

Dimensional Structure of Emotion in Patients with Schizophrenia*

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The primary purpose of the present study was to investigate how schizophrenic patients conceptualize emotion terms and judge facial expressions in order to understand the nature of their affective disturbance. In Study 1, 19 schizophrenic patients between the ages of 19 and 46 were given 105 pairs of emotion terms and asked to rate their similarity using a 7 point scale. Multidimensional Scaling Analysis of the similarity data revealed a one-dimensional model with the pleasant-unpleasant dimension for the schizophrenic group, while a two-dimensional model(pleasant-unpleasant and arousal) has been consistently reported for normal adults and children. In Study 2, 31 schizophrenic patients and 30 college students were presented with 28 photographed faces with various emotional expressions and asked to rate each of them on the arousal and pleasant-unpleasant dimension. The results indicated that schizophrenic patients tend to underevaluate the level of arousal and unpleasantness of the emotions expressed in the faces, particularly when the emotions expressed are negative and of high arousal. The low sensitivity of schizophrenic patients to the arousal dimension is consistent with Mednick's hypothesis which suggests that schizophrenic patients tend to avoid high arousal stimulus for fear that it might further stimulate their already highly aroused autonomic nervous system.

Keywords : schizophrenia, emotion, facial expression, dimensional model

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Schizophrenia has been considered predominantly a pathology of cognitive disturbances and much of the research on schizophrenia has focused on disturbances in cognition with affective disturbances largely neglected. Recently, however, theoretical and methodological advances in the area of emotion have generated new research interest in affective disturbances in schizophrenia.

Recent research in the emotional processes of schizophrenic patients largely confirmed that they have a general impairment in the affective domain. There have been a number of studies which demonstrated that schizophrenics, compared to normal controls, are less accurate in judging emotions from facial expressions (Chin, Choi, & Sohn, 1998; Doherty, Bartlett, & Izard, 1974; Heimberg, Gur, Erwin, Shatsel & Gur, 1992; Mandel, & Palchoudhury, 1986; Mandel & Rai, 1987; Morrison, Bellack, & Bashmore, 1988; Muzekari & Bates, 1977; Walker, Marwit, & Emory, 1980). There have also been reports that schizophrenics manifest less congruence between their verbal and affective messages (Gottheil, Thornton, & Exline, 1976), are less accurate in facial and vocal expressions of affective messages (Borod, Albert, Brozgold, & Martin, 1989), and show reduced responsiveness across emotions (Schneider, Heimann, Himer, Huss, Mattes, & Adams, 1990). It is not clear, however, whether the impairment is due to a specific deficit in emotional functioning or whether it is better considered as part of a more general cognitive deficit (Kerr & Neale, 1993; Salem, Kring, & Kerr, 1996). It also remains to be explored how impairment in emotion recognition or emotional expression is related to the clinical symptoms of schizophrenia.

Flat affect is one of the fundamental symptoms of schizophrenia. Since flat affect is closely associated with the chronic course of schizophrenia (Fenton &

McGlashan, 1991; Knight & Roff, 1985; Knight, Roff, Barnett, & Moss, 1979), it is of much theoretical as well as clinical significance to identify psychological mechanisms underlying this phenomenon. Flat affect is typically assessed in clinical interviews using the Scale for Assessment of Negative Symptoms (Andreasen, 1979) with facial expressions as the main focus of assessment and diminished affective expression has been consistently observed among schizophrenic patients (Pfohl & Winoukur, 1982). However, different pictures emerged when other methods of assessment were used. For instance, several studies reported that schizophrenics report subjective experiences of equally as many positive and negative emotions as their normal counterparts despite their "flat" facial expression (Berenbaum & Oltman, 1992; Kring, Kerr, Smith, & Neale, 1993; Kring & Neale, 1996). Thus, Kring & Neale (1996) concluded that the flat affect of schizophrenic patients reflects disjunction in the expressive, subjective-experiential and physiological components of emotion rather than their inability to experience emotions. Previous research studies have suggested that the three aspects of emotions (i.e., expressive, subjective-experiential, and physiological) do not correlate well with one another, providing support for the possibility of disjunction in the expressive, subjective and physiological aspects of emotion.

