The Journal of Counselor Preparation and Supervision

Volume 13 | Number 2 Article 1

2020

# The Impact of Neuroscience-Informed Cognitive-Behavior Therapy Training on Knowledge and Interoceptive Awareness

Raissa M. Miller
*Boise State University*, raissamiller@boisestate.edu

Thom A. Field
*Boston University School of Medicine*, tfield@bu.edu

Eric T. Beeson
*The Family Institute at Northwestern University*, eric.beeson@northwestern.edu

Diana M. Doumas
*Boise State University*, dianadoumas@boisestate.edu

Laura K. Jones
*University of North Carolina Asheville*, ljones3@unca.edu



## Recommended Citation

Miller, R. M., Field, T. A., Beeson, E. T., Doumas, D. M., & Jones, L. K. (2020). The Impact of Neuroscience-Informed Cognitive-Behavior Therapy Training on Knowledge and Interoceptive Awareness. *The Journal of Counselor Preparation and Supervision, 13*(2). http://dx.doi.org/10.7729/42.1348

# The Impact of Neuroscience-Informed Cognitive-Behavior Therapy Training on Knowledge and Interoceptive Awareness


## Abstract

This study evaluated the impact of a three-day Neuroscience-Informed Cognitive Behavior Therapy (nCBT) training on participants' post-training nCBT knowledge and interoceptive awareness. Results indicated a statistically significant increase in knowledge for the majority of the items and for interoceptive awareness, with effect sizes in the medium to large range. Implications for future nCBT trainings are discussed.



## Keywords

neuroscience, cognitive behavior therapy, counselor training



## Author's Notes

Raissa Miller, Department of Counselor Education, Boise State University; Thomas A. Field, Department of Psychiatry, Boston University School of Medicine; Eric T. Beeson, Department of Counseling@Northwestern, The Family Institute at Northwestern University; Center for Applied Psychological and Family Studies, Northwestern University; Diana M. Doumas, Department of Counselor Education, Boise State University; Laura K. Jones, Department of Health and Wellness, University of North Carolina at Asheville. Correspondence concerning this article should be addressed to Raissa M. Miller, Department of Counselor Education, Boise State University, 1910 University Drive, Boise, ID 83725. E-mail: raissamiller@boise.edu

Findings from neuroscience are increasingly informing the work of professional counselors (Beeson & Field, 2017). The most recent version of the Council for the Accreditation of Counseling and Related Educational Programs (CACREP) Standards (2015) includes knowledge of "biological, neurological, and physiological factors that affect human development, functioning, and behavior" (p. 11) in the common core curriculum. However, given that neuroscience-related education for counselors is relatively new, there are likely a significant number of practicing counselors who have had little to no training in neurobiological-informed assessment, conceptualization, and treatment frameworks. This gap in training presents a potential ethical concern as counselors aim to incorporate neuroscience into their work without sufficient knowledge. Counselors without adequate neuroscience-related training and knowledge are vulnerable to neuromyths and inaccurate application of neuroscience principles (Field, Miller, Beeson, & Jones, 2019). Counselors need access to high quality continuing education and exposure to neuroscience-informed models of practice. The purpose of this article is to briefly introduce one such neuroscience-informed counseling model, neuroscience-informed cognitive behavior therapy (nCBT), and to present findings related to nCBT continuing education training on participants' knowledge and interoceptive awareness.

## Neuroscience-Informed Cognitive-Behavior Therapy

The nCBT approach is a semi-structured treatment that integrates traditional cognitive behavior therapy (CBT) with emerging neuroscience findings (Beeson, Field, Jones, & Miller, 2017). First published in 2015 as a conceptual model (Field, Beeson, & Jones, 2015), nCBT employs a novel approach to case conceptualization that extends Albert Ellis' classic ABCDE model of rational emotive behavior therapy (REBT; Ellis, 1957, 1994). In the traditional REBT framework, counselors and clients work together to analyze the connection between activating

events (e.g., failing a test), beliefs (e.g., "I am stupid"), and emotional or behavioral consequences (e.g., feeling hopeless, dropping out of school). The focus of intervention is generally on interrupting the irrational thought or cognitive distortion (e.g., "I am stupid") in order to shift the emotional or behavioral response. The nCBT approach expands this traditional cognitive model by acknowledging an additional level of processing that occurs largely outside a person's conscious awareness (Field et al., 2015). In nCBT, Ellis' ABC progression is retained, but with changes that include levels of information processing (i.e., two phases of ABC) and recommendations for interventions that correspond with the appropriate phase. The modified framework is called The Waves of the ABCs (Field et al., 2015).

