

RESEARCH

Neuroscience-Informed Cognitive-Behavior Therapy in Clinical Practice: A Preliminary Study

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The field of neuroscience has influenced revisions to conventional models of cognitive behavioral therapy (CBT). In the mental health counseling field, a conceptual model of neuroscience-informed cognitive-behavior therapy (n-CBT) was first published in the Journal of Mental Health Counseling in 2015. The present article reviews findings from the first six months of a year-long pilot study that examined counselor and client use and perceptions of n-CBT following application in clinical practice settings. Counselors reported successful alleviation of client symptomatology with n-CBT, particularly anxiety and depressive disorders. Counselors and clients also held similar and consistently high perceptions of n-CBT's credibility and the likelihood of improvement when using the model.

Counseling has been defined as “a professional relationship that empowers diverse individuals, families, and groups to accomplish mental health, wellness, education, and career goals” (Kaplan, Tarvydas, & Gladding, 2014, p. 368). In order to promote optimal mental health and wellness, the 2016 CACREP Standards (Council for the Accreditation of Counseling and Related Educational Programs [CACREP], 2015, Section 2.F) stipulate that an understanding of client biological, neurological, and physiological processes is “foundational knowledge required of all entry-level counselor education graduates” (p. 9). The American Mental Health Counselors Association’s Standards for Practice (2015) also recommends that clinical mental health counselors receive advanced training in the biological bases of behavior.

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Despite the need for an increased focus on biological, neurological, and physiological processes, many of the theoretical models of helping and best-practices taught in counselor education programs overlook current findings in neuroscience research. Furthermore, most were developed by other mental health professionals, not counselors (Kaplan & Gladding, 2011). As such, counselors need to conceptualize and test new models of counseling that incorporate neuroscience findings, promote a unified professional counselor identity, and strengthen the counseling profession.

INTRODUCTION TO N-CBT

Emerging findings from the field of neuroscience have the potential to influence and revise existing theoretical models of counseling and psychotherapy. Experts in the cognitive-behavior therapy (CBT) field have reconsidered conventional CBT models to incorporate findings from neuroscience regarding how CBT changes functions of the brain (e.g., Clark & Beck, 2010). To address the need for more CBT models that incorporate neuroscientific knowledge, a new model of neuroscience-informed cognitive-behavior therapy (n-CBT) was described in the Summer 2015 edition of the *Journal of Mental Health Counseling* (Field, Beeson, & Jones, 2015). This model updated conventional forms of CBT with insights from neuroscience regarding physiological arousal and bottom-up processing (e.g., McRae, Misra, Prasa, Pereira, & Gross, 2012).

The new model of n-CBT (Field et al., 2015) modified Ellis' (1962) well-known ABC model to explain why client dysfunction occurs. Ellis' (1962) model theorizes that people experience emotional and behavioral consequences (C) based upon their core ideas and beliefs (B) that are stimulated by various activating events (A). As with all forms of conventional CBT, the client is taught to modify beliefs/cognitions (B) in response to an antecedent (A), leading to different emotional and behavioral consequences (C). During crisis moments, clients are taught to think before responding. Research studies (e.g., Riao, Orederu, Palazzolo, Shurick, & Phelps, 2013) have demonstrated that cognitive emotional regulation strategies are often ineffective under high stress conditions. The n-CBT model was developed from the need for a counseling approach that understands the limited capacity for a person to engage in conscious, rational processing when powerful hormones such as adrenaline (i.e., epinephrine) or noradrenaline (i.e. norepinephrine) and cortisol are released in times of perceived threat or high stress.

Wave1 and Wave2 Information Processing

The n-CBT model is informed by a neuroscientific understanding of fast vs. slow thinking (Kahneman, 2011). Brain processing is understood to occur via two distinct processes when an individual senses threat or seeks gratification, known in n-CBT as Wave1 (A1-B1-C1) and Wave2 (A2-B2-C2). A visual diagram of these two processes is provided in Appendix A. Wave1 is marked by very fast brain processing and automatically-generated responses to potential threats or pleasurable stimuli in the person's environment (Field et al., 2015).

During Wave1, a person first experiences an activating event (A1). Activating events can occur internally (e.g., somatic or interoceptive experiences) or externally (e.g., feeling verbally attacked). This antecedent results in brain activity from the bottom up (B2), such as the activation of subconscious implicit memories in the limbic area from prior exposure to similar threats or gratification. Emotions are generated (e.g., fear, excitement) and the limbic area sends messages quickly down the brain stem and throughout the nervous system (C1). Physiological consequences occur from the release of powerful hormones. The person may experience an increased heart rate, shallow breathing, and muscle tension as the body prepares itself to respond to the potential threat or pleasurable stimulus. If the person responds behaviorally during C1, he or she does so quickly and without much rational thought. Clients struggling with automatically-generated responses such as dissociation due to trauma, explosive anger, and various forms of sensation-seeking that include kleptomania and repetitive substance use may often complain of an inability to think first before responding.

