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# Psychological Distress and Drawing Tests among Women with Breast Cancer

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## ABSTRACT

**Background:** The aim of this study was to evaluate the use of the Diagnostic Drawing Series (DDS) as a screening tool for the breast cancer patients with psychological distress.

**Methods:** All of 64 patients with breast cancer participated in this study. Patients' depressive and anxiety symptoms were assessed using Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7) when the DDS was applied to the participants.

**Results:** Depressed patients used more enclosure in the Feeling drawings ( $P = 0.002$ ) and tilt in Free drawings ( $P = 0.048$ ). Patients with anxiety drew a picture over 67% of the paper ( $P = 0.015$ ) in Tree drawing and more medium pressure ( $P = 0.049$ ) in Feeling drawings. Thirty four subjects (77.3%) of unstable emotion group used over 67% of the space ( $P = 0.002$ ). More Landscapes were observed in the Feeling drawings of unstable patients ( $P = 0.042$ ).

**Conclusion:** These results suggested that DDS could be used as a supplemental screening tool for psychological distress in breast cancer patients.

**Keywords:** Anxiety; Depression; Breast Cancer; Diagnostic Drawing Series

## INTRODUCTION

Cancer patients experience psychopathological symptoms for various reasons, including their fear of dying, uncertainty, or risk of relapse.<sup>1</sup> In particular, women with breast cancer have higher levels of depression than patients with other cancers because of the stresses of chemotherapy side effects, somatic symptoms, mastectomies, edema, hair loss, menopause, and hormone degradation.<sup>2,3</sup> Around 50% of patients who are diagnosed with breast cancer experience depression during the year after their diagnosis. The 15% of them still have depressive disorders after their survival and even after five years.<sup>4</sup> Around 45% of patients with breast cancer feel anxiety during the six months after their diagnosis, and 33% experience both depression and anxiety simultaneously.<sup>4,5</sup>

Currently, medical institutes utilize self-reported questionnaires to screen for and detect distress in cancer patients. However, patients with cancer have a strong tendency to overlook their emotions indifferently because of their characteristics and cultural backgrounds, and they are more likely to be alexithymic.<sup>6,7</sup> In cultures that emphasize collective identities, such as Korea,

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expressing negative emotions is often considered disruptive and aggravating to social stability and is, therefore, discouraged.<sup>8</sup> Thus, self-reported questionnaires have a risk of distorted or inaccurate responses.<sup>9</sup> In this point of view, new assessment tools that can supplement self-reported questionnaires in evaluating levels of distress in breast cancer patients are necessary.

From the time of ancient Egyptian, art was one of the excellent communication tools. It was possible because art uses a symbolic image, which can be strongly expressed hidden needs and suppressed feeling even if it has no sound. The power of art was, again, stressed by Freud who recognized the values of art as a projective tool for human psychology. The theories of Freud regarding the power of drawings have been expanded to the field of Art therapy.<sup>10,11</sup> Currently, art is used in clinical settings as a supportive tool in the diagnoses of psychopathologies. However, despite its merits, the use of art as a diagnostic tool is still a controversial issue in the field of social science because of the lack of standard and scientific guidelines for interpreting the drawings.<sup>12</sup>

To address these limitations, Lesowitz et al., have developed and tested a drawing assessment tool called the Diagnostic Drawing Series (DDS) at the Fairfax Hospital Association.<sup>13</sup> The DDS is one of the widely studied diagnostic tools used in the field of art therapy with the systematic evaluation standard, the Drawing Analysis Form (DAF).<sup>14</sup> It is full of suggestion in the art therapy history that many psychiatrists were involved in examining the usefulness of the DDS.<sup>15</sup> The developers of the DDS focused on the relationship between the structural characteristics of the graphic elements and several different diagnostic categories in the Diagnostic and Statistical Manual of Mental Disorders (DSM-III, DSM-III-R, and DSM-IV) and proposed a manual to evaluate the drawing.<sup>13,14</sup>

In 1988, Cohen et al.,<sup>13</sup> reported that unusual placement in drawings was a strong characteristic of patients with Major Depressive Disorder after examining the DDS on the patients in the psychiatric hospital. Morris<sup>15</sup> found that patients with major depressive disorder used 2–3 colors and less space. Other studies stated that the psychotic disorder like eating disorder, schizophrenia, and substance-related disorder projected onto the DDS.<sup>14</sup> The DDS was researched even in Korea by Cha and Kim.<sup>16</sup> They announced that the DDS is related to the symptoms of schizophrenia. Most previous studies of the DDS have focused on the psychopathology of psychiatric patients but not on the patients with cancer.