In nCBT, the term *Waves* is used as a metaphor to help describe the way individuals process information (i.e., external or internal stimuli) from a neuroscience perspective (Field et al., 2015). The Waves framework was modeled after research into top-down and bottom-up emotion generation and regulation (LeDoux & Pine, 2016; McRae, Misra, Prasad, Pereira, & Gross, 2012; Ochsner & Gross, 2005). Top-down refers to the cognitive evaluation or appraisal of an event, whereas bottom-up refers to the more embodied physiological response to an event (McRae et al., 2012).

The first wave (Wave1) begins with a bottom-up appraisal (i.e., physiological response) of an activating event that the embodied brain interprets very quickly, often outside of conscious awareness, and leads to primary consequences throughout the nervous system (Field et al., 2015). For example, an event interpreted at this level as threatening may result in the nervous system sending signals to increase heart rate and breathing and the person jumping back before the individual has even become aware of the particular danger. The person then becomes aware of these Wave1 consequences (e.g., aware of feeling afraid or aware that they just behaved in a certain

way, such as jumping back), which is the beginning of Wave2. This awareness creates new sensory information that the person begins to consciously appraise and evaluate from the top-down. For example, individuals may have self-defeating thoughts about their response (e.g., "I am so weak for being afraid." or "I should be able to control myself more.") resulting in an experience of shame. This top-down processing then leads to secondary consequences throughout the nervous system, such as an impulse to withdraw from others. Traditional cognitive therapies have robust empirical support, but limitations have been identified related to the overreliance on rational, conscious processing that is termed Wave2 in the nCBT model (Beck & Haigh, 2014; McRae et al., 2012; Raio, Orederu, Palazolo, Shurick, & Phelps, 2013). The nCBT framework focuses on both Wave1 (i.e., physiological experiences) and Wave2 (i.e., cognitive appraisal), building the brain from the bottom-up, and then connecting the bottom to the top (Beeson et al., 2017).

The nCBT research team (Field et al., 2017; Field, Beeson, & Jones, 2016) has followed the National Institutes of Health's (NIH) six-stage model of intervention development in creating and validating the nCBT approach (Onken, Carroll, Shoham, Cuthbert, & Riddle, 2014). The NIH model of intervention development includes basic research (Stage 0), intervention generation/refinement (Stage 1), efficacy in research clinics (Stage II), efficacy in community clinics (Stage III), effectiveness (Stage IV), and implementation and dissemination (Stage V). Current nCBT research fits into the intervention generation and refinement stage, including pilot research exploring the understanding of counselor and client belief in the credibility and treatment expectancy of nCBT (Field et al., 2016; Field et al., 2017).

Field et al. (2016) explored the perceived credibility and treatment expectancy among counselors that attended a three-hour nCBT training and their clients. Results suggested that

counselors initially had a high belief in the credibility and expectancy of outcomes post-training. Following their implementation of nCBT in clinical practice, these high beliefs remained stable at three and six months. This trend was also observed in client ratings of credibility and belief in expectancy. These findings suggested that clients' initial belief in the credibility of nCBT and expectancy of outcomes remained stable after treatment began. Field et al. (2016) also found that the relationship between counselor and client ratings were not statistically significant at baseline but became statistically significant at three months, suggesting a synchronization of counselor and client beliefs in nCBT following implementation. These findings suggested that counselors' belief in nCBT influenced clients' buy-in and expectancy.

