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Emotional responding in deficit and non-deficit schizophrenia

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Abstract

Although emotional dysfunction is presumed to be a central part of the deficit syndrome in schizophrenia, it has not yet been empirically investigated in deficit and non-deficit patients. Emotional responding was examined in 19 male deficit patients, 22 non-deficit patients, and 20 non-patient controls. Patients participated in a semi-structured clinical interview that included questions from the Schedule for the Deficit Syndrome (SDS) and the Brief Psychiatric Rating Scale (BPRS), and then were then categorized into deficit and non-deficit groups. In addition, all participants viewed emotional films while their facial expressions were videotaped and then completed self-reports of emotional experience following each film. As predicted, deficit patients were less expressive than non-deficit patients and controls across the films. Contrary to prediction, deficit patients did not report experiencing less emotion to the films than non-deficit patients or controls. Thus, a disjunction in emotional responding appeared to characterize deficit patients, who were less expressive than controls but did not report less emotional experience. Alternative explanations for the findings are considered as are directions for future research. © 1999 Elsevier Science Ireland Ltd. All rights reserved.

Keywords: Deficit syndrome; Flat affect; Facial expression; Emotion; Negative symptoms

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1. Introduction

Emotional disturbances have long been recognized as an important feature of schizophrenia, as illustrated in this quote by Bleuler (1950):

> *In the outspoken forms of schizophrenia, the emotional deterioration stands in the forefront of the clinical picture...Many schizophrenics...sit about the institutions to which they are confined with expressionless faces, hunched-up, the image of indifference (1911 / 1950, p. 40).*

A number of recent empirical studies have confirmed these clinical observations of emotional disturbances in schizophrenic patients. These studies have shown that schizophrenic patients exhibit significantly fewer positive and negative facial expressions in response to emotional stimuli than non-patient controls (Krause et al., 1989; Berenbaum and Oltmanns, 1992; Kring et al., 1993; Dworkin et al., 1996; Kring and Neale, 1996). Additionally, schizophrenic patients have been found to report experiencing as much, if not more, positive and negative emotion in response to emotional stimuli (Berenbaum and Oltmanns, 1992; Kring et al., 1993; Dworkin et al., 1996; Kring and Neale, 1996; Kring and Earnst, 1999). Taken together, these findings suggest a disjunction between the expressive and experiential components of emotion.

Emotional dysfunction in schizophrenia is closely linked to the negative symptoms of the disorder. For example, flat affect refers to diminished outward expression and is consistent with findings of diminished expressivity noted above. Recently, theorists and researchers have noted the importance of distinguishing primary and secondary negative symptoms (e.g. Carpenter et al., 1988; Buchanan et al., 1990; Fenton and McGlashan, 1994; Mayerhoff et al., 1994; Samson et al., 1995; see Earnst and Kring, 1997 for a review). While the observable phenomena that constitute primary and secondary negative symptoms are the same (e.g. diminished facial expression, poverty of speech, etc.), secondary negative symptoms are believed to be linked to depression, medication side effects (e.g. akinesia), paranoia, or anxiety, whereas primary negative symptoms are not presumed to be associated with these factors. Primary and enduring negative symptoms are also called deficit symptoms. As defined by Carpenter and colleagues, the deficit *syndrome* includes six specific deficit symptoms (i.e. restricted affect, diminished emotional range, poverty of speech, curbing of interests, diminished sense of purpose, diminished social drive) (Carpenter et al., 1988).

The present study was designed to test the hypothesis that the deficit syndrome is associated with diminished emotional responding using a comprehensive assessment of emotion. The deficit/non-deficit distinction is particularly crucial for studying emotional responding in schizophrenia for a number of reasons. First, features of the deficit syndrome (i.e. flat affect, diminished emotional range, diminished sense of purpose) reflect emotional processes. For example, Bryson et al. (1998) found that deficit patients performed more poorly on an affect recognition test than non-deficit patients, and within the deficit group, diminished sense of purpose was the deficit symptom most strongly associated with impaired affect recognition. Second, flat affect, which is characterized by diminished facial, vocal, and gestural expression of emotion, shares many common features with akinesia (e.g. diminished facial expression, decreased spontaneous movements, lack of expressive gestures) and depression (e.g. diminished facial expression, motor retardation) (e.g. Van Putten et al., 1980; Carpenter et al., 1985; Sommers, 1985; Rifkin, 1987; Van Putten and Marder, 1987; Lindenmayer and Kay, 1989; Marder et al., 1991; Blanchard and Neale, 1992). Thus, differentiating between flat affect, akinesia, and depression, which is necessary for making the deficit/non-deficit categorization, is particularly important. Undoubtedly, most hypotheses about flat affect are referring to flat affect that is a primary feature of schizophrenia and not related to a secondary source (Carpenter, 1991). Third, previous studies of emotional responding in schizophrenia have likely included both deficit and non-deficit patients, who may have different patterns of emotional responding (Samson et al., 1995). Thus, it remains unclear whether the emotion disjunction in schizophrenia might be specific to a subset of schizophrenic

patients. Specifically, although both deficit and non-deficit patients would likely exhibit less facial expression than non-patient controls, there is evidence to suggest that only the deficit patients would also report less emotional experience. For example, deficit patients have been found to report less pleasurable emotions as assessed by measures of physical and social anhedonia (Kirkpatrick and Buchanan, 1990; Loas et al., 1996) and less depression (Kirkpatrick et al., 1994; Loas et al., 1996).

