Psychological Assessment
2007, Vol. 19, No. 2, 210–224

Copyright 2007 by the American Psychological Association
1040-3590/07/$12.00 DOI: 10.1037/1040-3590.19.2.210

The Facial Expression Coding System (FACES): Development, Validation, and Utility

Ann M. Kring
University of California, Berkeley

Denise M. Sloan
VA Boston Healthcare System

This article presents information on the development and validation of the Facial Expression Coding System (FACES; A. M. Kring & D. Sloan, 1991). Grounded in a dimensional model of emotion, FACES provides information on the valence (positive, negative) of facial expressive behavior. In 5 studies, reliability and validity data from 13 diverse samples, including students, psychiatric patients, and community adults, are presented, and results indicate that raters can reliably agree on instances of positive and negative expressive behavior. Validity studies indicate that FACES ratings are related in predictable ways to another observational coding system, facial muscle activity, individual-difference measures of expressiveness and personality, skin conductance, heart rate, and reports of experienced emotion. FACES can be a useful tool for assessing expressive behavior in a variety of contexts.

Keywords: emotion, facial expression, EMG, FACES

Facial expressive behavior is of interest to many researchers investigating emotion and its relationship to other aspects of behavior, such as emotional experience, physiological arousal, and communication. Interest in facial expression has a rich history, dating back to at least the mid-19th century (Gratiolet, 1865; Piderit, 1888). Perhaps the most influential of these early theorists was Charles Darwin. In his book, *The Expression of the Emotions in Man and Animals*, Darwin (1896) argued that facial expressions were universal and innate characteristics. In the infancy of the science of psychology, William James hypothesized that facial expression played a causative role in the experience of emotion. James' ideas about emotion set forth a tradition of scholarly debate about the role of facial expression in emotion that continues today (e.g., Keltner, 2004; Parkinson, 2005).

Researchers interested in measuring facial expressive behavior can choose from a variety of methods such as observational ratings of facial movement, judges' ratings of communication accuracy, and electromyographic (EMG) recording. Decisions about what method of measurement to adopt are most often driven by both theoretical and practical considerations. Grounded in a discrete emotion theoretical perspective, Ekman and Friesen (1976, 1978) developed the Facial Action Coding System, or FACS. This system was designed to provide a comprehensive assessment of all visible facial muscle movements. FACS raters are trained to identify 44 anatomically distinct muscle movements (e.g., lip corner puller) labeled action units (AUs), but they are not asked to make inferences about emotional state (e.g., happy, sad). A second system, the Emotion Facial Action Coding System (EMFACS), is an abbreviated version of FACS that assesses only those muscle movements believed to be associated with emotional expressions. The development of these two systems propelled the study of facial expressive behavior into the mainstream of psychological research. Other available systems have been designed to measure either specific aspects of facial behavior (e.g., Ermiane & Gergerian, 1978; Izard, 1979) or more generally defined facial expressions of emotion (e.g., Gross & Levenson, 1993).

The primary reason for developing the system presented in this article was based on the perceived need for a facial coding system that is more closely theoretically aligned with a dimensional model of emotion. Early research on the categorization of facial expression perception (e.g., Abelson & Sermat, 1962; Cliff & Young, 1968; Osgood, 1955, 1960; Schlosberg, 1952, 1954) found that facial expressions could be reliably rated using two dimensions roughly equivalent to pleasure–displeasure and activation.[1] Contemporary theory and research also support a dimensional structure to affective experience, with two dimensions reflecting valence (pleasant–unpleasant) and activation or arousal (high, low; e.g., Barrett & Russell, 1999; Kring, Barrett, & Gard, 2003; Larsen & Diener, 1992; Russell, 1980; Yik, Russell, & Barrett, 1999). The valence dimension is particularly central to emotional responding, with evidence supporting the presence of a pleasure–displeasure dimension in measures of experienced emotion, facial expressive behavior, facial muscle movements, and physiological responding (for a review, see Barrett, 2006b). Although some might argue that presently available coding systems of discrete facial expressions can be considered "dimensional" to the extent that discrete categories can be combined to form a valence dimension, this approach

Ann M. Kring, Department of Psychology, University of California, Berkeley; Denise M. Sloan, National Center for PTSD, VA Boston Healthcare System.

We thank Andrew Tomarken for his help with Study 1.

Correspondence concerning this article should be addressed to Ann M. Kring, Department of Psychology, 3210 Tolman Hall, University of California, Berkeley, Berkeley, CA 94720 or to Denise M. Sloan, National Center for PTSD, Behavioral Science Division, VA Boston Healthcare System, 150 South Huntington Avenue, Boston, MA 02130. E-mail: akring@berkeley.edu or denise.sloan@va.gov

[1] Although some of these early studies (e.g., Schlosberg, 1954) identified three dimensions, later work (e.g., Abelson & Sermat, 1962) provided support for two rather than three dimensions.

is inconsistent with the empirical literature upon which dimensional models of emotion have developed (e.g., Barrett, 2006a).

The Facial Expression Coding System (FACES) was designed to capture the valence of facial expressive behavior. The system was developed 15 years ago, and preliminary information regarding the system was presented alongside the development and validation of a self-report measure of emotional expressiveness (Kring, Smith, & Neale, 1994). In that article, we demonstrated high rater agreement for FACES raters and showed that FACES ratings were correlated with self-reports of expressive behavior, even after controlling for reported emotional experience. The system has been used in a number of published studies, and although these studies were not explicitly designed to assess the system's reliability and validity, they indirectly provide such evidence. For example, we have used FACES in studies of emotion in schizophrenia (e.g., Kring, Alpert, Neale, & Harvey, 1994; Kring & Earnst, 1999, 2003; Kring, Kerr, Smith, & Neale, 1993; Kring & Neale, 1996; Salem & Kring, 1999), depression (e.g., Sloan, Strauss, Quirk, & Sajatovik, 1997; Sloan, Strauss, & Wisner, 2001), and college students (e.g., Kring & Gordon, 1998; Kring, Smith, & Neale, 1994). These studies have all reported high rater agreement among raters using FACES. In a study of emotional responding in schizophrenia, test–retest reliability of FACES ratings was high for both schizophrenia patients and nonpatient controls (Kring & Earnst, 1999). Results from these studies also provide evidence regarding the validity of FACES. For example, facial expression variables derived from FACES are related to self-reports of emotional expressiveness (Kring, Smith, & Neale, 1994), clinical symptom ratings of diminished expressiveness (Kring, Alpert et al., 1994), vocal expressive behavior (Kring, Alpert et al., 1994), reports of experienced emotion (Kring & Earnst, 2003; Sloan et al., 1997, 2001), and electromyographic (EMG) activity (Kring & Earnst, 2003).

Other investigators have also used FACES in studies of posttraumatic stress disorder (Orsillo, Batten, Plumb, Luterek, & Roessner, 2004; Wagner, Roemer, Orsillo, & Litz, 2003), schizophrenia (Aghevli, Blanchard, & Horan, 2003), childhood sexual abuse (Luterek, Orsillo, & Marx, 2005), respiratory sinus arrhythmia (Frazier, Strauss, & Steinhauer, 2004), and romantic couples (Heisel & Mongrain, 2004). Findings from these studies replicate evidence supporting the system's reliability and validity. These studies report high rater agreement among raters using FACES. In addition, the frequency, intensity, and duration variables derived from FACES are related to one another (Aghevli et al., 2003), reports of experienced emotion (Frazier et al., 2004; Wagner et al., 2003), clinical symptom ratings of diminished expressiveness (Aghevli et al., 2003), reports of ambivalence about expressiveness (Heisel & Mongrain, 2004), and changes in interaction partners' experienced emotion (Heisel & Mongrain, 2004).

Despite the availability of these different studies that provide support for the reliability, validity, and utility of FACES, we thought it would be important to systematically report on the development and validation of this system, culling available data in one place for those who are potentially interested in adopting this method. In the present article, we present new data, spanning 13 diverse samples of students, community residents, and psychiatric patients. We present data on rater agreement across these diverse samples and sets of raters and then provide data to further support the validity of the system. First, we examine the correspondence between FACES and the widely used observational coding system developed by Ekman and colleagues (Ekman & Friesen, 1978), EMFACS. Despite being derived from differing theoretical perspectives, we predicted that the two systems would be related to one another. Both systems are designed to describe observable facial activity, and thus instances of facial behavior ought to be rated by raters using either system. Although EMFACS may provide more detailed information on facial movement, the two systems should nonetheless correspond. Second, we present data on the linkage between FACES and facial EMG activity in the zygomatic (smile) and corrugator (frown) muscle regions, predicting that FACES ratings of positive expressive behavior ought to be related to zygomatic activity and that FACES ratings of negative expressive behavior ought to be related to corrugator activity. Third, we present data on the relationship between FACES ratings and a number of individual-difference measures of constructs that are similar and dissimilar to expressive behavior. Finally, we present data on the linkage between FACES ratings and other psychophysiological indicators of emotional response, including heart rate and skin conductance, as well as data on the linkage between FACES variables and reported emotional experience, predicting that ratings from FACES (positive, negative) ought to be related to reports of positive and negative emotion.

Coding and Scoring With FACES

FACES yields information about the frequency, intensity, and duration of facial expressions. Coders can be trained using the coding manual (Kring & Sloan, 1991), and the training can be accomplished in 10–20 hr. We have found it helpful to have coders learn the system by coding actual videotapes, and we have often included pilot participants for our various studies in order to generate practice videotapes that are used for the training of coders. In all of our studies, undergraduate students have served as coders. Once coding has begun for a study, we have found it helpful to hold periodic meetings with coders to ascertain whether any rater drift was occurring.

