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Effect of brief psychoeducation using a tablet PC on distress and quality of life in cancer patients undergoing chemotherapy: a pilot study

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Abstract

***Background*: Managing distress has become crucial in optimized cancer care. Psychoeducation using tablet PCs has potential as a novel intervention to reduce distress in cancer patients. We examined the benefit of a single-session psychoeducation using a tablet PC during chemotherapy.**

***Methods*: Thirty-six cancer patients with significant levels of distress, as determined by the Hospital Anxiety and Depression Scale (HADS), enrolled from the chemotherapy unit in Seoul National University Cancer Hospital. Participants were quasi-randomized into either the intervention ($n = 19$) or control ($n = 17$) group. Twenty-minute-long psychoeducation on distress management was provided via tablet PCs during chemotherapy infusion. HADS, Short-form 8 Health Survey, MD Anderson Symptom Inventory, Insomnia Severity Index, and Impact of Event Scale-Revised (IES-R) were administered at baseline and 3 weeks later. The use of psychosocial services was reviewed 6 months later.**

***Results*: Compared with controls, the intervention group showed a superior 3-week clinical trajectory regarding the score changes of the HADS depression subscale ($U = 69.0$; $p = 0.006$), mental component summary score of the Short-form 8 Health Survey ($U = 75.5$; $p = 0.011$), Impact of Event Scale-Revised avoidance subscale ($U = 89.0$; $p = 0.036$), and Insomnia Severity Index total score ($U = 82.5$; $p = 0.021$). There was no significant between-group difference regarding the use of psychosocial services after 6 months.**

***Conclusions*: A tablet PC-based psychoeducation during chemotherapy infusion could be an effective intervention on managing depression, sleep disturbance, and quality of life in cancer patients suffering from distress.**

Introduction

Distress in cancer patients is known to be a significant problem. Over a third of cancer patients experience significant levels of distress across both diagnoses and the disease trajectory [1]. Thus, the need for assessing and managing distress has become crucial in optimizing cancer care [2,3]. The National Comprehensive Cancer Network has been updating distress management guidelines to increase awareness of distress among cancer patients [3]. However, cancer patients experience the highest level of unmet needs in the psychological domain [4]. The resolution is to provide psychosocial interventions, one of which is psychoeducation [5]: a structured, time-limited intervention that consists of stress management, health education, and psychological support [6].

Psychoeducation for cancer patients has been shown to improve anxiety, depression, pain, and quality of life (QOL) [7–11]. Even delivering evidence-based information to cancer patients improved patients' anxiety and/or depression as well as knowledge [12,13]. However, many psychoeducation programs for cancer patients have been taking the form of a multi-session group intervention [5,14–17]. This particular setting could prevent the intervention from becoming more accessible. Cancer patients who are busy with their active chemotherapy schedule or physically disabled to visit a hospital routinely could not benefit from such interventions. Thus, newer ways to deliver psychoeducation to cancer patients have been gaining focus.

To date, various conveying tools for psychoeducation on cancer patients have proven their effectiveness [18]. Applying telephone calls [19,20], videotapes [21], or booklets [22] has made intervention possible with less direct contact between the clinicians and the cancer patients. We assumed that tablet PCs, harboring touch-screen technology, might be another effective tool for psychoeducation. Touch-screen technology has already

been introduced in oncology literature [23,24]. Distress screening using touch-screen computers was reported to increase cancer patients' QOL via appropriate referral to psychosocial services [23]. Also, repetitive symptom assessment in cancer patients using touch-screen computers improved their QOL [24].

To our knowledge, however, there was no study elucidating the effectiveness of psychoeducation using tablet PCs on cancer patients' distress management. We developed a single-session individually delivered psychoeducation suitable for a tablet PC, which may have the potential for widespread dissemination [25,26].

The main objective of the current study was to evaluate the effectiveness of a tablet PC-based single-session psychoeducation for cancer patients reporting significant levels of distress. We hypothesized that the intervention, compared with control, would result in significant differences in the following: (1) 3-week score changes of distress-related and QOL-related measures and (2) the use of psychosocial services after 6 months.

