Running head: KNOWLEDGE AND PANIC TREATMENT

Importance of Knowledge in the Behavioral Treatment of Panic Disorder

 Extended Report

Abstract

**Background**: Cognitive Behavioral Therapy (CBT) for panic disorder encourages patients to learn about and make changes to thoughts and behavior patterns that maintain symptoms of the disorder. Instruments to assess whether or not patients understand therapy content do not currently exist.

**Aims**: The aim of this study was to examine if increases within specific knowledge domains of panic disorder were related to improvement in panic symptoms following an intensive two-day panic treatment.

**Method**: Thirty-nine Veterans enrolled in an intensive weekend panic disorder treatment completed knowledge measures immediately before the first session of therapy and at the end of the last day of therapy. Four panic disorder experts evaluated items and reached consensus on subscales. Subscales were reduced further to create psychometrically sound subscales of catastrophic misinterpretation (CM), behaviors (BE), and self-efficacy (SE). A simple regression analysis was conducted to determine whether increased knowledge predicted symptom change at a 3-month follow-up assessment.

**Results**: The overall knowledge scale was reduced to three subscales BE (*n* = 7), CM (*n* = 13), and SE (*n* = 8) with good internal consistency. Veterans improved knowledge of panic disorder from pre- to post-treatment. Greater increase in scores on the knowledge assessment predicted lower panic severity scores at a 3-month follow-up. A follow-up analysis using the three subscales as predictors showed that only changes in CM significantly contributed the prediction.

**Conclusions**: Veterans acquired new knowledge during an intensive weekend of panic treatment. Furthermore, in an intensive therapy format, reduction in panic severity was related to improved knowledge overall, but particularly as a result of fewer catastrophic misinterpretations.

KEYWORDS: Panic Treatment, Knowledge, Psychoeducation, Mechanisms of Change

Importance of Knowledge in the Behavioral Treatment of Panic Disorder

Annual rates of panic disorder (PD) in the general public are near 3% (Kessler, Chiu, Demler & Walters, 2005) and two to three times higher among Veterans (6.1% – 8.3%; Barrera, Graham, Dunn & Teng, 2013, Gros, Frueh & Magruder, 2011). Panic attacks are discrete periods of sympathetic nervous- system activation, which include physical sensations (e.g., rapid heart rate, increased respiration and sweating) and often co-occur with anxiety, mood, and personality disorders (Eaton, Kessler, Wittchen & Magee, 1994; Kessler et al., 2006; Ozkan & Altindag, 2005; Powers & Westen, 2006; Reich et al, 1994). Diagnostic criteria for PD include having unexpected panic attacks, negative beliefs about medical and social consequences of symptoms, fear about future attacks, and impaired functioning (Barlow, 1991; Beck, Emery & Greenberg, 1985; Clark, 1986; Foa & Kozak, 1986; McNally, 1994; Salkovskis, Clark & Gelder, 1996). PD severely impacts quality of life (Barrera, Hiatt, Dunn & Teng, 2012).

Cognitive Behavioral Therapy (CBT) is the recommended treatment for PD (National Institutes of Mental Health, NIMH, 2016) and emphasizes the role of thoughts (e.g., negative interpretation of symptoms) and behaviors (escape/avoidance) in the etiology and maintenance of PD (Craske & Barlow, 2007, Nelles & Barlow, 1988). Panic attacks occur when a person perceives a benign physical sensation (e.g., rapid heart rate) as threatening. Threat perception triggers the autonomic nervous system (fight-or-flight response), creating a feedback loop between the feared thought and physiological activation, intensifying the panic attack. Panic disorder occurs when individuals increase their estimation about the likelihood or consequences of a future attack, which can lead to avoidance. Treatments target catastrophic thoughts (Casey, Newcombe & Oei, 2005; Clark, 1988; McNally, 1990) and escape/avoidance behaviors (Craske & Barlow, 2007) as a way to deconstruct the negative feedback loop. Self-efficacy, or the belief in one’s ability to enact cognitive and behavioral changes, supports the treatment response (Casey et al., 2004).