This study aimed to examine the use of the DDS as an additional assessment tool in evaluating the levels of emotional distress in cancer patients. We studied the characteristics of breast cancer patients with the DDS graphic elements, DAF II, and general DDS analysis, which are used to assess depression, anxiety, and emotional status. We hope that the results of this study will contribute to the development of the use of the DDS as an additional screening test to assess the levels of depression and anxiety and the emotional statuses of breast cancer patients.

## METHODS

### Methodology

This study examined 64 breast cancer patients to analyze the relationships between the graphic elements of the DDS and the patients' levels of depression and anxiety and their emotional statuses. The Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7 (GAD-7) questionnaires were used to evaluate the psychological distress of the patients. The patients were asked to perform the drawing test in the DDS.

### Research subjects

This study was conducted from September 2016 to April 2017 at the hospital. The announcements were posted at the hospital to recruit volunteers for the study.

The research subjects were limited to patients who had been diagnosed with breast cancer who were currently undergoing or waiting to undergo chemotherapy or radiation therapy. The age of research subjects was between 20 and 70 years old. Their intellectual level and physical condition were required to fill up the questionnaires and to draw a picture without help. All subjects signed the informed consent before participating in this study.

To have an accurate observation, professional art therapists conducted the questionnaires and drawing test. We regulated a group maximum 8 people for the same reason. All of 64 patients participated in the study, and the responses and drawings of total 64 people were used for analyzing.

### Materials

Breast cancer patients commonly experience psychological distress, such as depression, anxiety, and emotional distress, which directly and indirectly affects their treatment processes and quality of life. This study employed the PHQ-9, GAD-7, and the DDS to examine the relationships between distress factors and the DDS graphic elements.

#### PHQ-9

The PHQ-9 is a self-assessment tool to evaluate depression status developed by Spitzer in 1999.<sup>17</sup> The PHQ-9 consists of nine questions on the symptoms of major depressive disorder.<sup>18</sup> The total score ranges from 0 to 27 points. It is categorized four different degrees, mild, moderate, moderately severe, and severe based on cut-off scores of 5, 10, 15, and 20, respectively.<sup>18</sup> Score '10' is the cut-off score to evaluate the depression status.<sup>17</sup>

Because different countries employ different cut-off scores in these tests,<sup>19</sup> this study used the standards described by Choi et al.<sup>20</sup> and An et al.<sup>21</sup> The PHQ-9 had shown high reliability (Cronbach's  $\alpha = 0.852$ ) in Korea and higher validity and specificity when the cut-off value was 9 instead of 10.<sup>20</sup> Therefore, we used 9 for the cut-off score of PHQ-9 in this study.

#### GAD-7

The GAD-7 is a self-reported assessment tool of the severity of Generalized Anxiety Disorder (GAD) and the existence of anxiety. In the mid-1990s, Spitzer and his colleagues developed the GAD-7.<sup>22</sup>

The GAD-7 consists of seven questions. The scores for each question range from 0 to 3 points and the highest possible score is 21 points. GAD is diagnosed in those who receive over 10 points. However, the cut-off score of GAD-7 with highest sensitivities is varied with countries; 12 in Netherlands and 9 in Finland.<sup>22,23</sup> In Korea, Seo and Park<sup>24</sup> reported the highest sensitivity (78.1%) and specificity (72.8%) when a cut-off score of over 5 was used. In this study, we used 5 points as the cut-off score for anxiety in this study.

#### DDS

The DDS was developed by Cohen et al.<sup>13</sup> based on diagnostic methods of the DSM-III and DSM-III-R to study the relationship between psychopathology and design elements. In contrast to usual drawing assessment methods, the DDS involves standardized evaluation criteria on

23 different design elements to prevent the potential problem of subjective error.<sup>13,14</sup> The significance of the DDS is that it is the first reliable and valid scientific method to use as a supplementary diagnostic tool to assess the psychopathological status of psychiatric patients.<sup>13</sup>

The DDS analyzes the patient's defense mechanisms and coping styles with the Free drawings, their self-development with the Tree drawings, and their capacity for emotional expression and abstract thinking with the Feeling drawings.<sup>13-15</sup> Three drawings should be completed within 50 minutes, with 15 minutes for each drawing. A blank white piece of paper (18 in × 23 in) and soft chalk pastels (12 colors) were used in the DDS. For each drawing, a direction is provided. No conversations are requested during the drawing process. After completion of all three drawing, discussion about each work is beginning. The directives for each drawing were as follows;<sup>13-15</sup>

- 1) Free drawing: Draw any picture with these materials.
- 2) Tree drawing: Draw a tree.
- 3) Feeling drawing: Draw your feeling with dots, lines, or faces.