Methods

Participants

The study was conducted at a daytime chemotherapy unit in Seoul National University Cancer Hospital (SNUCH). The unit accommodates patients on chemotherapy regimens that last for 4–12 h. The participants were recruited between May 1, 2012, and June 30, 2012. Cancer patients who visited the daytime chemotherapy unit on the first day of a designated cycle of a chemotherapy regimen were potential candidates for the study. Those included were bound to return to SNUCH in 3 weeks, for regular oncology appointment or chemotherapy. This prevented participants' additional hospital visits for study purposes.

On arrival to the chemotherapy unit, all candidates were recommended for distress screening using the Hospital Anxiety and Depression Scale (HADS) [27]. We selected the participants having a significant level of distress: those who scored 11 or more either on the HADS anxiety (HADS-A) or depression subscale (HADS-D) [28,29]. We only included adults (age 18–70 years), which is consistent with a previous study on psychoeducation [5]. We excluded those who had any contact with psychiatric services in less than 1 year and those who were taking psychotropic medication (e.g., antipsychotics, antidepressants, or psychostimulants). We exceptionally included patients using zolpidem or benzodiazepine only for sleep augmentation and patients who had been taking a stable dose of tricyclic antidepressants for more than 2 months for pain control.

Procedure

The study was performed in a quasi-randomization fashion, allocating the participants ($n = 36$) into either the intervention ($n = 19$) or control group ($n = 17$) according to the date of informed consent. Quasi-randomization according to alternate days was conducted to avoid contamination and to ensure blinding.

We explained the details of the study to eligible participants and asked for informed consent. Immediately after giving informed consent, the participants completed the baseline assessment (T1). Sociodemographic status, psychiatric conditions, and Eastern Cooperative Oncology Group (ECOG) performance status scale [30,31] were obtained using a self-report questionnaire.

Immediately after T1, each participant was allocated to either the intervention or control group. Every participant was given a tablet PC and a pair of headphones in bed, as they were being prepared for chemotherapy. According to group status, a tablet PC played one of two 20-min-long movie clips: a sham-control movie clip in the control group, containing a series of scenic images with relaxing music, or the psychoeducation material in the intervention group. As the researchers retrieved the tablet PCs, they informed the participants of how to further utilize psychosocial services. The intervention group then completed a questionnaire on satisfaction.

The participants were reassessed at the next visit to the oncology department (T2): 2–4 weeks after T1. Thirty-five participants (97.2%) completed both assessments. One participant failed to complete the study because of emotional discomfort at T2 (Figure 1).

Six months after T1, participants' electronic medical record was reviewed to assess the use of psychosocial services. All study procedures adhered to the intent and

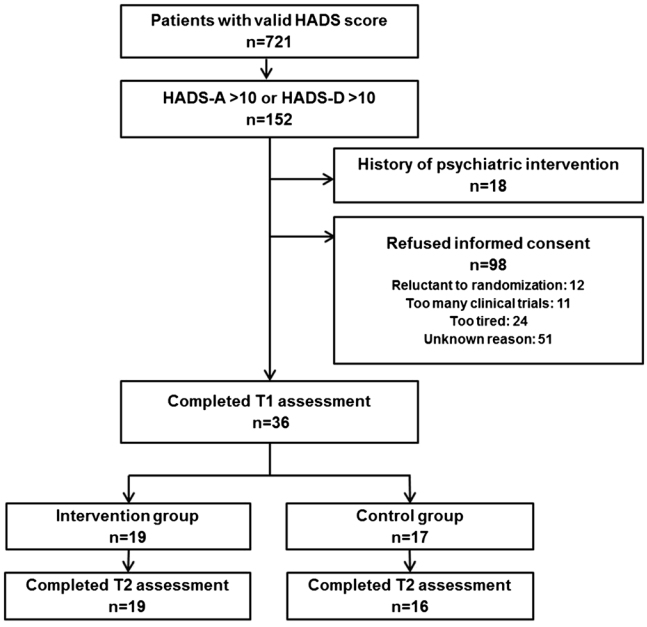

Figure 1. The flow of study participants. HADS, Hospital Anxiety and Depression Scale; HADS-A, HADS anxiety subscale; HADS-D, HADS depression subscale

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principles in the Declaration of Helsinki (2000) and were approved by the Seoul National University Hospital Institutional Review Board (H-1204-109-407).

