Medicine®

Investigating effective treatment factors in brief cognitive behavioral therapy for panic disorder

Jae-A Lim, MA[a], Yoonji Irene Lee, MS[a], Joon Hwan Jang, MD, PhD[a,b], Soo-Hee Choi, MD, PhD[a,c,*]

Abstract

Numerous studies have provided evidence for the effectiveness of cognitive behavioral therapy (CBT) on panic disorders (PDs). There has also been growing attention on brief CBT with regard to delivering intensive treatment efficiently. This study investigated the essential parts of mindfulness-based brief CBT to optimize treatment benefits.

A total of 37 patients were retrospectively enrolled in this study. They were recruited from the anxiety/panic/fear clinic of Seoul National University Hospital. The patients participated in group CBT once a week for a total of 4 sessions over a 4-week period, when they were assessed using the Panic Disorder Severity Scale (PDSS), Anxiety Sensitivity Index-Revised (ASI-R), Albany Panic and Phobia Questionnaire (APPQ), State-Trait Anxiety Inventory (STAI), Beck Anxiety Inventory (BAI), Beck Depression Inventory (BDI), and Yale-Brown Obsessive Compulsive Scale (Y-BOCS) before and after brief CBT. Twenty-nine patients completed the 1-month follow-up.

There were significant reductions in PDSS ($P < .001$), ASI-R-fear of respiratory symptoms ($P = .006$), ASI-R-fear of publicly observable anxiety reaction ($P = .002$), ASI-R-fear of cardiovascular symptoms ($P < .001$), ASI-R-fear of cognitive dyscontrol ($P = .001$), ASI-R-Total ($P < .001$), APPQ-Agoraphobia ($P = .003$), APPQ-Total ($P = .028$), STAI-State anxiety ($P < .001$), STAI-Trait anxiety ($P = .002$), BAI ($P = .003$), and BDI ($P < .001$) scores. We also found significant associations between ASI-R-fear of cardiovascular symptoms, ASI-R-Total, and changes in PDSS scores. A stepwise multiple linear regression analysis indicated that anxiety sensitivity for fear of cardiovascular symptoms predicted an improvement in panic severity ($\beta = 0.513$, $P = .004$).

Our findings suggested that behavioral aspects, especially physiological symptom control, needed to be considered in brief, intensive CBT for PD. The results also suggested that a mindfulness-based brief CBT approach might be particularly helpful for patients with PD who have severe cardiovascular symptoms.

Abbreviations: APPQ = Albany Panic and Phobia Questionnaire, ASI-R = Anxiety Sensitivity Index-Revised, BAI = Beck Anxiety Inventory, BDI = Beck Depression Inventory, CBT = cognitive behavioral therapy, PD = panic disorder, PDSS = Panic Disorder Severity Scale, STAI = State-Trait Anxiety Inventory, Y-BOCS = Yale-Brown Obsessive Compulsive Scale.

Keywords: anxiety sensitivity, brief cognitive behavioral therapy, meditation, panic disorder, relaxation

1. Introduction

Panic disorder (PD) is an anxiety disorder characterized by recurrent unexpected episodes of sudden panic and fear. The unexpected panic attack has no obvious cue or trigger at the time of occurrence. In contrast, an expected panic attack is an attack for which there is an obvious cue or trigger. The frequency and severity of panic attacks vary widely.[1]

PD is associated with significant personal, social, and economic costs; fortunately, effective treatments for these conditions exist.[2] Cognitive behavioral therapy (CBT) for PD has proved its effectiveness in previous studies.[3,4] In a meta-analysis examining the efficacy of CBT for PD and/or agoraphobia, Mitte[5] found significant effects of CBT on measures of anxiety and clinically significant changes relative to nontreated control conditions, as well as medium effects for CBT on these measures relative to placebo-controlled treatments.[2] Porter and Chambless[2] identified several pretreatment variables that seems to predict improvement in CBT for PD and/or agoraphobia according to the meta-analysis, the narrative review, and the box score analysis. They found that several factors, such as agoraphobic avoidance, comorbid cluster C personality disorders and traits, functional impairment, and low expectancy of change, consistently predict decreased symptom improvement in CBT among this population. A previous study also showed that CBT targeted at panic attacks with comorbid heart disease produced significant reductions in panic attacks, general anxiety, and depression.[6] Furthermore, as anxiety and depression are severely influenced the disability and burden of cognitive impairments, psychotherapeutic interventions such as adaptive or compensatory strategies targeted at frontosubcortical functions, diaries, or formal cognitive remediation and neurorehabilitation programs not only decrease symptoms, but also

[a] Department of Psychiatry, Seoul National University Hospital, [b] Department of Medicine, Seoul National University College of Medicine, [c] Department of Psychiatry and Institute of Human Behavioral Medicine in SNU-MRC, Seoul National University College of Medicine, Seoul, Republic of Korea.