Cognitive restructuring (Williams & Falbo, 1996; Salkovskis, Clark, Hackman, 1991) is effective in changing negative beliefs about sympathetic nervous-system activation and the social consequences of panic attacks into more balanced and accurate views. Behavioral interventions such as in vivo/situational exposure (van den Hout, Arntz & Hoekstra, 1994; Rjjken, Kraaimaat, de Ruiter & Garssen, 1992) and interoceptive exposure (Craske et al., 1997; Hecker et al., 1998; Ito et al., 1996) reduce escape and avoidance behaviors. CBT reduces over-breathing which is a secondary trigger for panic symptoms (di Beurs, Lange, van Dyck & Koele, 1995). Psychoeducation, repeated practice with techniques and improvements in quality of life indirectly improve self-efficacy (Stewart & Watt, 2008).

A large literature supports pre- to post- treatment symptom changes in CBT treatments for panic; however, little research explores mechanisms underlying these changes. To our knowledge, no studies have examined whether gaining knowledge about the processes underlying panic attacks and PD during treatment influences symptom changes. We posit that a patient’s ability to comprehend treatment-related information plays an important role in determining whether he/she can effectively apply what is learned in treatment and, subsequently, experience symptom reduction. This is consistent with a growing body of research evaluating “competency models” of assessment as a way to guide treatment.

The competency model asserts that mastery of knowledge and skills is a prerequisite for symptom change (Bryan, et al., 2012). Using competency to assess outcomes can also improve efficacy because it establishes a feedback mechanism to both the therapist and patient to help individualize elements of treatment.

 For this study, knowledge of the key domains in PD (catastrophic misinterpretation, escape/avoidance behaviors and self-efficacy; Cho, Smits, Powers & Telch, 2007; Harvey, Richards, Dziadosz & Swindell, 1993; Oei et al., 1999) were identified within a larger measure of PD-related knowledge questions. Because this is the first instrument to measure these constructs, psychometric properties of each subscale were evaluated. Next, data were analyzed to determine whether patients (1) mastered therapy-related information and (2) whether the degree of change in knowledge over the course of treatment impacted symptom severity at follow-up. We predicted that, after an intensive two-day panic treatment, participants would evidence increases in knowledge across domains and that knowledge would predict symptom severity at follow-up. Furthermore, we conducted a secondary analysis to assess the relative contribution of each domain of knowledge (i.e., catastrophic misinterpretations, escape avoidance behaviors, self-efficacy) to the prediction of panic severity. Our rationale in conducting this analysis was to explore whether panic treatment in an intensive therapy format impacts the domains of PD equally.

**Method**

**Participants**

 This study involves secondary data analyses of thirty-nine Veterans from all recent war eras (e.g., Vietnam, Persian Gulf, Afghanistan/Iraq) who participated in an open trial of a two-day course of Intensive Panic Control Treatment (IPCT; Teng et al., 2015) at a large VA hospital in the southeast. The mean age of this sample was 39.4 years (*SD =* 13.31). Most of the sample was male (*n* = 31; 80%); 46% were African American, 41% were Caucasian and 13% were Hispanic. Regarding partnership status, 51% percent were married, 20% were separated/divorced and 28% were single. All had graduated from high school, and 88% had attended at least some college. Of all participants, 46% served during Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) and 79% held a service-connected disability status. Inclusion criterion for the study was a current diagnosis of PD. All participants held diagnoses of current PD with or without agoraphobia, and 58.2% had a comorbid PTSD diagnosis based on structured clinical interviews. Veterans with current substance dependence, active suicidality or psychosis were excluded.