Developing the psychoeducation for tablet PC

The psychoeducation material used in our study was adapted from the 1-h single-session group psychoeducation developed by HY Park (psychiatrist), which was open to patients and caregivers every month in SNUCH. Because the previous psychoeducation was not originally for study purposes, its efficacy was not pretested.

The conversion of the psychoeducation into a 20-min movie clip was conducted using a PowerPoint slideshow with Korean narration. The final version of the psychoeducation material mainly consisted of four parts: (1) distress education (vulnerability, definition of distress, common symptoms, cancer progression and stress, and distress-managing modalities), (2) cancer survivor interview, (3) coping strategies and stress management (embracing the presence, properly expressing emotion, promoting regular physical activities, learning abdominal breathing, getting emotional support from others, keeping on what is meaningful, and seeking for help), and (4) psychosocial services (available resources, pharmacotherapy, meditation, and contact information). Two components (3 and 4) shared the same theoretical bases as Fawzy's widely reproduced psychoeducational intervention [6]. Component 1 was intended to put emphasis on distress management [2]. Component 2, cancer survivor interview, was added to compensate for the omission of a 'sharing experiences' component from the previous group psychoeducation. We also provided excerpts from medical literature: possible association between chronic stress and cancer progression [32] and the effectiveness of pharmacotherapy in cancer patients [33].

Assessment measures

The primary measures were HADS and the Short-form 8 Health Survey (SF-8). HADS was implemented to assess the levels of distress. It is a 14-item self-report measure widely used in people with medical illness [27], including cancer [34]. HADS has depression (HADS-D) and anxiety (HADS-A) subscales, each ranging from 0 to 21 items. SF-8 was used to assess health-related QOL. It is a generic, multipurpose, and self-reported tool composed of eight items. Regression coefficient weights are assigned to each item to produce physical and mental component scores (MCS-8) [35].

The secondary measures were the MD Anderson Symptom Inventory (MDASI), the Insomnia Severity Index (ISI), and the Impact of Event Scale-Revised (IES-R). MDASI was used to assess various physical symptoms that might affect primary measures. It is a self-report inventory quantifying cancer-related or chemotherapy-related symptoms in a numeric scale of 0–10 [36]. Among 13 symptom items in previously validated MDASI, we excluded three items (sleep disturbance, sadness, and distress) considering their redundancy with the items from ISI and HADS. We used the ISI to measure the intensity of insomnia. ISI is a brief self-report instrument that consists of seven items, rated on a numeric scale of 0–4 [37]. IES-R is a self-report measure used to evaluate and categorize posttraumatic stress symptoms; its usefulness in such a purpose has been previously validated [38]. Our study implemented IES-R with modified instructions to examine the symptoms specific to cancer diagnosis and treatment. IES-R comprises three subscales: intrusion, avoidance, and hyperarousal. Each subscale consists of eight, eight, and six items (ranging from 0 to 4), respectively. We implemented all questionnaires in a Korean-translated version, which has been validated and tested for reliability [29,39–42]. All primary and secondary measures were assessed twice: at T1 and T2.

A questionnaire assessing participants' satisfaction included four items: (1) feasibility, (2) satisfaction with the contents, (3) satisfaction on running time, and (4) understandability. Each item had a numeric scale of 1–5.

Statistical analysis

Between-group differences of categorical variables in sociodemographic and clinical data were tested using the chi-square test, Fisher's exact test, or Goodman and Kruskal's tau test. For continuous variables, the Mann–Whitney *U* test was used.

All primary and secondary measures were tested for between-group differences using the Mann–Whitney *U* test at T1 and T2. The between-group differences regarding the 3-week score change of primary and secondary measures were tested using the Mann–Whitney *U* test. Fisher's exact test examined the between-group differences in the utilization rate of psychosocial services. All statistical procedures were performed with IBM SPSS version 18 for Windows (SPSS, Chicago, IL, USA), and statistical tests were two tailed with a 5% significance level.