* Correspondence: Soo-Hee Choi, Department of Psychiatry, Seoul National University College of Medicine, 101 Daehak-ro, Jongno-gu, Seoul 03080, Republic of Korea (e-mail: soohchoi@snu.ac.kr).

disability associated with depression.[7] Despite these promising findings, a substantial minority of patients who undergo CBT for PD and/or agoraphobia fail to show significant symptom improvement; for this reason, many researchers have tried to identify predictors of CBT improvement.[2] To provide more effective treatments for a broad range of psychopathology, it is useful to examine baseline predictors of this psychopathology after CBT for PD.[8]

Several studies have also reported that very brief, intense, exposure-based interventions produce outcomes comparable to standard CBT in a matter of weeks,[9,10] or even days.[9,11] In general, standard CBT is delivered in 8 to 12 weekly sessions. However, individuals with part-time jobs or living far from the hospital have difficulties attending weekly treatments, and might refuse a treatment. Thus, brief CBT for PD should be regarded as a possibility for delivering effective treatment. Westling and Öst[10] investigated treatment effects for patients having PDs with or without mild agoraphobia using a 4-session CBT containing cognitive restructuring and interoceptive exposure, which showed significantly decreased anxiety and depression, self-reported panic attacks, agoraphobia, general anxiety, agora-phobic cognitions, anxiety sensitivity, and depression. It is therefore possible to achieve a clinically significant change with fewer sessions.[10] Also, small doses of mindfulness meditation training reduce self-reported psychological stress reactivity.[12] Mindfulness meditation can be used in many forms, but the core of each form is an experiential, comparatively nondiscursive observation of internal and/or external perceptual stimuli as they unfold in real time.[13] Tang et al. found that 5 training sessions on integrative body-mind training was effective in improving cognitive functioning, and in decreasing negative mood and stress-related cortisol levels.[14,15] Despite these studies, very few studies have examined the variety of outcomes of the positive results of brief meditation training reports.[14]

In this study, we identified essential treatment factors in mindfulness-based brief CBT for PD. In standard CBT, the benefits of identifying predictors of improvement are perhaps less obvious[2]; moreover, no specific predictor for the core part in brief, intensive CBT for PD has yet been reported.[8] Recognizing crucial factors in brief CBT for PD will establish treatment strategies for both standard and brief CBT interventions. Therefore, we investigated predictors to identify crucial aspects in brief CBT that would improve therapeutic approaches for PD. The brief CBT protocols used in this study focused on intensive relaxation and meditation training, and we identified whether this type of brief intervention would be effective in patients with PD. Specifically, we hypothesized that mindfulness-based brief CBT would affect domains of physiologic symptomatology such as palpitations, pounding heart, or accelerated heart rate.

2. Materials and methods

2.1. Participants

Data were collected retrospectively at Seoul National University Hospital. Eligible participants were 37 medicated patients (14 men and 23 women) with PD who attended a group CBT program. The psychiatrists provided psychiatric assessment and medication management, and designated brief CBT interventions. The mean patient age was 37.8 ± 10.7 years (men = 37.6 ± 10.72 years and women = 38.0 ± 10.9 years; $P = .335$). None of the participants had an acute medical illness that could have affected psychiatric symptoms during 1 month before CBT.

Thirty-three (14 men and 19 women) of the 37 patients (89.2%) who started the CBT program completed all CBT sessions. Twenty-nine patients (12 men and 17 women) completed the self-rating scales, both at pre- and post-CBT levels. The study protocol was approved by the Seoul National University Hospital Institutional Review Board (Seoul, Republic of Korea). The acquisition of the informed consent from the patients was waived due to the retrospective nature of this study.

2.2. CBT procedure

The brief CBT included a 4-session protocol consisting of a 60-minute lecture and 60-minute relaxation/meditation training, which were specifically designed to manage PD. Treatments were delivered collectively in once-weekly sessions. Treatment was targeted to panic attacks and the directly associated anxiety of panic symptoms, combined with exposure and cognitive restructuring. The main objective of the treatment was exposure to somatic sensations associated with panic attacks. Relaxation/meditation was included because it is a traditional behavioral treatment approach to anxiety-related disorders.