In FACES, an expression is defined in two ways. First, a change in the face from a neutral display (i.e., no expression) to a nonneutral display and back to a neutral display is counted as an expression. For example, someone may begin smiling and then return to a neutral display. Second, a change from one nonneutral (i.e., emotional) display to another nonneutral display constitutes an expression. For example, someone may begin smiling, but instead of returning to a neutral display, the person may instead begin frowning, indicating a confused look. When one of these changes is detected, coders make a judgment about the valence (positive or negative) of the expression that is recorded as *frequency* of expressions. In the first example above, one positive expression is recorded. In the second example, two expressions are recorded, one positive (smiling) and one negative (frowning). While FACES raters decide (i.e., make an inference about) whether an expression is positive or negative, they do not assign a discrete emotion label. There is support in the literature for this approach, often referred to as the *cultural informants approach* (e.g., Gottman & Levenson, 1985; Gross & Levenson, 1995). That is, judgments about emotion, in this case whether an expression is positive or negative, are made by persons who are considered to be familiar with emotion in a particular culture.

After making a frequency rating of either positive or negative, coders then rate the *intensity*[2] of the expression using a 4-point Likert scale ranging from 1 (*low*) to 4 (*very high*). For example, a low-intensity expression might be signified by a smile with slightly raised mouth corners and very little movement around the eyes. A medium-intensity rating would be indicated by a smile bordering on a laugh, with the eyebrows slightly raised and the lips apart, exposing the teeth. The high rating is given for an expression that involves most, if not all, of the face, such as an open mouth laugh with raised eyebrows and cheeks. The very high rating would be indicated by intense laughing with the mouth completely open and substantially raised eyebrows and cheeks.

Finally, coders rate the *duration* of the expression, denoting the time (in seconds) of the expression. For example, the timing would begin as soon as the face changes from a neutral to nonneutral display (e.g., smile) and would end when the face either returns to a neutral display or changes to a different emotional expression (e.g., frown). In summary, coders using FACES generate ratings of frequency, intensity, and duration for both positive and negative expressions, yielding a total of six variables.

Prior studies using FACES have reported that the frequency, intensity, and duration variables are moderately intercorrelated (e.g., Earnst & Kring, 1999; Kring & Gordon, 1998; Kring et al., 1993). Given the relatedness among the variables, investigators may choose to use just one of the variables (e.g., frequency ratings) in order to reduce the number of dependent variables in their analyses. Alternatively, FACES composite variables can be created by first creating standardized scores for each of the variables because they are measured in different units (frequency count, Likert-type scale for intensity, and seconds for duration). Thus, z scores can be computed for the positive and negative frequency, intensity, and duration variables and then summed to form positive and negative expression composites for each emotion.

Overview of Studies and Samples

Seven of the samples are university students from a variety of regions in the United States (northeast, midwest, and south). Three of the samples comprise patients diagnosed with schizophrenia from the southern and western regions of the United States, and 3 of the samples comprise community adults who served as healthy controls in the schizophrenia studies. The diversity of these samples with respect to age, gender, ethnicity, geographic region, educational attainment, and diagnostic status highlight that FACES can be used with a variety of different populations. All participants provided written informed consent prior to participating in the study. Participants in the 13 samples were presented with emotion eliciting film clips, and their facial expressions were videotaped and later coded. Although all laboratory inductions of emotion can be somewhat artificial, film clips are among the most powerful and commonly used techniques for eliciting emotion in this context (e.g., Gross & Levenson, 1993). For all samples, two trained raters coded the videotapes using FACES. For all samples, raters were blind to the hypotheses of the study as well as to the nature and names of the film clips. For the patient and community adult samples, raters were also blind to diagnostic status of the participants.

The studies presented below are organized according to the measures against which FACES is being compared or validated, including an alternative observational coding system (EMFACS), EMG recordings of facial muscle activity, measures of individual-difference constructs (expressiveness, personality), other psychophysiological indicators of emotional responding (heart rate and skin conductance), and reports of experienced emotion.

Study 1: FACES and EMFACS

Method

Participants

Sample U6 ($N = 60$) participated in a study in exchange for course credit. Characteristics of the sample are presented in Table 1.

Stimuli

Participants viewed brief excerpts from contemporary movies that were selected on the basis of their ability to elicit happiness (two clips), fear (two clips), and disgust (five clips). Participants were randomly assigned to view the nine films in one of four different orders.

Procedure

Participants in this study were part of a larger study in which resting electroencephalographic (EEG) patterns and emotional reactivity were investigated (for a summary of findings and the EEG recording procedure, see Wheeler, Davidson, & Tomarken, 1993). Each participant was run individually in a session that involved continuous recording of EEG during film clip viewing. Presentation and timing of the film clips were controlled by computer. While viewing film clips, participants were unobtrusively videotaped. No participant reported awareness of the videotaping.

EMFACS Ratings

EMFACS ratings were completed independently and coded by two raters who had met the FACS reliability criterion of agreement with Paul Ekman's laboratory, as assessed by a standardized test administered by this laboratory. Each of these raters had at least 1 year's experience using EMFACS. One rater rated about 75% of the participants; the other rater rated the remaining 25%. Raters recorded the frequency and duration of the subset of AUs comprising EMFACS. AUs were then translated into emotion codes on the basis of the EMFACS dictionary that identifies the facial expressions of seven emotions and blends of those emotions. Emotion codes included happiness (both enjoyment and social smiles),[3] disgust, anger, sadness, contempt, surprise, and fear.

[2] Although intensity of expressive behavior is rated in FACES, this does not necessarily constitute a parallel to the arousal or activation dimension of emotion. Evidence instead suggests that intensity is best characterized as a combination of both valence and activation dimensions (Reisenzein, 1994).

[3] Enjoyment smiles in EMFACS are also referred to as *Duchenne smiles* and reflect a combination of two muscle movements, the cheek (*zygomaticus major*) and eye (*obicularis oculi*). Social smiles are also referred to as *non-Duchenne smiles* (Ekman et al., 1990).

Table 1
Sample Descriptions

Characteristic or measure	Sample												
	U1	U2	U3	U4	U5	U6	U7	S8	S9	S10	C11	C12	C13
Sample size	60	24	60	66	112	89	66	15	41	28	16	20	13
Age (mean or range)	19.2	18.8	18.2	20.1	19.3	17–21	18.4	40.5	42.6	41.8	41.6	38.5	35.1
% Women	50	50	75	100	61	100	50	0	0	46	0	0	0
% European American	77	88	85	87	56		85	60	56	50	47	55	43
% African American	12	4	15	11	31		3	40	42	25	53	45	43
% Asian American	5	4	0	2	5		6	0	0	0	0	0	7
% Latino/Hispanic	4	4	0	0	6		3	0	0	0	0	0	0
% other ethnicity	3	0	0	0	2		3	0	2	0	0	0	7
FACES	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
EMFACS	N	N	N	N	N	Y	N	N	N	N	N	N	N
EMG	Y	Y	N	N	Y	N	N	Y	Y	N	Y	Y	N
HR and SC	Y	Y	N	N	Y	N	Y	Y	Y	N	Y	Y	N
Emotion self-report	N	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y
Individual-difference measures	N	N	Y	N	N	N	Y	N	N	N	N	N	N
Emotions elicited	ad	d	hadf	hsdf	hasdf	hfd	hasdf	hadf	ad	hasd	hadf	ad	hasd

Note. U = undergraduate students; S = schizophrenia samples; C = community adult samples; FACES = Facial Expression Coding System; EMFACS = Emotional Facial Action Coding System; EMG = electromyographic; HR = heart rate; SC = skin conductance; Y = yes; N = no; a = amused; d = disgust; h = happy; f = fear; s = sad.

Thus, frequency and duration ratings of these eight emotion codes comprised the EMFACS ratings. An overall negative composite, including all of the negatively valenced codes (disgust, fear, anger, sadness, contempt), was also computed and used in later analyses.

Results

The correspondence between coding systems was examined separately for each type of emotional film (happy, fear, and disgust). Thus, means were computed across the two happy films, the two fear films, and the five disgust films for all dependent variables.

Interrater Agreement: FACES Ratings

For purposes of comparison with EMFACS frequency and duration ratings, only FACES frequency and duration ratings were included in these analyses. Following the recommendations of Shrout and Fleiss (1979), intraclass correlations (ICCs; Case 2) were computed for pairs of raters across these variables (positive frequency and duration for the happy films; negative frequency and duration for the disgust and fear films). Using this formula, raters (judges) are considered to be selected from a random sample of raters, and each rater rates each participant or target. Because the variance resulting from raters is estimated as an effect, the correlations can be interpreted as an index of agreement rather than as consistency (Shrout & Fleiss, 1979). As is shown in Table 2, rater agreement was high, with an average ICC of .86. For this and all other studies, the FACES frequency and duration variables were averaged across the two raters for further analyses.

Correspondence Between Coding Systems

As shown in Table 3, there was a good deal of correspondence between FACES frequency and duration ratings and EMFACS ratings.[4] Although FACES ratings of positive expressions were more strongly related to EMFACS ratings of enjoyment smiles, the FACES positive ratings were also related to the EMFACS social smiles, indicating that FACES coders are also likely to detect both types of smiles. On the basis of the Dunn-Clark z test for the equality of two dependent correlations (Dunn & Clark, 1969; for a review, see Steiger, 1980), correlations between EMFACS enjoyment smile ratings and FACES positive ratings were significantly higher than the correlations between EMFACS social smile ratings and FACES positive ratings ($p < .05$).