Wave2 is a slower, more complex brain process than Wave1 (Field et al., 2015). After the person has experienced physiological, emotional, and/or behavioral consequences from Wave1, messages are sent up the nervous system to the brain stem and the limbic area before being sent to the pre-frontal cortex where the person becomes capable of rational thought. This first results in an awareness (A2) of what happened during Wave1. Because powerful hormones (e.g., norepinephrine, cortisol) may be released during Wave1, awareness may not occur until after the person has downregulated physiological flooding. Awareness leads to brain activity from the top down (B2), whereby the person is able to rationally think about the situation and his or her response. Secondary physiological, emotional, and/or behavioral consequences (C2) result from the person's cognitive appraisal of what occurred during Wave1. These two processes (Wave1 and 2) may repeat several times during the same event.

Interventions

The goal of n-CBT (Field et al., 2015) is to help clients by raising their awareness of and attention to physiological responses (Wave1) before teaching them conventional CBT techniques such as cognitive restructuring (Wave2). The model proposes that techniques assisting people to become aware of, accept, and regulate their physiological responses are better suited to Wave1 than conventional restructuring techniques. Conventional CBT techniques such as cognitive restructuring are well suited to Wave2 when the person has the ability to rationally appraise responding. Techniques that assist clients in attending to physiological reactions include mindfulness, biofeedback and neurofeedback, and sensory-stimuli as healthy coping behaviors. These techniques must be practiced repetitively for the client to access those coping strategies during Wave1. Systematic desensitization to threats or pleasurable stimuli can also facilitate state-dependent learning and assist clients to become more attuned to their physiological states when antecedents occur.

PURPOSE OF CURRENT STUDY

Currently, little is known about the clinical application, utility, and acceptability of n-CBT. Studies are needed to examine the effectiveness of n-CBT in clinical practice. Because meta-analyses have found that the counselor's and client's shared belief in an intervention (Anderson, Lunnen, & Ogles, 2010) influences outcomes more than the specific therapy model selected (e.g., Wampold et al., 1997), it would be useful to examine counselor and client perceptions of n-CBT's credibility and their expectations of improvement occurring when using the model.

The purpose of this preliminary study was to understand counselor and client perceptions of n-CBT following clinical application and how these perceptions evolve over time. This article examines counselor and client perceptions from the first six months of a 12-month pilot study. The following research questions guided this study: How do counselor perceptions of n-CBT rationale credibility and improvement expectancy evolve following clinical application of the model, and when, how, and why do counselors use n-CBT in clinical practice?

METHODOLOGY

Qualitative data regarding counselor and client use and perceptions of n-CBT were merged with quantitative data regarding counselor perceptions of n-CBT's credibility and the expectancy of client improvement occurring when using the model, as measured by the Credibility/Expectancy Questionnaire (Borkovec & Nau, 1972; Devilly & Borkovec, 2000). Applying a multiphase mixed methods design (Creswell & Plano-Clark, 2011), data were collected and analyzed concurrently in four phases: immediately after a training workshop, three months post-training, six months post-training, and 12 months post-training. This article provides findings from the first six months of data collection. The timeline of the phases was determined by the need to examine changes in counselor perceptions as they began using n-CBT and how counselor and client perceptions regarding n-CBT credibility and the expectancy of improvement changed during the course of treatment. Merged data between phases were connected in sequence to compare and contrast counselor perceptions. In mixed methods research, one form of data collected during the study (e.g., quantitative) is usually used to support and/or explain the other form of data collected (e.g., qualitative). Greater importance (or weighting) is typically attributed to findings from the primary data collection source. In this study, quantitative data were given higher weighted priority than qualitative data since qualitative data primarily served to explain the quantitative data. Because this is a naturalistic study, the design did not use control groups or randomization.