In Kring & Neale (1996) and Kring et. al (1993), it was emphasized that schizophrenic patients were able to report emotional experiences consistent with the situation and thus the emotional impairment indicated by the "flat affect" is limited to the expressive component of emotion. However, a close examination of the data suggested interesting differences. First, although the schizophrenics' reports of experiences varied in the expected direction according to the stimulus presented, differentiation of

experienced emotions appeared to be less pronounced for schizophrenics compared to normal controls. For instance, King et al. (1993) reported that schizophrenics reported slightly higher levels of happiness than the normal control group following sad, fear, and neutral films, while they reported slightly less happiness than normals following a happy film. Similarly, in Kring & Neale's study (1996), schizophrenics reported significantly more negative emotions in response to positive or neutral films. Thus schizophrenic patients appeared to be less capable of clear discriminations with regard to the positive-negative dimension of the stimuli. Second, Kring & Neale (1996) reported that schizophrenic patients compared to normals showed relatively higher levels of GSR not only to films eliciting positive or negative emotions but also to neutral films. Although their subjective experience was not directly evaluated, schizophrenic patients' higher level of GSR might indicate their higher emotional arousal in general (Bradley, Cuthbert, & Lang, 1990; Winton, Putnam, & Krauss, 1984). It remains to be seen how the generally high arousal level of schizophrenics affects the ways that they process and interpret emotional stimuli.

A number of researchers have argued that self-reported emotion can be represented in a circumplex comprised of two bipolar dimensions. Russell (1980), for instance, proposed a two dimensional model with the valence (pleasant- unpleasant) and the arousal or activation of emotion as two key dimensions. There is a large body of literature supporting the two dimensional model as proposed by Russell for emotional experience of normal controls (Russell, 1978, 1991; Kim, Kim, Park, Oh & Chung, 1998; Kim, Moon, & Oh, 1999), but it remains to be seen whether the same two dimensional model adequately describes the structure

of emotion in schizophrenic patients.

The purpose of the present study is to identify the fundamental dimensions of emotion in schizophrenic patients and how they are different from those identified in normal controls. In study 1, Multidimensional Scaling Analysis was conducted on the similarity rating data of emotion terms obtained from schizophrenics and normal controls in order to find out whether the two dimensional structure with valence and arousal as two dimensions can adequately describe the data from schizophrenics as well as normal controls. In study 2, schizophrenic patients and normal control subjects were presented with pictures of facial expressions and asked to rate the emotional states of the faces using the valence and arousal dimensions in order to find out if and how the two groups differ in their sensitivity to the two dimensions in their judgments of facial expressions.

Study 1

Method

Participants

Nineteen patients (10 males and 9 females) with a clinical diagnosis of schizophrenia and 20 university students (10 males and 10 females) participated in the study. The schizophrenic group were recruited from psychiatric rehabilitation programs in two community mental health centers in Seoul. The mean age of the schizophrenic group was 32.4 years (*SD* 7.79) with the range from 19 to 46 years. The duration of illness ranged from 2 to 22 years with a mean of 9.16 years (*SD* 6.06). There were 3 college graduates, 11 high school graduates, 1 high school dropout and 4 middle

school graduates in the schizophrenic group. The students in the normal control group participated in the study as part of their course requirement.

