

# Diagnostic Efficiency of BDI in a Clinical Setting: Comparison among Depression, Anxiety, Psychosis and Control group

HyunJi.Kim and EunHee.Park

**Abstract—** The BDI total mean score and the mean scores of the three factors (Negative Attitude, Performance Difficulty, and Somatic Element) are significantly different among the Depression, Anxiety, Psychosis, and control group. Especially, the BDI total mean score on the Depression group is significantly higher than other two clinical groups and the control group. Within the BDI three factors, Negative Attitude is the most important predictor in distinguishing the Depression group from both the Anxiety and Psychosis group and Negative Attitude and Somatic Element are the most important predictors in distinguishing the Depression group from the control group..

**Index Terms—** BDI, Depression, Anxiety, Psychosis.

## I. INTRODUCTION

It has been addressed that there are some advantages of self-report scales in that they are economical and can be administered to many subjects at the same time. Moreover, they make it easy to quantify symptoms and assess them objectively. The Beck Depression Inventory [1], [2] is one of the most widely used self-report scales, measuring the severity of depression in psychiatry. This instrument is one of the 10 most utilized instruments in the clinical practice of American psychologists [3]. Moreover, the BDI is generally considered one of the best screening tools available for differentiating depressed from non-depressed patients [4]. In Korea, the BDI was not only introduced and translated into Korean, but also standardized and studied with respect to the reliability and validity [5]. The BDI has a high reliability and coefficient alpha, and construct validity has been established, as well [6] - [9].

Factor analytic studies have investigated whether the BDI items could be grouped into factors or components, representing the constructs that underlay the instrument. Through some factor analytic studies, there were reports regarding a three-factor model: Negative Attitude, Performance Difficulty, and Somatic Element [10], [11]. In Korea, Cho and Kim [12] investigated a fitness of six models, including a simple factor model, an independent

two-factor model [9], a three-factor model [8], each associated correlation model [8], [9], and a hierarchical three-factor model [10], [11]. As a result, a hierarchical three-factor model was the most appropriate and useful model to describe the Korean version of the BDI and this was proved in both clinical populations and college students [12].

According to studies of the BDI total mean score on clinical groups, there were significant differences with the BDI total mean score among Major Depressive Disorder, Dysthymic disorder, and control group [13]. There were significant differences in the BDI total mean score, depending on the presence of depressive symptoms in Anxiety and Psychosis group [14], [15]. In some studies comparing the BDI total mean score on psychiatric patients, the BDI total mean score on clinical groups (Depressive disorder, Anxiety disorder (Generalized Anxiety Disorder, Social Phobia, Specific Phobia, Panic Disorder, Separation Anxiety, and Post-Traumatic Stress Disorder)) was 25.10, while the BDI total mean score on a control group was 9.85 [16]. That is, there was a significant difference of the BDI total mean score between the clinical groups and the control group. There was also a difference of the BDI total mean score between the Depression and Anxiety group, 24.1 and 15.5, respectively [16]. Park, Seo and Lee [17] found that the BDI total mean score was 15.20 (10.20) for Schizophrenia patients, 21.52 (10.49) for Depression patients, and 19.51 (10.17) for Alcohol dependence patients, and the Depression patients had significantly higher scores than the Schizophrenia patients. In the study of Ryu and Park [18], the BDI total mean scores of Depression and Schizophrenia group were significantly higher than a control group and the Depression group had a higher BDI total mean score than the Schizophrenia group.

Although the BDI seems to be used commonly in research and clinical settings, few studies have been conducted to compare the BDI total scores among the clinical groups or between the clinical groups. There have been no attempts to compare the characteristics of depression symptoms according to the BDI factors among the clinical groups. Therefore, the aim of the present study was test whether the clinical groups and the control group have significant differences in the BDI total mean score and the mean scores of the factors. Furthermore, we examined which factors were

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H.J. Kim is with the Department of Psychiatry, Hallym University Sacred Heart Hospital, #896, Pyung-Chon Dong, Dong-An Gu, An-Yang, Kyung-Gi, 431-070, South Korea (e-mail: lihya0421@naver.com).

E.H.Park is with the Department of Psychiatry, Hallym University Sacred Heart Hospital, #896, Pyung-Chon Dong, Dong-An Gu, An-Yang, Kyung-Gi, 431-070, South Korea (e-mail: psyneh@daum.net)..

the important predictors in distinguishing between the clinical groups or between the psychiatric patients and nonclinical individuals. It might be useful to understand the different aspects of depression as well as the degree of depression in the different clinical groups.