In the present study, the expressive and experiential components of emotion were examined in deficit patients, non-deficit patients, and non-patient controls. Because previous research has typically made the deficit/non-deficit syndrome distinction rather than the primary/secondary distinction, the former distinction is supported by considerably more validity data than the latter distinction (e.g. Wagman et al., 1987; Carpenter et al., 1988; Thaker et al., 1989; Buchanan et al., 1989, 1990; Kirkpatrick and Buchanan, 1990; Tamminga et al., 1992; Breier et al., 1994; Buchanan et al., 1994, 1997; Conley et al., 1994; Fenton and McGlashan, 1994; Mayerhoff et al., 1994). The study had two major components. First, schizophrenic patients participated in a semi-structured clinical interview and assessment of medication side effects to determine whether or not they exhibited the deficit syndrome; clinical ratings of psychiatric symptoms were also assessed. Second, all participants watched emotional film clips while their facial expressions were videotaped. Following each film, participants also completed a self-report measure of emotional experience.

Because flat affect (diminished facial expression) and diminished emotional range (decreased experience of positive and/or negative emotion) are components of the deficit syndrome, we predicted that deficit patients would exhibit fewer facial expressions and report experiencing less pleasant and unpleasant emotion in response to the films than both non-deficit patients and controls. That is, we expected that deficit patients would show a diminution in *both* expressed and experienced emotion. In contrast, while some non-deficit patients may have diminished facial expression that is secondary to depression or medication side effects, others will exhibit little or no decrease in facial expression. Also, it stands to reason that secondary features such as depression, anxiety, and paranoia would be associated with greater negative emotional experience. Consequently, we predicted that non-deficit patients would be somewhat less expressive but report experiencing as much pleasant and more unpleasant emotion in response to the films compared to controls. Thus, the disjunction between expression and experience found in previous studies of emotional responding in schizophrenia was predicted to be confined to patients who do not meet criteria for the deficit syndrome (i.e. non-deficit patients).

2. Materials and methods

2.1. Participants

Forty-one male schizophrenic patients between the ages of 18 and 60 selected from the inpatient and outpatient schizophrenia clinics of the Nashville Veterans Affairs Medical Center and Vanderbilt Outpatient Psychiatry were paid $25 to participate in the study. The 41 study patients were drawn from a larger cohort of patients, whose psychiatric records had been pre-screened in an effort to recruit equal numbers of deficit and non-deficit patients into the study. Thus, several potential study candidates who appeared likely to be assigned to the non-deficit group (based on chart review) were not selected for participation. The majority of the patients were outpatients, although there were three inpatients in the deficit group and five inpatients in the non-deficit group. DSM-IV (American Psychiatric Association, 1994) diagnoses of schizophrenia were determined using the Structured Clinical Interview for DSM-IV (SCID-P: First et al., 1994). The SCID-P was conducted by a doctoral candidate in clinical psychology trained by a licensed clinical psychologist. All of the patients were taking neuroleptic medication at the time of testing. Patients with a history of severe head trauma, stroke, neurological disease, or any other DSM-IV

Axis I disorder or with current substance abuse problems were excluded from the study. Also, because the involuntary facial movements of tardive dyskinesia may resemble and/or interfere with spontaneous facial expressions of emotion, patients with tardive dyskinesia were excluded. Clinical characteristics of the patient groups are reported in Table 1. The deficit and non-deficit patients did not differ significantly on the number of previous hospitalizations, chlorpromazine (CPZ) equivalent dose of neuroleptic medication (American Psychiatric Association, 1997), or benztropine (BZT) equivalent dose of anticholinergic medication (deLeon et al., 1994).

Twenty male non-patient controls were recruited from the community using advertisements placed in a local technical school and in the housekeeping staff office at the Nashville Veterans Affairs Medical Center. Individuals were asked a series of screening questions (some of which were taken from the SCID-P) regarding their personal and family medical/psychiatric history and were subsequently excluded for a personal or family history of schizophrenia, a personal

Table 1
Demographic and clinical characteristics[a]

	Deficit patients	Non-deficit patients	Non-patients
Age	40.79 (8.31)	44.36 (8.22)	38.50 (8.54)
Education (years)	12.47 (0.84)	13.14 (2.48)	13.40 (1.19)
Race (*n*)			
Caucasian	13	10	11
African–American	5	12	9
Other	1	0	0
Marital Status (*n*)			
Married	4	9	2
Divorced	4	5	9
Single	10	8	9
Living with	1	0	0
Employment status (*n*)			
Unemployed	18	18	7
Employed	1	4	13
Number of previous hospitalizations	7.95 (5.86)	8.55 (8.73)	
Daily neuroleptic dosage (CPZ equivalent)	664.74 (448.04)	843.32 (464.31)	
Daily anticholinergic dosage (BZT equivalent)	2.82 (1.47)	3.25 (1.61)	
Neuroleptic medications (*n*)			
Chlorpromazine	0	2	
Trifluoperazine	2	1	
Haloperidol	2	6	
Fluphenazine	3	6	
Thiothixene	3	3	
Perphenazine	1	0	
Clozapine	2	0	
Risperidone	4	0	
Olanzapine	2	4	
Anticholinergic medications (*n*)			
Benztropine	11	11	
Trihexyphenidyl	0	3	
Diphenhydramine	0	2	
None	8	6	

[a] *Note*: Tabled age, education, hospitalization, and dosage equivalent values are means, with S.D. in parentheses.

history of mood disorder, current substance abuse problems, or a history of severe head trauma, stroke, or neurological disease.

Demographic characteristics of all the groups are also presented in Table 1. The three groups did not differ significantly with respect to age, $F_{2,58} = 2.64$, ns, race χ^2 (4, $N = 61$) = 5.12, ns, education, $F_{2,58} = 1.53$, ns, or marital status, χ^2 (8, $N = 61$) = 10.50, ns. The groups did differ significantly with respect to employment status, χ^2 (6, $N = 61$) = 20.97, $P < 0.002$, with more unemployed individuals in the deficit and non-deficit groups than in the non-patient group.