**Treatment**

 Intensive Panic Control Treatment (IPCT; Teng et al., 2015) was adapted from Panic Control Treatment (PCT), an empirically supported, cognitive behavioral treatment for PD (Craske, Barlow & Meadows, 2000). Components of PCT are typically delivered across 12 weeks in either an individual or group format. Content includes psychoeducation regarding the cycle of panic including physiological changes. Cognitive restructuring techniques focus on reducing catastrophic misinterpretations of panic attacks. Behavioral exercises include breathing retraining and engaging in symptom induction exercises that mimic panic symptoms interoceptive exposure). The final component of treatment focuses on generalizing skills to daily life (in vivo exposure). In the original format, PCT has demonstrated 70-80% reductions in the frequency and severity of panic attacks in civilian (Barlow, Craske, Cerny & Klosko 1989) and Veteran populations (Teng et al., 2008). Participants undergoing IPCT receive all components of PCT during two six-hour treatment sessions on consecutive days, reducing opportunities for between-session practice/reinforcement of skills. IPCT has demonstrated significant reductions in anxiety sensitivity, panic attack frequency, and panic attack fear, similar to PCT (Teng et al., 2015).

 Brief, intensive treatments allow Veterans to initiate an evidence-based psychotherapy while reducing the risk of drop out due to obligations, such as work, school and family (Ouimette, et al., 2011) with comparable clinical outcomes and satisfaction to weekly sessions (Teng et al., 2015).

**Measures**

The Anxiety Disorders Interview Schedule for *DSM-IV* (ADIS-IV; Brown, Barlow, & Di Nardo, 1994) is a structured clinical interview that assesses a variety of Axis I diagnoses including anxiety, mood and substance use problems. The measure has demonstrated strong reliability and validity for all diagnostic categories assessed (Di Nardo, Moras, Barlow, Rapee, & Brown, 1993). Participants were administered the PD, depression and substance use modules of the ADIS-IV.

The Knowledge Assessment (KA) was adapted for use in the current study and has not been tested in its original format. Items on the instrument were selected from the Mastery of Anxiety and Panic Manual (MAP-Manual; Barlow & Craske, 1994) “self-assessment” items that appear at the end of each session. Sixty-seven true-or-false items assess patient knowledge of panic symptoms, knowledge of effective symptom management and beliefs about ability to manage symptoms. KA scores are based on accurate responses to items, with 1 being assigned for each correct response and 0 being assigned for each incorrect response. Scores range from 0 to 67, with higher scores indicating higher levels of comprehension and knowledge.

Veterans also completed Panic Records (Barlow & Craske, 1994) during the seven days preceding the first day of treatment, the seven days immediately following the last day of treatment and the seven-day period prior to the three-month follow-up assessment. Participants recorded the details of each panic attack, including the date, time and trigger of the attack and symptoms they experienced during the attack, using a checklist of common panic symptoms and peak level of fear, using a scale from 0 (*minimum fear*) to 8 (*extreme fear*).

**Procedure**

Veterans completed KA questionnaires on the first day of treatment and at the end of the second day of treatment. Trained masters- and doctoral-level therapists administered the PD, depression and substance abuse sections of the ADIS-IV interview one week prior to treatment and one week after treatment. A different clinician performed the assessment at each time point whenever possible; however, interviewers were not masked to participant diagnosis.

**Statistical Analysis**

 Four study clinicians evaluated items from the KA and identified conceptual themes or categories. Catastrophic Misinterpretations (CM), Self-efficacy (SE), and Behaviors (BE) were the consensus categories and are consistent with the literature on the CBT model for PD (Casey et al., 2004; Cho, Smits, Powers & Telch, 2007). Clinicians used definitions of each category based on widely available published definitions of the three constructs. The *behaviors* definition included items addressing “things one can do” to manage their anxiety symptoms. The definition provided for *catastrophic misinterpretation* included items with interpretations of benign physical sensations as dangerous or life threatening. The *self-efficacy* definition referred to items involving beliefs about one’s ability to manage symptoms or to overcome panic disorder. Clinicians first independently evaluated each of the 67 items followed by a group meeting to reach consensus. Items were assigned to one designated category when high consensus was attained. Next, each item was correlated with its assigned category to test for correlation with the overall scale. Items with low correlation were eliminated from the subscale (*r* < .30; Carper et al., 2012). Internal consistency was calculated for the remaining items within each subscale.