Participants

Participants were recruited for the study through convenience sampling from two sources. First, attendees of a three-hour n-CBT training at an annual national counseling organization conference were invited to participate in the study. Second, an email invitation was sent to licensed mental health counselors and associates (i.e., post-masters, pre-licensed counselors completing residency requirements for licensure) in a large urban county of a Northwestern U.S. State to participate in one of two free three-hour trainings followed by an opportunity to voluntarily enroll in the research study. Inclusion criteria for participants included (1) current provision of direct counseling services and (2) prior experience providing CBT. The decision to exclude counselors without experience providing CBT was determined by the need to ensure that counselors had the ability to reflect on similarities and differences between conventional CBT models and n-CBT. To minimize allegiance bias, all counselors were either independently licensed or supervised by persons unrelated to the study.

A sample size of approximately 10 to 25 counselors was sought for adequate data saturation and redundancy of qualitative data (Lincoln & Guba, 1985). A total of 24 counselors enrolled in the study by completing the informed consent and initial (zero month) questionnaire following the three trainings. Of the 24 total counselors enrolled, five counselors (20.1%) dropped out of the study before the three-month interval. Of the five who dropped out, one was the sole participant who identified as working in a non-clinical setting (supportive housing). The other counselors reported that they were too busy with other commitments, such as taking a new job, doctoral study, or having a baby. No further counselors dropped out between three and six months. The sample size at the six month interval was 19.

Participants did not receive direct benefits for participating. Participation was voluntary and confidential, and participants were free to withdraw at any time without negative consequences.

Instruments

A survey created for the purpose of the current study included the following: (1) demographic section, (2) counselor questionnaire, and (3) Credibility/Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000). The demographic section asked participants about their personal characteristics (e.g., age) and professional identity (e.g., counselor). The counselor questionnaire contained 14 multiple choice and open-ended questions asking participants about their experiences using n-CBT. Questions in this section of the survey (i.e., external to the CEQ) were constructed following Patton's (2002) guidelines and piloted with colleagues of the first author prior to beginning the study, ensuring both ease of use and that the questions directly asked about desired information. The CEQ was originally developed as a five-item questionnaire using a 10-point Likert scale (Borkovec & Nau, 1972) and is used to measure client perceptions of rationale credibility and treatment expectancy

for improvement during the course of therapy. In 2000, Devilly and Borkovec published an update of the instrument after finding that participants across three separate studies provided different ratings depending on whether they were asked to “think” or “feel” in response to question items. As a result, the instrument was expanded to six Likert scale questions. Devilly and Borkovec (2000) found high internal consistency reliability for full scale scores ($\alpha = .84-.85$) and factors ($\alpha = .79-.90$ for expectancy factor, $\alpha = .81-.86$ for credibility factor). One-week test-retest reliability was adequate for factors ($r = .82$ for expectancy and $.75$ for credibility). The instrument was found to differentiate client perspectives of credibility and expectancy between interventions with and without an encompassing theoretical approach.

Procedure

The study was approved by an Institutional Review Board at the first author’s university prior to initiation of the study. Immediately following the initial n-CBT training, counselors reviewed and signed an informed consent form. Counselors then completed the initial survey containing the basic demographic questionnaire, a counselor questionnaire, and the CEQ. The counselor questionnaire and CEQ were also administered to counselors at three-, six-, and 12-month intervals after attending the initial training. Counselors were given materials to use with clients, including psychoeducational handouts, worksheets, questionnaires, a client informed consent document, postage-paid envelopes for returning data to the primary researcher at three-, six-, and 12-month intervals, and the business card of the primary researcher.

Counselor involvement in the study included completing a series of post-training surveys while using n-CBT with clients in their clinical practice as the counselor deemed fit. Counselors were required to obtain a signed copy of the informed consent document from their client prior to initiating n-CBT with their client. The client informed consent document described the counselor’s involvement in the study and the client’s involvement in the study. Counselors were also tasked with administering and collecting completed CEQ instruments given to the same client participants following the counseling session when n-CBT was first introduced, and at the three month follow-up. Counselors collected and stored all client data in a locked cabinet in their personal offices until the data were mailed to the first author at three-month intervals. Counselors were reminded of follow-up data collection intervals via episodic email and phone contact with the first author.

Data Analysis

Quantitative data were analyzed via descriptive and inferential statistics, using the Statistical Package for the Social Sciences data analysis software (SPSS, IBM Corporation, 2013). Qualitative data were transformed into quantitative data by coding the data using the constant comparative method from grounded theory research (Glaser & Strauss, 1967), identifying themes in the data and continuing until data approached saturation or redundancy

(Lincoln & Guba, 1985). The first author created an initial codebook by coding the 0 month counselor questionnaires independently. The two other authors then coded the data from 0 months using the initial codebook, with modifications made to the codebook following divergence in coding between authors. Discrepancies between authors were resolved using consensus coding. The three authors of the study constituted the coding consensus team. Qualitative data were merged with quantitative data from the CEQ, which provided greater understanding of the nomothetic data. An audit trail was kept to enhance validity.