2.2. Clinical assessments

Patients participated in a semi-structured clinical interview and an assessment of medication side effects. The clinical interview included questions from the Schedule for the Deficit Syndrome (SDS; Kirkpatrick et al., 1989) and the Brief Psychiatric Rating Scale (BPRS; Overall and Gorham, 1962). The SDS and BPRS scores were assigned by two trained raters (two doctoral candidates in clinical psychology trained by a licensed clinical psychologist). Medication side effects were assessed using the Rating Scale for Extrapyramidal Symptoms (RSES; DiMascio et al., 1976) and the Abnormal Involuntary Movement Scale (AIMS; Guy, 1976), and scores were assigned by one of the two trained raters described above.

2.2.1. Deficit / non-deficit categorization

The SDS is a symptom rating scale that was developed to facilitate the categorization of patients into deficit and non-deficit groups. In order to meet criteria for the deficit syndrome, two of six negative symptoms (restricted affect, diminished emotional range, poverty of speech, curbing of interests, diminished sense of purpose, diminished social drive) must have been at least moderately severe, persistent over the prior 12 months, and not attributable to secondary sources (e.g. paranoia, depression, akinesia, and anxiety). In addition to questions from the SDS, additional information on the severity and temporal stability of symptoms, as well as possible secondary sources of symptoms, were obtained from the patient's treating psychiatrist, family members, and/or chart. Specifically, the severity and temporal course of symptoms was determined by examining

Table 2
Clinical rating scales[a]

	Deficit patients		Non-deficit patients	
	Mean	S.D.	Mean	S.D.
BPRS				
Total	18.66	7.06	18.02	7.14
Positive symptom scale	4.66	4.37	5.96	4.62
Negative symptom scale	7.08	2.90	3.30	1.74
Blunted affect item	3.29	0.93	1.32	0.98
Anxiety item	1.08	1.10	2.02	0.98
Depression item	1.00	1.37	1.00	1.26
Suspiciousness item	0.90	1.54	1.80	1.73
Affective range composite	3.87	3.49	5.86	2.84
Proxy measure	−0.58	3.63	−4.36	2.73
AIMS	1.21	2.12	3.55	2.65
RSES				
Total	1.63	1.21	1.86	0.99
Parkinsonian scale	0.79	0.86	0.82	1.05

[a] *Note*: BPRS, Brief Psychiatric Rating Scale; AIMS, Abnormal Involuntary Movement Scale; RSES, Rating Scale for Extrapyramidal Symptoms; BPRS proxy measure (Blunted Affect–Affective Range).

consecutive psychiatry outpatient chart notes for evidence of stable symptoms, and also discussing the severity and stability of symptoms over the past year with the patient's treating psychiatrist. Negative symptoms were considered secondary if they: (1) were reported by the patient and treating psychiatrist to improve in conjunction with improvements in depression, anxiety, or paranoia; (2) were consistently present along with significant depression or significant medication side effects; (3) appeared to be caused by significant anxiety or paranoia (e.g. social withdrawal resulting from persecutory delusions); (4) were consistently present in conjunction with marked sedation, which is thought to be commonly associated with akinesia; or (5) improved when the patient stopped taking neuroleptic medication or began taking anticholinergic medication (to reduce side effects of neuroleptic medication) (Kirkpatrick et al., unpublished results). Nineteen patients met deficit syndrome criteria and thus were included in the deficit group, while 22 patients did not meet deficit syndrome criteria and were included in the non-deficit group.

2.2.2. General psychiatric symptoms

General psychiatric symptoms were evaluated using the BPRS, which consists of 18 items that are rated on a scale from 0 (not present) to 6 (extremely severe) (Thompson et al., 1994). A BPRS positive symptom subscale (sum of the suspiciousness, unusual thought content, hallucinatory behavior, and conceptual disorganization items) (Kirkpatrick et al., 1993) and a negative symptom subscale (sum of the blunted affect, emotional withdrawal, and motor retardation items) (Carpenter et al., 1988) were computed.

In addition, a proxy measure for the deficit syndrome, which is composed of scores on various BPRS items, has been used successfully to discriminate between deficit and non-deficit patients already categorized using the SDS (Kirkpatrick et al., 1993). It can also be used to make the deficit/non-deficit distinction when SDS ratings are unavailable. The proxy measure is based on the notion that deficit patients will exhibit both flat affect (i.e. higher scores on the BPRS blunted affect item) and diminished affective range (i.e. lower scores on the affective range composite, which is composed of summed scores on the BPRS anxiety, depression, hostility, and guilt items). The proxy score is computed by subtracting the affective range score from the blunted affect score.

2.2.3. Medication side effects

The assessment of medication side effects was conducted using the RSES and the AIMS. The RSES comprised three subscales, Parkinsonian syndrome (diminished facial expression, tremor, akinesia, and rigidity), akathisia, and dystonia, which were rated on a scale from 0 (none/normal) to 3 (severe). Scores on the Parkinsonian syndrome subscale were particularly relevant for distinguishing between patients with and without deficit symptoms because of the similarity between features of the Parkinsonian syndrome and flat affect. The AIMS was used to assess involuntary facial/oral, extremity, and trunk movements. The AIMS total score (range: 0–42) is computed by summing the scores on the 12 individual AIMS items. As mentioned above, involuntary facial movements would be particularly problematic for the present study because of the possibility that they would resemble and/or interfere with spontaneous facial expressions of emotion, and thus patients with tardive dyskinesia were excluded.

2.3. Apparatus

2.3.1. Stimuli

Participants were randomly assigned to watch one of two orders of film clips. Film clips included two neutral, one positive (happy), and one negative (disgust) film clip. Participants assigned to order 1 viewed the film clips in the sequence: neutral, positive, neutral, negative. Participants assigned to order 2 viewed the film clips in the sequence: neutral, negative, neutral, positive. The emotional film clips included scenes of physical, slapstick comedy and a man being swarmed by cockroaches. The neutral film clips included scenes of trains moving along a track and of geometric shapes and patterns. Each of the film

clips was between 1 and 6 min in length. Normative self-report ratings of experienced emotion in response to these films have been established (Gordon and co-workers, unpublished results; Kring et al., 1993; Gross and Levenson, 1995; Kring and Neale, 1996; Kring and Earnst, 1999).