The complete drawings were analyzed based on the DAF evaluation criteria described by Cohen et al.<sup>13</sup> In the DAF, total 23 different graphic elements are presented to evaluate. Each of them is given specific grading criteria.

In this study, we followed the scoring criterion suggested by Cohen et al.<sup>13</sup> except for color, space usage, and enclosure. The color, space usage, and enclosure in DAF have several select options in answer to evaluate the drawing. Because none of the subjects used the single color and left the page as blank, we combined 'mono' with '2-3' and excluded 'blank' for statistics analysis. The space usage in DAF is divided into 5 categories: 1-33, 34-66, 67-99, full, and blank, to evaluate how to use the space of paper. We integrated '1-33' into '34-66' and excluded 'blank' from evaluation because the subjects who used 1-33 and blank page were hardly found in their drawing. Last, we changed three different select options of the enclosure into two select options. It is originally divided into no enclosure, enclosure and surrounded but we combined enclosure and surrounded for statistics purpose because the number of participants in this study is not enough.

### Statistical analysis

SPSS 23.0 (IBM Corporation, Armonk, NY, USA) was used to perform the statistical analyses. The  $\chi^2$  tests were used to analyze.

### Ethics statement

The study was approved by Institutional Review Board of Asan Medical Center (IRB No. 2016-0751). Informed consent was obtained from subjects. Also, we got approval from patients to use of drawing as an example.

## RESULTS

### Sociodemographic characteristics

Total 64 patients participated in this study (Table 1). The mean age of the subjects was 45.21 years. Of the subjects, patients in their 40s (n = 27, 42.2%) made up the largest age group, while those in their 50s composed the second largest group (n = 22, 34.4%). Patients over

**Table 1.** Sociodemographic characteristics

Variables	Full samples (n = 64)	
	No. of patients	Component ratio (%)
Age		
20s to 30s	12	18.8
40s	27	42.2
50s	22	34.4
Over 60s	3	4.7
Clinical stage		
Stage 0	2	3.1
Stage 1	18	28.1
Stage 2	26	40.6
Stage 3	14	21.9
Stage 4	4	6.3
Surgery		
No	3	4.7
Yes	61	95.3
Treatment		
Chemotherapy	16	25.0
Radiation therapy	41	64.1
Other	7	10.9

60 were the smallest age group in this study. For disease stage, stage 2 contained the most patients (n = 26), which was followed by stage 1 (n = 18) and stage 3 (n = 14). Most of patients (n = 61, 95.3%) had undergone surgery. The treatment type consisted of three categories: 64.1% of the patients had received radiation therapy, while 25% received chemotherapy, and 10.9% received another type of antihormonal therapy.

### The relationships between the graphic elements and depression

Depressive symptom measured with PHQ-9 was significantly related to the use of enclosure ( $\chi^2 = 9.958$ ,  $P = 0.002$ ) in the Feeling drawings and tilt ( $\chi^2 = 3.707$ ,  $P = 0.048$ ) in the Free drawings in the DDS (Table 2).

Of the non-depressed subjects, 40.5% (n = 17) did not draw a picture, which is enclosed the objects, while 81.1% (n = 18) of depressed subjects drew it. The results showed that enclosure