A priori sample size calculation

A priori sample size was calculated using the Mann–Whitney–Wilcoxon test in PASS version 11 for Windows (NCSS, Kaysville, UT, USA). The assumptions were based on Katz's study results [22], where the mean between-group difference of the Center for Epidemiologic Studies Depression Scale (CES-D) [43] score change was reported to be 6.2. Considering the possible score range of each tool (CES-D: 0–60; HADS-D: 0–21), the CES-D score change was divided by 3 to estimate an equivalent HADS-D score change. Katz's [22] psychoeducation might have contributed to the mean between-group difference of 2.07 regarding the HADS-D score change. Thus, we generated a sample size for the study with 80% power to reject the null

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hypothesis of an equal HADS-D score change, if the true difference is at least 2. We also assumed that the HADS-D score change in the two groups would show normal distribution and would both yield a standard deviation (SD) equal to 2. The estimates for SD could only be roughly assumed, as the previous reports lacked information on SD of CES-D score changes. The estimation was made at a 5% significance level, producing a total sample size of 34 participants: 17 in each group.

Results

During the study period, 787 patients were recommended for distress screening. Among 721 screened patients, 152 (21.1%) scored 11 or more in either HADS-A or HADS-D. The number of study-eligible patients was 134 after excluding those who had used psychiatric service or psychotropic medication. Ninety-eight refused to give informed consent (Figure 1). The reasons for refusal were as follows: (1) reluctance to randomization ($n = 12$; 12.2%), (2) too many clinical trials ($n = 11$; 11.2%), and (3) being too tired ($n = 24$; 24.5%). Fifty-one patients (52.0%) declined to report reasons for refusal.

Demographic data and clinical status

Among all participants, the median age was 57.5 years (range: 34–71 years). Over half (55.6%) of participants were women. Twenty-three (63.9%) had stage IV cancer, and 25 (69.5%) had an ECOG score of 0 or 1 (Table 1).

Both study groups included patients with various cancer diagnoses, whereas a between-group difference was not reported statistically ($\tau = 0.036$; $p = 0.270$). A significant between-group difference ($\chi^2 = 5.707$; $p = 0.023$) was found regarding the history of cancer surgery. The number of participants who had had cancer surgery was 12 (63.2%) and 4 (23.5%) in the intervention and control groups, respectively. Other sociodemographic variables did not show between-group differences.

Seven participants were taking psychotropic medication: three from the intervention group (lorazepam = 2; amitriptyline = 1) and four from the control group (zolpidem = 2; clonazepam = 1; amitriptyline = 1). There was no between-group difference regarding the use of any psychotropic medication ($\chi^2 = 0.343$; $p = 0.684$).

Baseline characteristics

Among all participants, the mean scores of HADS total, HADS-A, and HADS-D at T1 were 22.83 (SD = 3.26), 10.44 (SD = 2.34), and 12.39 (SD = 2.73), respectively. The mean physical and component scores of the SF-8 and MCS-8 were 35.71 (SD = 9.69) and 38.90 (SD = 7.53), respectively. The mean total score of ISI was 13.14 (SD = 6.42). The mean scores of IES-R total, avoidance, intrusion, and hyperarousal subscales were 34.11 (SD = 17.47),

Table 1. Sociodemographic data and clinical status

Variables	All participants ($n = 36$)
Median (range) age in years	57.5 (34–71)
Median (range) elapsed time since diagnosis in months	11.5 (1–135)
Sex	
Female	20 (55.6)
Marital status	
Never married	2 (5.6)
Married	26 (72.2)
Divorced/separated	6 (16.7)
Bereaved	2 (5.6)
Years in education	
<7	7 (19.4)
≥7, <10	5 (13.9)
≥10, <13	11 (30.6)
≥13, <15	4 (11.1)
≥15	9 (25.0)
Religion	
Atheist	13 (36.1)
Christian	13 (36.1)
Catholic	1 (2.8)
Buddhism	9 (25.0)
Occupation	
Employed	7 (19.4)
Temporary time off	12 (33.3)
Unemployed	12 (33.3)
Retired	2 (5.6)
Unpaid family worker	3 (8.3)
Monthly income in Korean won	
<2,000,000	12 (33.3)
≥2,000,000, <4,000,000	14 (38.9)
≥4,000,000, <6,000,000	6 (16.7)
≥6,000,000	1 (2.8)
Unknown	3 (8.3)
Cancer stage	
I	2 (5.6)
II	5 (13.9)
III	6 (16.7)
IV	23 (63.9)
History of cancer surgery	
Yes	16 (44.4)
History of hormone therapy	
Yes	1 (2.8)
History of radiation therapy	
Yes	8 (22.2)
ECOG	
0	2 (5.6)
1	23 (63.9)
2	7 (19.4)
3	4 (11.1)
4	0 (0.0)
Cancer type	
Lung	10 (27.8)
Breast	9 (25.0)
Colorectal	5 (13.9)
Gastric	3 (8.3)
Lymphoma	3 (8.3)
Others[a]	6 (16.7)

Values are numbers (percentages) of participants unless otherwise indicated. $1 = ₩1090 (September 2013).