2.3.2. Self-report of emotional experience

Participants completed a 44-item checklist after the baseline period and after viewing each film clip. Forty-two of these adjectives are based on the circumplex model of emotion, in which attributes are subdivided according to their loading on two dimensions of emotion: valence (pleasant and unpleasant) and activation (high and low) (Russell, 1978; Larsen and Diener, 1992). Two other adjectives (neutral and disgust) were added as target emotions. Participants responded to each of the adjectives using a 5-point Likert scale (1 = very slightly or not at all; 5 = extremely). The circumplex self-report measure is reliable, with internal consistency values being high for both schizophrenic patients (e.g. Kring and Earnst, 1999) and non-patient samples (e.g. Ketelaar, unpublished results; Kring and Earnst, 1999). Mean scores for individual circumplex scales were computed. The pleasant, unpleasant, high activation, and low activation scales included items from the pleasant, unpleasant, high activation, and low activation circumplex octants, respectively.

2.4. Procedure

After the clinical interview and assessment, patients were given a 15-min break, and they then viewed the emotional films. Non-patient controls only viewed the films. Consequently, testing sessions lasted approximately 2.5 h for patients and approximately 1.5 h for non-patients. Before beginning the testing, participants signed informed consent forms after the experimenter had taken efforts to ensure their understanding of the forms.

A 5-min baseline period ensued in which participants were instructed to relax while facial EMG and skin conductance were recorded (surface facial electromyographic activity and electrodermal activity were also recorded during the films). Following the baseline period, participants were asked to complete the circumplex self-report measure as an index of baseline mood.

Next, participants were given instructions for the film-viewing task. They were given a cover story in an attempt to reduce possible effects of demand characteristics. Specifically, they were told that the effects of movies on their uncontrollable, physiological responses were being examined. Participants viewed the film clips approximately 6 feet from a 13-inch color television with VCR while their observable facial expressions were videotaped. The experimenter, computer, psychophysiological equipment, and camera were positioned behind a partition so that the testing procedure was as unobtrusive as possible.

After each film clip, participants were asked three content questions about the film clip (e.g. 'What bugs were in the film clip?' during the negative film clip) to assess attention and understanding. Following these questions, participants completed the circumplex self-report measure.

2.5. Coding facial expression

Participants' videotaped facial expressions were coded using the Facial Expression Coding System (FACES; Kring and Sloan, 1991), which is used to code the frequency, intensity (1 = low; 4 = very high), and duration of positive and negative expressions. Coding of facial expressions was done by three undergraduate research assistants who were trained to use FACES. Coders were blind to the specific film clips being used, the patients' deficit/non-deficit status, the participants' patient/non-patient status, and the specific predictions of the study. Most patients' ($n = 34$) and two-thirds of the controls' ($n = 13$) videotaped facial expressions were coded by two research assistants. The facial expressions of remaining participants (four deficit patients, three non-deficit patients, and seven controls) were coded by one research assistant.

3. Results

3.1. Preliminary analyses

3.1.1. FACES rater agreement

Intraclass correlations (ICCs) were computed for pairs of raters for the positive and negative frequency, intensity, and duration FACES variables for all four films, following the case 2 recommendations of Shrout and Fleiss (1979). The mean ICC was 0.84 for patients and 0.62 for non-patients. None of the non-patients exhibited any negative expressions during the neutral film, resulting in some low ICC values for non-patients. For those participants whose expressions were coded by two raters, the FACES variables were averaged across raters for the remaining analyses.

3.1.2. FACES composite variables

Similar to previous studies (Kring et al., 1993; Kring and Neale, 1996), positive expression frequency, intensity, and duration were highly correlated for patients and controls, as were negative expression frequency, intensity, and duration. Because these variables were so highly correlated and to reduce the number of dependent variables in the analyses, FACES composite variables were computed as a measure of overall expressivity. Specifically, each individual FACES variable (frequency, intensity, duration) was standardized (Z score) using the entire sample, and the FACES composite variable was created by adding these standardized scores (Kring et al., 1993). Thus, positive FACES composites for each film were computed by adding the z-scored positive frequency, positive intensity, and positive duration values for that film. Similarly, negative FACES composites for each film were computed by adding the z-scored negative frequency, negative intensity, and negative duration values for that film.

3.1.3. Rater agreement for symptom rating scales

All of the patients were rated on the BPRS, and the SDS by two trained raters. ICCs for the BPRS positive, negative, affective range, and total scale scores were 0.86, 0.74, 0.86, and 0.80, respectively, and the average ICC for individual BPRS items was 0.69. Interrater reliability for the SDS deficit/non-deficit categorization was examined using the kappa statistic (Bartko and Carpenter, 1976). The raters agreed on the deficit/non-deficit categorization for 39 out of 41 patients, resulting in a kappa coefficient of 0.90. The raters were able to reach a consensus categorization for the other two patients.

3.1.4. Neutral films

Two neutral film clips were used in the study. The first neutral film was designed to acclimate the participants to the film viewing task. To reduce the number of dependent variables in the analyses, facial expressivity and emotional experience during the films were assessed using only the second neutral film. Importantly, results of the analyses using one neutral film did not differ from results using two neutral films.

3.1.5. General analytic strategy

For group comparisons on the expression and experience variables, initial analyses examined whether the order of film presentation affected the dependent variables. The order effect was significant for only one circumplex scale (high activation) and was included in that analysis. Subsequently, group and film main effects were examined. If either main effect was significant, Dunn's multiple comparison procedure was conducted for all pairwise comparisons among groups (i.e. deficit vs. non-deficit patients, deficit patients vs. controls, and non-deficit patients vs. controls) or films (i.e. positive vs. negative, positive vs. neutral, negative vs. neutral), with the overall error rate (α) being divided among the comparisons.

