Forced-Choice Response Format in the Study of Facial Expression[1]

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This article is a methodological note on a potential problem with a forced-choice response scale in the study of facial expressions of emotion. For example, a majority of subjects categorized Matsumoto and Ekman's (1988) reported facial expression of "anger" as contempt *when using one forced-choice format, as* disgust, *with another format, and as* frustration, *with a third. When shown the anger expression and given a choice among* anger, frustration, *and other labels, few subjects (12.5% on average) selected* anger. *If* contempt, disgust, *and* frustration *are considered wrong answers, then forced choice can yield consensus on the wrong answer; if* anger *is the right answer, then forced choice can fail to yield consensus on the right answer.*

In this article, I attempt to raise questions about the precise conclusions that can be drawn from a response format commonly used in studies of the judgment of emotion from facial expression.

In such studies, subjects are often asked to select the emotion from a prespecified list. Adults might be given a list such as *happiness, sadness, fear, surprise, anger, contempt,* and *disgust.* Children might be given *happy, sad, scared,* and *mad.* Some variant of the forced-choice response format has been used, either alone or with other formats, in many of the important studies cited as showing that specific emotions are recognized from specific facial expressions (Boucher & Carlson, 1980; Ekman, 1972; Ekman & Friesen, 1971, 1975; Ekman et al., 1987; Ekman & Heider, 1988; Ekman,

Sorenson, & Friesen, 1969; Izard, 1971; McAndrew, 1986; Niit & Valsiner, 1977). Results from forced choice alone have been taken to establish which emotion a particular facial configuration expresses (Ekman & Friesen, 1986, 1988; Matsumoto & Ekman, 1988), even when contradicted by results from other formats (Ekman, O'Sullivan & Matsumoto, 1991).

Potential problems with forced choice have not been widely discussed (Russell, 1989). If the observers find on the prespecified list the precise emotion that they had already spontaneously thought of, then no problem arises. However, consider the situation in which the list of response options fails to include a label for the observers' spontaneous categorization of the expression. It might be thought that such a situation would be immediately obvious because it would result in random or idiosyncratic responses. However, this situation might instead yield a consensus on one of the available labels—or, at least, such is the prediction from several possible accounts of categorization. For example, by one account, to label a facial expression is to select the available label closest to that expression within a structural model (Russell & Bullock, 1986; Russell & Fehr, 1987). Whatever the theoretical explanation, if this prediction is borne out, then the researcher who uses forced choice alone would have no way to detect cases in which the observer's spontaneous categorization is missing. The result could be potentially misleading.

The purpose of the present study was therefore to show that, when forced-choice is used, a given facial expression can be categorized as the "wrong" emotion, and the "wrong" expression can be categorized as a given emotion—wrong, that is, from the perspective of those who claim that specific facial expressions signal specific emotions. And "wrong" does not mean simply expressions slightly different from the prototype, but expressions previously claimed as expressing "fundamentally" different emotions: the "anger" expression categorized as *contempt*, the "contempt" expression categorized as *disgust*, the "disgust" expression categorized as *anger* and so on. According to these predictions, subjects' use of a forced-choice format is systematic and understandable, but the results obtained need not point to a single correct answer.

STUDY 1: FORCED CHOICE AMONG REMOTE ALTERNATIVES

The first study consisted of six conditions—or demonstrations. In each condition, subjects were shown a photograph of one type of facial expression, the label for which had been established by Matsumoto and Ekman (1988). Subjects were then asked to select one response option from a list of five. The list was the same for all conditions, except for the middle option, which was the focus of the study. In each case, the word in the middle option was predicted to be the one that subjects would find the best of

those available (Russell & Fehr, 1987), although the word was not a synonym for Matsumoto and Ekman's label.

Method

Subjects. Subjects were 480 adults, half men, half women, all native speakers of English. Subjects were selected randomly in public places and assigned randomly to one of six conditions (within the constraint of equal number of subjects per cell). There were thus 80 subjects per condition, 20 subjects for each of four photographs.

Photographs. Stimuli were sixteen 3 × 5 color prints from the set JACFEE, developed by Matsumoto and Ekman (1988): Four each were labeled *anger, disgust, sadness,* and *contempt*. The sample of photographs for each emotion was balanced with male and female, Japanese and Caucasian, models.

Procedure. The experimenter showed the subject one of the 16 photographs, saying "Please look at the photograph carefully." Written instructions then asked the subject to circle the one word that best described the feeling expressed in the photograph. The options available in each condition are shown in Table I. For example, in the first condition, the options were *happiness, surprise, contempt, fear,* and *interest*.