## II. METHODS

### A. Subjects

The sample was composed of 170 psychiatric inpatients and outpatients, who had visited Hallym University Sacred Heart Hospital from Jan, 2008 to Nov, 2009. All patients were diagnosed by experienced psychiatrists according to DSM-IV criteria, or clinical psychologists, depending on the result of the psychological evaluation. There were 57 Depressive disorder (Major Depressive Disorder and Depressive Disorder NOS), 53 Anxiety disorder (Panic Disorder, Social Phobia, Obsessive-Compulsive Disorder, Posttraumatic Stress Disorder (PTSD), and Generalized Anxiety Disorder (GAD)), and 60 Psychosis patients (Schizophrenia, Schizophreniform, and Psychotic Disorder NOS). However, patients with comorbid other Axis I or Axis II disorders and brain damage were excluded in this study.

The control group was consisted of 37 healthy adults whose age and gender are similar to the clinical group. They were interviewed with a structured interview form, including questions about the presence of psychiatric disorders and brain damage and T-score in the Symptom Check List-90-Revision (SCL-90-R) [19] was less than 70 points.

### B. Assessments

The Beck Depression Inventory (BDI) was developed to assess a type and degree of depression, based on symptoms of depression. The questionnaire contains 21 items about emotional, cognitive, motivational, physiological, and other symptoms. Each Item consists of four statements, describing increasing intensities of symptoms of depression. The items are rated on a scale from 0 to 3, reflecting how participants have felt over the past week. Possible score range from 0 to 48 and higher scores reflect more severe depressive symptomatology. In this study, Korean translated version was used [8] and its Cronbach's coefficient alpha was .82.

The SCL-90-R was used to evaluate the psychological health status in the clinical and nonclinical setting. The

SCL-90-R was developed by Derogatis [19] and restandardized in Korean version [20]. It is a questionnaire containing 90 items about psychosomatic complaints of the patient, and covers nine scales of the following domains: somatization, depression, anxiety, phobia, hostility, interpersonal sensitivity, obsessive-compulsive behaviors, paranoia and psychoticism. It was used as a screening instrument for psychiatric symptoms in the normal samples in this study.

### C. Analysis

In order to examine the mean differences of the BDI total score and the scores of three factors among the four groups, One-way ANOVA and Scheff's post-hoc test were performed. Also, a series of Logistic regression analyses was administered for detecting the most influential factors in distinguishing between the four groups. Analyses were done in WIN SPSS 15.0.

## III. RESULTS

### A. Demographic Characteristic

Table 1 represents the demographic characteristics of the samples in this study. There were no significant group differences in terms of age and sex ratio. However, educational level in the normal group was significantly higher than other three clinical groups ( $F=9.085, p < .001$ ), but the effect size of educational level was not statistically significant so that educational level was not considered in this study.

### B. Comparison of the BDI total score and the mean scores of three factors among groups

Table 2 presents the results of analyses of variance and Scheff's post hoc tests with the BDI total mean score and the mean scores of the three factors. The BDI total mean score of the Depression group was 26.68(11.12). It was also identified the mean score of 12.37(5.88), 9.21(3.87), and 5.11(3.04) on the factor 1 (Negative Attitude), factor 2 (Performance Difficulty), and factor 3 (Somatic Element), respectively in the Depressive patients. The BDI total mean score for the Anxiety group was 18.98(11.89). The mean scores of the factor 1 (Negative Attitude), factor 2 (Performance Difficulty), and factor

TABLE 1. DEMOGRAPHIC CHARACTERISTICS OF THE DEPRESSION, PSYCHOSIS, AND ANXIETY PATIENTS

	Depression (N= 57)	Anxiety (N= 53)	Psychosis (N= 60)	Control (N= 37)
	M(SD)	M(SD)	M(SD)	M(SD)
Age	38.60(13.82)	33.98(14.38)	32.32(12.56)	34.70(11.64)
Sex ratio: % female	46%	55%	60%	57%
Educational level	11.79(3.54)	12.58(2.32)	12.60(2.76)	14.81(2.04)***

\*\*\* $p < .001$

3(Somatic Element) were 7.81(6.29), 7.36(4.23), and 3.62(2.65), respectively in the Anxiety patients. The BDI

total mean score for the Psychosis group was 16.22(12.35). The mean score of the factor 1(Negative Attitude) was 7.85(6.94), and the mean scores of factor 2(Performance Difficulty) and factor 3(Somatic

Element) were 5.88(4.39) and 2.52(2.48), respectively in the Psychosis patients. The BDI total mean score for the control group was 6.57(5.64). The mean scores of the factor 1 (Negative Attitude), factor 2 (Performance Difficulty), and factor 3(Somatic Element) were 2.84(2.95), 3.08(2.47), and 0.65(1.00), respectively in the nonclinical group.