The first session started with psychoeducation about the nature of fear, anxiety, panic symptoms, and agoraphobia, as well as defining the stages of the treatment model and explaining its application to PDs. Participants were administered meditation training and relaxation, followed by education. The second session started with psychoeducation about understanding hyperventilation, meditation training, and muscle relaxation, followed by education. The third session started with psycho-education about dysfunctional automatic thoughts, followed by a further disputation of the catastrophic interpretation in relation to the patient's own list of evidences. After education, meditation training and relaxation were implemented. The fourth session started with psychoeducation about interoceptive exposure and real-life exposure. Participants performed meditation training and relaxation followed by education. The participants were also assigned homework after each session.

2.3. Clinical assessments

Patients answered the self-report clinical assessments at pre- and post-CBT sessions.

2.3.1. Panic Disorder Severity Scale. The Panic Disorder Severity Scale (PDSS) is a 5-point scale used to assess PD severity.[16] The participants rated the severity of 7 PD features on a scale ranging from 0 (none) to 4 (extreme). The 7 areas covered were frequency of panic attacks, distress during panic attacks, anticipatory anxiety, agoraphobic fear/avoidance, interoceptive fear/avoidance, work impairment/distress, and impairment of social functioning.[8] The Korean version of PDSS has been reported to have adequate reliability and validity.[17]

2.3.2. Anxiety Sensitivity Index-Revised. The Anxiety Sensitivity Index-Revised (ASI-R) is a 36-item, expanded version of the original ASI. Each item on a scale ranges from 0 (very little) to 4 (very much).[18] ASI-R consists of 4 lower-order factors, all of which are added to a single higher-order factor. The factors are as follows: fear of respiratory symptoms, fear of publicly observable anxiety reactions, fear of cardiovascular symptoms, and fear of cognitive dyscontrol. The ASI-R is a promising set of parameters for measuring anxiety sensitivity, and the reliability and validity of the Korean version of the ASI-R has been reported.[19]

2.3.3. Albany Panic and Phobia Questionnaire. The Albany Panic and Phobia Questionnaire (APPQ) is a scale that has been designed to measure the distinct dimensions of fears related to sensation-producing activities, in addition to fears associated with common agoraphobic and social phobic situations.[20,21] The scale consists of 27 items forming 3 subscales, which are interpreted as reflecting fear of agoraphobic situations ("agoraphobia"), fear of social situations ("social phobia"), and fear of activities that produce somatic sensations ("interoceptive"). Higher scores on the APPQ reflected higher levels of a particular fear.

2.3.4. State-Trait Anxiety Inventory. The State-Trait Anxiety Inventory (STAI) is a measure of state and trait anxiety.[22,23] The scale includes 20 items for assessing state anxiety and 20 for trait anxiety. All items are rated on a 4-point scale (e.g., from "almost never" to "almost always"). Higher scores indicated greater anxiety.

2.3.5. Beck Anxiety Inventory. The Beck Anxiety Inventory (BAI) is used to measure anxiety; it consists of 21 items rated on a 4-point scale regarding the severity of anxiety experienced during the past week.[24,25] Total scores from 0 to 7 indicate a minimal level of anxiety, those from 8 to 15 indicate mild anxiety, those from 16 to 25 indicate moderate anxiety, and those from 26 to 63 indicate severe anxiety.

2.3.6. Beck Depression Inventory. The Beck Depression Inventory (BDI) is a 21-item self-reported scale in which each item consists of 4 statements reflecting different levels of severity of a particular depressive symptom experienced during the past week.[26,27] A total score of 0 to 13 is classified as reflecting minimal depression, 14 to 19 as mild depression, 20 to 28 as moderate depression, and 29 to 63 as severe depression.

2.3.7. Yale-Brown Obsessive Compulsive Scale symptom checklist. The Yale-Brown Obsessive Compulsive Scale (Y-BOCS) symptom checklist elucidates specific obsessions and compulsions.[28] The scale consists of 8 categories measuring obsessions (aggressive, contamination, sexual, hoarding, religious, symmetry, somatic, and miscellaneous), and 7 areas for compulsions (cleaning, checking, repeating, counting, ordering, hoarding/collecting, and miscellaneous). We used a version of the Y-BOCS symptom checklist that was validated for the Republic of Korea.[29]

2.4. Statistical analysis

First, we performed exploratory data analysis to characterize distributions and outliers. Second, a paired t test was used to compare clinical rating scales at pretreatment and posttreatment. Effect size was measured using Cohen's d parameter. Third, Pearson correlation analysis was used to evaluate the associations among clinical assessments. Finally, a multiple linear regression analysis was conducted to identify the unique contribution of clinical features to the prediction of PD symptom reductions using brief CBT. Statistical analyses were performed using the Statistical Package for the Social Sciences software for Windows, version 21.0 (IBM, Armonk, NY). All statistical tests were 2-tailed, and P values $<.05$ were considered significant.