RESULTS

Counselors ($n = 24$) completing the initial post-workshop questionnaire (zero months) provided demographic information. Counselors were overwhelmingly located in the Northwestern U.S. ($n = 23$, 95.8%), with one participant located in the Northeastern U.S. (4.2%). Counselors were primarily female ($n = 21$, 87.5%), and ranged in age from 30 to 64 years ($M = 45.74$, $SD = 10.86$). Counselors were Euro-American (58.3%, $n = 14$), Asian and Asian-American (16.7%, $n = 4$), Latino/a (8.3%, $n = 2$), African and African-American (4.2%, $n = 1$), and “other ethnicity” (8.3%, $n = 2$). One counselor (4.2%) identified as multi-ethnic (Asian/Asian-American and Pacific Islander), and another did not provide information about ethnicity (4.2%, $n = 1$). Nearly all respondents identified as counselors ($n = 23$, 95.8%), with one practitioner identifying as a social worker (4.2%). Most counselors were independently licensed ($n = 18$, 75%), with six counselors (25%) currently in residency for independent licensure. Of those who were licensed ($n = 18$), all but one ($n = 17$) were licensed counselors with one participant licensed as an independent social worker. Three participants (12.5%) also held concurrent licenses as chemical dependency professionals/counselors. Aside from one participant who held a doctoral degree (4.2%), all participants in the study held master’s degrees (95.8%). Most counselors worked in private practice ($n = 17$, 70.8%), with others working in community mental health centers ($n = 4$, 16.7%), inpatient hospitals ($n = 1$, 4.2%), emergency rooms ($n = 1$, 4.2%), and one working in a non-clinical setting (supportive housing). One counselor reported working in three settings (a private practice, a community mental health center, and an inpatient hospital).

As might be expected, considering that prior experience with CBT was an inclusion criterion for the study, 75% of participants ($n = 18$) identified CBT as one of the theoretical approaches they used in counseling. Four counselors (16.7%) did not identify CBT as one of their theoretical approaches, and two counselors (8.3%) did not report their theoretical orientation. Other theoretical approaches used included humanistic forms of therapy (person-centered, existential; $n = 8$, 33.3%), psychodynamic forms of therapy (including object relations, interpersonal psychotherapy; $n = 6$, 25%), systems theory ($n = 3$, 12.5%), reality therapy ($n = 2$, 8.3%), narrative therapy ($n = 1$, 4.2%), emotionally-fo-

cused therapy ($n = 1, 4.2\%$), eye movement/desensitization and reprocessing ($n = 1, 4.2\%$), Morita therapy ($n = 1, 4.2\%$), and lifespan integration ($n = 1, 4.2\%$).

Preparedness

Counselors were given a five-item multiple choice proficiency test at the conclusion of the workshop to measure n-CBT comprehension. The majority of participants ($n = 22, 91.7\%$) answered at least four out of five questions correctly (i.e., 80% proficiency), with only two counselors (8.3%) answering three of five questions correctly. Of note, both of these counselors dropped out of the study before the study reached the three-month interval. No counselors answered fewer than three out of five questions correctly. Finally, participants also rated their level of preparedness to use n-CBT in practice with clients on a 0-10 scale. Counselors felt prepared overall ($M = 7.40, SD = 1.01$).

Counselor Use of n-CBT

After three months of the study, nearly half of the counselors who completed the three-month counselor survey ($n = 9, 47.4\%$) reported using n-CBT with clients. At six months, the total number of clients receiving n-CBT was 35. While a few counselors who were already n-CBT utilizers chose to use n-CBT with an additional client between the three and six month intervals, no non-utilizers at three months began using n-CBT with clients between three and six months of the study. Counselor use of n-CBT ranged from 0 to 5 clients at the six month interval, with an average of 2.5 clients ($SD = 2.44$). Qualitative data indicated that some counselors who did not formally use n-CBT with clients reported using concepts from n-CBT with clients. No counselors cited concerns with the model as reason for their non-utilization of n-CBT.