**Table 2.** The graphic elements of the DDS and depression

Variables		Normal group (PHQ-9 ≤ 9) n = 42 (65.6%)	Depressed group (PHQ-9 > 9) n = 22 (34.4%)	Full sample n = 64 (100%)	$\chi^2$ test
DDS: enclosure					
Free drawing	No	19 (45.2)	13 (59.1)	32 (50.0)	$\chi^2 = 9.958^a$
	Yes	23 (54.8)	9 (40.9)	32 (50.0)	df = 1, $P = 0.430$
Tree drawing	No	29 (69.0)	17 (77.3)	46 (71.9)	$\chi^2 = 0.483^a$
	Yes	13 (31.0)	5 (22.7)	18 (28.1)	df = 1, $P = 0.560$
Feeling drawing	No	25 (59.5)	4 (18.2)	33 (51.6)	$\chi^2 = 9.958^a$
	Yes	17 (40.5)	18 (81.8)	31 (48.4)	df = 1, $P = 0.002^c$
DDS: tilt					
Free drawing	No	18 (42.9)	15 (68.2)	33 (51.6)	$\chi^2 = 3.707^a$
	Yes	24 (57.1)	7 (31.8)	31 (48.4)	df = 1, $P = 0.048^b$
Tree drawing	No	35 (83.3)	17 (77.3)	52 (81.3)	$\chi^2 = 0.348^a$
	Yes	7 (16.7)	5 (22.7)	12 (18.8)	df = 1, $P = 0.536$
Feeling drawing	No	33 (78.6)	19 (86.4)	52 (81.3)	$\chi^2 = 0.575^a$
	Yes	9 (21.4)	3 (13.6)	12 (18.8)	df = 1, $P = 0.345$

Values are presented as number (%). It is statically insignificant between depression and other graphic elements of the DDS such as color, idiosyncratic color, blending, elements, line length, integration, tree, depiction, edges, image, pressure, movement, space usage, unusual placement, ground line, people, animals, objects, symbols, writing, and landscape.

DDS = Diagnostic Drawing Series, PHQ-9 = Patient Health Questionnaire-9, df = degrees of freedom

<sup>a</sup>0 cells (0%) have expected count less than 5; <sup>b</sup> $P < 0.05$ ; <sup>c</sup> $P < 0.005$ .

was found more in the drawings of depressed subjects than in the drawings of the non-depressed subjects.

The tilt in the Free drawing showed that 57.1% (n = 24) of non-depressed subjects and 31.8% (n = 7) of depressed subjects used Tilt for their drawings. These results implied that non-depressed patients were more likely to draw an object slantingly than depressed subjects did.

### The relationships between the graphic elements and anxiety

As shown in Table 3, anxious symptom measured with GAD-7 was related to space usage ( $\chi^2 = 7.173$ ,  $P = 0.015$ ) and pressure ( $\chi^2 = 6.022$ ,  $P = 0.049$ ).

For space usage, 14 subjects (56%) in the non-anxious subjects' group used less than 66% of the space of paper, while 30 subjects (76.9%) of the anxious subjects utilized more than 67%.

Regarding pressure, 14 subjects (56%) in the non-anxious subjects' group used light pressure, while 24 (37.5%) subjects in anxious subjects' group used medium pressure. These results showed that medium pressure tends to be used the most in the anxious subjects' group, while light pressure tends to be used the most in the non-anxious subjects' group.

### The relationship between the graphic elements and emotional states

In this study, emotional states were divided into two categories, emotionally stable and emotionally unstable, which means that the subjects are depressed or anxious or both depressed and anxious. The results of the relationships between the graphic elements and emotional states were related to space usage in the Tree drawings and landscape in the Feeling drawings (Table 4).

The result of space usage ( $\chi^2 = 10.673$ ,  $P = 0.002$ ) in Tree drawing showed that the subjects with emotionally normal condition (35.0%, n = 7) were less used the space for drawing than the subjects (77.3%, n = 34) with emotionally unstable subjects.

**Table 3.** The graphic elements of the DDS and anxiety

Variables		Normal group (GAD-7 ≤ 5) n = 25 (39.1)	Anxiety group (GAD-7 > 5) n = 39 (60.9)	Full sample n = 64 (100)	$\chi^2$ test
DDS: space usage					
Free drawing	> 66%	8 (32.0)	10 (25.6)	18 (28.1)	$\chi^2 = 0.305^a$
	< 67%	17 (68.0)	29 (74.4)	46 (71.9)	df = 1, $P = 0.584$
Tree drawing	> 66%	14 (56.0)	9 (23.1)	23 (35.9)	$\chi^2 = 7.173^a$
	< 67%	11 (44.0)	30 (76.9)	41 (64.1)	df = 1, $P = 0.015^b$
Feeling drawing	> 66%	14 (56.0)	15 (17.7)	29 (45.3)	$\chi^2 = 1.891^a$
	< 67%	11 (44.0)	24 (21.3)	35 (45.7)	df = 1, $P = 0.204$
DDS: pressure					
Free drawing	Light	8 (32.0)	21 (17.7)	29 (45.3)	$\chi^2 = 3.300^a$
	Middle	12 (48.0)	11 (14.0)	23 (35.9)	df = 2, $P = 0.192$
	Heavy	5 (20.0)	7 (7.3)	12 (18.8)	
Tree drawing	Light	13 (52.0)	16 (17.7)	29 (45.3)	$\chi^2 = 2.731^a$
	Middle	6 (24.0)	11 (28.2)	17 (26.6)	df = 3, $P = 0.435$
	Heavy	5 (20.0)	12 (30.8)	17 (26.6)	
Feeling drawing	Light	14 (56.0)	12 (30.8)	26 (40.6)	$\chi^2 = 6.022^a$
	Middle	9 (36.0)	15 (38.5)	24 (37.5)	df = 2, $P = 0.049^b$
	Heavy	2 (8.0)	12 (30.8)	14 (21.9)	