3. Results

Table 1 shows the participants' clinical characteristics. There were significant decreases in PDSS [$t(28)=4.999$, $P<.001$], ASI-R-Respiration [$t(28)=2.986$, $P=.006$], ASI-R-Publicly [$t(28)=3.343$, $P=.002$], ASI-R-Cardiovascular [$t(28)=4.190$, $P<.001$], ASI-R-Cognitive dyscontrol [$t(28)=3.680$, $P=.001$], ASI-R-Total [$t(28)=4.793$, $P<.001$], APPQ-Agoraphobia [$t(27)=3.280$, $P=.003$], APPQ-Total [$t(28)=2.318$, $P=.028$], STAI-State anxiety [$t(23)=4.360$, $P<.001$], STAI-Trait anxiety [$t(24)=3.392$, $P=.002$], BAI [$t(27)=3.217$, $P=.003$], and BDI [$t(27)=4.131$, $P<.001$] scores.

Table 2 shows correlations between the baseline clinical self-reported scales of patients. We added a delta PDSS variable to determine the critical features in panic symptom reductions during brief-intensive CBT. Delta PDSS scores were positively correlated with ASI-R-Cardiovascular ($r=0.513$, $P=.004$) and ASI-R-Total ($r=0.430$, $P=.020$) scores. In addition, there were significantly positive associations between panic-related measures and anxiety-related variables. Age was negatively

---

Table 1

Pre- and post-cognitive behavioral therapy clinical scale scores in patients with panic disorders.

Clinical variable	Pre (n=29) Mean±SD	Post (n=29) Mean±SD	T	P	Score range	Effect size
PDSS	10.621±6.184	6.362±6.396	4.999*	<.001	0–28	0.928
ASI-R-Respiration	21.586±11.773	16.655±11.537	2.986*	.006	0–48	0.555
ASI-R-Publicly	11.552±7.967	8.276±6.881	3.343*	.002	0–28	0.621
ASI-R-Cardiovascular	13.966±8.744	9.207±6.894	4.190*	<.001	0–44	0.778
ASI-R-Cognitive dyscontrol	5.483±4.983	2.897±3.783	3.680*	.001	0–24	0.683
ASI-R-Total	52.586±25.283	37.034±23.596	4.793*	<.001	0–144	0.890
APPQ-Agoraphobia	27.429±16.947	20.536±16.919	3.280*	.003	0–72	0.620
APPQ-Social phobia	21.000±18.130	15.621±14.763	1.865	.073	0–80	0.346
APPQ-Interoceptive	20.931±15.984	18.448±15.720	1.080	.289	0–64	0.201
APPQ-Total	69.379±38.655	53.897±40.894	2.318*	.028	0–216	0.430
STAI-State anxiety	50.250±7.958	41.750±11.144	4.360*	<.001	20–80	0.890
STAI-Trait anxiety	48.400±10.935	41.900±11.513	3.392*	.002	20–80	0.678
BAI	15.607±12.479	10.750±11.734	3.217*	.003	0–63	0.608
BDI	19.286±16.675	13.643±15.550	4.131*	<.001	0–63	0.781
Y-BOCS	4.000±3.391	3.517±3.860	0.646	.523	0–15	0.120

APPQ = Albany Panic and Phobia Questionnaire, ASI-R = Anxiety Sensitivity Index-Revised, BAI = Beck Anxiety Inventory, BDI = Beck Depression Inventory, PDSS = Panic Disorder Severity Scale, STAI = State-Trait Anxiety Inventory, Y-BOCS = Yale-Brown Obsessive Compulsive Scale.
* $P<.05$.