Use of n-CBT with mental disorders. Participants were asked to predict their likelihood of using n-CBT to address different mental disorders at the zero month interval. Table 1 depicts that counselors overwhelmingly selected anxiety and depressive disorders as the diagnoses they were most likely to treat with n-CBT. Counselors also believed they were likely to use n-CBT with anxiety-related disorders that have now been classified as trauma and stressor-related disorders in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2013), such as post-traumatic stress and adjustment disorder. The only non-anxiety or depressive disorder that was selected by more than 50% of counselors was substance use disorder. Counselors predicted that they were unlikely to use n-CBT with medical conditions, sleep-wake disorders, neurodevelopmental disorders such as autism and intellectual disability, or paraphilias. Respondents further explained that they were less likely to use n-CBT for clients with intellectual disability and neurocognitive disorders such as dementia, because clients with those conditions were considered less “able to do the homework” with less “ability to be in the present moment.” Two counselors were willing to try n-CBT on any and all clients. Counselors held discrepant opinions regarding the use of n-CBT for conditions such as impulse-control, neurocognitive, paraphilic,

Table 1. Counselor Use of n-CBT with Mental Disorders

Disorder	Predicted Use (0 months)				Actual Use (3 months)			
	Likely		Unlikely		Used		Refrained	
	n	%	n	%	n	%	n	%
Anxiety, unspecified	23	95.8			4	44.4		
Depression, unspecified	23	95.8			3	33.3		
Anxiety, generalized	22	91.7			3	33.3		
Anxiety, social	20	83.3			3	33.3		
Panic	20	83.3			3	33.3		
Posttraumatic stress	20	83.3			3	33.3		
Depression, major	19	79.2			4	44.4		
Obsessive-compulsive	18	75.0			1	11.1		
Adjustment	15	62.5						
Substance use	15	62.5	1	4.2	3	33.3		
Anxiety, separation	14	58.3						
Persistent depressive	12	50.0			1	11.1		
Bipolar	12	50.0	2	8.3	2	22.2		
Chronic pain	12	50.0	2	8.3				
Insomnia	12	50.0	2	8.3				
Borderline personality	12	50.0	5	20.8	2	22.2	2	22.2
Disruptive mood dysregulation	10	41.7						
Anorexia nervosa	10	41.7	1	4.2				
Somatic symptom	10	41.7	1	4.2				
Pathological gambling	10	41.7	2	8.3				
Binge eating	9	37.5	1	4.2				
Bulimia	9	37.5	1	4.2			1	11.1
Oppositional-defiant	8	33.3			1	11.1		
Avoidant personality	8	33.3	1	4.2	1	11.1	2	22.2
Intermittent explosive	8	33.3	1	4.2				
Illness anxiety	8	33.3	2	8.3				
Attention-Deficit/Hyperactivity	8	33.3	3	12.5	2	22.2		
Trichotillomania	5	20.8	2	8.3				
Dependent personality	5	20.8	3	12.5			2	22.2
Gastrointestinal	5	20.8	3	12.5	12.5		1	11.1
Histrionic personality	5	20.8	5	20.8				
Sexual dysfunction	4	16.7					1	11.1
Conduct	4	16.7	1	4.2	4.2		1	11.1
Dissociative identity	4	16.7	2	8.3				
Fibromyalgia	4	16.7	4	16.7	16.7		1	11.1
Narcissistic	4	16.7	11	45.8			3	33.3
Exhibitionistic	3	12.5	2	8.3				
Conversion	3	12.5	2	8.3				
Depersonalization	3	12.5	2	8.3				
Pica	3	12.5	4	16.7				
Antisocial personality	3	12.5	8	33.3				

Traumatic brain injury	2	8.3	5	20.8		
Neurocognitive	2	8.3	5	20.8		
Hyper-somnolence	1	4.2	1	4.2		
Fetishistic	1	4.2	3	12.5		
Voyeuristic	1	4.2	4	16.7		
Pre-menstrual dysphoric	1	4.2	4	16.7		
Gender Identity	1	4.2	5	20.8	1	11.1
Pedophilic	1	4.2	6	25.0		
General Medical	1	4.2	7	29.2	2	22.2
Schizophrenia	1	4.2	8	33.3	1	
Intellectual disability	1	4.2	13	54.2	3	33.3
Frotteristic			2	8.3		
Factitious			2	8.3	1	11.1
Reactive attachment			2	8.3		
Sexual masochism			3	12.5	1	11.1
Sexual sadism			4	16.7		
Tic/tourette's			4	16.7		
Dissociative amnesia			5	20.8	2	22.2
Narcolepsy			7	29.2		
Medication-induced			7	29.2	2	22.2
Transvestic			7	29.2	1	11.1
Autism			11	45.8	1	

Note. "Refrained" refers to counselors who intentionally chose not to use n-CBT for the treatment of mental disorders in certain client cases.

personality, and somatic disorders; some counselors predicted they were likely to use n-CBT for these conditions, while others predicted they were unlikely to use n-CBT for those conditions.