Materials and Procedure

Fifteen emotion terms were used to construct the 105 pairs to be rated on similarity. The 15 emotion terms were selected on the basis of frequency in the free association data of college students (Kim et al., 1998). They included so-called basic emotion words such as happy, sad, angry, surprise as well as other frequently used internal state words such as interested, relaxed, bored, lonely, tense, fearful, satisfied, distressed, excited, sleepy, and dislike. For the schizophrenic group, the similarity rating task was given individually, while the normal control group did the task in groups. Both groups did the rating task at their own pace. In order to control the presentation order of word pairs, subjects were randomly assigned to one of the 3 pre-constructed presentation orders.

Results

Similarity rating data of the schizophrenic and normal control groups were analysed using a nonmetric multidimensional scaling procedure (Kruskal, 1964). The number of optimal number of dimensions was determined on the basis of the stress value, R^2 and interpretability (Hair, Anderson, Tathan, & Black, 1998). The measures of fit for the dimensions which were added for each group are presented in Table 1.

Table 1. MDS Analysis Results for the Normal Control and the Schizophrenic Group: Number of Dimensions and Measures of Fit

Number of Dimensions	Normal Control (n=20)		Schizophrenic Group (n=19)	
	R^2	stress value	R^2	stress value
1 dimension	.470	.455	.621	.385
2 dimensions	.881	.136	.724	.225
3 dimensions	.946	.080	.800	.157

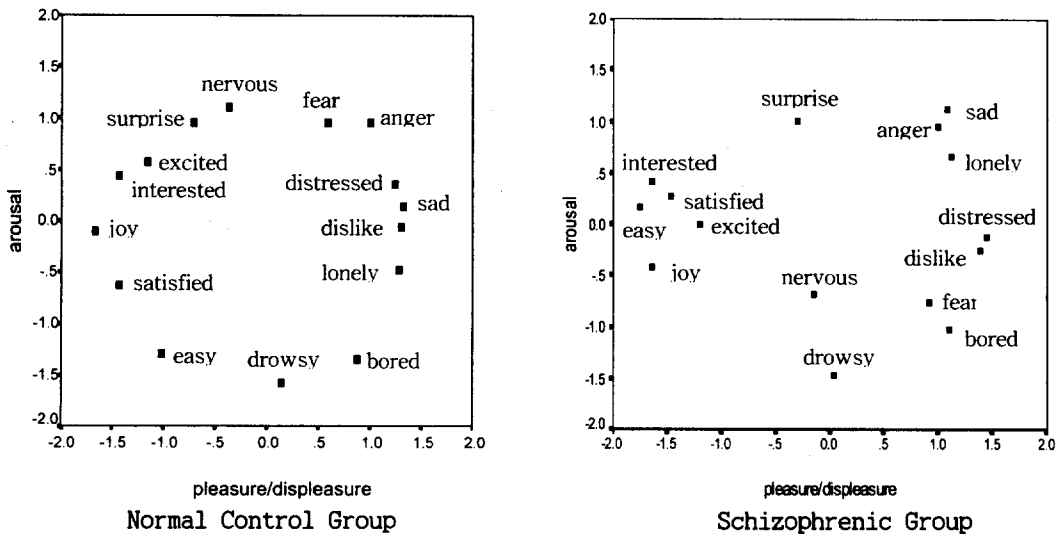


Figure 1. 15 emotion terms plotted on the two dimensional plane.

For the normal control group, the first dimension accounted for 47% of the total variance with the second dimension accounting for an additional 41%. For the schizophrenic group, the first dimension accounted for 62% and an additional 10% was accounted for by the second dimension. In both groups, after the first two dimensions, the percentage of variance accounted for by each additional dimension was insignificant; thus, a two dimension solution was selected for both groups. The 15 emotion words plotted on the two dimensional plane are presented in Figure 1.

When plotted in the two dimensional plane, the 15 emotion terms were nicely arranged around circumplex with valence and arousal as two dimensions for the normal control group, which is very analogous to what has been reported in previous research (Russell, 1980).