Pre- to post-treatment changes for the KA total and the three subscales were assessed using paired *t*-tests. Also, we examined changes in PA severity using a paired t-test. Next, we calculated residualized change scores (Twisk & Proper, 2004) from pre- to post-treatment for the KA total and subscale scores. To assess the effects of change in knowledge on PA symptoms, we conducted a simple regression to assess the relationship of residualized KA total scores on PA severity measured at the 3-months follow-up. Following this first analysis which examined changes in the KA overall, we conducted a multiple linear regression model to assess the relative contribution of each KA subscale (i.e., CM, SE, BE) on symptom severity.

**Results**

**Preliminary Analyses**

Of the 39 Veterans enrolled in the study, four did not complete the second day of IPCT and were not included in the analyses. Statistical analyses were not possible to compare between IPCT completers and drop-outs due to too few cases in the drop-out condition. Median scores on each of the continuous baseline variables were as follows: completers had a median age of 37 (range: 23-67), median KA total of 23 (range: 4-27), and median PA severity of 5.3 (range: 1-8); drop-outs had a median age of 31 (range: 26-56) median KA total of 21 (range: 20-23), and median PA severity of 5.0 (range: 2-7). Differences on categorical baseline variables were not assessed as there were fewer than five drop-outs. Three additional participants who completed both days of IPCT but did not complete the post-KA were retained for analyses.

**Scale Development**

Using data from the pre-treatment administration of the KA (*n* = 35 Veterans), we retained 65 of the 67 items in the overall scale because they capture the overall construct of general knowledge. We eliminated two items from the total score due to wording and clarity problems. Clinicians initially identified 48 items that corresponded to definitions of catastrophic misinterpretation (CM), self-efficacy (SE), and behaviors (BE). Clinicians reached consensus on 43 items and failed to reach consensus on three items, which we considered for more than one category in the second phase of scale development. The final three extracted scales were comprised of 28 unique items.

**Behaviors (BE).** Clinicians identified 20 items that fit the definition of BE. Examples of items in this category included knowledge related to the function of tracking panic attacks and the purpose of breathing control exercises. Internal consistency on the original 20-item scale was low α = .50. Thirteen items showed low correlation with the overall scale (α < .30) and were removed. The remaining 7 items were re-assessed and yielded adequate internal consistency, α = .73. Participants answered an average of 4.23 (*SD* = 1.83) questions correctly out of 7 (60%) at immediate pre-treatment.

**Catastrophic Misinterpretation (CM).** Clinicians identified eighteen items that fit the definition of CM. Examples of items in this category included interpretations about the symptoms of a panic attack and beliefs about the immediate and long-term consequences of panic attacks on mental and physical health. Internal consistency on the original 18-item scale was high α = .80. However, five items showed low correlation with the overall scale (*r* < .30) and were removed. The remaining 13 items were re-assessed and yielded improved internal consistency, α = .88. Participants answered an average of 9.63 (*SD* = 3.55) questions correctly out of 13 (74%) at immediate pre-treatment.

**Self-Efficacy (SE).** Clinicians initially identified ten items that fit the definition of SE. Examples of items in this category centered on beliefs of the degree to which people felt they could control panic attacks. Internal consistency on the original 10-item scale was acceptable, α = .76. Two items showed low correlation with the overall scale (*r*  < .30) and were removed. The remaining eight items were re-assessed and yielded adequate internal consistency, α = .86. Participants answered an average of 6.63 (*SD* = 2.14) questions correctly out of 8 (83%) at immediate pre-treatment.