Consistent with initial predictions, Table 1 depicts that n-CBT was being used effectively in the treatment of depression and anxiety at the three-month interval, as well as for associated anxiety disorders such as panic disorder, post-traumatic stress, and obsessive-compulsive disorder. Counselors were also using n-CBT with substance use. Also consistent with predictions, some counselors (though not all) found n-CBT to be used effectively for personality disorders (avoidant, borderline), schizophrenia, and autism spectrum disorders, whereas other counselors had intentionally refrained from treating those same diagnoses with n-CBT.

Qualitative data provided important insights into factors influencing the likelihood of whether counselors would use n-CBT for certain disorders. Counselors predicted they were likely to use n-CBT when they felt the client could benefit, when they had previously used CBT for the same disorders, and, most importantly, when those disorders were ones they had experience of treating in their practice.

Optimal time for introducing n-CBT with clients. The majority of counselors ($n = 14, 58.3\%$) at the zero-month interval believed that the optimal time for introducing n-CBT to clients was from the outset of therapy, regardless

of whether the client had received prior counseling. Only a third of counselors believed that they would want to implement n-CBT later in treatment at the zero-month interval, depending on how the client progressed ($n = 8$, 33.3%). Two counselors (8.3%) believed they would implement n-CBT from the outset only with clients who had received prior counseling and would implement n-CBT later in treatment for new clients. Of the counselors ($n = 10$) who provided written responses to the “optimal time” question during the three month interval, seven (70%) believed n-CBT should be introduced from the outset of therapy, two (20%) believed that n-CBT should be introduced later in treatment, and one (10%) counselor believed that n-CBT was only appropriate for clients who had received prior counseling.

Qualitative data indicated that participants who favored the use of n-CBT from the outset of therapy for all clients tended to believe that n-CBT was a good “basic” model for “explaining many psychopathologies” and “helping the client understand their brain.” These counselors wanted to avoid a delay in providing an intervention believed to be effective and believed the model was already similar to their current approach in treatment (“because I often use CBT methodologies and present brain science as part of my initial psychoeducation, for me presenting this therapy at the onset seems reasonable”). Counselors who felt they would implement the model later in treatment emphasized establishing rapport and conducting assessment first. These counselors reported wanting to use the model in conjunction with other approaches based on client need (“this model is one of the tools I’ll use”).

Credibility and Expectancy

Counselors rated their belief in n-CBT’s credibility and their expectancy for client improvement when using the model by completing the CEQ instrument. Counselor mean CEQ ratings were consistently high between zero months ($M = 7.62$, $SD = 1.57$, $n = 24$), three months ($M = 7.23$, $SD = 1.95$, $n = 19$), and six months ($M = 7.42$, $SD = 0.42$, $n = 19$) post-training. A repeated-measures ANOVA (with the assumption of sphericity met) indicated no significant differences between intervals, $F(2, 16) = 0.14$, $p = .87$, $\eta^2 = .01$. This was mirrored by the consistency in client ratings between 0 months ($M = 6.79$, $SD = 0.75$, $n = 29$) and 3 months ($M = 7.07$, $SD = 0.27$, $n = 35$). A one-tailed paired-samples t-test indicated no significant differences ($p = .46$) between client ratings at zero and three months. The correlation between counselor and client ratings at zero months was low ($r = .19$), though considerably higher at three months ($r = .63$). It is possible that the different sample sizes for both counselors and clients between 0 and 3 months may have impacted these correlations.

Qualitative feedback at three months helped explain why counselors retained consistent perceptions of the model as credible and persisted in their expectations of client improvement when using n-CBT. Counselors reported finding n-CBT to be “logical,” evidenced by statements such as: “to me it makes logical sense to focus on the trigger and somatic responses before trying

to restructure thoughts.” Improvement expectancy was sustained by positive client outcomes and counselor belief in the effectiveness of the model. The majority of counselors at zero months ($n = 15$, 62.5%) explicitly wrote that n-CBT was an “effective,” “helpful,” and “useful” intervention, with no contrary responses found at zero- or three-month intervals. At the three-month interval, counselors shared client success stories as evidence of the effectiveness of n-CBT. For example, a counselor reported that a client who was diagnosed with a depressive disorder and autism spectrum disorder was particularly benefiting from the approach. This client had apparently asked to create his own electronic application of an n-CBT worksheet to track data on physiological response. Another counselor reported that one could “almost see the light go on” when using n-CBT with clients.