The plotting of the schizophrenic group data, however, did not form a circumplex on the plane. The pattern of the arrangement of the 15 emotion words on the plane suggested that the first dimension might be interpreted as pleasant/unpleasant. However, those words which are negative in valence but differ in the level of arousal (e.g., anger, loneliness and sadness) were plotted in close vicinity for the schizophrenic group, which makes it difficult to interpret the second dimension as arousal. The correlation of the coefficients for pairs of 15 emotion words on the first dimension was .97, while not statistically significant for the second dimension, suggesting that meanings attributed by the two groups were almost identical for the first dimension, but very different for the second dimension.

Study 2

Study 2 was conducted in order to clarify the

results of Study 1 which suggested that schizophrenic patients appear to respond differently to the two fundamental dimensions of emotions, valence and arousal. In study 2, pictures of faces with various emotional expressions were presented and subjects were asked to rate each picture on the valence and arousal dimension in order to see if and how schizophrenic patients differ from normal controls in the way they utilize the two dimensions in their judgments.

Method

Participants

30 schizophrenic patients (19 males and 11 females) who were either at the time hospitalized or enrolled in a psychiatric rehabilitation program at a local community mental health center were recruited to participate in the study. All patients in the schizophrenic group including those recruited from the community mental health center were on medication at the time of the study. The normal control group consisted of 31 university students (17 males and 14 females).

In order to make the level of education comparable for the two groups, patients with less than high school education were excluded from the study. Patients with a known organic brain syndrome or substance addiction were also excluded. The mean age of the schizophrenic group was 34.53 years (*SD* 6.78), the mean duration of illness, 9.04 years (*SD* 3.76), and the mean number of hospitalizations, 4.67 (*SD* 3.76). The mean age of the control group was 21.68 (*SD* 1.72), which was significantly lower than the mean age of the schizophrenic group ($t_{59} = -10.10, p < .001$).

Experimental Task 137 black and white still

photographs of facial expressions were selected from the database of 2500 photographs of facial expressions taken from 19 Korean movies (Chung, Oh, Lee & Bun, 1998) on the basis of picture clarity and the absence of explicit situational cues concerning the emotional state of the person. From the initial pool of 137 pictures, 28 which represent varying degrees of the pleasant-unpleasant and arousal dimension were selected. The final set of 28 pictures were of 9 actors and actresses, and they were widely distributed across the two-dimensional plane with valence and arousal as the two dimensions. When the pictures were placed on the two-dimensional plane using mean ratings in the database, 5 of the 28 pictures were in the Pleasant/High Arousal Quadrant, 4 in the Pleasant/Low Arousal Quadrant, 13 in the Unpleasant/High Arousal Quadrant, and 4 in the Unpleasant/Low Arousal Quadrant. The photographs of facial expressions printed in 7 cm × 7 cm black and white pictures were presented in 4 different presentation orders. Examples of stimulus pictures are presented in Appendix 1.

Procedures

After a brief explanation of the nature of the two dimensions to be rated and how to use the rating scales, subjects were presented with 28 pictures of facial expressions one by one and asked to make a rating on the pleasant/unpleasant and arousal dimension concerning the emotion that the person in each of the pictures would be experiencing. Specifically, for the pleasant/unpleasant dimension, subjects were asked to judge on whether the person feels pleasant or unpleasant. For the arousal dimension, subjects were told that high arousal refers to the state when you are physiologically aroused as indicated by

sweating and heart pounding, and it was emphasized that the arousal level is independent of pleasantness. Following the instruction, pictures of facial expressions representing the high and low ends of the pleasant-unpleasant and the arousal dimension were presented to serve as anchor points in the subsequent rating task. The stimulus pictures used in the practice trials were not used in the main task.

Subjects were provided with a 7 point scale on a 210 cm × 297 cm sheet of white paper in order to facilitate them in the rating task. The schizophrenic group gave their responses orally which the experimenter recorded, while the normal control group recorded their own responses. The task was self-paced for both the schizophrenic and the normal control group in order to allow sufficient time for responses. It took about 10 minutes for most subjects including the schizophrenic patients to complete the task.

