowery, L., Imada, S., & Haidt, J. (1999). The CAD triad hypothesis: A mapping between the other-directed moral emotions, disgust, contempt, and anger, and Shweder's three universal moral codes. Journal of Personality & Social Psychology, 76, 574-586.

Skinner, M., & Mullen, B. (1991). Facial asymmetry in emotional expression: A meta analysis of research. British Journal of Social Psychology, 30, 113-134.

Smith, W. J. (1975). The behavior of communicating. Cambridge, Mass.: Harvard University Press.

Smith, W. J., Chase, J., & Liebllich, A. K. (1974). Tongue showing: A facial display of humans and other primate species. Semiotica, 11 (3), 201-246.

Table 1

Valence distribution of spontaneously expressed asymmetric and symmetric expressions

Valence	Symmetric	Asymmetric (more expressive side)		Total
		Left	Right	
Negative	276	113	140	529
Neutral	240	110	115	465
Positive	352	93	122	567
Total	868	316	377	1561

Table 2

Frequency distribution of emotion categories reported.

(Proportion is of all emotions reported for each type (asymmetric and symmetric).

(Emotions listed in italics are those which we consider outside of the standard list of facially expressed emotions; bold faced emotions are not on the standard lists but one could rather easily assimilate them to standard emotions)

<u>Asymmetric expressions</u>		<u>Symmetric expressions</u>	
<u>Emotion</u>	<u>Proportion*</u>	<u>Emotion</u>	<u>Proportion*</u>
<i>Confusion</i>	.14	Happiness	.14
<i>Joke, amuse</i>	.10	<i>Joke, amused</i>	.09
Happiness	.08	Surprise	.08
<i>Think, concentrate</i>	.08	Anger	.08
Anger	.06	<i>Think, concentrate</i>	.06
Worry	.06	<i>Excite</i>	.06
Disgust	.05	<i>Confusion</i>	.05
<i>Interest</i>	.04	Worry	.05
<i>Flirtaciousness</i>	.04	<i>Indifference</i>	.04
Surprise	.04	<i>Interest</i>	.04
<i>Skepticism</i>	.03	Sadness	.04
<i>Tired</i>	.03	Disgust	.04
<i>Indifference</i>	.03	<i>Tired</i>	.03
<i>Pain</i>	.02	Contentedness	.02
<i>Frustration</i>	.02	<i>Embarrassment</i>	.02
Sadness	.02	<i>Frustration</i>	.02
<i>Embarrassment</i>	.02	<i>Pain</i>	.02
Contentedness	.02	<i>Disappointment</i>	.01
<i>Disapproval</i>	.01	<i>Skepticism</i>	.01
<i>Excitement</i>	.01		
<i>Disappointment</i>	.01		

* The categorizations tabulated here comprise 91% of all of the asymmetric emotions listed by participants, and 90% of the symmetric emotions.

Table 3

Basic facial movements features listed as characteristic of reports of confusion/puzzle,
 think/concentrate, and worry

(specific facial expressions are listed in this table only if reported at least 8 times across the three
 nonstandard emotions, or at least 5 for any particular category of emotion and symmetry.

Facial action	Confusion Symmet	Confusion Asymm	Worry Symmet	Worry Asymm	Concentrat Symmet	Concentrat Asymm
EYE AREA						
Eyebrow raise/ arched	11	41		3	6	13
Eyebrow furrow/ arched down/ come together/knitted	10	8	6		11	
Eyebrow lower	2	6	2		3	4
Eye closed		1	1	1	1	7
Eye squint	7	13		2	6	9
Stare					6	
Eyebrows together/ scrunch	1	2				
Frown	3	3	6	2	2	1
Eyes look up			1		3	5
Eyes wide open	3	1	5	2	1	
MOUTH AREA						
Side mouth stretch						5
Lips/mouth raise	2	15		6		3
Lips purse/scrunch		5	3	1	5	3
Smile	5	9	3	2	4	6
Lip corner lower	1	3	1	4	2	
Lip press			4	1	3	1
Tongue protrude/ move on teeth					1	5
Open	4		3	2	3	
Bite lip		2	4	16	5	6
Face scrunch		4	1			2