Counselors believed the effectiveness of the model was dependent on certain factors. At the zero month interval, several counselors mentioned that their delivery of the material influenced the likelihood of a client responding positively to the model (“I think it will be effective if I can speak confidently and follow-through effectively”; “it will work well with those I present it well to”). Other counselors cited client insight and motivation as important factors in the success of the intervention. This theme was also apparent in qualitative data collected during the three-month interval. Counselors stated that successful response to n-CBT varied, depending on client motivation. Two counselors mentioned that their clients were resistant to completing worksheets outside of the session. One of these counselors reported not understanding how the self-monitoring log worked, which may have led to some ambivalence with explaining the worksheet to clients and encouraging clients to complete the worksheet. Some counselors noted that the neuroscience psychoeducation included in the model was more difficult for adolescents to understand compared to adults, contrary to their initial expectations.

Counselors seemed to smoothly integrate the model into their counseling practice, evidenced by responses such as: “I noticed myself already using these concepts with clients and seeing clients’ reactions [as] positive and productive.” Counselors reflected that integrating n-CBT into practice felt like a smooth transition because n-CBT felt similar to their current therapeutic approach. This was particularly true for counselors who had prior experience providing neuroscience-based psychoeducation and/or backgrounds in mindfulness. Other counselors were new to the neuroscience components of the model, and these counselors found that the organized structure of the model provided them with a framework to guide their practice (“I believe it would be easy to naturally implement this approach to what I already do, with the benefit of added structure and theoretical/research-based background”).

DISCUSSION

Data collected during the first six months of this research project suggest that counselors with experience providing CBT may feel comfortable using n-CBT, believing it to be credible and expecting client improvement to occur.

Counselor and client belief in the credibility and expectancy of improvement remained stable subsequent to their use of the model with clients, suggesting that n-CBT is as effective and credible as counselors and clients first believed. Counselors with backgrounds in neuroscience, mindfulness, and mindfulness-based CBT found the model familiar, and counselors overall appreciated that the model used neuroscience psychoeducation to help clients better understand their experiences.

Counselors felt increasingly comfortable using the model early during treatment and did not believe n-CBT should be reserved for clients who have not responded to other approaches, though a minority of counselors believed that foundational rapport and an assessment of the client's needs should precede the introduction of n-CBT. Use of n-CBT was consistent for both early adopters and non-adopters. Counselors who were early adopters at three months used n-CBT with additional clients between three and six months, whereas non-adopters at three months did not subsequently use n-CBT with clients. It therefore appears that counselors who are willing to try n-CBT were impressed enough with its effectiveness to continue using the model with more clients. While some counselors were hesitant to use the model in their practice, other counselors were using n-CBT concepts in their client work when not fully adopting n-CBT.

For both counselors and clients, ratings of n-CBT credibility and improvement expectancy remained stable with no significant differences between intervals. No significant differences were found between counselor and client ratings. However, the correlation between counselor-client ratings was low at zero months ($r = .19$) and considerably higher at three months ($r = .63$). These correlations may have been impacted by changes in sample size for both counselors and clients between the zero and three month interval. If valid, it was unclear why counselor-client belief in the credibility of the model and in the likelihood of improvement occurring had become more closely aligned as treatment continued. A follow-up question to counselor and client participants during the 12-month interval could be useful to understand this finding.

Based on this pilot study, it appears that counselors may consider n-CBT to be most useful in the treatment of anxiety and depressive disorders, including related disorders such as posttraumatic stress and adjustment disorders, along with substance use. Overall, counselors did not feel n-CBT would be effective in treating intellectual disability, medical conditions, or neurocognitive disorders and felt mixed about using n-CBT for personality disorders. While it is possible that counselors felt uncomfortable treating these disorders in their practice in general, it is likely that counselors believe n-CBT may be most helpful for clients with enough insight to understand the workings of their brain and with the attentional ability to practice mindfulness. Of note, while counselors believed initially that they were least likely to use n-CBT with autism out of all diagnoses, one counselor reported that one client with a diagnosis of comorbid depression and autism had responded very positively to n-CBT within three months.