The frequency and duration ratings of the two systems for the disgust films were also significantly correlated. In addition, FACES negative ratings were related to a composite of all discrete negative EMFACS codes for disgust films. This finding is not surprising given that FACES does not distinguish between negative emotional expressions. EMFACS ratings of fear during the fear films were not related to the FACES negative ratings. However, these low correlations are largely because of the low frequency of fear expressions, with fewer than one expression lasting around 1 s (mean frequency of EMFACS fear was .02 s [$SD = 0.21$], and duration was .08 s [$SD = 0.77$]; the mean frequency of FACES negative expressions was .30 s [$SD = 0.61$], and duration was 1.10 s [$SD = 2.32$]). Ratings of EMFACS disgust frequency and duration during the fear films were significantly correlated with FACES negative frequency, $r(87) = .56$, $p < .001$, and duration, $r(87) = .58$, $p < .001$, ratings. This is not surprising given that significantly more instances of EMFACS disgust were coded than EMFACS fear for the fear films, $t(88) = 2.54$, $p < .01$. Similarly, the duration

[4] We opted to use a nonparametric index of association because the distribution of the data did not meet the assumption of bivariate normality required for computation of Pearson's product–moment coefficients (Marascuilo & McSweeney, 1977). However, results with Pearson's correlations were the same as with Spearman's correlations.

Table 2
FACES Rater Agreement Across Samples

	Sample										
Emotion	U3	U4	U5	U6	U7	S8	S9	S10	C11	C12	C13
					Frequency						
Amusement	.98	.81	.89		.97	.94	.99	.89	.97	.96	.96
Sadness		.93	.96		.98			.95			.77
Fear	.98	.91	.94	.75	.84	.75		.84	.97		
Disgust	.95	.84	.88	.87	.98	.84	.93	.94	.91	.97	.93
Happiness	.98		.92	.92		.99		.98	.97		.70
n	60	66	112	89	66	15	41	28	16	20	13
					Duration						
Amusement	.98	.70	.83		.89	.98	.98	.84	.96	.98	.96
Sadness		.60	.76		.86			.84			.86
Fear	.96	.69	.67	.89	.87	.98			.97		
Disgust	.92	.91	.87	.83	.97	.76	.98	.91	.91	.71	.87
Happiness	.95		.88	.89		.99		.98	.98		.60
n	60	66	112	89	66	15	41	28	15	20	13
					Intensity						
Amusement	.88	.91	.85		.92	.78	.81	.51	.86	.96	.89
Sadness		.84	.88		.82			.65			.74
Fear	.83	.62	.71		.64	.84			.85		
Disgust	.81	.92	.89		.85	.84	.99	.81	.87	.62	.58
Happiness	.95		.84			.96		.92	.96		.68
n	60	66	112	89	66	15	41	28	16	20	13

Note. Tabled values are intraclass correlations. All values significant at $p < .05$. U = undergraduate students; S = schizophrenia samples; C = community adult samples.

of EMFACS disgust was significantly longer than the duration of fear for the fear films, $t(88) = 2.00$, $p < .05$. FACES negative ratings were also related to an EMFACS composite of all discrete negative emotions during the fear and disgust films.

Table 3
Correlations Between FACES and EMFACS

EMFACS variable	FACES frequency	FACES duration
Frequency enjoyment smile	.78**	.74**
Duration enjoyment smile	.75**	.74**
Frequency social smile	.44**	.45**
Duration social smile	.47**	.50**
Frequency disgust	.64**	.36**
Duration disgust	.22*	.52**
Frequency all negative disgust	.67**	.66**
Frequency all negative disgust	.53**	.55**
Frequency fear	.07	.07
Duration fear	.07	.07
Frequency all negative fear	.45**	.46**
Frequency all negative fear	.46**	.48**

Note. $n = 89$. Correlations are Spearman rho coefficients. FACES = Facial Expression Coding System; EMFACS = Emotional Facial Action Coding System; all negative = sum of all EMFACS codes of negative emotions, including fear, disgust, sadness, contempt, and anger.
* $p < .05$. ** $p < .001$.

Discussion

Data from Study 1 add to the evidence supporting FACES' reliability and validity. Raters achieved a high degree of agreement. Despite being derived from different theoretical perspectives, correspondence between the FACES, based more on a dimensional approach, and EMFACS, grounded in a discrete emotion perspective, is fairly high. As a number of theorists have noted, these two views on emotion may be more complementary than opposed methods for understanding the nature of emotion (e.g., Barrett, 2006a; Bradley, Greenwald, & Hamm, 1993; Lang, Greenwald, Bradley, & Hamm, 1993). Although the two systems showed a relatively high degree of relatedness, one should not assume that the two systems are necessarily interchangeable. Researchers interested in measuring specific emotion facial expressions should consider EMFACS. A distinct advantage to EMFACS lies in its distinction between enjoyment (Duchenne) smiles and social (non-Duchenne) smiles (but see Russell, Bachorowski, & Fernández-Dols, 2003). Researchers interested in a dimensional model of emotion, however, should consider FACES, which was designed in line with this theoretical framework.

Study 2: FACES and EMG

Method

Converging evidence from several studies using EMG recording indicates that EMG activity over the brow region (*corrugator* *supercilii*) increases during the presentation of unpleasant stimuli, and EMG activity over the cheek region (*zygomaticus major*) increases during the presentation of pleasant stimuli (e.g., Brown & Schwartz, 1980; Cacioppo, Bush, & Tassinary, 1992; Cacioppo, Petty, Losch, & Kim, 1986; Dimberg, 1982; Kring, Kerr, & Earnst, 1999). In this study, we examined the linkage between FACES ratings and EMG activity across three undergraduate samples, two schizophrenia patient samples, and two community adult samples. Because FACES ratings provide information about valence, we predicted that FACES positive facial expression ratings would be related to cheek muscle (zygomatic) activity, and FACES negative facial expression ratings would be related to brow muscle (corrugator) activity.

Participants

Undergraduates from samples U1 ($n = 60$), U2 ($n = 24$), and U5 ($n = 112$) participated in exchange for course credit (see Table 1 for sample characteristics). Schizophrenia (S) patients (S8, $n = 15$; S9, $n = 41$) and community (C) adults (C11, $n = 16$; C12, $n = 20$) also participated in a study assessing emotional responding in schizophrenia. Additional details about the patient samples can be found in previously published reports (Earnst & Kring, 1999; Kring & Earnst, 1999).[5] Undergraduates received course credit for their participation; patients and community adults were paid in exchange for their participation.

Stimuli

Participants viewed brief excerpts from contemporary movies. Samples U1, S9, and C12 viewed two film clips—one that elicited amusement and one that elicited disgust (see Earnst & Kring, 1999). Sample U2 viewed only the disgust film. Sample U5 viewed two positive film clips (amusing, happy) and three negative film clips (sad, fear, disgust). Samples S8 and C11 viewed two positive film clips (amusing, happy) and two negative film clips (fear, disgust; see Kring & Earnst, 1999). For samples U5, S8, and C11, there were no differences in FACES ratings or EMG activity to the specific film clips, and thus we have collapsed across the two similarly valenced film clips. In all samples, participants were randomly assigned to view the films in one of several different orders.

EMG Recording

For all samples, EMG activity was recorded from the left zygomatic and corrugator regions with miniature Ag/AgCl electrodes. The electrolyte used was TECA electrode gel (Fridlund & Cacioppo, 1986). EMG signals were amplified with a Coulbourn Instruments bioamplifier (S75-01; Allentown, PA), with high- and low-pass filters set to 8 and 250 Hz, respectively. Signals were then rectified and smoothed using a Coulbourn contour following integrator (S76-01), with a time constant of 20 ms. Sampling at 100 Hz, the amplified and integrated EMG signals were stored online for later analysis. Mean zygomatic and corrugator activity (in μvolts) was computed for each film clip.

Procedure

Each participant was run individually in a session that involved continuous recording of EMG during film clip viewing. For the undergraduate samples, the videotaping was done unobtrusively. No participant reported awareness of the videotaping. For the patient and community adult samples, participants were knowingly videotaped, though every effort was made to make this as unobtrusive as possible.

Results and Discussion

Interrater Agreement and Correspondence Among FACES Ratings

Rater agreement was assessed via ICCs (Case 2 formula; Shrout & Fleiss, 1979) computed for pairs of raters across the FACES frequency, intensity, and duration variables. Rater agreement was high (average ICC = .88) and is shown in Table 2 for samples U5, S8, S9, C11, and C12. Rater agreement was not computed for samples U1 and U2 because only a small subset of the participants ($n = 10$ and 5 for samples U1 and U2, respectively) were coded by two raters.

As shown in Table 4, the frequency, intensity, and duration FACES variables were significantly intercorrrelated with one another across the samples, a finding consistent with prior studies (e.g., Earnst & Kring, 1999; Kring & Gordon, 1998; Kring et al., 1993). *Z* scores were computed for the positive and negative frequency, intensity, and duration variables and were then summed to form positive and negative expression composites for each emotion. The individual FACES variables and composites were used in later analyses.

Correspondence Between FACES and EMG

Table 5 presents correlations between the FACES positive and negative facial expression variables and EMG activity. FACES ratings of positive frequency, intensity, and duration as well as the overall composite were significantly correlated with zygomatic facial EMG activity across the samples. Only the frequency ratings in sample U1 did not significantly correlate with zygomatic facial EMG activity.

FACES ratings of negative frequency, intensity, and duration as well as the overall composite were less robustly correlated with corrugator facial EMG activity across the samples, though they were related. The wider variability in linkages between FACES negative expression ratings and corrugator facial EMG activity may reflect the fact that corrugator activity often reflects processes not necessarily linked to emotion, such as anticipated effort, concentration, or puzzlement (e.g., Cacioppo, Petty, & Morris, 1985; Kring et al., 1999; Pope & Smith, 1994; Smith, 1989).