**Changes in Knowledge from Pre- to Post-treatment**

We examined change in KA from pre- to post-treatment using paired t-tests. Participants demonstrated a significant increase in total knowledge from pre- to post- treatment (*t* = 5.91, *p* < .001). At pre-treatment, they responded correctly to an average of 21.16 (*SD* = 5.28) or approximately 68.3% of the items. At post-treatment, the mean total score increased to 24.94 (*SD* = 4.28) or approximately 83.1% of items. This increase represents a 13% increase in overall panic knowledge. Statistically significant increases in knowledge occurred from pre- to post- treatment on all KA subscales with all changes significant at or below *p* = .05. The KA total and BE subscale showed large effect-size increases in knowledge from pre- to post-treatment whereas the CM and SE subscales showed medium effect size (See Table 1).

**Changes in Symptoms from Pre-Treatment to 3-Month Follow Up**

We examined change in PA severity from pre-treatment to 3-month follow-up using a paired t-test. Participants demonstrated a significant decrease in PA severity from pre-treatment (*M* = 4.6, *SD* = 2.4) to 3-month follow-up (*M* = 1.7, *SD* = 2.6); *t*(18) = -3.56, *p* = 0.002.

**Relationship between Knowledge and Changes in Symptoms**

We first conducted a simple linear regression to examine the predictive value of residualized change in KA total scores from pre- to post-treatment on PA severity measured at the 3-month follow-up assessment. Results showed that residualized KA total change scores significantly predict PA severity at follow-up, *R*2=.261, *F*(1,19) = 6.70, *p* = .018 (see Table 2). Each one-point increase in the residualized KA total change scores leads to a 1.48 decrease in PA severity.

To further elucidate the impact of KA scores on symptom severity, we conducted a multiple regression model including each of the three subscales as predictors. The overall regression model was statistically significant, *R*2=.397, *F*(3,17) = 3.73, *p*=.031 (see Table 2). However, examination of each KA subscale indicated that only CM subscale change scores (*p* = .006) significantly predicted PA severity at follow-up; change in the BE (*p* = .856) and SE (*p* = .357) subscales did not add to the prediction of PA severity. The results show that each one-point increase in the residualized CM subscale change score leads to a 2.173 decrease in PA severity.

**Discussion**

Findings from this study point toward important mechanisms of change underlying cognitive behavioral treatments for panic disorder and provide a rationale and methodology for assessing knowledge acquisition during the course of treatment. Consistent with the competency model, which specifies that knowledge acquisition is associated with positive treatment outcome and long-term symptom change, the current study demonstrated associations between CM (which decreased by the end of IPCT) and PA severity at follow-up.

Participant scores at immediate pre-treatment suggested that patients possessed inaccurate knowledge related to the behaviors (BE) that maintain PD but relatively accurate knowledge about the dangerousness of symptoms (CM) and the likelihood of overcoming PD (SE). Consistent with hypotheses, Veterans lacked knowledge of appropriate behavioral responses when feeling anxious, endorsing approximately half of the questions on this subscale in the direction of avoidance, escape and distraction. Increased knowledge of the appropriate techniques for symptom management at post-treatment indicated that many misperceptions about the utility of escape and avoidance had shifted towards more adaptive beliefs. This underscores the importance of in-session practice of interoceptive exposure and attention to encouraging out-of-session in vivo practice to reinforce skills. Improvement in BE scores from pre- to post-treatment is notable; as IPCT is brief, and there is little opportunity to practice and hone skills. General knowledge related to CM and SE was better than we anticipated at immediate pre-treatment, and Veterans were able to accurately identify statements about the dangerousness of symptoms and self-efficacy related to overcoming symptoms.

Several explanations are offered for the inconsistencies observed between Veteran performance on the pre-treatment knowledge measure and self-reported catastrophic thinking and low self-efficacy when facing panic attacks. These include (a) lack of emotional activation during measure completion and (b) objective knowledge when calm versus emotion-laden cognitions that occur during the panic attack. Implications for this measure include the importance of teaching the patient to access knowledge at times when anxiety is acute. This can be reinforced during exposure activities such as interoceptive exposure exercises during the treatment session.