Values are presented as number (%). It is statically insignificant between anxiety and other graphic elements of the DDS such as color, idiosyncratic color, blending, elements, line length, integration, tree, depiction, edges, image, enclosure, movement, tilt, unusual placement, ground line, people, animals, objects, symbols, writing, and landscape.

DDS = Diagnostic Drawing Series, GAD-7 = Generalized Anxiety Disorder - 7, df = degrees of freedom.

<sup>a</sup>0 cells (0%) have expected count less than 5; <sup>b</sup> $P < 0.05$ , <sup>c</sup> $P < 0.005$ .



**Table 4.** The graphic elements of the DDS and emotional state

Variables		Normal group (PHQ-9 $\leq$ 9 and GAD-7 $\leq$ 5) n = 20 (31.3)	Unstable group (PHQ-9 > 9 or GAD-7 > 5) n = 44 (68.8)	Full sample n = 64 (100)	$\chi^2$ test
DDS: space usage					
Free drawing	> 66%	7 (35.0)	11 (25.0)	18 (28.1)	$\chi^2 = 0.680^a$
	< 67%	13 (65.0)	33 (75.0)	46 (71.9)	df = 1, $P = 0.550$
Tree drawing	> 66%	13 (65.0)	10 (22.7)	23 (35.9)	$\chi^2 = 10.673^a$
	< 67%	7 (35.0)	34 (77.3)	41 (64.1)	df = 1, $P = 0.002^c$
Feeling drawing	> 66%	10 (50.0)	19 (43.2)	29 (45.3)	$\chi^2 = 2.58^a$
	< 67%	10 (50.0)	25 (56.8)	35 (54.7)	df = 1, $P = 0.787$
DDS: landscape					
Free drawing	No	16 (80.0)	38 (86.4)	54 (84.4)	$\chi^2 = 0.422^a$
	Yes	4 (20.0)	6 (13.6)	10 (15.6)	df = 1, $P = 0.712$
Tree drawing	No	13 (65.0)	26 (59.1)	39 (60.9)	$\chi^2 = 0.202^a$
	Yes	7 (35.0)	18 (40.9)	25 (39.1)	df = 1, $P = 1.000$
Feeling drawing	No	10 (50.0)	11 (25.0)	21 (32.8)	$\chi^2 = 3.898^a$
	Yes	10 (50.0)	33 (75.0)	43 (67.2)	df = 1, $P = 0.042^b$

Values are presented as number (%). It is statically insignificant between emotional state and other graphic elements of the DDS such as color, idiosyncratic color, blending, elements, line length, integration, tree, depiction, edges, image, enclosure, pressure, movement, tilt, unusual placement, ground line, people, animals, objects, symbols, and writing.

DDS = Diagnostic Drawing Series, PHQ-9 = Patient Health Questionnaire-9, GAD-7 = Generalized Anxiety Disorder-7, df = degrees of freedom.

<sup>a</sup>0 cells (0%) have expected count less than 5; <sup>b</sup> $P < 0.05$ , <sup>c</sup> $P < 0.005$ .