In summary, FACES observational ratings of positive and negative expressions were linked in predictable ways to psychophys-

[5] All the data presented in the present article are new and have not been published elsewhere. The range of ICCs were reported for samples S8, S9, C11, and C12 (Earnst & Kring, 1999; Kring & Earnst, 1999) but not the individual ICCs for the different FACES variables for individual films. Although some correlations between FACES, EMG, and skin conductance for samples S8 and C11 are presented in a book chapter (Kring & Earnst, 2003), the data presented in the book chapter were from a subset of participants collapsed across two different time points. The data presented here are from the entire sample and come from the initial testing session.

Table 4
Intercorrelations Among FACES Variables

Variable	U1 (n = 60)	U2 (n = 24)	U5 (n = 112)	S8 (n = 15)	S9 (n = 41)	C11 (n = 16)	C12 (n = 20)
FACES variable pair (positive)							
Frequency–intensity	.43**		.63**	.74**	.56**	.68**	.57**
Frequency–duration	.67**		.58**	.95**	.78**	.93**	.90**
Intensity–duration	.42**		.52**	.63**	.46**	.70**	.59**
FACES variable pair (negative)							
Frequency–intensity	.67**	.61**	.67**	.93**	.77**	.85**	.69**
Frequency–duration	.90**	.47**	.45**	.50*	.79**	.91**	.70**
Intensity–duration	.71**	.54**	.55**	.57*	.68**	.58**	.93**

Note. FACES = Facial Expression Coding System.
* $p < .05$. ** $p < .01$.

iological recordings of facial muscle activity when participants viewed emotionally evocative film clips, adding to the validity of the system. As with EMFACS, we do not view these two methods of measuring facial expressive behavior as interchangeable. Investigators interested in subtle, often unobservable muscle movements should consider the use of facial EMG recording, as it is a more sensitive measure of facial muscle activity. However, it is not always practical and feasible to record facial EMG activity, and in such cases, FACES may provide a useful alternative method.

Study 3: FACES and Individual-Difference Measures

To further demonstrate the convergent validity of FACES, along with its discriminant validity, we examined the relationship between expressive behavior assessed with FACES and conceptually similar constructs (e.g., self-reports of expressive behavior, extraversion, agreeableness) and conceptually dissimilar constructs (e.g., conscientiousness, self-esteem). Consistent with prior research (e.g., Gross & John, 1997; Kring et al., 1994), we predicted that expressive behavior elicited in a laboratory context would be related to reports of general expressive behavior. Because prior studies have shown that self-reported expressive behavior is related to expressiveness in the family (e.g., Kring, Smith, & Neale, 1994), we expected that FACES ratings of expressive behavior elicited in a laboratory context would also be related to reports of family expressiveness. A good deal of evidence indicates that the personality constructs Extraversion and Neuroticism have strong positive and negative affect components to them, respectively (e.g., John, 1990; Watson, Gamez, & Simms, 2005), and prior studies have found that these two personality constructs are reliably related to self-report measures of expressive behavior (e.g.,

Table 5
Correlations Between FACES and EMG

Variable	U1 (n = 60)	U2 (n = 24)	U5 (n = 112)	S8 (n = 15)	S9 (n = 41)	C11 (n = 16)	C12 (n = 20)
EMG zygomatic muscle activity							
FACES positive ratings							
Frequency	.22		.47**	.61**	.54**	.83**	.73**
Intensity	.44**		.38**	.50*	.43**	.60**	.48*
Duration	.68**		.46**	.60**	.31*	.53*	.45*
Composite	.62**		.54**	.65**	.65**	.75**	.71**
EMG corrugator muscle activity							
FACES negative ratings							
Frequency	.35*	.38*	.25**	.39	.18	.52*	.07
Intensity	.15	.37*	.21*	.39	.31*	.27	.26
Duration	.34*	.55**	.41**	.44*	.31*	.55*	.41*
Composite	.32*	.35*	.36**	.49*	.26*	.46*	.17

Note. FACES = Facial Expression Coding System; EMG = electromyographic.
* $p < .05$. ** $p < .01$.

Gross & John, 1995, 1998; Kring, Smith, & Neale, 1994). In the present study, we tested the hypothesis that these linkages would extend to expressive behavior coded with FACES following a laboratory induction of emotion. Prior studies have also found self-reports of positive expressive behavior to be related to Agreeableness and Openness (e.g., Gross & John, 1995, 1998), and thus we also tested whether these linkages would extend to expressive behavior coded with FACES. Finally, we did not expect a significant relationship between expressive behavior coded with FACES and self-esteem or Conscientiousness (Gross & John, 1997).

Method

Participants

University students from samples U1 ($n = 60$), U3 ($n = 60$), U4 ($n = 66$), and U7 ($n = 66$) completed different individual measures as part of larger studies of emotional responding. They received course credit in exchange for their participation.

Measures

Emotional Expressivity Scale (EES). Kring, Smith, and Neale (1994) developed the EES to measure general, dispositional expressivity. The EES contains 17 items that assess the extent to which people outwardly express their emotions, regardless of their valence, and items are answered using a 6-point Likert scale ranging from 1 (*never true*) to 6 (*always true*). The EES has demonstrated high internal consistency, test–retest reliability, and construct validity (Kring, Smith, & Neale, 1994). Sample U1 completed the EES.

Family Expressiveness Questionnaire (FEQ). Halberstadt (1986) designed the FEQ to measure family styles of expressive behavior. The FEQ contains 40 items that assess various positive and negative expressive behaviors of family members using a Likert scale. The FEQ has good internal consistency and convergent and discriminant validity (Halberstadt, 1986), and previous studies have indicated that college students' and parents' judgments on the FEQ show good agreement (Burrowes & Halberstadt, 1987; Halberstadt, 1986). Sample U7 completed the FEQ.

The NEO scales. Sample U3 completed the 60-item NEO scale (Costa & McCrae, 1992), which assesses the Big Five personality dimensions (e.g., Goldberg, 1992; John, 1990). The five personality dimensions—Neuroticism, Extraversion, Openness, Conscientiousness, and Agreeableness—are each assessed with 12 items on a Likert scale. The NEO scale has high internal consistency, high test–retest reliability, and well-established convergent and discriminant validity (Costa & McCrae, 1992). Sample U3 completed the NEO.

Rosenberg Self-Esteem Scale (Rosenberg, 1965). The Rosenberg Self-Esteem Scale contains 10 items answered on a 3-point Likert scale that measure self-esteem. This measure has been used in many studies of self-esteem, and its psychometric properties are well established (e.g., Blascovich & Tomaka, 1991). Sample U4 completed the Self-Esteem scale.

Stimuli

As described in Study 2, sample U1 viewed one amusing and one disgusting film clip. Sample U3 viewed the same two positive (happy, amusing) and two negative (fear, disgust) film clips as samples S8 and C11 (Kring & Earnst, 1999). Sample U4 viewed one positive (amusing) and three negative film clips (sad, fear, disgust) that were selected from the validated film set of Gross and Levenson (1995). Sample U7 viewed the same films as sample U3 with one addition: they also viewed a sad clip, taken from the film set of Gross and Levenson (1995) and used in prior studies (Kring et al., 1993; Kring & Neale, 1996).

Procedure

Participants completed the individual-difference measures in a large group testing session. For the film viewing, participants were run individually. All participants were randomly assigned to view the film clips in one of two orders. During film viewing, participants' faces were unknowingly videotaped.

Results and Discussion

Similar to the other samples, rater agreement for FACES raters of samples U3, U4, and U7 was high (see Table 2). Because we did not have predictions about specific emotions but rather about the valence dimension, we collapsed across similarly valenced film clips to examine linkages between FACES positive and negative ratings and the individual-difference measures.

Correlations between FACES ratings and the individual-difference measures are presented in Table 6. As predicted, FACES ratings of positive and negative expressive behavior were related to self-reports of expressive behavior, as indexed by the EES. In addition, FACES ratings of expressive behavior were related to reports of family expressiveness, and this was particularly true for negative expressive behavior.

Extraversion was related to FACES ratings of positive expressive behavior but not negative expressive behavior. Somewhat contrary to expectations, Neuroticism was not strongly related to FACES negative frequency or intensity ratings, though it was significantly related to the duration of negative expressions as well as the overall FACES negative composite. Interestingly, Neuroticism was negatively related to FACES ratings of positive expressive behavior. In this sample, Neuroticism and Extraversion were negatively correlated with one another, $r(58) = -.32$, $p < .05$. To test the possibility that the correlations observed between positive expressive behavior and Neuroticism were influenced by extraversion,[6] we computed partial correlations between the FACES positive variables and Neuroticism, controlling for Extraversion. Results indicated that the magnitude of the correlations were reduced somewhat, but the correlations between Neuroticism and FACES positive intensity, $r(58) = -.25$, $p < .05$, duration, $r(58) = -.47$, $p < .01$, and overall composite, $r(58) = -.36$, $p < .01$, variables remained significant.

Positive and negative frequency ratings were related to Agreeableness, as was the duration rating of negative expressive behavior, replicating prior research that has shown a linkage between self-reported expressiveness and Agreeableness. However, this research has found that Agreeableness is related to self-reported positive expressive behavior but not negative expressive behavior (Gross & John, 1995, 1998). Yet, in the present study, we found

[6] We thank Oliver John for this helpful suggestion.