Statistically significant differences were observed in the BDI total mean score among the Depression, Anxiety, Psychosis group, and control group ( $F=25.96, p < .001$ ). The BDI total mean score with the Depression group was higher than other two clinical groups and the control group. Moreover, the Depression group was on severe level of depression, whereas the Anxiety and Psychosis group were in a stage of mild depression and the control group was on normal level. Moreover, the BDI total mean scores of all clinical groups were significantly higher than nonclinical group in Scheff's post-hoc test

When comparing differences on the mean scores of the three factors on the BDI, the mean scores of all three factors (Negative Attitude, Performance Difficulty, and Somatic Element) were significantly different among the four groups

( $F=19.55, F=19.57, F=25.54, p < .001$ , respectively). The Scheff's post hoc test revealed that the mean scores of factor 1 (Negative Attitude) and factor 3 (Somatic Element) were significantly higher on the Depression group than other two clinical groups and the mean score for factor 2 (Performance Difficulty) showed significantly higher on the Depression group than the Psychosis group. The mean scores of all three factors in three clinical groups were significantly higher than the nonclinical group.

A series of logistic regression analyses was conducted to identify the important factors associated with depressive symptoms within the BDI three factors: 1) the Depression and Anxiety group, 2) the Depression and Psychosis group and 3) the Depression and Control group. Table 3 presents the results of analyses of logistic regression with the scores of the three factors on the BDI. Negative Attitude was proved to be the most important predictor in distinguishing the Depression group from both the Anxiety and Psychosis group ( $\beta = -.124, \beta = -.108, p < .001$ , respectively). Furthermore, Negative Attitude and Somatic Element were the most significant predictors in distinguishing the Depression group from the control group ( $\beta = -.422, \beta = -.652, p < .001$ , respectively).

TABLE 2.RESULTS OF THE ANALYSES OF VARIANCE(ANOVA) AND SCHEFFS' POST HOC TESTS FOR THE TOTAL MEAN SCORE AND THE MEAN SCORES OF THE THREE FACTORS ON THE BDI

	Depression (N= 57)	Anxiety (N= 53)	Psychosis (N= 60)	Control (N= 37)		
	M(SD)	M(SD)	M(SD)	M(SD)	F	
BDI- Total	26.68(11.12)	18.98(11.89)	16.22(12.35)	6.57(5.64)	25.96***	D> A, P> C
BDI- Negative Attitude	12.37(5.88)	7.81(6.29)	7.85(6.94)	2.84(2.95)	19.55***	D> A, P> C
BDI- Performance Difficulty	9.21(3.87)	7.36(4.23)	5.88(4.39)	3.08(2.47)	25.54***	D> P D, A, P> C
BDI- Somatic Element	5.11(3.04)	3.62(2.65)	2.52(2.48)	0.65(1.00)	26.33***	D> A, P> C

\*\*\* $p < .001$  / D: Depression / P: Psychosis / A: Anxiety / C: Control

TABLE 3.RESULTS OF THE ANALYSES OF A STEPWISE LOGISTIC REGRESSION FOR THE MEAN SCORES OF THE THREE FACTORS ON THE BDI

Step/Factors	$\chi^2$ (df)	$\chi^2_{chg}$ (df)	Wald	$\beta^a$	SE	Odds Ratio	CL (95%)	
							Lower	Upper
The Depression and the Anxiety group								
Step 1 Negative Attitude	14.596(1)**		12.257	-.124	.03	.883	.824	.947
	*				5			
The Depression and the Psychosis group								
Step 1 Negative Attitude	13.568(1)**		11.809	-.108	.03	.898	.844	.955
	*				1			
The Depression and the Control group								
Step 1 Negative Attitude	69.734(1)**		11.601	-.422	.12	.656	.514	.836
	*				4			

Step 2 Somatic Element	79.485(2)**	10.751(1)*	7.065	-.652	.24	.521	.322	.843
	*	*			5			

CL: Confidence interval. \*\*\* $p < .001$ , \*\* $p < .01$

<sup>a</sup>Wald,  $\beta$  and odds ratio are the measurements from the last step, (-) $\beta$  presents the Depression group

#### IV. DISCUSSION

In this study, we compared the BDI total mean score and the mean scores of the three factors among the Depression, Anxiety, Psychosis patients, and control group.