ECOG, Eastern Cooperative Oncology Group performance status.

[a]Hepatocellular carcinoma, adrenal gland cancer, pancreatic cancer, head and neck cancer, metastatic bone tumor, and malignant peripheral nerve sheath tumor.

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1.563 (SD = 0.826), 1.627 (SD = 0.794), and 1.460 (SD = 0.904), respectively. No significant between-group difference was found among these variables at T1 (Table 2). The participants reported various degrees of cancer-related symptoms, whereas no significant between-group difference was seen in any of the MDASI items at T1 (Table 3).

Effect of the psychoeducation on distress and quality of life

Primary and secondary measures that showed significant between-group differences at T2 were HADS total, HADS-D, MCS-8, and ISI total scores (Table 2). No between-group difference was shown in other primary/secondary measures at T2, including MDASI (Table 3).

Some measures showed a significant between-group difference regarding the score change over 3 weeks, reflecting a better psychosocial outcome in the intervention group than in controls: HADS total ($U = 58.0$; $p = 0.002$), HADS-D ($U = 69.0$; $p = 0.006$), MCS-8 ($U = 75.5$; $p = 0.011$), ISI total ($U = 82.5$; $p = 0.021$), and IES-R avoidance subscale ($U = 89.0$; $p = 0.036$). No between-group difference was found in the score changes of other primary/secondary variables (Table 2), including MDASI (data not shown).

Participants' satisfaction on the psychoeducation

Nineteen participants (100%) completed the questionnaire on satisfaction. The mean scores on feasibility, satisfaction on the contents, satisfaction on running time, and understandability were 3.84 (SD = 1.26), 4.21 (SD = 0.63), 3.68 (SD = 0.89), and 3.79 (SD = 1.13), respectively.

Effect of the psychoeducation on further psychosocial service use

Among those who completed the study, five (14.3%) utilized any psychosocial services within 6 months after T1: two from the intervention group (10.5%) and three from the control group (18.8%). There was no between-

Table 2. Change in distress and quality of life measures

		Baseline (T1)			After 3 weeks (T2)			Score change (T1 to T2)		
		Intervention ($n = 19$)	Control ($n = 17$)	Statistics	Intervention ($n = 19$)	Control ($n = 16$)	Statistics	Intervention ($n = 19$)	Control ($n = 16$)	Statistics
Variables		Mean (SD)	Mean (SD)	(U)	Mean (SD)	Mean (SD)	(U)	Mean (SD)	Mean (SD)	(U)
HADS	Total	22.84 (2.95)	22.82 (3.66)	153.5	16.11 (5.79)	21.81(6.39)	76.5*	−6.74 (5.76)	−1.00 (5.50)	58.0**
	Anxiety	10.11 (2.38)	10.82 (2.30)	132.0	7.37 (3.35)	9.31 (4.21)	104.5	−2.74 (2.77)	−1.63 (3.86)	119.5
	Depression	12.74 (1.45)	12.00 (3.69)	147.0	8.74 (2.79)	12.50 (3.72)	61.5**	−4.00 (3.28)	+0.63 (4.26)	69.0**
SF-8	Physical	35.07 (10.59)	36.44 (8.84)	154.0	36.93 (7.99)	36.06 (9.27)	138.0	+1.86 (7.21)	−0.44 (7.57)	95.0
	Mental	39.18 (8.63)	38.59 (6.34)	149.0	45.56 (5.36)	37.09 (9.76)	69.5**	+6.38 (6.72)	−1.54 (10.01)	75.5*
ISI	Total	11.53 (6.27)	14.94 (6.27)	115.0	8.58 (5.71)	14.56 (7.38)	79.0*	−2.95 (3.75)	−0.44 (4.56)	82.5*
IES-R	Total	31.32 (20.37)	37.24 (13.47)	123.0	24.68 (16.67)	36.31 (19.44)	94.0	−6.63 (11.50)	−1.81 (15.72)	113.0
	Avoidance	1.49 (0.96)	1.64 (0.67)	144.0	1.10 (0.80)	1.70 (0.94)	97.0	−0.39 (0.48)	+0.02 (0.72)	89.0*
	Intrusion	1.45 (0.92)	1.82 (0.59)	122.5	1.19 (0.81)	1.69 (0.85)	93.0	−0.26 (0.53)	−0.18 (0.81)	132.0
	Hyperarousal	1.32 (1.05)	1.62 (0.70)	121.5	1.08 (0.77)	1.55 (0.92)	100.0	−0.23 (0.69)	−0.11 (0.75)	130.5