Preliminary Analysis. Preliminary analysis using χ^2 within each condition found no reliable differences due to sex of subject or to which one of the four photographs was shown. Data were therefore collapsed across these factors.

Results

The percentage of subjects selecting each response option in each condition is shown in Table I. Responses were far from what would be expected by random assortment, and the predicted option was the modal choice in each case. The six modal responses ranged from 46.3 to 96.3%, the median of which was 83.2%. Results were not *quantitatively* different from those seen in previous studies.

In the first condition, subjects were shown an "anger" expression and 76% categorized it as *contempt*. The size of this majority is similar to that obtained by those who found the same expression categorized as *anger*. For example, Ekman and Friesen (1986) found that 73% of their subjects categorized their "anger" expressions as *anger*. Or the present result can be compared with Ekman and Friesen's (1986) claim that a very different expression, a unilateral lip curl, is "unique to contempt": The percentage of their subjects selecting *contempt* for the lip curl averaged 75% across 10 samples.

Table I. Percentage of Judges Choosing Various Response Options for Facial Expressions Reported to Be of Anger, Disgust, Sadness, and Contempt[a]

Facial expression[b]	Response options					N	χ^2
"Anger"	Happiness 1.2	Surprise 6.3	Contempt 76.2	Fear 5.0	Interest 11.2	80	160.2[c]
"Anger"	Happiness 0	Surprise 0	Frustration 96.3	Fear 1.2	Interest 2.5	80	258.9[c]
"Disgust"	Happiness 0	Surprise 7.5	Contempt 90.0	Fear 0	Interest 2.5	80	246.5[c]
"Sadness"	Happiness 1.2	Surprise 1.2	Contempt 46.3	Fear 36.3	Interest 15.0	80	67.2[c]
"Contempt"	Happiness 2.5	Surprise 0	Boredom 88.8	Fear 0	Interest 8.8	80	238.4[c]
"Contempt"	Happiness 1.2	Surprise 1.2	Disgust 77.5	Fear 1.2	Interest 18.8	80	180.3[c]

[a]*Note:* For each condition, a separate $\chi^2(4, N = 80)$ examined whether response labels were chosen at random. Response option predicted to capture the most endorsements is indicated by underlining.
[b]Label is that given the photograph by Matsumoto & Ekman (1988).
[c]$p < .001$.

In the second condition, subjects saw the same "anger" expressions, but 96.3% categorized them as *frustration*. This condition can be compared directly with the first condition because subjects saw the same facial expressions but were given different response options. The "anger" expression was categorized as *contempt* in the first condition, and as *frustration* in the second—thus directly demonstrating the power of the response list.

In the third condition, subjects were shown a "disgust" expression, and 90% categorized it as *contempt*. In the fourth condition, subjects were shown a "sad" expression, and 82.3% categorized it as *contempt* or *fear*, thus indicating a contempt–fear blend. That is, Ekman and Friesen (1975) interpreted a bimodal response distribution as possibly resulting from a blend.

Finally, conditions 5 and 6 both used a "contempt" expression but varied in response options. Given the first list of options, 89% of subjects categorized the "contempt" expression as *boredom*. Given the second list of options, 78% of subjects categorized the same expression as *disgust*. For comparison, Ekman and Friesen (1986) reported that 74% of their subjects

selected *disgust* for the "disgust" expression, and 75% selected *contempt* for their "contempt" expression.

STUDY 2: A REPLICATION

Study 1 was limited in technical details. Only four kinds of facial expression were studied. All response scales were 5-place. The predicted option was always put in the middle position. Moreover, the word *contempt* appeared among the response options in three of the six conditions, and a facial expression reported to be of "contempt" was the stimulus in two. The present study sought to replicate the basic finding of Study 1 with changes in such technical details.

Method

The method was identical to that used in Study 1 with the following exceptions. There were five target photographs, which were labeled by Matsumoto and Ekman (1988) as *anger, fear, sadness, disgust,* and *surprise.* There was one rather than four photographs per condition; in all photographs, the model was Caucasian, and across the conditions three models were men, three women. The response options were six in number and are listed in Table II. The predicted option was placed in a different position in each condition, as shown in Table II. Preliminary analysis showed no reliable differences due to sex of subject. Data were therefore collapsed across this factor.

Results

The percentage of subjects selecting each response option in each condition is shown in Table II. Responses were again far from what would be expected by random assortment, and the predicted option was again the modal choice in each case. The range of the six modal responses was 70.0 to 93.75, the median of which was 76.87. Results were again not quantitatively different from those seen in previous studies.