Table 6
FACES and Individual-Difference Measures

	Measure							
Variable	EES	FEQ	E	N	A	C	O	SE
Positive expression								
Frequency	.37**	.25*	.26*	−.26*	.32*	.06	.12	−.11
Intensity	.25*	.17	.33**	−.33**	.05	.11	.09	.03
Duration	.48**	.11	.42**	−.54**	.13	.23	.17	−.12
Composite	.44**	.16	.40**	−.44**	.20	.16	.15	−.07
Negative expression								
Frequency	.54**	.25*	.19	.18	.29*	.01	.23*	.01
Intensity	.30*	.24*	.12	.19	.10	−.04	−.01	.04
Duration	.30*	.31*	.14	.33**	.24*	.08	.24*	.06
Composite	.55**	.30*	.08	.28*	.21	.07	.08	.05

Note. FACES = Facial Expression Coding System; EES = Emotional Expressivity Scale (Sample undergraduate [U] U1); FEQ = Family Expressiveness Questionnaire (Sample U7); E = Extraversion (Sample U3); N = Neuroticism (Sample U3); A = Agreeableness (Sample U3); C = Conscientiousness (Sample U3); O = Openness (Sample U3); SE = Self-Esteem Scale (Sample U4).
* $p < .05$. ** $p < .01$.

that Agreeableness was related to FACES ratings of negative frequency and duration, suggesting that individuals higher in Agreeableness were more likely to be expressive of both positive and negative emotions in response to emotionally evocative films. This finding regarding negative expressive behavior was not expected. Agreeableness is typically construed as reflecting altruism, kind-hearted behavior, and the like, and it is not entirely clear why these characteristics would be linked with greater negative expressive behavior in a laboratory context. The frequency and duration ratings of negative expressive behavior were related to Openness, but none of the FACES positive variables was significantly related to Openness. As expected, neither positive nor negative FACES ratings were strongly related to Conscientiousness. Finally, as predicted, expressive behavior, as measured by FACES, was not related to reports of self-esteem.

In summary, FACES ratings of positive and negative expressive behavior were moderately related to conceptually similar concepts and not related to conceptually dissimilar constructs, further supporting the convergent and discriminant validity of the system.

Study 4: FACES and Other Psychophysiological Measures

The extent to which different components of emotional responding, including expressive behavior, emotional experience, and psychophysiological responding, correspond or cohere remains a topic of debate (e.g., Barrett, 2006a; Bradley & Lang, 2000; Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005). Functionalist accounts of emotion suggest that coherence among response components is adaptive (e.g., Levenson, 1994), yet the empirical data supporting coherence are mixed (Barrett, 2006a). There are a number of reasons why particular emotion components may not cohere in any given study, including sample characteristics, emotion elicitation methods, emotion component measurements, data analytic techniques, as well as whether even under ideal circumstances emotion coherence is the exception rather than the norm. A recent study (Mauss et al., 2005) demonstrated coherence between facial expression, emotional experience, and psychophysiological responding for particular emotions (amusement, sadness) and under a particular set of circumstances (within subjects research design, continuous measures of each component, varying levels of emotional intensity). Other studies have demonstrated that expressive behavior is related to reports of experienced emotion, particularly for positive emotions such as amusement (e.g., Adelmann & Zajonc, 1989; Bonanno & Keltner, 2004; Ekman, Davidson, & Friesen, 1990; Ekman & Rosenberg, 1994; Gross, John, & Richards, 2000). The evidence for correspondence between expressive behavior and psychophysiological responding is less robust (Mauss et al., 2005), but it has been demonstrated (e.g., Adelmann & Zajonc, 1989), particularly with measures of the valence dimension (e.g., Cacioppo, Berntson, Larsen, Poehlmann, & Ito, 2000; Lang et al., 1993).

Given the mixed findings regarding correspondence between components of emotional responding, it is somewhat difficult to make firm predictions. Nevertheless, we expected that FACES ratings would correspond to psychophysiological responding to some degree, consistent with other studies that have demonstrated such a relationship (e.g., Lang et al., 1993; Mauss et al., 2005). Lang and colleagues (1993) have shown that skin conductance is reliably related to reports of arousal, and heart rate is reliably related to reports of valence. Because the positive and negative emotional film clips were also arousing,[7] we expected that positive

[7] Participants in all samples provided self-report ratings of their experienced activation in response to each film. In all samples, the positive and negative films elicited more activation than neutral films: Sample U1, $F(1, 59) = 164.29$, $p < .001$; Sample U5, $F(1, 111) = 87.21$, $p < .001$; Sample U7, $F(1, 65) = 527.46$, $p < .001$; Sample C11, $F(1, 15) = 19.90$, $p < .001$; Sample C12, $F(1, 19) = 59.04$, $p < .001$. In addition, reports of activation did not differ between the positive and negative films for samples U1 and C12. For samples U7, $F(1, 65) = 185.30$, $p < .01$, and C11, $F(1, 15) = 5.57$, $p = .03$, the negative films elicited more activation than the positive films.

and negative facial expressiveness would be moderately related to both skin conductance and heart rate.

Method

Participants

Undergraduates from samples U1 (n = 60), U5 (n = 112), and U7 (n = 66) and community adults from samples C11 (n = 16) and C12 (n = 20) individually viewed emotional film clips while peripheral psychophysiology was recorded. The university students received course credit, and the community adults were paid in exchange for their participation.

Psychophysiological Recording

For samples U1, U5, U7, C11, and C12, skin conductance was recorded following the recommendations of Fowles and associates (Fowles et al., 1981). After participants washed their hands with soap and water, separate adhesive collars were attached to two Beckman 16-mm Ag/AgCl cup electrodes which were then filled with a 0.05 molar NaCl electrolyte and attached to the hypothenar eminence of the nondominant palm. Skin conductance level (SCL) was recorded using a Coulbourn Instruments constant-voltage skin conductance coupler (S71-23), applying a constant voltage of 0.5 volts across electrodes. SCL data were displayed and stored online. Samples were recorded at a rate of 100 samples/second. For samples C11 and C12, skin conductance responses (SCRs) were extracted from the SCL record during later analysis. SCRs were defined by phasic changes in SCL exceeding 0.05 μS (Dawson, Schell, & Filion, 1990). The frequency of SCRs was divided by the total time of each film to yield an index of SCRs per minute.

For sample U1, heart rate was recorded by placing SensorMedics plate electrodes (SensorMedics, Anaheim, CA) on the left and right wrists. Electrode placement and electrocardiogram (ECG) recording followed the recommendations of Jennings et al. (1991) and Papillo and Shapiro (1990). The raw ECG was recorded using a Coulbourn Instruments high-gain bioamplifier (S75-01), with high and low pass filters set at 40 and 0.1 Hz, respectively. Heart rate in beats per minute (bpm) was obtained from later analysis of the saved ECG data.

For sample U5, heart rate recordings were obtained using Beckman standard Ag-AgCl electrodes placed on each inner forearm. The signal was filtered and amplified by Coulbourn Hi-Gain Bioamplifier (Coulbourn Instruments, Allentown, PA) and fed to a digital input on the computer, which detected R-waves and recorded the interval between R-waves in milliseconds. Heart rate in bpm was obtained from later analyses of the saved data.

Results and Discussion

Table 7 presents the correlations between FACES ratings, skin conductance, and heart rate. FACES positive ratings were positively correlated with skin conductance for three of the five samples (U1, U5, and C11), and FACES negative ratings were positively correlated with skin conductance for all samples, although the correlations approached significance for the fairly small sample C11. In addition, heart rate was positively correlated with FACES positive and negative ratings for samples U1 and U5. Given that the extent to which facial expressive behavior coheres with psychophysiological responding varies quite a bit, the amount of correspondence observed across these five diverse samples is broadly consistent with other studies of emotional responding. These findings suggest that FACES ratings are tapping positive and negative expressive behavior that is modestly to moderately linked with skin conductance and heart rate in a laboratory setting.

Study 5: FACES and Reports of Experienced Emotion

Prior studies have shown that FACES ratings are related to reports of emotional experience (Frasier et al., 2004; Heisel & Mongrain, 2004; Kring & Earnst, 2003; Luterek et al., 2005; Wagner et al., 2003). We present additional data from 10 samples on the correspondence between FACES ratings and reports of experienced emotion in this section. Similar to previous findings, we predicted that FACES positive expression variables would be related to reports of positive emotional experience, and FACES negative expression variables would be related to negative emotional experience. As noted earlier, however, the correspondence between expressive behavior and reports of emotion experience varies from study to study, and if anything, the linkage appears to be stronger for positive than for negative emotions (e.g., Gross et al., 2000; Mauss et al., 2005).

Method

Participants

All samples except U1 (n = 60), U6 (n = 89), and U7 (n = 66) completed measures of emotional experience following the viewing of each film clip. Undergraduates received course credit for their participation; patients and community adults were paid in exchange for their participation.

Emotional Experience Measures

Sample U2 (n = 24) completed two bipolar 7-point Likert scales assessing valence (pleasant, unpleasant) and activation (high, low). Samples U3 (n = 60), U4 (n = 66), and U5 (n = 112) completed a scale containing 20 emotion terms that assessed valence and activation from which positive and negative emotion experience scales were created. The remaining samples (S8, n = 15; S9, n = 41; S10, n = 28; C11, n = 16; C12, n = 20; C13, n = 13) completed a 44-item scale that assessed valence and activation dimensions of emotion from which positive and negative emotion experience measures were created.

Procedure

All samples completed the emotion experience measure immediately following each film clip. Samples S9 and C13 completed the experience measure on a computer; the remaining samples completed a paper-and-pencil measure. Samples S9 and C13 viewed the same film clips as samples S8 and C11. The undergraduate samples were unknowingly videotaped during film viewing; the patient and community adult samples were knowingly videotaped, though the camera was made as unobtrusive as possible. As described earlier, raters were blind to the nature and names of all film clips and to the diagnostic status of participants in the patient and community adult samples.