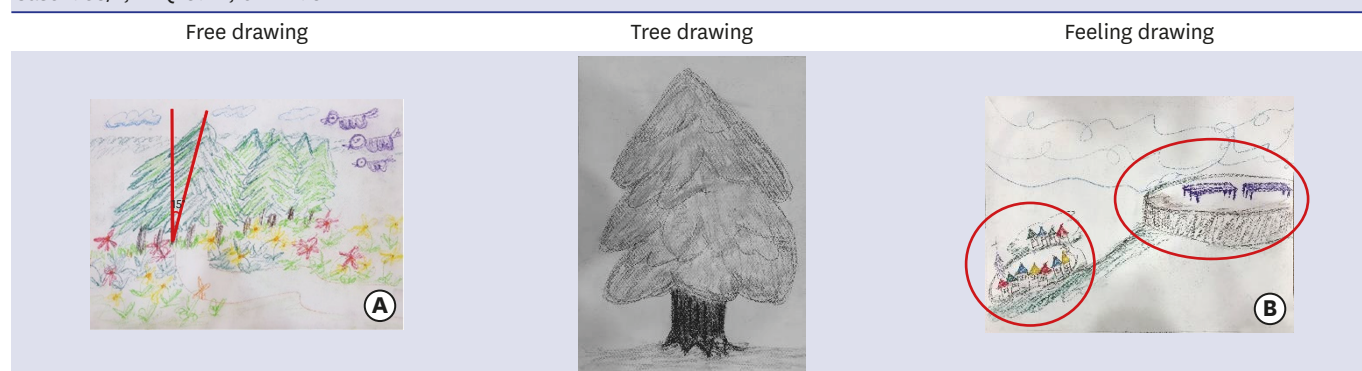
Although landscape was related to emotional state, the only significant relationship was found in the emotionally unstable subjects' group ( $\chi^2 = 3.898$ ,  $P = 0.042$ ) in the Feeling drawings. 75% (n = 33) of the emotionally unstable subjects group used landscape in their drawings, while 25% (n = 11) of them did not use landscape in their drawings. There is no significant difference in the emotionally stable group.

### Analyzing the drawings of the subjects

**Figs. 1-3** contain representative drawings of the graphic elements of the DDS that are related to depression, anxiety, and emotional state. The example drawings were properly selected from the subjects' group who had the higher score than the cut-off score in each assessment tool, PHQ-9, and GAD-7.

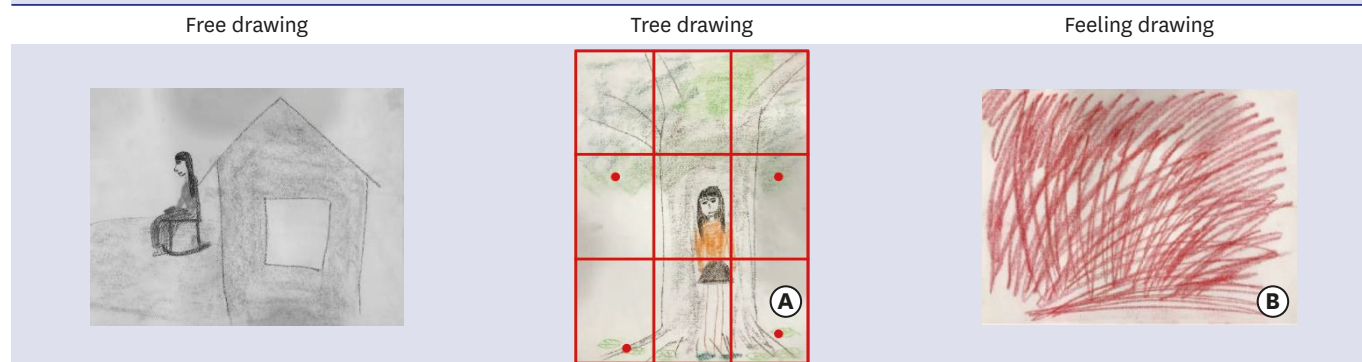
According to the statistical analysis, the depressed subjects tend not to use tilt in Free drawings and to use enclosure in the Feeling drawing (**Fig. 1**). Although the tree in the Free drawing of **Fig. 1** is looked tilted, it did not count as tilt because it slanted less than 15

Case 1. 38/F, PHQ-9: 12, GAD-7: 5



**Fig. 1.** Analysis of the drawings of a subject with depression. (A) The example of Tilt of a subject with depression. (B) The example of Enclose of a subject with depression. PHQ-9 = Patient Health Questionnaire-9, GAD-7 = Generalized Anxiety Disorder-7.