Table 2

Correlations between clinical scales at baseline.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
Age (1)	1																
PDSS (2)	−.267	1															
Delta PDSS (3)	.033	.324	1														
ASI-R Respiration (4)	−.256	.736*	.311	1													
ASI-R Publicly (5)	−.389**	.467*	.167	.459*	1												
ASI-R Cardiovascular (6)	−.006	.484*	.513*	.550*	.158	1											
ASI-R Cognitive dyscontrol (7)	−.496*	.523*	.277	.488*	.406**	.435*	1										
ASI-R Total (8)	−.337**	.749*	.430**	.878*	.641*	.747*	.711*	1									
APPQ-Agoraphobia (9)	−.042	.611*	.153	.611*	.330**	.475*	.209	.583*	1								
APPQ-Social phobia (10)	−.451*	.363**	.042	.246	.603*	.097	.338**	.394*	.435*	1							
APPQ-Interoceptive (11)	−.022	.499*	.193	.575*	.367**	.570*	.338**	.641*	.537*	.190	1						
APPQ-Total (12)	−.226	.638*	.165	.618*	.563*	.489*	.380**	.696*	.862*	.714*	.731*	1					
STAI-State anxiety (13)	−.478*	.580*	.029	.250	.325	.068	.443*	.330	.126	.273	.131	.230	1				
STAI-Trait anxiety (14)	−.441*	.561*	−.043	.394**	.357**	.175	.524*	.459*	.292	.416**	.175	.387**	.797*	1			
BAI (15)	−.382**	.757*	.199	.558*	.510*	.524*	.730*	.740*	.388**	.392**	.376**	.502*	.532*	.543*	1		
BDI (16)	−.292	.548*	.128	.552*	.311	.153	.401**	.476*	.283	.108	.324	.307	.486*	.578*	.438*	1	
Y-BOCS (17)	−.169	.139	−.110	.142	.172	.223	.282	.255	.027	.185	.034	.107	.018	.258	.195	.116	1

APPQ = Albany Panic and Phobia Questionnaire, ASI-R = Anxiety Sensitivity Index-Revised, BAI = Beck Anxiety Inventory, BDI = Beck Depression Inventory, PDSS = Panic Disorder Severity Scale, STAI = State-Trait Anxiety Inventory, Y-BOCS = Yale-Brown Obsessive Compulsive Scale.

* $P < .05.$
** $P < .01.$

correlated with ASI-R-Publicly ($r = -0.389$, $P = .019$), ASI-R-Cognitive dyscontrol ($r = -0.496$, $P = .002$), ASI-R Total ($r = -0.337$, $P = .044$), APPQ-Social phobia ($r = -0.451$, $P = .006$), STAI-State anxiety ($r = -0.478$, $P = .004$), STAI-Trait anxiety ($r = -0.441$, $P = .009$), and BAI ($r = -0.382$, $P = .024$).

Table 3 lists the predictors for essential treatment features for the improvement of panic symptoms. Based on the results of correlation analyses, we set ASI-R cardiovascular subscales and ASI-R total scores at baseline as independent variables, and the delta PDSS (pre-PDSS score minus post-PDSS score) as a dependent variable. The baseline ASI-R-cardiovascular subscale score predicted the delta PDSS score ($\beta = 0.513$, $P = .004$); no other variable was significant.

4. Discussion

The present study examined the crucial parts of brief CBT for PD, and provided evidence of anxiety sensitivity for fear of cardiovascular symptoms subscale at baseline that predicted panic symptom reductions in PD. The results were consistent with previous findings that ASI-physical scores were strongly associated with PD symptoms.[8,30] High scores on the ASI-physical concerns factor denoted worry about the physical health consequences of arousal sensations (e.g., heart palpitations leading to a heart attack).[30] Anxiety sensitivity has been shown to be significantly associated with the development of panic attack frequency and the incidence of panic, independently of negative effects.[31,32] Panic symptoms were especially pronounced for high ASI patients who had been trained to monitor

their heart rate before the challenge; hence, attention to sensations among those who fear them was notably panicogenic.[33] The ASI is a better predictor of response to biological challenges than are measures of general trait anxiety.[33–35] The strong association between elevated ASI scores and PDs has been replicated many times,[33,36] and ASI item analyses have indicated that fears of cardiorespiratory symptoms are especially prominent in PD.[33,37] These results supported the suggestion that physical concerns are most closely associated with PD,[30,38] specifically, ASI-R-fears of cardiovascular symptoms may be an important predictor of the clinical course of PD, but we could not find ASI-R-fears of respiratory symptoms predicting reduction in panic symptoms in this study.