Connection between Counselor Preparedness and Perceptions

The preparedness of counselors in n-CBT seemed connected to counselor perceptions of n-CBT's credibility and their expectancy of improvement occurring when using the model. Counselors mostly demonstrated adequate proficiency in their understanding of the model and felt prepared to implement n-CBT, with preparedness ratings strikingly similar to counselor CEQ mean scores at zero, three month, and six month intervals. Comprehension seemed to be the most important factor that caused counselors and clients to drop out of the study. Two of the five participants who dropped out of the study were the only counselors who did not meet the 80% criterion for comprehension of the n-CBT model. This lack of comprehension may have resulted in those counselors dropping out, though those counselors did not mention this as a reason for their withdrawal. Another counselor did not drop out of the study, but had abandoned using n-CBT with clients. This counselor also seemed to struggle with comprehension, reporting confusion about how to explain and use the self-monitoring log, which led to subsequent negative responses from three clients. It therefore appears that more training is needed for counselors to use n-CBT in practice settings, as some counselors lacked an understanding of the model following the initial training workshop. Counselors being trained in n-CBT may benefit from receiving more explanation and guided practice in using self-monitoring worksheets with clients. This need for expanded training was consistent with initial counselor responses following the workshop. A sizeable minority of counselors ($n = 6$, 25%) believed that the workshop needed to be a full-day training (6-8 hours) rather than a half-day training (3-4 hours).

Limitations

While this study yielded important information about counselor and client perceptions of n-CBT, findings cannot be considered generalizable to populations outside of this study. Female counselors (87.5%) were over-represented in the sample group, along with counselors working in private practice (70.8%). The sample intentionally consisted almost entirely of counselors (95.8%); other mental health professionals (and their clients) may have responded differently to the model. The sample size, while appropriate for descriptive statistics and basic qualitative data analysis, was only large enough to compute repeated measures inferential statistics. A sizable number of counselors ($n = 5$) dropped out of the study, further reducing the sample size. Attrition occurred due to working in a non-clinical setting (supportive housing) or being too busy to participate due to time commitments. While one counselor reported negative client response related to their confidence and competence with using self-monitoring worksheets, no counselors cited concerns with using n-CBT with clients as a reason for leaving the study. Changes to sample size for both counselors and clients may have impacted the validity of correlations for counselor-client CEQ scores between the 0 and 3 month interval.

Further limitations of the study included the use of convenience sampling to recruit participants and the lack of randomization or control groups. Finally,

while counselor and client perceptions are informative, client outcome data are needed to evaluate n-CBT's effectiveness.

Conclusion and Areas for Further Study

This pilot study represents the first empirical investigation into the use of n-CBT and extends the current support for the utility of modified forms of CBT that are informed by mounting neurophysiological research (e.g., Clark & Beck, 2010). Based on data from the first six months of the study, the majority of counselors believed n-CBT to be a credible approach to treatment and expected improvement and change to occur when using the model. Furthermore, n-CBT was successfully utilized in practice settings. Further information from the next six months of the study will be helpful to understand how counselor perceptions and use of n-CBT evolves over time. Although the Wampold et al. (1997) research would suggest that experimental studies comparing n-CBT with CBT would find equivalent efficacy with clients, an experimental study may eventually be warranted to better understand the response to n-CBT when compared with conventional CBT.

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APPENDIX A: PSYCHOEDUCATIONAL HANDOUT FOR CLIENTS

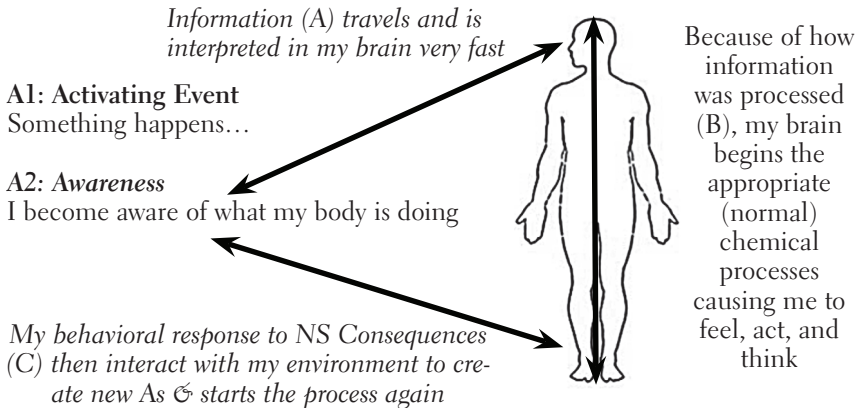
"I don't know what happened, it came on like a wave"

B1: Brain from the Bottom-Up

My brain makes sense of the stimulus without me knowing it

B2: Brain from the Top-Down

My brain collects more information and begins to make sense of it while I begin to make decisions about it



C1: Consequences (Nervous System)

My body responds to what my pre-conscious brain tells it to do

C2: Consequences (Nervous System)

My body responds to what my conscious brain tells it to do