3.2. Clinical rating scales

Descriptive statistics for individual BPRS items and subscales are shown in Table 2. Comparisons between deficit and non-deficit patients were conducted to provide additional confirmation of patients' SDS deficit/non-deficit categorization. That is, by definition, deficit patients would be expected to exhibit more severe negative symptoms while not showing more severe depression,

anxiety, suspiciousness, or medication side effects compared to non-deficit patients. In addition, deficit patients would also be expected to score higher on the BPRS proxy measure for the deficit syndrome (BPRS blunted affect score-BPRS affective range composite), higher on the BRPS blunted affect score, and lower on the BPRS affective range composite. Consistent with these expectations, deficit patients had significantly higher scores on the BPRS blunted affect item, $t(39) = 6.56$, $P < 0.001$, and the Negative Symptom subscale, $t(39) = 5.15$, $P < 0.001$, as well as on the BPRS proxy measure, $t(39) = 3.81$, $P < 0.001$. Furthermore, deficit and non-deficit patients did not differ on their scores on the BPRS total score, $t(39) = 0.29$, ns, depression item, $t(39) = 0.00$, ns, or the Positive Symptom subscale, $t(39) = 0.92$, ns. Also, deficit patients scored lower on the BPRS affective range composite, $t(39) = 1.84$, $P < 0.04$, and on the anxiety, $t(39) = 2.91$, $P < 0.004$, and suspiciousness items, $t(39) = 1.75$, $P < 0.05$, than non-deficit patients.

Examination of the frequency of specific SDS symptoms in the two patient groups provides further confirmation of patients' SDS deficit/non-deficit categorization. Descriptive statistics for the specific SDS symptoms, as well as the total number of symptoms exhibited by deficit and non-deficit patients, are shown in Table 3. For example, nearly half of the deficit patients had five or six (out of a maximum of six) deficit symptoms of at least moderate severity, and 84% of deficit patients had three or more deficit symptoms of at least moderate severity. Consistent with the definition of the deficit syndrome, all non-deficit patients had less than two primary, enduring negative symptoms. In addition, most non-deficit patients (85%) had less than two secondary negative symptoms.

Deficit and non-deficit patients were also compared on the RSES and the AIMS. Deficit and non-deficit patients did not differ on the RSES Parkinsonian subscale, $t(39) = 0.09$, ns, or total score, $t(39) = 0.67$, ns, indicating that the two

Table 3
SDS symptoms for deficit and non-deficit patients[a]

Individual symptoms	Number of patients with each symptom		
	Deficit ($n = 19$)	Non-deficit ($n = 22$)	
		Primary	Secondary
Restricted affect	13	0	1
Diminished emotional range	15	1	1
Poverty of speech	10	0	1
Curbing of interests	16	1	5
Diminished sense of purpose	15	1	5
Diminished social drive	12	0	6
Percentage of patients with varying symptom totals (range 0–6)			
Total number	Deficit	Non-deficit	
of symptoms		Primary	Secondary
0	0	84	50
1	0	16	35
2	16	0	5
3	11	0	5
4	26	0	0
5	16	0	0
6	31	0	5

[a]*Note:* SDS, Schedule for the Deficit Syndrome. The top portion of the table reflects the number of deficit patients with primary, enduring symptoms of at least moderate severity (score of 2 or greater), and the number of non-deficit patients with primary or secondary symptoms of at least moderate severity. The bottom portion of the table reflects the percentage of deficit and non-deficit patients within each of seven possible deficit symptom totals (range 0–6) of at least moderate severity.

groups did not differ on severity of extrapyramidal symptoms. However, non-deficit patients scored higher on the AIMS total score than deficit patients, $t(39) = 3.08$, $P < 0.005$, indicating that non-deficit patients exhibited more severe facial/oral, extremity, and trunk movements. It is important to note that while non-deficit patients scored higher on the AIMS than deficit patients, the severity of their tardive dyskinesia was extremely mild (mean AIMS total score of 3.55 relative to a maximum total score of 42). Correlations between the AIMS scores and FACES variables were non-significant for both deficit and non-deficit patients, suggesting that AIMS scores were not strongly related to expressivity during the films.

3.3. Emotional expressivity

The positive and negative expression FACES composites for each group are shown in Fig. 1. As done in previous studies (e.g. Kring et al., 1993; Kring and Neale, 1996), stimulus-congruent FACES composite variables (positive composite for the positive film, negative composite for the negative film, and mean of the positive and negative composites for the neutral film) were used in the expressivity analyses. To determine whether deficit patients, non-deficit patients, and controls differed on their expressiveness in response to the films, a three (Group: Deficit, Non-deficit, Control) × three (Film Type: Positive, Negative, Neutral) repeated measures MANOVA was conducted for the FACES composite variables, with group as a between-subjects factor and film type as a within-subjects factor. The group main effect was significant, $F_{2,58} = 3.23$, $P < 0.05$. The Group × Film Type interaction was not significant, and the film type main effect could not be evaluated in this analysis because the dependent variables