The first condition replicated the result of Study 1 in which the "anger" expression was labeled as *contempt.* The second condition found the same "anger" expression labeled as *disgust.* In subsequent conditions, the "fear" expression was labeled as *surprise,* the "sad" expression as *fear,* the "disgust" expression as *anger,* and the "surprise" expression as *fear.*

Table II. Percentage of Judges Choosing Various Response Options for Facial Expressions Reported to Be Anger, Disgust, Sadness, Fear, and Surprise[a]

Facial expression[b]	Response options						χ^2
"Anger"	Contempt 70.0	Joy 0.0	Relaxation 0.0	Surprise 5.0	Fear 10.0	Interest 15.0	344.4[c]
"Anger"	Joy 0.0	Relaxation 0.0	Disgust 93.75	Surprise 0.0	Fear 0.0	Interest 6.25	687.4[c]
"Fear"	Joy 0.0	Relaxation 0.0	Anger 5.0	Contempt 8.75	Surprise 71.25	Disgust 15	354.6[c]
"Sadness"	Joy 5.0	Fear 73.75	Relaxation 2.5	Surprise 11.25	Excitement 0.0	Interest 7.5	382.2[c]
"Disgust"	Joy 0.0	Relaxation 0.0	Surprise 12.5	Anger 75.0	Fear 7.5	Interest 5.0	402.4[c]
"Surprise"	Joy 3.75	Relaxation 0.0	Anger 0.0	Contempt 6.25	Disgust 11.25	Fear 78.75	453.8[c]

[a]Note: For each condition, a separate $\chi^2(5, N = 80)$ examined whether response labels were chosen at random. Response option predicted to capture the most endorsements is indicated by underlining.
[b]Label is that given the photograph by Matsumoto & Ekman (1988).
[c]$p < .001$.

DISCUSSION OF STUDIES 1 AND 2

A consensus emerged in 11 of the 12 conditions in Studies 1 and 2. Of course, even in random assortment, some response is likely to be modal. However, the results here were not random; the selected option was the predicted one; and the size of the majority was similar to that found in many previous studies considered strong evidence on the association of specific expressions with specific emotions. With forced choice, subjects select not what emotion is signaled but must select the best option available. Given different options, they choose different labels. Thus, forced choice can yield a consensus even on what researchers have generally concluded is the wrong answer. This point is perhaps simple and obvious; it would hardly require empirical demonstration except to produce specific examples that raise questions about the prior use of forced choice in the study of facial expressions, and a warning about its future use.

For example, Matsumoto and Ekman (1988) claimed that certain facial expressions signal anger, and supported that claim by showing that a consensus emerges on the label *anger* from a forced-choice format. Subjects here were shown some of those same facial expressions. In one condition, the consensual label was *contempt*, in another condition it was *frustration*, and in still another it was *disgust*. The present results thus force us to this interpretation of Matsumoto and Ekman's result: *Anger* was the best option of those available, but not necessarily what was signaled. Many labels were not available. The question then arises whether subjects still prefer *anger* when other, plausible alternatives are available. To my knowledge, subjects have not been given a choice among *anger, frustration*, and other possibilities. In the next study, they were given that choice.

STUDY 3: FORCED CHOICE AMONG NEARBY ALTERNATIVES

In the third and final study, subjects were given a choice of options all close to the reported "correct" one, and indeed including the correct one. Subjects saw a facial expression reported to be of anger and chose their response from the following options: *anger, determination, frustration, hatred, hostility, jealousy*, and *pain*. These seven options are all close to the location of the "anger" expression in Russell and Fehr's (1987) judgment space for emotions. Still, a semantic analysis leaves the word *anger* as the only option that unequivocally denotes the emotion of anger. *Hostility, hatred*, and *jealousy* refer to emotions qualitatively different from anger, according to Johnson-Laird and Oatley's (1989) semantic analysis. *Pain* refers to a complex sensation rather than to a prototypical emotion. *Frustration* and *determination* refer, not to emotions, but to the conditions of having a goal blocked and the resolve to do something.

Method

The method was identical to that of Study 1 with the following exceptions. There were 120 subjects randomly assigned to one of two conditions. The two conditions differed only with respect to which one of two photographs was shown. Both photographs showed facial expressions labeled by Matsumoto and Ekman (1988) as *anger*. The response scale provided seven options, which are listed in Table III. Preliminary analysis using χ^2 within each condition found no reliable differences due to sex of subject. Data were therefore collapsed across this factor.