SD, standard deviation; HADS, Hospital Anxiety and Depression Scale; SF-8, Short-form 8 Health Survey; ISI, Insomnia Severity Index; IES-R, Impact of Event Scale-Revised.
*$p < 0.05$; **$p < 0.01$.

Table 3. Change in MD Anderson Symptom Inventory scores

	Baseline (T1)			After 3 weeks (T2)		
	Intervention ($n = 19$)	Control ($n = 17$)	Statistics	Intervention ($n = 19$)	Control ($n = 16$)	Statistics
Items	Mean (SD)	Mean (SD)	(U)	Mean (SD)	Mean (SD)	(U)
Fatigue	4.63 (2.39)	5.71 (2.08)	117.0	4.37 (1.95)	5.75 (2.49)	102.5
Forgetfulness	2.74 (2.16)	3.41 (2.92)	148.0	2.32 (2.45)	2.44 (2.80)	148.0
Numbness/tingling	4.37 (2.93)	5.24 (3.65)	139.0	4.47 (2.88)	5.88 (3.03)	108.0
Vomiting	2.42 (3.01)	3.00 (3.18)	145.5	2.21 (2.66)	2.75 (3.57)	149.0
Nausea	2.95 (2.91)	4.41 (3.14)	116.5	2.53 (2.20)	3.56 (3.46)	131.0
Pain	3.47 (2.37)	5.00 (3.62)	117.0	3.16 (2.22)	4.88 (3.22)	104.5
Shortness of breath	3.53 (2.67)	3.71 (3.29)	158.5	2.79 (2.53)	3.00 (3.71)	140.5
Appetite loss	4.16 (2.91)	4.94 (3.07)	135.0	4.32 (3.06)	4.31 (3.14)	151.0
Drowsiness	3.58 (2.06)	4.76 (2.54)	116.0	3.42 (2.44)	4.13 (2.85)	128.5
Dry mouth	3.74 (2.73)	5.12 (2.60)	112.5	3.68 (2.71)	4.13 (3.05)	140.5

SD, standard deviation.

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group difference in the rate of any psychosocial service utilization ($\chi^2 = 4.80$; $p = 0.642$).

Discussion

To our knowledge, this is the first study to examine the effect of a psychoeducational intervention using a tablet PC in cancer patients. In this study, we found that a brief psychoeducation on cancer patients using a tablet PC may have short-term benefits in depression, insomnia, QOL, and avoidant tendency following cancer-related traumatic events.

Although depression is known to naturally decrease over time in cancer patients [44], we could find significant between-group differences in the score changes of distress-related and QOL-related measures. Because the results were drawn from a sham-controlled quasi-randomized trial, the intervention could be regarded as having additional benefits on managing distress beyond the natural clinical course. The possible benefits of our intervention are consistent with those of previous brief psychoeducational interventions promoting stress management, coping, and communication skills [6,10,15,45]. Our intervention was more brief (20 min) than the previous interventions (1–3 h) [10,45]. However, it still had potential benefits on depressive symptoms over a 3-week period.