Educational level of the control group was significantly higher than other three clinical groups ( $F=9.085$ ,  $p < .001$ ) as a result of relatively higher educational level of the control group in this study. However, our result was almost the same when we further conducted the ANCOVA designating the educational level as the covariate and educational level was not statistically significant in effect size so that it was not considered importantly in this study.

It was useful to utilize the BDI total score and the scores of the three factors for detecting depressive symptoms in psychiatric patients and nonclinical individuals. The BDI total mean scores had statistically significant differences among four groups ( $F=25.96$ ,  $p < .001$ ) and the BDI total mean score on the Depression group was higher than other two clinical groups and the control group in post hoc test. In the review of previous literatures, there were significant differences on the BDI total mean score between the clinical groups and the control group [8], [16]. Even within the clinical groups, the Depression group had the much higher BDI total mean score than the Anxiety or Psychosis group [17], [18].

In addition, the mean scores of all three factors (Negative attitude, Performance difficulty, and Somatic element) on the BDI were significantly different according to the Depression, Anxiety, Psychosis group, and control group ( $F=20.38$ ,  $F=20.25$ ,  $F=26.33$ ,  $p < .001$ , respectively). As a result of the Scheff's post hoc test, the Depression group showed the higher mean scores than other two clinical groups and the control group in Negative Attitude and Somatic Element, and the mean score of Performance Difficulty was much higher in the Depression group than in the Psychosis and control group. Depression might result from a tendency to interpret everyday events in a negative way [2], [6]. The result of this study also identified that Depression patients tended to have more negative attitudes about their situations than other two clinical groups and the control group. Depressive people became depressed when they made an attribution that they had no control over the stress in their lives [21]. In other words, the depressive people tended to perceive that situations they experienced were internal, in that the individual attributed negative events to personal failings, stable, in that even after a particular negative event passed, the belief that additional bad things would be last was continued, and global, in that the attribution extent crossed a variety of issues. Some evidence indicated that these pessimistic styles of attributing negative events resulted in

hopelessness and desperation to depressive people. Moreover, depressed patients experienced the performance difficulties more often than non-depressed patients; they had cognitive difficulties (such as impairments of concentration, judgment, and ability to perform a task) and disturbed behaviors (such as social withdrawal and interpersonal relationship problems) [22]. Even in this study, the Depression group had the highest difficulties in performing various functions among the Depression, Anxiety, Psychosis, and control group. In addition, the Depression group suffered from more performance difficulties than Psychosis patients and nonclinical population did. Lastly, it has been pointed out that the depressed patients complained about disturbed physical functions (such as altered sleeping pattern, significant changes in appetite and weight, or notable loss of energy) [23]. We also found that somatic complaints accompanied by depression occurred more frequently in the Depression group than in other two clinical groups and the control group.

As a result of the analyses of logistic regression, Negative Attitude was proved to be the most important predictor in distinguishing the Depression group from both the Anxiety and Psychosis group ( $\beta = -.126$ ,  $\beta = -.110$ ,  $p < .001$ , respectively). Furthermore, Negative Attitude and Somatic Element were the most significant predictors in distinguishing the Depression group from the control group ( $\beta = -.422$ ,  $\beta = -.652$ ,  $p < .01$ , respectively). Therefore, Negative Attitude, a tendency to interpret everyday events in a negative way, was one of the core features of the Depressed patients as compared to the Anxiety and Psychosis patients and nonclinical sample. In a previous study, Negative Attitude among the BDI three factors was the only factor for predicting the suicide idea in the Depression group so that it was concluded that the cognitive factor, negative and desperate thinking, was the most correlated with suicidal ideation in the Depression group [24].

Several limitations to the present study exist. First, the use of a sample of psychiatric patients treated by only one hospital may have limited generalizability. Second, since some factors, such as cognitive functions and insight, were not considered, it was possible for them to impact the results of this study.

Although some research has been done to compare the BDI total mean scores and test factor structures of the BDI, no study has analyzed whether the scores of the factors on the BDI are significantly different among the Depression, Anxiety, and Psychosis, and control group. According to this study, the BDI total mean score appears to detect the differences of the severity of depressive symptom in the Depression, Anxiety, Psychosis, and control group.

Moreover, utilizing the BDI three factors in the clinical field could be highly efficient to understand the specific factors associated with depression so that it might be useful as basic data for treatment of depression in the clinical populations.

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