Results

Since 4 different presentation orders were used, a one-way ANOVA was conducted with the presentation order as the independent variable in order to evaluate the effect of the presentation order. The analysis revealed no significant effect of the presentation order ($p > .05$), and thus the data were pooled across the four presentation orders in subsequent analyses. The mean ratings on the valence and arousal dimension for the schizophrenic and normal control group plotted on the two dimensional plane are presented in Figure 2.

A 2 (Group) × 28 (Stimulus Pictures) repeated measures ANOVA revealed a significant group difference in the valence ratings ($F_{1,57} = 4.92, p < .05$) with the schizophrenic group showing a tendency to rate pictures more positively, but when the level of

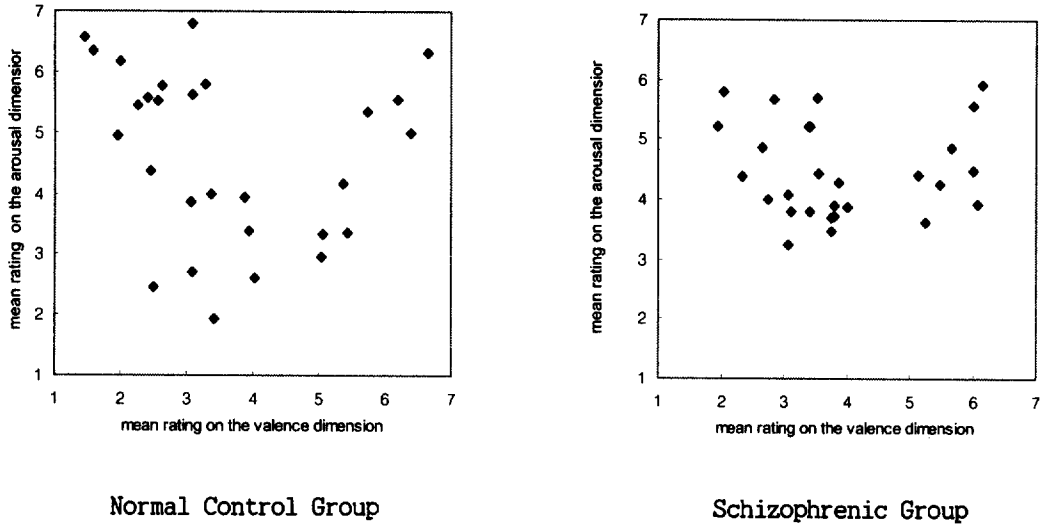


Figure 2. Mean ratings on the valence and arousal dimension for each of the 28 photographs.

education was statistically controlled the group difference was no longer significant ($F_{1,57}=.927, p>.05$). The schizophrenic group also showed a lower mean rating in the arousal dimension, but the group difference was not significant ($F_{1,57}=.927, p>.05$).

Since it was expected that the deficit of the schizophrenic group would be particularly obvious in the judgment of negative/high arousal emotions, ratings of the schizophrenic and normal control group were compared for each individual picture in order to see whether pictures with significant group differences were concentrated in the negative/high arousal emotions. In the valence rating, the group difference was significant in 6 pictures at the $p<.01$ level, while 9 out of 28 pictures showed significant group differences in the arousal rating. In all the pictures with significant group differences, ratings of the schizophrenic group converged toward the midpoint in the scale: that is, the schizophrenic group tended to judge negative facial expressions less

negatively and high arousal expressions as less aroused. Four of the 6 pictures with significant group difference in the valence rating and 6 out of the 9 pictures with significant group differences in the arousal rating belonged to the negative/high arousal quadrant in the two dimensional plane, suggesting that the schizophrenic group might have particular difficulties with negative and high arousal emotions. The schizophrenic group also showed greater within-group variance in their ratings than the normal control group, particularly with regard to the arousal dimension. The level test of homogeneity of variance revealed significant group difference at .01 level for 13 stimulus pictures (46.4%) in the valence rating and 22 stimulus pictures (79%) in the arousal rating.