An interesting finding of the study was that only change in knowledge relating to catastrophic misinterpretations, and not change in knowledge relating to behaviors or self-efficacy, predicted PA severity. This finding is supported by the cognitive model, which recognizes the important role of automatic thoughts in the intensification and exacerbation of panic symptoms. Treatments that can effectively modify such beliefs, especially in compressed protocols are critical. Our analyses showed that each of these knowledge domains might play a role in preventing PA from occurring. However, in compressed treatment formats changes in catastrophic misinterpretations are particularly salient. It is possible that increases in knowledge of self-efficacy and behavior may require coaching and extended support following the compressed treatment. Future studies would do well to compare change in knowledge and its subsequent impact on functioning between standard and compressed delivery methods.

Limitations to this study include the use of a pilot sample and an untested method for measuring knowledge. Though encouraging that there were few drop-outs for the treatment, this precluded statistical analyses to compare completers to drop-outs. Items are face valid, and the sample size is small. Additionally, items on the measure are scored by marking true or false limiting the variability and increasing the likelihood of false positive scores on an item (50% chance of answering each item correctly). Another limitation is that these analyses relied solely on patient self-report of panic knowledge and symptoms. Finally, as an open-trial, findings should be interpreted with caution due to the lack of a comparison group.

Future directions for this research would be to collect data on a large, representative sample of PD patients to validate the psychometric properties of the instrument thoroughly. A factor analysis could strengthen the measure by evaluating specific items for editing or removal. More work is needed to elucidate how changes in knowledge affect specific PA symptoms. Implications of this study include support for the wider use of knowledge and other competency measures of patient comprehension, particularly during brief treatments such as IPCT. Incorporating such measures may better inform and enhance the overall effectiveness of cognitive-behavioral treatments.

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Table 1

*Pre- to Post-Treatment Changes in Overall Knowledge, BE, CM and SE.*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Pre |  | Post |  |  |  |
| Scale | M | SD |  | M | SD | t-test | *p* | Cohen’s *d* |
| BE  | 4.16 | 1.85 |  | 5.94 | 0.91 | 5.62 | <.001 | 1.22 |
| CM  | 10.12 | 3.02 |  | 11.56 | 2.44 | 4.36 | <.001 | 0.52 |
| SE  | 6.87 | 1.81 |  | 7.44 | 1.54 | 3.48 | .006 | 0.33 |
| KA total | 21.16 | 5.28 |  | 24.94 | 4.28 | 5.91 | <.001 | 0.79 |

*Note. N* = 32. These paired analyses exclude data for three participants that completed the pre-treatment KA, but not the post-treatment KA. The BE includes 7 items, CM 13 items, SE 8 items, and KA total 28 items. These analyses used Bonferroni-corrected p-value adjusted for four comparisons. Calculation of Cohen’s d uses the pooled variance.

Table 2.

*Regression Models using Residualized KA Total and Subscale Change Scores to Predict PA Severity at Follow-up.*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Model/Variable | *B* | *SE B* | *β* | *t* | *95% CI**Lower Upper* | *Model R2* | *Model F of R2* |
| Model 1 |  |  |  |  |  |  | .261 | 6.704\* |
|  Constant | 1.994 | .557 |  |  3.581\*\* | .829 | 3.160 |  |  |
|  KA total  | -1.476 | .570 | -.511 | -2.589\* | -2.670 | -.283 |  |  |
| Model 2 |  |  |  |  |  |  | .397 | 3.734\* |
|  Constant | 1.912 | .541 |  | 3.536 | .771 | 3.052 |  |  |
|  KA BE | .106 | .574 | .036 | .185 | -1.104 | 1.316 |  |  |
|  KA CM  | -2.173 | .700 | -.757 | -3.105 \*\* | -3.650 | -.697 |  |  |
|  KA SE | .664 | .700 | .235 | .948 | -.814 | 2.141 |  |  |

*Note. N* = 21 \* *p* < .05, \*\* *p* < .01.