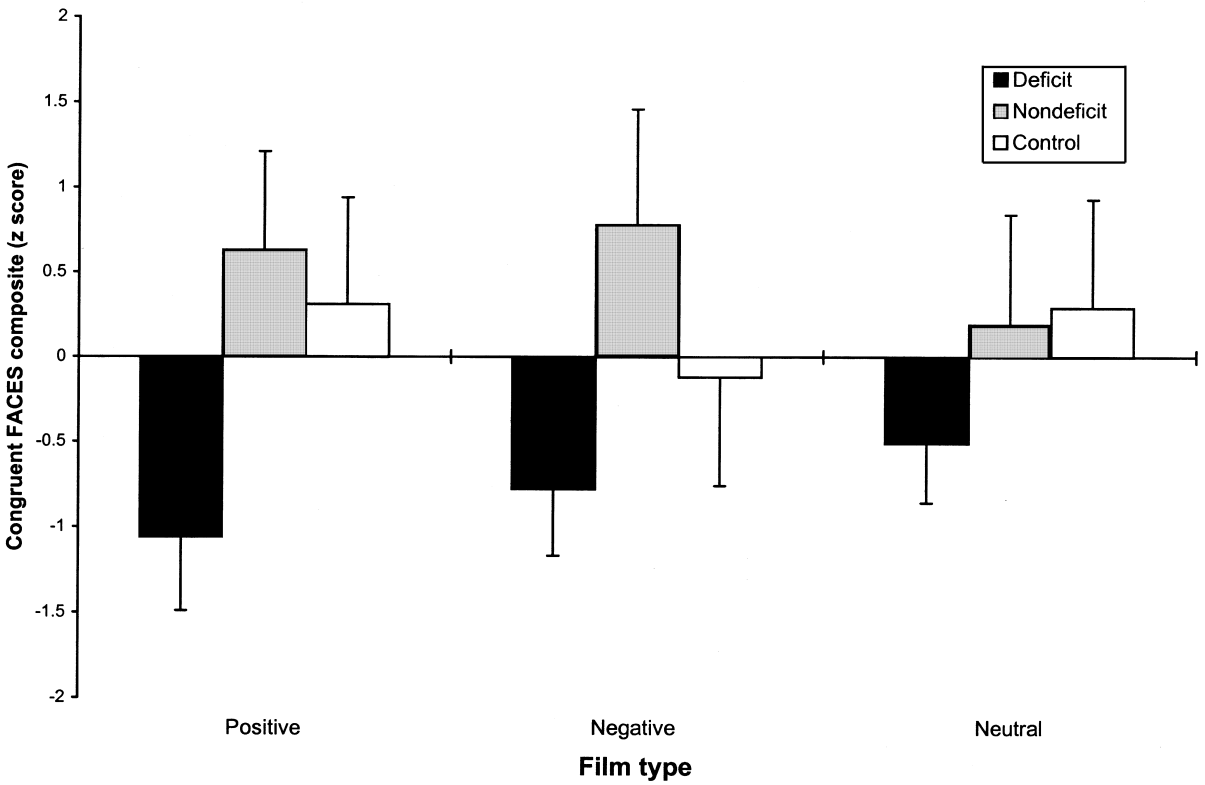

Fig. 1. Facial expression in response to emotional films.

were standardized (Z) scores. That is, the mean score for each composite variable (positive composite for the positive film, negative composite for the negative film, and the mean of the positive and negative composites for the neutral film) across the entire sample was zero. To further evaluate group differences, an overall composite score was computed by summing the composite values for the three films separately for each group. Deficit patients had a significantly lower overall composite score than non-deficit patients, $t(39) = 2.73$, $P < 0.01$, and controls, $t(39) = 1.87$, $P < 0.08$, indicating that deficit patients were less expressive than non-deficit patients and tended to be less expressive than controls across the three films. The difference between non-deficit patients and controls on the overall composite score was not statistically significant.

3.4. Emotional experience

Alpha reliabilities (Cronbach, 1951) for these scales were generally high for deficit patients, non-deficit patients, and controls, as shown, along with other descriptive statistics, in Table 4.[1] These findings are consistent with several prior studies that have found that schizophrenic patients can provide self-reports of their emotional experience in a reliable manner (Kring et al., 1993; Blanchard et al., 1994; Kring and Neale, 1996; Kring and Earnst, 1999). To determine whether deficit patients, non-deficit patients, and controls differed on their reported emotional experience in response to the films, three (Group) $\times$ three (Film Type) repeated measures MANOVAs were computed separately for the pleasant, unpleasant, high activation, and low activation scales. Order was included in the analyses of the high activation scale. The group main effect was significant only for the unpleasant scale. Across all analyses, the Group $\times$ Film Type interaction failed to reach significance; however, the film type main effect was highly significant (all $P < 0.001$).

For the unpleasant scale, the group main effect was significant, $F_{2,57} = 4.86$, $P < 0.02$. Non-deficit patients reported experiencing more unpleasant emotion to the negative film than controls, $t(40) = 2.28$, $P < 0.03$. In addition, both deficit patients and non-deficit patients reported experiencing more unpleasant emotion to the positive film than controls, $t(36) = 2.90$, $P < 0.007$, and $t(40) = 3.68$, $P < 0.002$, respectively. Following up the film type effect ($F_{2,56} = 16.40$, $P < 0.001$), all participants reported experiencing more unpleasant emotion to the negative film than to the positive film, $t(59) = 5.51$, $P < 0.001$, or the neutral film, $t(59) = 4.65$, $P < 0.001$. For the pleasant scale, follow-up analyses to the significant film type effect ($F_{2,56} = 35.29$, $P < 0.001$) indicated that all participants reported experiencing more pleasant emotion to the positive film than to the negative film, $t(59) = 7.35$, $P < 0.001$, or the neutral film, $t(59) = 7.97$, $P < 0.001$.

For high activation emotion, follow-up analyses of the film type effect ($F_{2,53} = 53.13$, $P < 0.001$) revealed that all participants reported experiencing more activated emotion to the negative film than the neutral film, $t(59) = 9.37$, $P < 0.001$, as well as more activated emotion to the positive film than the neutral film, $t(59) = 8.84$, $P < 0.001$. Similarly, for the low activation scale, the film type main effect was significant, $F_{2,56} = 18.87$, $P < 0.001$, and follow-up analyses showed that all participants reported experiencing more unactivated emotion to the neutral film than to the positive film, $t(59) = 4.68$, $P < 0.001$, or the negative film, $t(59) = 6.03$, $P < 0.001$.

In sum, contrary to predictions, deficit patients did not differ from non-deficit patients or controls on the high activation, pleasant, or low activation self-report scales. However, deficit patients reported experiencing more unpleasant emotion to the positive film than controls, which was also not expected. Consistent with predictions, non-deficit patients reported experiencing more unpleasant emotion to the negative and positive films than controls.