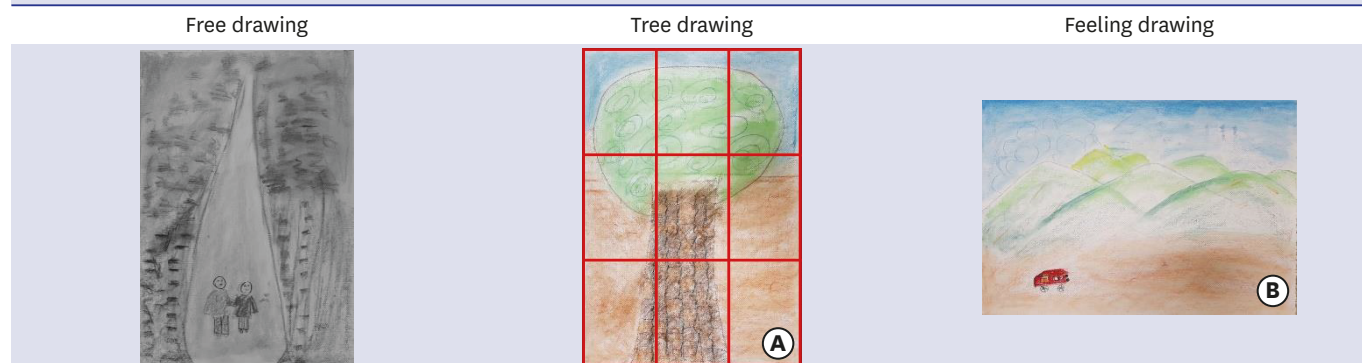
Case 2. 42/F, PHQ-9: 7, GAD-7: 13



**Fig. 2.** Analysis of the drawings of a subject with anxiety. (A) The example of space usage of a subject with anxiety. (B) The example of medium pressure of a subject with anxiety.

PHQ-9 = Patient Health Questionnaire-9, GAD-7 = Generalized Anxiety Disorder-7.

Case 3. 64/F, PHQ-9: 13, GAD-7:13



**Fig. 3.** Analysis of the drawings of a subject for emotional state. (A) The example of space usage of a subject with unstable emotion. (B) The example of landscape of a subject with unstable emotion.

PHQ-9 = Patient Health Questionnaire-9, GAD-7 = Generalized Anxiety Disorder-7.

degrees. Therefore, we did not count free drawing of Fig. 1 as tilted. In the Feeling drawing, the houses on the left side and the benches on the right side of the page were besieged with the circle. So, it counted as enclosure. Subjects with anxiety tend to use over 67% of the space of page and medium pressure (Fig. 2).

The space usage is determined by how many columns and rows are filled with drawing after the paper is equally divided into three parts. Over 67% means that the drawing is filled all columns and rows on the paper as indicated in the Tree drawing of Fig. 2. Pressure means the pen pressure. It is the major factor to estimate Pressure that how tightly white face of the paper is covered with paste. In the Feeling drawing of Fig. 2, the medium pressure was used to fill the surface up. It cannot afford to reveal the surface of the paper and to cover it too much with pastel.

The emotional state was related to the space usage in the Tree drawing and landscape in the Feeling drawing. The drawing in Fig. 3 was completed by a subject who has both depression and anxiety. In the Tree drawing of case 3, all space was covered by pastel. In the Feeling drawing, she completed the desert landscape with a car and the mountains, which is the grading point of the landscape; some other objects based on fundamental elements of the landscape.



## DISCUSSION

Psychological distress in patients with breast cancer negatively affects their compliance to treatment, the possibility of recurrence, and life quality after treatment.<sup>5,25</sup> Because of these effects, it is increasingly important for patients to receive treatment from psycho-oncology professionals as well as anticancer treatment. However, because of the cultural environment in Korea that discourages the expression of negative emotions and patients' tendencies to suppress their emotions greatly, the patients might distort their answers on distress questionnaires. To alleviate this potential problem, we examined the applicability of the DDS as a supportive diagnostic tool for distress questionnaires. The subjects in this study were women with breast cancer who were between 20 and 70 years old. They were registered at Asan Medical Center, in Seoul, Korea. To analyze the relationship between distress and the DDS, the PHQ-9 and GAD-7 were used to evaluate the psychological distress of the subjects, and the DDS was used as a drawing test.