We also observed clinically significant reductions in self-rated PD symptoms, anxiety, and depression after a 1-month CBT intervention. The results of the present study showed that patients significantly improved from pre- to post-treatment on self-rated measures. These results were consistent with previous studies reporting the effectiveness of short-term CBT for PD.[10,39] A brief four sessions of CBT for patients having PD yielded a significant improvement of panic symptoms at 4 weeks of post-treatment and 6-month follow-up.[10] In addition, treatment effects of a 2 days of brief intensive group CBT for patients with agoraphobia with panic attacks were also maintained after 1-year follow-up.[11] Brief mindfulness meditation intervention also induced greater changes when compared to the sham meditation and control groups in distressed moods and heart rates, suggesting that brief mindfulness meditation training was effective for reducing overall negative moods, including depression, tension, fatigue, confusion and

Table 3

Stepwise multiple linear regression analysis for the effect of a unique predictor of improvement in panic symptoms.

Change in scores	Significant predictor	β	R^2	SE	t	P	95% CI (lower)	95% CI (upper)
PDSS	ASI-R-Cardiovascular	0.513	0.263	4.010	3.106	.004	0.091	0.447

The table shows the standardized beta coefficient.
ASI-R = Anxiety Sensitivity Index-Revised, CI = confidence interval, PDSS = Panic Disorder Severity Scale, SE = standard error.

anxiety, and for lowering heart rate.[14] Moreover, an empirical study revealed that higher baseline heartbeat perception-accuracy could lead to enhanced therapeutic gains concerning agoraphobic behaviors and beliefs, which adopted brief form of standard CBT for PD with agoraphobia.[40]

We also found that age was negatively correlated with anxiety-related variables. This observation was consistent with the finding that the severity of anxiety symptoms during episodes of anxiety disorders decreased over time for each of the anxiety disorders examined (PD, generalized anxiety disorder, and social phobia), and these findings added to the limited empirical data available on the long-term course of anxiety disorders.[41] However, whether anxiety sensitivity also becomes more important for the development of anxiety-related psychopathology in a linear fashion as adults age is unclear.[31] Our results did not include information about the duration of illnesses, so this negative association should be investigated in future research with detailed demographic information. Moreover, we did not observe a significant reduction in APPQ-Social phobia and APPQ-Interoceptive subscales; these results might be due to the psychometric properties of the APPQ subscales. The APPQ scale was developed for identification of overt activities feared by individuals with PD and PD with agoraphobia, so the scale measured the fear of overt activities associated with somatic sensations,[42] whereas ASI was indicative of beliefs about the personal consequences of experiencing anxieties.[43] ASI is unique, not only when compared with trait anxiety but also when compared with the much broader personality trait of negative effects.[43] Individuals who did not experience serious anxieties or panic attacks could possibly have high levels of anxiety sensitivity. This study involved patients with PD who have relatively less severe panic symptoms, so the participants' characteristics might have affected the present results.

Our findings suggested that behavioral aspects, particularly managing fear of cardiovascular symptoms, should be included in brief, intensive CBT to improve therapeutic efficiency. Also, we concluded that this type of brief intervention could be particularly effective for PD patients who suffered from cardiovascular symptoms. More specifically, increasing awareness of heartbeat perception through heart rate biofeedback strategies would facilitate habituation during exposure session,[40] this approach could help perceiving their own heartbeats more precisely. In a heartbeat perception task, known as "mental tracking,"[44] participants are asked to silently count all heartbeats they feel in their body, without taking their pulse.[45] To the best of our knowledge, no study has investigated the treatment effect in mindfulness-based brief CBT containing "mental tracking" paradigm, it would be interesting research topic concerning therapeutic efficacy in PD population.

This study had several limitations. First, the study did not include a control group, and analyses of the effects of brief CBT relied on within-group changes. We could not conclude that CBT was responsible for the changes shown in the participants. Second, our sample was somewhat more functional than the PD population at large, as evidenced by the relatively mild panic severities and anxiety/depression levels. Thus, brief CBT may not suitable for all individuals with PD. Third, there was no assessment to determine whether the effects of brief CBT were as effective as those of standard treatment.

In conclusion, our results indicated that managing anxiety sensitivity for fear of cardiovascular symptoms may be a crucial factor in PD symptom reduction. Therefore, it might be useful to emphasize a behavioral approach, especially physiological symptom reduction, in brief CBT sessions. In addition, it is possible that patient help themselves to perceive their own heartbeat accurately in brief CBT session, PD patients who have severe fear of cardiovascular symptoms will benefit the most from this type of brief CBT intervention.