[1] One deficit patient was missing data for all scales because he had difficulty understanding the directions for the circumplex self-report measure. Despite this difficulty, the patient correctly answered content questions about the films and thus seemed to be attending to the film task.

Table 4
Descriptive statistics for circumplex scales

	Deficit patients	Non-deficit patients	Non-patients
Pleasant			
Positive film			
Mean	2.59	2.54	2.84
S.D.	1.06	1.17	0.93
α	0.86	0.88	0.84
Negative film			
Mean	1.49	1.50	1.39
S.D.	0.79	0.81	0.67
α	0.86	0.82	0.89
Neutral film			
Mean	1.32	1.69	1.27
S.D.	0.41	0.83	0.47
α	0.71	0.83	0.68
Unpleasant			
Positive film			
Mean	1.68	1.86	1.10
S.D.	0.87	0.90	0.19
α	0.82	0.88	0.38
Negative film			
Mean	2.20	2.61	1.97
S.D.	1.21	1.02	0.76
α	0.85	0.77	0.75
Neutral film			
Mean	1.71	1.89	1.50
S.D.	0.76	0.83	0.67
α	0.61	0.65	0.85
High activation			
Positive film			
Mean	2.54	2.91	2.53
S.D.	1.04	0.89	1.03
α	0.81	0.79	0.91
Negative film			
Mean	2.65	2.81	2.53
S.D.	1.11	1.09	0.73
α	0.85	0.87	0.73
Neutral film			
Mean	1.61	1.64	1.39
S.D.	0.76	0.73	0.48
α	0.83	0.83	0.74
Low activation			
Positive film			
Mean	1.99	1.84	1.63
S.D.	0.83	0.60	0.55
α	0.63	0.43	0.49
Negative film			
Mean	1.83	1.74	1.43
S.D.	0.91	0.65	0.47
α	0.73	0.57	0.59
Neutral film			
Mean	2.21	2.33	2.50
S.D.	1.13	1.00	0.77
α	0.84	0.69	0.67

3.5. Relationship between symptoms and emotional responsivity

To examine the relationship between expressivity during the interview to expressivity during the films, correlations were computed between the BPRS flat affect item and the positive and negative expression composite variables for the positive and negative films, respectively. Neither deficit nor non-deficit patients' blunted affect scores were significantly correlated with positive or negative expressivity to the films.

The relationships between putative secondary sources of negative symptoms and facial expressivity to the films were examined. Specifically, the scores of the deficit and non-deficit patients on the BPRS depression, anxiety, and suspiciousness items and on the RSES Parkinsonian subscale were correlated with the positive FACES composite for the positive film and the negative FACES composite for the negative film. The positive FACES composite was marginally correlated with anxiety, $r = 0.39$, $P < 0.08$, indicating that the non-deficit patients with the greatest anxiety tended to show the most positive expressivity during the positive film. Also, the negative FACES composite was marginally correlated with depression, $r = -0.39$, $P < 0.08$, indicating that non-deficit patients who were the most depressed tended to show the least negative expressivity during the negative film. For deficit patients, correlations between these items and expression during the films were all non-significant. Depression, anxiety, suspiciousness, and the RSES Parkinsonian subscale were also correlated with the pleasant scale for the positive film and with the unpleasant scale for the negative film. None of these correlations were significant for either non-deficit or deficit patients.

The relationship between patients' scores on the SDS diminished emotional range item and reported emotional experience to the films was also examined. The predictions made about deficit and non-deficit patients' emotional experience in response to the films were based on the assumption that higher scores on the diminished emotional range item would be related to reports of less emotional experience to the films. Because the

SDS diminished emotional range item and the global severity of deficit symptoms were highly correlated, $r = 0.77$, $P < 0.001$, partial correlations were computed to examine the unique relationship between diminished emotional range and experiential responding to the films, independent of overall severity of deficit symptoms. Deficit patients' scores on the diminished emotional range item were negatively correlated with reported positive emotion to the positive film, $pr = -0.40$, $P < 0.06$, and activated emotion to both the positive film, $pr = -0.53$, $P < 0.02$, and the negative film, $pr = -0.61$, $P < 0.005$. These findings indicate that more severely diminished emotional range is associated with reports of less positive emotion to the positive film and less activated emotion to the positive and negative films.

3.6. Content questions

As mentioned above, three content questions were asked after the films to assess attention and understanding. The total number of correct responses to these questions was computed separately for each film, and the accuracy scores were entered into separate one-way ANOVAs, with group as the between-subjects factor. The group main effect was not significant for the positive or the neutral film; however, it was significant for the negative film, $F_{2,58} = 3.25$, $P < 0.05$. Follow-up analyses revealed that deficit patients ($M = 2.68$, S.D. = 0.58) had significantly lower accuracy scores for the negative film than controls ($M = 3.00$, S.D. = 0.00), $t(37) = 2.43$, $P < 0.02$. It is important to note that while the deficit patients had lower accuracy scores than controls for the negative film, the majority of deficit patients ($n = 14$) answered all three content questions correctly. Besides reflecting decreased understanding of the films, lower accuracy scores might be related to decreased emotional responsivity to the films. To explore this possibility, correlations were computed between accuracy scores and both facial expressivity (i.e. FACES) and emotional experience in response to the films. None of these correlations were significant, suggesting that decreased understanding of the films was not strongly related to emotional responding.