A twenty-minute psychoeducation might seem to have a temporary and small effect. However, we expected our intervention to yield discriminative benefits owing to its specific positioning: during chemotherapy infusion. It is already suggested that cancer patients benefit most dramatically from psychosocial interventions during difficult times (e.g., during chemotherapy) [46]. Furthermore, the coping strategies and relaxation technique we delivered were able to be self-practiced by the patients during a 3-week interval. This possible effect beyond the time of delivery has already been witnessed in the previous studies, where new coping strategies were introduced to cancer patients [22]. Pruitt's 3-h psychoeducation, whose overall contents are similar to ours, has been proven to show benefits on depressive symptoms after 1 month among radiotherapy recipients [10]. However, this delayed effect can only be assumed at best because of a lack of information on individual coping.

According to our study results, the accessibility of tablet PCs is useful not only for lowering physical barriers or generating initial psychiatric contacts but also for providing temporary support, bridging hospital visits. Tablet PCs may enable psychoeducation to be converted into various forms and to be utilized at many oncological fields for distress management. This form of intervention is expected to be integrated as a sequential process following computerized distress screening, which has already been demonstrated to improve QOL in cancer patients [23].

Various coping strategies were delivered to the patients in our study. Because coping is a multidimensional concept, we cannot neglect the effect of Korean culture on our study. It is known that both problem-focused and emotion-focused coping strategies are used by cancer patients [47,48]. However, Korean cancer patients are known to use emotion-focused coping more frequently than problem-focused coping strategies [49]. Koreans are also known to use a positive mindset when depressed, consistent with their cultural virtue [50]. Coping with depression through positive thinking seems to echo cognitive–behavioral approaches developed in the Western cultures. Korean breast cancer patients have been reported to benefit from a cognitive restructuring, regarding QOL and fatigue [51]. In this context, we assumed that the coping strategies included in our intervention might be readily accepted among Korean participants and might enhance their emotion-focused coping.

In contrast to a previous study [23], our study failed to show that a single-session psychoeducation may positively affect the utilization rate of psychiatric service. The result may be due to the cultural aspect of Korean cancer patients: less frequent use of problem-focused coping. Considering the modality of our intervention, it also might have been difficult for the clinician and the patient to forge a working alliance: a stable basis for long-term follow-up. A relatively small sample size might additionally have contributed to this statistical insignificance.

The strength of our study is its low attrition rate. Among 36 participants, only one participant (2.8%) was dropped out of the study. This may have been possible because we had coordinated the follow-up assessment date on the same day of oncology appointment, minimizing participants' perceived burden. No participant dropped out especially from the intervention group, which may be explained by the participants' high satisfaction with the intervention: the average scores were above 3.5 (score range: 1–5) for all four questions in the survey. The participants showed the highest satisfaction (average score = 4.21) toward the contents of the psychoeducation material.

One of the major limitations of our study is that we could not assess whether the psychoeducation material was adequately delivered to each participant. Some patients might have had difficulty concentrating fully for 20 min. Also, the participants were small in number and had heterogeneous cancer types. Participants were younger than the general patients owing to age restriction, might be more willing to participate in novel interventions, and might have better cognitive function. Although the participants may not be a representative sample of all cancer patients undergoing chemotherapy, they may represent potential users of tablet PC-based psychoeducation. Thus, the study sample may reflect the generalizability of the results and the acceptability of the intervention.

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A high refusal rate was shown in our study: 73.1% among 134 potential candidates. In some studies on cancer patients' psychoeducation, refusal rates were unreported [22] or incalculable [10]. Once reported, however, the refusal rates were lower than that in our study. Boesen [5] reported a refusal rate of 34% among malignant melanoma patients in an outpatient clinic, where he tested the effectiveness of six weekly sessions of 2-h psychoeducation. The refusal rate was 37% among breast cancer patients when Jones [14] recruited them during scheduled radiation appointments for a 2-h didactic psychoeducation. Several attributes in our study may be associated with the high refusal rate: (1) we asked for informed consent when the eligible participants were possibly distracted during chemotherapy preparation; and (2) our intervention began immediately after giving consent, which could be perceived as both physically and mentally overwhelming.

The future researches on tablet PC-based intervention should incorporate a comparison of different doses of the intervention and measurement of the potential confounding factors (e.g., knowledge on coping). Short-term and long-term outcomes of psychiatric profile need further replication and validation. Developing more effective and acceptable psychoeducation material and determining its optimal positioning must be pursued in further research.

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Conflict of interest

There is no conflict of interest involved in this study.

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