Author contributions

Conceptualization: Joon Hwan Jang, Soo-Hee Choi.
Formal analysis: Jae-A Lim.
Funding acquisition: Joon Hwan Jang, Soo-Hee Choi.
Investigation: Yoonji Irene Lee.
Methodology: Jae-A Lim, Joon Hwan Jang.
Supervision: Joon Hwan Jang, Soo-Hee Choi.
Validation: Joon Hwan Jang, Soo-Hee Choi.
Writing – original draft: Jae-A Lim.

References

[1] American Psychiatric Association. Diagnostic and statistical manual of mental disorders: DSM-5. 5th ed. Washington, DC: American Psychiatric Association; 2013.

[2] Porter E, Chambless DL. A systematic review of predictors and moderators of improvement in cognitive-behavioral therapy for panic disorder and agoraphobia. Clin Psychol Rev 2015;42:179–92.

[3] Tim H, Tilo K, Benjamin S, et al. Predicting treatment response to cognitive behavioral therapy in panic disorder with agoraphobia by integrating local neural information. JAMA Psychiatry 2015;72:68–74.

[4] Tsao JC, Lewin MR, Craske MG. The effects of cognitive-behavior therapy for panic disorder on comorbid conditions. J Anxiety Disord 1998;12:357–71.

[5] Mitte K. A meta-analysis of the efficacy of psycho- and pharmacotherapy in panic disorder with and without agoraphobia. J Affect Disord 2005;88:27–45.

[6] Tully PJ, Sardinha A, Nardi AE. A New CBT model of panic attack treatment in comorbid heart diseases (PATCHD): how to calm an anxious heart and mind. Cogn Behav Pract 2017;24:329–41.

[7] Gonda X, Pompili M, Serafini G, et al. The role of cognitive dysfunction in the symptoms and remission from depression. Ann Gen Psychiatry 2015;14:27.

[8] Ino K, Ogawa S, Kondo M, et al. Anxiety sensitivity as a predictor of broad dimensions of psychopathology after cognitive behavioral therapy for panic disorder. Neuropsychiatr Dis Treat 2017;13:1835–40.

[9] Deacon BJ, Abramowitz JS. A pilot study of two-day cognitive-behavioral therapy for panic disorder. Behav Res Ther 2006;44:807–17.

[10] Westling BE, Ost LG. Brief cognitive behaviour therapy of panic disorder. Scand J Behav Ther 1999;28:49–57.

[11] Evans L, Holt C, Oei TPS. Long term follow-up of agoraphobics treated by brief intensive group cognitive behavioural therapy. Aust N Z J Psychiatry 1991;25:343–9.

[12] Creswell JD, Pacilio LE, Lindsay EK, et al. Brief mindfulness meditation training alters psychological and neuroendocrine responses to social evaluative stress. Psychoneuroendocrinology 2014;44:1–2.

[13] Rahl HA, Lindsay EK, Pacilio LE, et al. Brief mindfulness meditation training reduces mind wandering: the critical role of acceptance. Emotion 2017;17:224–30.

[14] Zeidan F, Johnson SK, Gordon NS, et al. Effects of brief and sham mindfulness meditation on mood and cardiovascular variables. J Altern Complement Med 2010;16:867–73.

[15] Tang Y-Y, Ma Y, Wang J, et al. Short-term meditation training improves attention and self-regulation. Proc Natl Acad Sci 2007;104:17152–6.

[16] Shear M, Brown T, Barlow D, et al. Panic disorder severity scale—self report form. Am J Psychiatry 1997;154:1571–5.

[17] Lee EH, Kim JH, Yu BH. Reliability and validity of the self-report version of the panic disorder severity scale in Korea. Depress Anxiety 2009;26: E120–3.

[18] Deacon BJ, Abramowitz JS, Woods CM, et al. The Anxiety Sensitivity Index-Revised: psychometric properties and factor structure in two nonclinical samples. Behav Res Ther 2003;41:1427–49.

[19] Lim YJ, Yu BH, Kim JH. Korean Anxiety Sensitivity Index-Revised: Its factor structure, reliability, and validity in clinical and nonclinical samples. Depress Anxiety 2007;24:331–41.

[20] Brown TA, White KS, Barlow DH. A psychometric reanalysis of the Albany Panic and Phobia Questionnaire. Behav Res Ther 2005;43:337–55.

[21] Kim JH, Yang JC, Kim JB, et al. A validation study of Korean Albany Panic and Phobia Questionnaire (APPQ). J Korean Neuropsychiatr Assoc 2004;43:329–36.

[22] Spielberger CD, Gorsuch RL, Lushene RE. Manual for the State-Trait Anxiety Inventory. 1970;Consulting Psychologists Press, Palo Alto, CA:1–23.