4. Discussion

The present study was designed to examine emotional responding in deficit patients, non-deficit patients, and controls, and to investigate the importance of the deficit/non-deficit distinction for studies of emotional responding in schizophrenia. As predicted, deficit patients exhibited fewer outward facial expressions to the films than both non-deficit patients and controls. Several previous studies have found that schizophrenic patients exhibit less facial expressivity to emotional stimuli than non-patients (Krause et al., 1989; Berenbaum and Oltmanns, 1992; Kring et al., 1993; Kring and Neale, 1996). However, none of these studies distinguished between deficit and non-deficit patients. In the present study, diminished expressivity to the films was found for deficit, but not for non-deficit patients, suggesting that differences in observable expressivity between schizophrenic patients and non-patients may be primarily confined to deficit schizophrenic patients.

Non-deficit patients were expected to be somewhat less expressive in response to the films than controls because it seemed likely that a number of patients within the non-deficit group would manifest secondary flat affect. However, only one non-deficit patient exhibited secondary flat affect of at least moderate severity during the clinical interview, while the remainder of non-deficit patients either exhibited minimal or no flat affect. Perhaps a non-deficit group consisting of several patients with secondary flat affect would have exhibited less expressivity to the films than controls.

The most surprising result of the study is that the deficit patients did not report experiencing less emotion to the films than non-patients. Perhaps diminished emotional range is not related to reported emotional experience to the films.

Diminished emotional range, as defined in the SDS, is characterized by a dampening of emotional experience for at least a 1-year period and thus presumably represents an enduring, trait-like measure of emotional experience. In contrast, reported emotional experience in response to films is a state measure based on a single assessment of emotion *experienced in the moment.* Studies that have examined the relationship between other trait measures of affect, such as anhedonia, and state, self-reported emotional experience to films have yielded inconsistent findings but generally suggest partial correspondence between trait and state measures of emotion in schizophrenia (e.g. Berenbaum and Oltmanns, 1992; Blanchard et al., 1994). Similarly, in the present study, the diminished emotional range item was correlated with reported positive and activated emotion to the films, suggesting partial agreement between trait-like and state assessments of emotional experience.

Previous studies using emotional stimuli have found that schizophrenic patients show a disjunction in emotional responding (i.e. diminished expressivity but not diminished experience), and the present study hypothesized that this disjunction might be confined to non-deficit patients. Contrary to predictions, however, non-deficit patients showed a correspondence between the expressive and experiential components of emotion. That is, compared to controls, non-deficit patients were as expressive and reported experiencing as much pleasant and more unpleasant emotion in response to the films. By contrast, a disjunction in emotional responding seemed to characterize deficit patients, who were less expressive but did not report less emotional experience.

Deficit and non-deficit patients have previously been found to differ on clinical ratings of psychiatric symptoms that are related to emotional responding, and the present study sought to replicate these differences. Specifically, by definition, deficit patients were expected to exhibit more severe negative symptoms (e.g. flat affect), have a diminished affective range, and not show more severe depression or anxiety compared to non-deficit patients. Indeed, compared to non-deficit patients, deficit patients exhibited more severe flat affect and negative symptoms and a diminished affective range, did not differ on depression, and had less severe anxiety.

One avenue for future research would be to more closely examine the clinical and behavioral correlates of the diminished emotional range item of the SDS. Interestingly, diminished emotional range is not among the negative symptoms currently supported by factor-analytic and reliability studies (Earnst and Kring, 1997). While this symptom is highly correlated with other SDS symptoms, it has not been included in factor analyses of negative symptoms. Future factor analyses of schizophrenia symptoms should include diminished emotional range to determine whether it has a strong loading on the negative symptom factor.

Another fruitful avenue for research would be to compare deficit and non-deficit patients' emotional experience using other emotion-eliciting situations. Indeed, the generalizability of emotional responding from a film-viewing paradigm is somewhat limited. Future research might examine patients' reported emotional experience while they are describing emotional events from their own lives or while they are interacting with family members and/or significant others. Interestingly, Ventura et al. (1996) found that deficit patients reported significant positive life events (e.g. starting school or a job) as less challenging compared to non-deficit patients and controls, and also reported significant negative life events (e.g. quitting a job, ending a relationship) as less distressing compared to non-deficit patients. If deficit patients were indeed found to report diminished emotional experience on the basis of a number of other experimental techniques, the present study's null findings for emotional experience might say more about the external validity of the film-viewing paradigm than about the relevance of the deficit/non-deficit distinction for the study of emotional experience in schizophrenia.

Limitations of the present study should be acknowledged. First, the groups only included male participants, and thus it is unclear whether female participants would exhibit similar patterns

of emotional responding. Second, all of the patients in the present study were taking neuroleptic medication, which can produce side effects such as akinesia, although it is unlikely that this side effect influenced the results because many of the patients did not exhibit any akinesia symptoms, and those non-deficit patients who did generally had symptoms of very mild severity. In a longitudinal study that examined emotional responding in a group of schizophrenic patients when they were unmedicated and again when they were medicated, facial expressivity and reported emotional experience were not affected by medication status (Kring and Earnst, 1999). Third, the majority of the patients were outpatients and had mild psychiatric symptoms overall, and thus it is uncertain whether similar patterns of emotional expression and experience would be seen in patients with more severe psychiatric symptoms. Fourth, the study had a relatively small sample size, and thus the lack of group differences on the pleasant, high activation, and low activation emotional experience scales may have been due to insufficient power to reject the null hypothesis. However, we did have sufficient statistical power to detect other between-group effects and also within-group effects due to the film manipulation.

In sum, these data provide fairly compelling evidence for diminished expressivity among deficit patients. In addition, clinical ratings of psychiatric symptoms related to emotional responding showed diminished affective experience among deficit patients. In contrast, deficit patients did not report experiencing less emotion in response to the films than controls. It seems that while deficit patients may have diminished trait-like emotional experience, they are able to experience emotion, in the moment, in response to powerful emotional stimuli. Taken together, these findings suggest that deficit patients may have a higher threshold for experiencing emotion. It is important to have converging evidence from other experimental paradigms to determine the contexts in which deficit patients show diminished emotional experience, so that the hypothesis of a higher experiential threshold among deficit patients can be fully investigated.

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