Discussion

The ability to accurately judge emotional states of

others and respond to them appropriately is essential to social adjustment and significant impairments in this area are likely to present serious difficulties in day to day living. There exist a large number of studies on various aspects of affective disturbance of schizophrenia, but few studies have been done on the fundamental question of how schizophrenic patients conceptualize their emotional experiences and how their emotion structure might differ from that of normal controls. In the present study, the fundamental dimensions of emotion in patients with schizophrenia were examined to see whether and how they might differ from those in normal controls.

The results of the present study can be summarized as follows. First, while previous studies with normal population suggested the pleasant-unpleasant and arousal dimensions to be two fundamental dimensions of emotion, the present study suggested that the arousal dimension might not be as salient for schizophrenic patients as the pleasant-unpleasant dimension. Second, when asked to make ratings concerning facial expressions on the pleasant-unpleasant and the arousal dimension, schizophrenic patients were able to make judgments in the general direction that is consistent with the normal controls, but they tended to avoid extreme ratings, preferring the middle portion of the rating scale. The tendency was particularly obvious for those facial expressions of negative/high arousal emotions. In addition, the schizophrenic group showed a larger within-group variance in ratings compared to the normal controls, particularly in the arousal dimension, suggesting that they might have difficulty with the arousal dimension.

The difficulty of the schizophrenic group with regard to the arousal dimension might be due to the fact that the arousal dimension requires the ability to reflect on one's own internal states. Kim, Moon, & Oh (1999) reported that the same two dimensional

model was obtained in the MDS analysis of similarity rating data of children and adolescents, but the % of variance accounted for by the second dimension (i.e., the arousal dimension) was much smaller in children compared to college students, suggesting that the utilization of the arousal dimension might be closely related to the cognitive developmental level. Although most of the subjects in the schizophrenic group in Study 1 had high school education or above and in Study 2, participation was limited to those with high school education or above, their cognitive function at the time of their participation in the study might have been significantly impaired. However, while a previous study by Kim et al. (1999) reported that the arousal dimension was obtained in the data from children and adolescents, although smaller in the percentage of variance accounted for, the data from the schizophrenic group did not yield a dimension interpretable as an arousal dimension at all in the present study. In addition, differences in the responses of the schizophrenic and normal control group tend to be concentrated on facial expressions of negative emotions, making it difficult to attribute it to general cognitive impairment.

Mednick (1958) suggested that schizophrenic patients have a tendency to avoid stimulus with the potential to further stimulate their already high arousal level of their autonomic nervous system. Plowsky and Basset (1980) and Mandal (1988) reported that in a free association task, schizophrenic patients made significantly fewer responses to emotions with high arousal such as fear or anger compared to those with low arousal such as sadness or happiness. Srivastava & Mandal (1990) also reported that, when asked to indicate preference for social interaction, schizophrenics chose faces with low arousal emotions such as sadness or happiness,

while avoiding angry or fearful faces expressing negative emotions with high arousal. These findings are in agreement with Mednick's (1958) hypothesis that schizophrenic patients show a tendency to avoid stimulus with high arousal. Such avoidance tendency of the schizophrenics, if it persists over a long period of time, is likely to lead to a general impairment in the ability to recognize and interpret cues in social interaction (Walker, Marwit & Emory, 1980). The lower sensitivity of the schizophrenic groups to the arousal dimension in the present study might be an indication of the desensitization caused by continued defensive avoidance to high arousing stimulus.