First, depression in the women with breast cancer was associated with the use of enclosure in the Feeling drawings and tilt in the Free drawings (**Table 2**). Enclosure, which was defined as lines or shapes that surrounded other images, were used most in the depressed subjects group (18 subjects, 81.8%). Women with breast cancer experience post-traumatic stress disorder (PTSD) immediately after their diagnosis.<sup>26</sup> PTSD is closely connected with the occurrence of depression.<sup>27</sup> Besides, side effects of cancer treatments, including hair loss, edema, and mastectomies, are also causal factors for depression.<sup>5,25</sup> Therefore, the results of a previous study of DDS reported that enclosure usage is related to PTSD<sup>15</sup> are in agreement with the results of this study. The defensive mechanisms of women with breast cancer who tend to regard cancer as a taboo and restrain their depressive feelings because of the shock of the diagnosis of cancer are illustrated by the object in the enclosure, which is isolated from the outside objects.

The use of tilt, which is related to depression, appeared in the Free drawing. Tilt, grading when an object leans over 15 degrees to the left or right, is drawn more by patients in the non-depressed group. Moreover, no tilt was observed in a subject with the depressed group in this study. Interestingly, these results differ from the results of the previous studies that depressed people used tilt.<sup>30</sup> It seems to be their psychology, suppressing the suffering and distress from cancer. Their wish to show healthy instead of sick to others might be projected onto a vertically straight line with no tilt. This result support Cohen et al.'s theory<sup>25</sup> that defense mechanisms are shown in the Free drawings.

Second, anxiety correlated with space usage in the Tree drawings and with pressure in the Feeling drawings. The usage of over 67% of the space in the anxious subjects' group corresponds with the results of the study by Neals<sup>28</sup> that children with adjustment disorders used more space, 64%–99% of the space, than normal children did. These findings support that the anxiety of the breast cancer patients might be shown in DDS even if they hide and avoid their unstable emotion.

The anxiety of breast cancer patients was also related to pressure in the Feeling drawings. Although medium pressure was used more than the light and heavy pressure in the anxious subjects' group, there were no significant differences in the result value. On the other hand, in the non-anxious subjects' group, the use of light pressure was used twice higher than the use of medium and heavy pressure (**Table 3**). In art therapy, pressure reflects the subject's

physical and psychological energy level, the degree of tension, and level of aggressiveness and impulsiveness.<sup>29</sup> If the pressure is too strong or too weak, the subject is more likely to be unstable. Emotional stability is expressed with medium pressure.<sup>29</sup> Different from the previous study, the findings of this study that medium pressure is more used in the anxious subjects' group may be because the side effects of treatment, edema, nausea, and fatigue, might impact the patient's physiological energy level such grasping power.

Third, the emotional states in this study are divided into stable and unstable condition. Unstable emotion includes the state of depression or anxiety, or both depression and anxiety. It significantly related to space usage in the Tree drawings and landscape in the Feeling drawings. The results on space usage in the emotional state are similar to those of the subject with anxiety only. The unstable group used landscapes more than the stable group in the Feeling drawing (Table 4). The emotion of subjects projects into the big waves of the sea, rainbows, heavy rain, and falling on their Feeling drawing in this study. These results supported the theory of Cohen et al.<sup>25</sup> that subjects faced and expressed their emotion in the Feeling drawings while their self-defensive mechanisms are not working well.

As one of the first studies to examine the relationship between the psychological distress of women with breast cancer and the use of the DDS, the results of this study suggested that the DDS can be used as a supportive diagnostic tool to evaluate psychological distress of breast cancer patients. According to the result of this study, pressure, space usage, enclosure, tilt, and landscapes in the list of evaluating sheet called DAF in the DDS significantly related to the subjects with breast cancer. It confirms that their drawing style is similar to the drawing of the patients with PTSD than the patients with major depressive disorder and anxiety disorder. These results support the theory of Kangas et al.<sup>31</sup> that women with breast cancer develop symptoms of PTSD.

We conducted this study to determine whether it is possible to use DDS as a supportive tool. Its results suggested that DDS could be used as a supplemental screening tool for psychological distress in breast cancer patients. However, this study had some limitations. First, the subjects in this study were limited to women with breast cancer who registered at a university hospital in Korea. Therefore, the results of this study may not be generalizable to all patients with cancer. Second, it is hard to believe that the score of the PHQ-9 and GAD-7 explained the subjects' emotional states sufficiently because it adopted the self-reported response to the questions. Third, this study does not evaluate the interrater agreement of the DDS because only one art therapist was involved in this study. Based on the verification of the feasibility of the use of the DDS in this study, future research may expand the number of participants and extend the range to other kinds of cancers. Also, it may need to evaluate the interrater agreement of the DDS with more than two professional art therapists.

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