Table 7
Correlations Between FACES, Skin Conductance, and Heart Rate

Variable	U1 (n = 60)	U5 (n = 112)	U7 (n = 66)	C11 (n = 16)	C12 (n = 20)
	FACES positive				
Frequency	$.44^{**}$ ($.33^{*}$)	$.52^{**}$ ($.30^{**}$)	.15	$.62^{*}$	.19
Intensity	$.73^{**}$ (.24)	$.64^{**}$ ($.22^{*}$)	.21	$.49^{*}$	.27
Duration	$.52^{**}$ ($.28^{*}$)	$.46^{**}$ ($.26^{**}$)	.11	$.54^{*}$	.31
Composite	$.74^{**}$ ($.35^{**}$)	$.53^{**}$ ($.34^{**}$)	.16	$.55^{*}$	.27
	FACES negative				
Frequency	$.38^{**}$ ($.37^{**}$)	$.44^{**}$ ($.39^{**}$)	$.30^{*}$	$.45^{\dagger}$	.15
Intensity	$.30^{*}$ (.22)	$.37^{**}$ ($.24^{**}$)	$.29^{*}$	.32	$.49^{*}$
Duration	$.32^{*}$ ($.27^{*}$)	$.34^{**}$ ($.28^{**}$)	.23	$.45^{\dagger}$	$.58^{*}$
Composite	$.34^{**}$ ($.37^{**}$)	$.43^{**}$ ($.41^{**}$)	$.29^{*}$	$.44^{\dagger}$	$.43^{*}$

Note. Correlations with heart rate are in parentheses. Samples U1 and U5 measured skin conductance level (SCL) and heart rate; Sample U7 measured SCL; Samples C11 and C12 measured the number of skin conductance responses. FACES = Facial Expression Coding System; U = undergraduate students; C = community adult sample.
$^{\dagger}p < .08$. $^{*}p < .05$. $^{**}p < .01$.

Results and Discussion

The correlations between FACES ratings and reports of experienced emotion are presented in Table 8. Consistent with other studies examining the link between facial expressive behavior and emotion experience (e.g., Ekman et al., 1990; Mauss et al., 2005), positive FACES ratings were consistently positively related to reports of positive emotion during an amusement film. The linkage between positive FACES ratings and reports of positive emotion during a happy film was also strong, but not as robust as for the amusement film. The linkage between FACES negative ratings and reports of negative experienced emotion was more modest, particularly for fear. This may reflect the fact that the fear film clip used in these studies did not elicit a good deal of negative expressive behavior, as was also the case in Study 1. With respect to the schizophrenia patient samples, the lack of correspondence is consistent with a number of studies in which a disconnect has been found between patients' outward expressive behavior and reports of experienced emotion (e.g., Berenbaum & Oltmanns, 1992; Kring & Earnst, 1999; Kring et al., 1993; Kring & Neale, 1996). That schizophrenia patients' positive expressive behavior was linked to reports of positive emotion experience suggests that even though the patients are less expressive than community adults (Earnst & Kring, 1999; Kring & Earnst, 1999), the more expressive patients nevertheless reported experiencing more positive emotion, similar to the community adults. Taken together, the linkage between FACES ratings and reports of experienced emotion is consistent with our predictions and further supports the validity of the system.

General Discussion

FACES is a system that provides information about the valence of outward expressive behavior, grounded in a dimensional model of emotion that emphasizes valence as a "basic building block of emotional life" (cf. Barrett, 2006b). Raters using FACES code the frequency, intensity, and duration of positive and negative expressive behavior. Across a diverse set of samples and raters, we have shown that FACES can be reliably rated. Although this is not the same as reliability in the classical sense of the word, the high agreement suggests that raters can reliably agree on what is being observed, in this case positive and negative facial expressive behavior.

The five studies presented in this article support the validity of FACES. First, FACES ratings correspond to ratings derived from another widely used system for rating facial expressive behavior, EMFACS. Although these two systems are derived from different theoretical traditions, they nonetheless correspond fairly well, suggesting that FACES is picking up on the same expressive behavior that is tapped by EMFACS. Despite this degree of relatedness, one should not assume that the two systems are interchangeable. Rather, investigators intent on measuring facial expressive behavior ought first to consider the theoretical framework upon which each system was designed. EMFACS is based on a discrete emotions perspective, and investigators interested in measuring specific emotions and their associated expressive behavior ought to consider EMFACS. By contrast, FACES is based in a dimensional perspective, and investigators interested in emotional valence ought to consider FACES. Even though we have included judgments about specific emotions (forced-choice rating and Likert format ratings about the predominant emotion expressed) with FACES, these were mainly developed as manipulation checks for emotional film clips and not intended to supplant other systems that are derived from a discrete emotion perspective.

In Study 2, we showed that FACES positive ratings are linked with zygomatic facial muscle activity and that FACES negative ratings are linked with corrugator facial muscle activity. These findings support the contention that FACES is sensitive to emotional valence, and several studies using facial EMG activity have demonstrated that zygomatic and corrugator activity are reliably associated with positive emotion and negative emotion, respectively. In Study 3, we showed that FACES ratings are associated with reports of individual and family expressive behavior as well

Table 8
Correlations Between FACES and Reports of Experienced Emotion

Variable	U2 (n = 24)	U3 (n = 60)	U4 (n = 66)	U5 (n = 112)	S8 (n = 15)	S9 (n = 41)	S10 (n = 28)	C11 (n = 15)	C12 (n = 20)	C13 (n = 13)
					Happiness					
Frequency		.39**	.32**	.22*	.50*		.25	.51*		.17
Intensity		.36*	.51**	.19*	.24		.26	.27		.24
Duration		.61**	.37**	.21*	.48*		.16	.51*		.13
Composite		.49**	.46**	.23*	.39		.26	.35		.19
					Amusement					
Frequency		.53**		.42**	.56*	.39**	.56**	.40	.73**	.47*
Intensity		.72**		.31**	.50*	.44**	.57**	.60**	.52**	.25
Duration		.74**		.27**	.59**	.31	.50**	.62**	.60**	.27
Composite		.62**		.35**	.54*	.44*	.62**	.67**	.70**	.37
					Disgust					
Frequency	−.25/ .34*	.29*	.42**	.39**	.21	.17	.36*	.72**	.22	.33
Intensity	−.35*/ .64**	.18	.45**	.38**	.17	.24	.30	.58**	.11	.29
Duration	−.39*/ .52**	.35**	.39**	.35**	.16	.20	.36*	.54*	.10	.10
Composite	−.23/ .37*	.30**	.47**	.37**	.22	.22	.38*	.64**	.16	.27
					Fear					
Frequency		.24*	.15	.11	.02		−.31*	.27		−.35
Intensity		.47**	.23*	.08	.16		−.16	.13		.12
Duration		.31**	.30**	.07	.18		−.32*	.32		−.23
Composite		.54**	.22*	.13	.16		−.28	.13		−.24

Note. For Happiness and Amusement, tabled values are the correlations between positive FACES and ratings and reports of positive emotional experience. For Disgust and Fear, tabled values are the correlations between negative FACES and ratings and reports of negative emotional experience. FACES = Facial Expression Coding System; U = undergraduate students; S = schizophrenia samples; C = community adult samples.
* $p < .05$. ** $p < .01$, one-tailed tests.

as with reports of Extraversion and Neuroticism. FACES ratings were modestly associated with reports of Agreeableness and Openness, a finding that is generally consistent with studies showing a link between these two personality constructs and self-reported expressive behavior (e.g., Gross & John, 1995, 1998). Moreover, supporting the discriminant validity of FACES, we found that FACES ratings were not strongly related to reports of conscientiousness or self-esteem.

Finally, we found that FACES ratings were related to other components of emotional responding, including skin conductance, heart rate, and reports of experienced emotion. As discussed earlier, the extent to which different components are expected to correspond continues to be debated (e.g., Barrett, 2006a; Mauss et al., 2005). However, the findings reported here are consistent with prior studies showing a linkage between expressive behavior and experienced emotion following laboratory inductions of emotion, particularly for amusement (e.g., Ekman et al., 1990; Mauss et al., 2005). Similarly, the correspondence between positive and negative FACES ratings and psychophysiological responding is consistent with studies using different measures of expressive behavior (e.g., Cacioppo et al., 2000; Lang et al., 1993).

Decisions about what method to adopt for coding facial expressive behavior is driven by both theoretical and practical concerns. A reasonable place to begin is for investigators to carefully unpack their research questions. These questions may include Am I interested in testing hypotheses about specific emotions? or Am I interested in testing hypotheses about emotion dimensions? What level of analysis am I interested in assessing—specific aspects of expressive behavior, such as the frequency, intensity, or duration, or a more global level of analysis? Answers to these questions will guide investigators in their choice of a method that is closely linked with their interests.

One advantage of FACES is the economy inherent to its use. It requires less training and coding time than other systems such as EMFACS. Some might argue that this time savings is not without cost, however, because EMFACS provides more detailed information on facial behavior. However, as is evident from Study 1, the two systems show a high degree of correspondence. The degree of correspondence between FACES and measures of facial muscle activity (smile and frown muscles) demonstrated in Study 2 is noteworthy, as some investigators might find EMG studies not practical or feasible to conduct. Ultimately, the decision concerning what method (and system) to use should be based on both theory and practicality. What is clear is that FACES is a less time-consuming method for assessing facial expression from a dimensional perspective.