[23] Hahn D-W, Lee CH, Chon KK. Korean adaptation of Spielberger's STAI (K-STAI). Korean J Heal Psychol 1996;1:1–4.

[24] Beck AT, Epstein N, Brown G, et al. An inventory for measuring clinical anxiety: psychometric properties. J Consult Clin Psychol 1988;56:893–7.

[25] Yook SP, Kim ZS. A clinical study on the Korean version of Beck Anxiety Inventory: comparative study of patient and non-patient. Korean J Clin Psychol 1997;16:185–97.

[26] Beck AT, Ward CH, Mendelson M, et al. An inventory for measuring depression. Arch Gen Psychiatry 1961;4:561–71.

[27] Lee YH, Song JY. A study of the reliability and the validity of the BDI, SDS, and MMPI-D Scales. Korean J Clin Psychol 1991;10:98–113.

[28] Goodman W, Rasmussen S, Price L, et al. Yale-Brown Obsessive Compulsive Scale (Y-BOCS). Verhaltenstherapie 1991;1:226–33.

[29] Seol S-H, Kwon JS, Shin M-S. Korean self-report version of the Yale-Brown obsessive-compulsive scale: factor structure, reliability, and validity. Psychiatry Investig 2013;10:17–25.

[30] Olthuis JV, Watt MC, Stewart SH. Anxiety Sensitivity Index (ASI-3) subscales predict unique variance in anxiety and depressive symptoms. J Anxiety Disord 2014;28:115–24.

[31] Olatunji BO, Wolitzky-Taylor KB. Anxiety sensitivity and the anxiety disorders: a meta-analytic review and synthesis. Psychol Bull 2009; 135:974–99.

[32] Schmidt NB, Keough ME, Timpano KR, et al. Anxiety sensitivity profile: predictive and incremental validity. J Anxiety Disord 2008;22:1180–9.

[33] McNally RJ. Anxiety sensitivity and panic disorder. Biol Psychiatry 2002;52:938–46.

[34] Rapee RM, Medoro L. Fear of physical sensations and trait anxiety as mediators of the response to hyperventilation in nonclinical subjects. J Abnorm Psychol 1994;103:693–9.

[35] Sturges LV, Goetsch VL, Ridley J, et al. Anxiety sensitivity and response to hyperventilation challenge: physiologic arousal, interoceptive acuity, and subjective distress. J Anxiety Disord 1998;12:103–15.

[36] Cox BJ, Borger SC, Enns MW. Anxiety sensitivity and emotional disorders: psychometric studies and their theoretical implications. Anxiety Sensitivity: Theory, Research, and Treatment of the Fear of Anxiety. The LEA Series in Personality and Clinical Psychology Lawrence Erlbaum Associates Publishers, Mahwah, NJ: 1999;115–48.

[37] Blais MA, Otto MW, Zucker BG, et al. The Anxiety Sensitivity Index: item analysis and suggestions for refinement. J Pers Assess 2001;77: 272–94.

[38] Rodriguez BF, Bruce SE, Pagano ME, et al. Factor structure and stability of the Anxiety Sensitivity Index in a longitudinal study of anxiety disorder patients. Behav Res Ther 2004;42:79–91.

[39] Zlomke K, Davis TE3rd. One-session treatment of specific phobias: a detailed description and review of treatment efficacy. Behav Ther 2008;39:207–23.

[40] Masdrakis VG, Legaki EM, Vaidakis N, et al. Baseline heartbeat perception accuracy and short-term outcome of brief cognitive-behaviour therapy for panic disorder with agoraphobia. Behav Cogn Psychother 2015;43:426–35.

[41] Ramsawh HJ, Raffa SD, Edelen MO, et al. Anxiety in middle adulthood: effects of age and time on the 14-year course of panic disorder, social phobia and generalized anxiety disorder. Psychol Med 2009;39:615–24.

[42] Rapee RM, Craske MG, Barlow DH. Assessment instrument for panic disorder that includes fear of sensation-producing activities: the Albany Panic and Phobia Questionnaire. Anxiety 1994;1:114–22.

[43] Reiss S. Expectancy model of fear, anxiety, and panic. Clin Psychol Rev 1991;11:141–53.

[44] Schandry R. Heart Beat Perception and Emotional Experience. Psychophysiology 1981;18:483–8.

[45] Willem Van Der Does AJ, Antony MM, Ehlers A, et al. Heartbeat perception in panic disorder: a reanalysis. Behav Res Ther 2000;38: 47–62.