Several methodological problems have been pointed out concerning the tasks used in previous emotion research. For instance, it has been pointed out that the use of a limited number of posed facial expressions in many studies made it difficult to generalize the results outside the laboratory conditions (Carroll & Russell, 1996). And typically a higher error rate of schizophrenic sample in emotion recognition tasks was interpreted as an indication of emotional impairment and little effort has been made to further explore the specific nature of impairment. In the present study, different approaches were used to explore the emotion structure of schizophrenics. In Study 1, similarity ratings for pairs of emotion terms were obtained and subjected to the MDS procedure to derive the fundamental dimensions of emotion for schizophrenic patients. In Study 2, ratings for facial expressions on the two fundamental dimensions of emotion (i.e., pleasant-unpleasant and arousal) were used to evaluate the possibility of judgment biases in schizophrenic patients. Further, stimulus pictures used in Study 2 were selected from a large database of facial expressions from movies and videos in order to enhance the ecological

validity of the study.

The schizophrenic patients in the present study were quite heterogeneous with regard to age, clinical characteristics as well as duration of illness and number of hospitalizations. Cutting (1981) and Gessler, Cutting, Frith & Weinman (1989) have reported that deficits in emotion recognition were limited to patients in the acute stage of schizophrenia. Considering that schizophrenic patients in the early stage of illness and those in the chronic phase might have different cognitive characteristics, it is likely that they might vary in their performance on emotion recognition tasks as well. Since the desensitization caused by long-term defensive avoidance is expected primarily from chronic patients, it will be necessary to see whether the phenomenon is limited to chronic schizophrenic patients or can also be seen in patients in the early stage of schizophrenia. Further research with more homogeneous subgroups will be necessary to clarify the results.

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Appendix 1.

정신분열병 환자의 정서구조 분석: 차원모형을 중심으로

오 경 자 문 혜 신 김 영 아 박 수 경 김 진 관

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본 연구에서는 정신분열병 환자들이 정서상태를 개념화하고 얼굴표정을 통하여 타인의 정서 상태를 판단하는 과정을 정상인과 비교하였다. 연구 1에서는 만 19세-46세의 정신분열병 환자 19명에게 정서 관련 형용사 15개로 구성된 105개의 형용사 쌍에 대하여 유사성을 평정하도록 하여 MDS로 분석한 결과, 쾌/불쾌와 각성의 두 차원이 일관되게 보고되고 있는 정상집단과는 달리 정신분열병 집단의 자료에서는 쾌/불쾌 차원만이 뚜렷하게 나타나고 각성 차원은 얻어지지 않았다. 연구 2에서는 다양한 정서를 표현한 얼굴 사진 28개를 정신분열병 환자 30명과 대학생 31명에게 제시하고 각 사진의 인물이 경험하고 있는 내적 상태를 쾌/불쾌와 각성의 두 차원에 대하여 각각 7점 척도로 평정하도록 한 결과 특히 부정적이고 각성 수준이 높은 내적 상태를 표현하는 사진 자극에 대하여 정신분열병 환자 집단은 대학생 집단에 비하여 각성수준을 과소평가하는 경향이 두드러지게 나타났다. 이와 같은 결과를 종합하여 볼 때, 정신분열병 환자들은 정서상태의 개념화 과정에서 각성 차원에 대하여 상대적으로 낮은 민감도를 보이고 있으며, 특히 부정적인 정서상태를 표현하는 얼굴들에 대한 판단에서는 각성 차원을 과소평가하여 높은 각성 수준을 나타내는 표정과 낮은 각성수준을 변별하는데 어려움을 보이는 것으로 해석될 수 있다. 본 연구의 결과는 정신분열병 환자들은 자율신경계의 높은 각성 수준으로 인하여 각성 수준을 더 높일 가능성이 있는 자극을 회피하는 경향이 있다는 Mednick의 가설과 일관되는 결과로 이들의 각성 수준에 대한 낮은 민감도는 방어적인 회피성향의 지속에 따른 둔감화의 결과로 해석될 수 있다.

주요어 : 정신분열병, 정서, 얼굴표정, 차원모형