Limitations of the studies presented in the present article include the examination of only one patient group (schizophrenia) that was predominantly male. However, FACES has been shown to be reliable and valid when used with other patient samples, such as those with depression and posttraumatic stress disorder, that included more women (Orsillo et al., 2004; Sloan et al., 1997, 2001; Wagner et al., 2003). Although the samples presented here are diverse with respect to geographic region, age, education level, and psychopathology, the majority of the student participants were European American participants. It will be important to demonstrate the usefulness of FACES in more ethnically and culturally diverse samples. Another potential limitation is that film clips were used to elicit emotional responses for all of the samples included here. Thus, investigators may obtain different results when using FACES in contexts other than film clips. Indeed, elicitation of emotion using film clips yields positive expressive behavior more readily than negative expressive behavior, particularly fear, perhaps accounting for the more consistent linkages between positive expressive behavior and the other variables compared with negative expressive behavior. Nonetheless, FACES has been used to code expressions elicited in other contexts, including social interactions (Heisel & Mongrain, 2004), social role-plays (Aghevli et al., 2003), interviews (Kring, Alpert et al., 1994), and emotion eliciting pictures (Sloan et al., 1997, 2001), suggesting that this system has utility across different methods for eliciting facial expressions of emotion. Finally, it remains to be seen whether the utility of FACES extends to studies with children. All of the studies presented here, as well as previously published reports, have been conducted with adult or college student samples. Although we have no reason to believe the system would not be useful in studies with children, this remains to be empirically demonstrated.

In summary, accumulating evidence points to FACES as a useful, reliable, and valid method for coding facial expressive behavior. FACES is a good choice for investigators interested in studying valence. It remains unclear whether FACES has utility in more clinical settings, but we can envision scenarios in which the system may be helpful for clinicians working to alter patients' emotional expressive behavior. Indeed, facial expressive behavior is important in a number of treatments that target social skills training for patients diagnosed with schizophrenia (Bellack, Mueser, Gingerich, & Agresta, 2004), depression (e.g., Markowitz & Weissman, 1995), and social anxiety disorder (Heimberg & Becker, 2002). For example, treatments might specifically target social skills by working with patients to increase positive expressive behavior and decrease negative expressive behavior during social interactions. FACES could be used in this circumstance to observe the mean duration and intensity of positive and negative facial expressions displayed within and across sessions so that therapists could better determine the extent to which patients display proper changes in facial expressivity. Facial expressive behavior is also important for therapy approaches that focus on improving emotion regulation skills, such as dialectical behavior therapy (Linehan, 1993) and acceptance and commitment therapy (ACT; Blackledge & Hayes, 2001). In the case of ACT, a primary goal of therapy is to have the patient remain in contact with previously avoided negative thoughts and feelings. FACES could be used within ACT by using coded negative facial expressions as an objective index of the patient becoming and remaining in contact with negative emotions and feelings during experiential exposure sessions that are part of the ACT treatment. Similarly, FACES could be used to examine the degree of emotional engagement that occurs during exposure-based therapy. For example, during prolonged exposure (Foa & Rothbaum, 1998), one would expect to observe high duration and intensity of negative facial expressions during initial exposure sessions and a decrease in duration and intensity of negative facial expressions as successful habituation to the feared stimulus (i.e., trauma cues) occurred. For all of these treatment approaches, it might be useful to examine expressive behavior before, during, and after therapy in order to assess efficacy of the treatment. Given the economical nature of FACES and the reliability and validity data presented in this article, FACES is an ideal system to use for this assessment purpose. Overall, the FACES system has been shown to be a very useful observational system to index facial expressive behavior in the laboratory, and it has potential to be useful in clinical settings as well.

References

Abelson, R. P., & Sermat, V. (1962). Multidimensional scaling of facial expressions. *Journal of Experimental Psychology, 63,* 546–554.

Adelmann, P. K., & Zajonc, R. B. (1989). Facial efference and the experience of emotion. *Annual Review of Psychology, 40,* 249–280.

Aghevli, M., Blanchard, J. J., & Horan, W. P. (2003). The expression and experience of emotion in schizophrenia: A study of social interactions. *Schizophrenia Research, 119,* 261–270.

Barrett, L. F. (2006a). Solving the emotion paradox: Categorization and the experience of emotion. *Personality and Social Psychology Review, 10,* 20–46.

Barrett, L. F. (2006b). Valence is a basic building block of emotional life. *Journal of Research in Personality, 40,* 35–55.

Barrett, L. F., & Russell, J. A. (1999). The structure of current affect: Controversies and emerging consensus. *Current Directions in Psychological Science, 8,* 10–14.

Bellack, A. S., Mueser, K. T., Gingerich, S., & Agresta, J. (2004). *Social skills training for schizophrenia* (2nd ed.). New York: Guilford Press.

Berenbaum, H., & Oltmanns, T. F. (1992). Emotional experience and expression in schizophrenia and depression. *Journal of Abnormal Psychology, 101,* 37–44.

Blackledge, J. T., & Hayes, S. C. (2001). Emotion regulation in acceptance and commitment therapy. *Journal of Clinical Psychology, 57,* 243–255.

Blascovich, J., & Tomaka, J. (1991). Measures of self-esteem. In J. P. Robinson, P. R. Shaver, & L. S. Wrightman (Eds.), *Measures of personality and social psychological attitudes* (pp. 115–160). San Diego, CA: Academic Press.

Bonanno, G. A., & Keltner, D. (2004). The coherence of emotion systems: Comparing "online" measures of appraisal and facial expressions and self-report. *Cognition & Emotion, 18,* 431–444.

Bradley, M. M., Greenwald, M. K., & Hamm, A. O. (1993). Affective picture processing. In N. Birbaumer & A. Öhman (Eds.), *The structure of emotion: Psychophysiological, cognitive, and clinical aspects* (pp. 48–68). Toronto: Hogrefe & Huber.

Bradley, M. M., & Lang, P. J. (2000). Measuring emotion: Behavior, feeling, and physiology. In R. D. Lane & L. Nadel (Eds.), *Cognitive neuroscience of emotion* (pp. 242–276). New York: Oxford University Press.

Brown, S., & Schwartz, G. E. (1980). Relationships between facial electromyography and subjective experience during affective imagery. *Biological Psychology, 11,* 49–62.

Burrowes, B. D., & Halberstadt, A. G. (1987). Self- and family-expressiveness styles in the experience and expression of anger. *Journal of Nonverbal Behavior, 11,* 254–268.

Cacioppo, J. T., Berntson, G. G., Larsen, J. T., Poehlmann, K. M., & Ito, T. A. (2000). The psychophysiology of emotion. In R. Lewis & J. M. Haviland-Jones (Eds.), *The handbook of emotion* (2nd ed., pp. 173–191). New York: Guilford Press.

Cacioppo, J. T., Bush, L. K., & Tassinary, L. G. (1992). Microexpressive facial actions as a function of affective stimuli: Replication and extension. *Personality and Social Psychology Bulletin, 18,* 515–526.

Cacioppo, J. T., Petty, R. E., Losch, M., & Kim, H. S. (1986). Electromyographic activity over facial muscle regions can differentiate the valence and intensity of emotional reactions. *Journal of Personality and Social Psychology, 50,* 260–268.

Cacioppo, J. T., Petty, R. E., & Morris, K. J. (1985). Semantic, evaluative, and self-referent processing: Memory, cognitive effort, and somatovisceral activity. *Psychophysiology, 22,* 371–384.

Cliff, N., & Young, F. W. (1968). On the relation between unidimensional judgments and multidimensional scaling. *Organizational Behavior and Human Performance, 3,* 269–285.

Costa, P. T., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI) professional manual.* Odessa, FL: Psychological Assessment Resources.

Darwin, C. R. (1896). *The expression of the emotions in man and animals.* New York: Appleton.

Dawson, M. E., Schell, A. M., & Filion, D. L. (1990). The electrodermal system. In J. T. Cacioppo & L. G. Tassinary (Eds.), *Principles of psychophysiology, physical, social, and inferential elements* (pp. 295–324). Cambridge, England: Cambridge University Press.

Dimberg, U. (1982). Facial reactions to facial expressions. *Psychophysiology, 19,* 643–647.

Dunn, O. J., & Clark, V. A. (1969). Correlation coefficients measured on the same individuals. *Journal of the American Statistical Association, 64,* 366–377.

Earnst, K. S., & Kring, A. M. (1999). Emotional responding in deficit and nondeficit schizophrenia. *Psychiatry Research, 88,* 191–207.

Ekman, P., Davidson, R. J., & Friesen, W. V. (1990). The Duchenne smile: Emotional expression and brain physiology, II. *Journal of Personality and Social Psychology, 58,* 342–353.

Ekman, P., & Friesen, W. V. (1976). Measuring facial movement. *Journal of Environmental Psychology, 1,* 56–75.

Ekman, P., & Friesen, W. V. (1978). *The Facial Action Coding System.* Palo Alto, CA: Consulting Psychologists Press.

Ekman, P., & Rosenberg, E. (1994). Coherence between expressive and experiential systems in emotion. *Cognition & Emotion, 8,* 201–229.

Ermiane, R., & Gergerian, E. (1978). *Album des expressions du visage* [*Atlas of facial expressions*]. Paris: La Pensee Universelle.

Foa, E. B., & Rothbaum, B. O. (1998). *Treating the trauma of rape: Cognitive-behavioral therapy for PTSD.* New York: Guilford Press.

Fowles, D. C., Christie, M. J., Edelberg, R., Grings, W. W., Lykken, D. T., & Venables, P. H. (1981). Publication recommendations for electrodermal measurements. *Psychophysiology, 18,* 232–239.

Frazier, T. W., Strauss, M. E., & Steinhauer, S. E. (2004). Respiratory sinus arrhythmia as an index of emotional response in young adults. *Psychophysiology, 41,* 75–83.

Fridlund, A. J., & Cacioppo, J. T. (1986). Guidelines for human electromyographic research. *Psychophysiology, 23,* 567–589.

Goldberg, L. R. (1992). The development of markers for the Big-Five factor structure. *Psychological Assessment, 4,* 26–42.