Table III. Percentages of Judges Choosing Various Response Options for Two
Facial Expressions Reported to Be Anger[a]

Response options	Expressions		Total
	A	B	
Frustration	45.0	35.0	40.0
Determination	40.0	23.3	31.7
Anger	5.0	20.0	12.5
Hostility	6.7	11.7	9.2
Hatred	0.0	5.0	2.5
Jealousy	1.7	3.3	2.5
Pain	1.7	1.7	1.7

[a]*Note*: Sixty judges saw each photograph.

Results

The percentage of subjects selecting each response option in each condition is shown in Table III. There was a reliable difference between the two photographs: When response options were collapsed to *frustration, determination, anger,* and *other*, a $\chi^2(df = 4, N = 120) = 11.6, p < .05$, was obtained. For the first expression, *frustration* and *determination* were the dominant choices, together capturing 85% of responses; *anger* was in fourth place, capturing 5% of responses. For the second expression, *frustration* and *determination* were still the dominant options, but captured only 58.3% of responses. *Anger* was in third place, capturing 20% of responses. Although both expressions allegedly signalled the same emotion, the response format used here revealed that the psychological response to the two was somewhat different. Despite the differences, another result was also clear: *Anger* was not the modal choice, for either expression.

GENERAL DISCUSSION

In many previous studies, subjects have been shown a photograph of a facial expression and asked to choose one emotion from a short list. For example, shown the hypothesized anger expression, and given the list *happy, surprise, fear, anger, disgust,* and *sadness,* most subjects selected *anger*. What precise conclusion follows from this result? In Studies 1 and 2 here, subjects were shown the reported anger expression and were given different lists. In one condition, most subjects selected *contempt,* in another *frustration,* and in a third *disgust*. What precise conclusion follows from this result?

Data gathered with forced choice must not be misunderstood as showing that the "anger" expression really expresses contempt or disgust or frustration—or anger. Such results alone cannot be used to say what emotion a particular expression signals, nor what emotion observers attribute to that facial stimulus.

It might be argued that the list of category choices presented to subjects in Studies 1 and 2 was overly restrictive. Indeed, any short list, including the lists used here and in previous studies, is likely to be overly restrictive. The present results show that the occurrence of near consensus in the results is no evidence to the contrary. It might be argued that the list of category choices in Studies 1 and 2 failed to include the "correct" option. The problem is that there is no guarantee that the list of category choices used in previous studies included the "correct" option either. The occurrence of consensus in those studies is no evidence to the contrary. The correct label has not yet been established, if such exists. In previous studies, one option was included that was predicted by a particular theory to be correct (just as one option was included here that was predicted to be, not correct, but chosen).

Studies of judgment of emotion from facial expression have sometimes used formats other than forced choice, most notably free listing (Boucher & Carlson, 1980; Frijda, 1953; Izard, 1971; Sorenson, 1975). Although these studies have generally been interpreted as supporting the same conclusions as forced-choice studies, the results were not generally as strong. In light of problems with forced choice, more weight would have to be given to those studies that have used other formats to gather responses.

Of course, forced choice has its place. For example, although the present studies were designed to examine forced choice as a method, they yielded results that are interesting from a substantive perspective. In three studies, subjects showed interesting, understandable, and systematic behavior in selecting a category label for various facial expressions. They did not find all labels so absurd that they had to resort to some idiosyncratic process. Various alternative explanations for their judgments might be formulated. Indeed, in the first two studies, the modal response was the label predicted on the basis of a structural model of emotion judgment (Russell & Fehr, 1987). Note that the response predicted here did not have some of the advantages of the predicted options in previous studies. For instance, the photographs were not preselected to agree with the present hypothesis; indeed photographs were drawn from a set preselected to agree with a different hypothesis.

An alternative, or possibly complementary, account might be derived from the theory of basic discrete emotions and how they are linked to facial

behavior (Izard, 1971). Subjects might have selected the available category label associated with the most similar facial expression to the one shown. For example, the subjects might have selected *fear* for the "surprise" face in Study 2 because the prototypical facial expression of fear includes some of the same features found in the prototypical "surprise" expression. Some of the choices made in Studies 1 and 2 lend themselves to an explanation of this kind, although it is not obvious on this account why, for example, in Study 1 subjects selected *boredom* for the "contempt" expression. More important, it is not clear why subjects in Study 3 failed to select *anger* for the "anger" expression.

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