Gottman, J. M., & Levenson, R. W. (1985). Assessing the role of emotion in marriage. *Behavioral Assessment, 8,* 31–48.

Gratiolet, P. (1865). *De la physionomie et des mouvements d'expression.* Paris: Hetzel.

Gross, J. J., & John, O. P. (1995). Facets of emotional expressivity: Three self-report factors and their correlates. *Personality and Individual Differences, 19,* 555–568.

Gross, J. J., & John, O. P. (1997). Revealing feelings: Facets of emotional expressivity in self-reports, peer ratings, and behavior. *Journal of Personality and Social Psychology, 72,* 435–448.

Gross, J. J., & John, O. P. (1998). Mapping the domain of expressivity: Multimethod evidence for a hierarchical model. *Journal of Personality and Social Psychology, 74,* 170–191.

Gross, J. J., John, O. P., & Richards, J. M. (2000). The dissociation of emotion expression from emotion experience: A personality perspective. *Personality and Social Psychology Bulletin, 26,* 712–726.

Gross, J. J., & Levenson, R. W. (1993). Emotional suppression: Physiology, self-report, and expressive behavior. *Journal of Personality and Social Psychology, 64,* 970–986.

Gross, J. J., & Levenson, R. W. (1995). Emotion elicitation using films. *Cognition & Emotion, 9,* 87–108.

Halberstadt, A. G. (1986). Family socialization of emotional expression and nonverbal communication styles and skills. *Journal of Personality and Social Psychology, 51,* 827–836.

Heimberg, R. G., & Becker, R. E. (2002). *Cognitive-behavioral group therapy for social phobia: Basic mechanisms and clinical strategies.* New York: Guilford Press.

Heisel, M. J., & Mongrain, M. (2004). Facial expressions and ambivalence: Looking for conflict in all the right faces. *Journal of Nonverbal Behavior, 28,* 35–52.

Izard, C. (1979). *The maximally discriminative facial movement coding system* (MAX). Unpublished manuscript, University of Delaware, Instructional Resources Center.

Jennings, J. R., Berg, W. K., Hutcheson, J. S., Obrist, P., Porges, S., & Turpin, G. (1981). Publication guidelines for heart rate studies in man. *Psychophysiology, 18,* 226–231.

John, O. P. (1990). The "Big Five" factor taxonomy: Dimensions of personality in the natural language and in questionnaires. In L. A. Pervin (Ed.), *Handbook of personality: Theory and research* (pp. 66–100). New York: Guilford Press.

Keltner, D. (2004). Ekman, emotional expression, and the art of empirical epiphany. *Journal of Research in Personality, 38,* 37–44.

Kring, A. M., Alpert, M., Neale, J. M., & Harvey, P. D. (1994). A multichannel, multimethod assessment of affective flattening in schizophrenia. *Psychiatry Research, 54,* 211–222.

Kring, A. M., Barrett, L. F., & Gard, D. E. (2003). On the broad applicability of the affective circumplex: Representations of affective knowledge in schizophrenia. *Psychological Science, 14,* 207–214.

Kring, A. M., & Earnst, K. S. (1999). Stability of emotional responding in schizophrenia. *Behavior Therapy, 30,* 373–388.

Kring, A. M., & Earnst, K. S. (2003). Nonverbal behavior in schizophrenia. In P. Philippot, E. Coats, & R. S. Feldman (Eds.), *Nonverbal behavior in clinical settings* (pp. 263–286). New York: Oxford University Press.

Kring, A. M., & Gordon, A. H. (1998). Sex differences in emotion: Expression, experience, and physiology. *Journal of Personality and Social Psychology, 74,* 686–703.

Kring, A. M., Kerr, S. L., & Earnst, K. S. (1999). Schizophrenic patients show facial reactions to emotional facial expressions. *Psychophysiology, 36,* 186–192.

Kring, A. M., Kerr, S., Smith, D. A., & Neale, J. M. (1993). Flat affect in schizophrenia does not reflect diminished subjective experience of emotion. *Journal of Abnormal Psychology, 102,* 507–517.

Kring, A. M., & Neale, J. M. (1996). Do schizophrenic patients show a disjunctive relationship among expressive, experiential, and psychophysiological components of emotion? *Journal of Abnormal Psychology, 105,* 249–257.

Kring, A. M., & Sloan, D. (1991). *The Facial Expression Coding System (FACES): A user's guide.* Unpublished manuscript.

Kring, A. M., Smith, D. A., & Neale, J. M. (1994). Individual differences in dispositional expressiveness: The development and validation of the Emotional Expressivity Scale. *Journal of Personality and Social Psychology, 66,* 934–949.

Lang, P. J., Greenwald, M. K., Bradley, M. M., & Hamm, A. O. (1993). Looking at pictures: Affective, facial, visceral and behavioral reactions. *Psychophysiology, 30,* 261–273.

Larsen, R. J., & Diener, E. (1992). Promises and problems with the circumplex model of emotion. *Review of Personality and Social Psychology, 13,* 25–59.

Levenson, R. W. (1994). Human emotion: A functional view. In P. Ekman & R. J. Davidson (Eds.), *The nature of emotion* (pp. 123–126). New York: Oxford University Press.

Linehan, M. M. (1993). *Cognitive-behavioral treatment of borderline personality disorder*. New York: Guilford Press.

Luterek, J. A., Orsillo, S. M., & Marx, B. P. (2005). Emotional experience, expression, and disclosure in childhood sexual abuse survivors. *Journal of Traumatic Stress, 18,* 237–244.

Marascuilo, L. A., & McSweeney, M. (1977). *Nonparametric and distribution-free methods for the social sciences*. Monterey, CA: Brooks/Cole Publishing.

Markowitz, J. C., & Weissman, M. M. (1995). Interpersonal psychotherapy. In E. E. Beckman & W. R. Leber (Eds.), *Handbook of depression* (2nd ed., pp. 376–390). New York: Guilford Press.

Mauss, I., Levenson, R. L., McCarter, L., Wilhelm, F., & Gross, J. J. (2005). The tie that binds? Coherence among emotion experience, behavior, and physiology. *Emotion, 5,* 175–190.

Orsillo, S. M., Batten, S. V., Plumb, J. C., Luterek, J. A., & Roessner, B. M. (2004). An experimental study of emotional responding in women with posttraumatic stress disorder related to interpersonal violence. *Journal of Traumatic Stress, 17,* 241–248.

Osgood, C. E. (1955). Fidelity and reliability. In H. Quastler (Ed.), *Information theory in psychology* (pp. 374–390). Glencoe, IL: Free Press.

Osgood, C. E. (1960). Cognitive dynamics in human affairs. *Public Opinion Quarterly, 24,* 341–365.

Papillo, J. F., & Shapiro, D. (1990). The cardiovascular system. In J. T. Cacioppo & L. G. Tassinary (Eds.), *Principles of psychophysiology: Physical, social, and inferential elements* (pp. xxx–xxx). Cambridge, England: Cambridge University Press.

Parkinson, B. (2005). Do facial movements express emotion or communicate social motives? *Personality and Social Psychology Review, 9,* 278–311.

Piderit, T. (1888). *La Mimique et al physiognomie.* Paris: Alcan.

Pope, L. K., & Smith, C. A. (1994). On the distinct meaning of smiles and frowns. *Cognition & Emotion, 8,* 65–72.

Reisenzein, R. (1994). Pleasure-arousal theory and the intensity of emotions. *Journal of Personality and Social Psychology, 67,* 525–539.

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology, 39,* 1161–1178.

Russell, J. A., Bachorowski, J.-A., & Fernández-Dols, J.-M. (2003). Facial and vocal expressions of emotion. *Annual Review of Psychology, 54,* 329–349.

Salem, J. E., & Kring, A. M. (1999). Flat affect and social skills in schizophrenia: Evidence for their independence. *Psychiatry Research, 87,* 159–167.

Schlosberg, H. (1952). The description of facial expression in terms of two dimensions. *Journal of Experimental Psychology, 44,* 229–237.

Schlosberg, H. (1954). Three dimensions of emotion. *Psychological Review, 61,* 81–88.

Shrout, P. E., & Fleiss, J. L. (1979). Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin, 86,* 420–428.

Sloan, D. M., Strauss, M. E., Quirk, S. W., & Sajatovik, M. (1997). Subjective and expressive emotional responses in depression. *Journal of Affective Disorders, 46,* 135–141.

Sloan, D. M., Strauss, M. E., & Wisner, K. L. (2001). Diminished pleasurable response in depressed women. *Journal of Abnormal Psychology, 110,* 488–493.

Smith, C. A. (1989). Dimensions of appraisal and physiological response in emotion. *Journal of Personality and Social Psychology, 56,* 339–353.

Steiger, J. H. (1980). Tests for comparing elements of a correlation matrix. *Psychological Bulletin, 87,* 245–251.

Wagner, A. W., Roemer, L., Orsillo, S. M., & Litz, B. (2003). Emotional experiencing in women with posttraumatic stress disorder: Congruence between facial expressivity and self-report. *Journal of Traumatic Stress, 16,* 67–75.

Watson, D., Gamez, W., & Simms, L. J. (2005). Basic dimensions of temperament and their relation to anxiety and depression: A symptom-based perspective. *Journal of Research in Personality, 39,* 46–66.

Wheeler, R. E., Davidson, R. J., & Tomarken, A. J. (1993). Frontal brain asymmetry and emotional reactivity: A biological substrate of affective style. *Psychophysiology, 30,* 82–89.

Yik, M. S., Russell, J. A., & Barrett, L. F. (1999). Structure of self-reported current affect: Integration and beyond. *Journal of Personality and Social Psychology, 77,* 600–619.

Received June 30, 2006
Revision received October 20, 2006
Accepted December 4, 2006 ■