The Field et al. (2016) study provided insight into the necessity of demonstrating comprehension of nCBT prior to using nCBT with clients. Specifically, trainees with less comprehension tended to drop out of the study and use nCBT less frequently. In a follow-up study, Field et al. (2017) found that belief in the credibility and use of nCBT was related to counselors understanding, allegiance, trust, and communication of the model. Although encouraging, these findings are but a small step in the development of an effective intervention with limitations in terms of sample size, fidelity testing, and lack of controls. These limitations create the need for more rigorous methods to further establish nCBT as a Stage I intervention (i.e., initial evidence of nCBT principles and processes as clearly defined, operationalized, and useful for clinical work) prior to moving to Stage II research (i.e., outcome-focused research on the efficacy of nCBT in research clinics). Refinement of training protocol and outcomes is essential to this process. A component of developing the training protocol is assessing outcomes related to attributes and comprehension of concepts deemed important for effective nCBT practice. Knowledge of core

nCBT principles, such as the Waves described above, is one such component. Interoceptive awareness is an additional component.

## Interoceptive Awareness

Wave1 experiences and consequences are primarily preconscious in nature, and thus require attention to and awareness of implicit (i.e., embodied physiological and emotional responding) experiences. One way for clients to foster greater awareness of Wave 1 processes is to develop interoceptive awareness. *Interoception* is defined as one's awareness of and ability to integrate sensory information about internal, physiological bodily states (Craig, 2009; Tsakiris & Critchley, 2016). This awareness also allows individuals to monitor and respond to motivational needs (Craig, 2009). In this way, interoception aides in homeostatic regulation or allostasis of the body (Berntson, Cacioppo, & Quigley, 1993). The concept was originally conceptualized as a perceptual experience distinct from other perceptual experiences such as *exteroception* (awareness and sensitivity to stimuli originating outside the body via the five senses, e.g., the sensation of someone touching your hand) and *proprioception* (sensory awareness of your body relative to space, or movement, and your body parts relative to one another, e.g., I am walking forward, and my left foot is in front of my right). Since this initial conceptualization, the body of literature related to defining, measuring, and improving interoceptive awareness has grown, and interoceptive awareness is now understood to be a complex, multidimensional construct that incorporates several emotional, cognitive, and behavioral components (Mehling et al., 2012).

Through both qualitative and quantitative inquiry, researchers have defined interoceptive awareness as including the following: being aware of uncomfortable, comfortable, and neurophysiological sensations; maintaining attention to uncomfortable and painful sensations; accepting the emotional response to uncomfortable and painful sensations; maintaining attention

to bodily sensation amongst various competing stimuli; being aware of physiological and emotional states; regulating distress with attention to bodily sensations; listening to insight from the body; and trusting the body as safe (Mehling et al., 2012). Operationally, interoception can be characterized along three dimensions, namely interoceptive accuracy (objective assessment comparing self-report to measured bodily state), interoceptive sensibility (self-reported, subjective assessment of interoceptive states), and interoceptive awareness (metacognitive awareness of one's accuracy; Garfinkel, Seth, Barrett, Suzuki, & Critchley, 2015). Each of these categories can be assessed in relation to general interoceptive awareness as well as in relation to the functionality of a specific organ or organ system (e.g., cardiac function, cardioreception). A common instrument used to measure interoception is the Multidimentional Assessment of Interoceptive Awareness (MAIA; de Jong et al., 2016; Mehling et al., 2012), which we will further describe in the methods section.

Additional neurophysiological research has elucidated possible networks involved in interoceptive awareness and processing (Schulz, 2016). The brain is continually getting signals from the various organs and organ systems of the body (e.g., heart, lungs, intestines and enteric nervous system) largely by way of the autonomic nervous system. Once in the brain these afferent signals are integrated, interpreted, and processed. Craig (2002) proposed a model of interoceptive processing that highlights the primary role of the insula, leading researchers to dub the insula the interceptive cortex (for review see Craig, 2009; Duquette, 2017). Information from the body travels through the brainstem and thalamus and then on to the posterior insula, which produces a topographical representation of the body. From there, the middle insula integrates interoceptive signals with other information from the body and brain. Finally, the anterior insula, often in association with the inferior frontal operculum and gyrus, integrates cognitive and affective

information, thus being involved in the cognitive evaluation of internal body states and related emotion (Craig, 2009; Duquette, 2017). The insula works in concert with other cortical and subcortical regions forming a network of areas implicated in interoceptive awareness and processing. In addition to strong connections and coordinated functioning with the anterior cingulate cortex (Craig 2009; Duquett, 2017), other areas include the orbitofrontal cortex, striatium, areas of the temporal lobe, and the somatosensory cortex of the parietal lobe (Craig 2009; Duquett, 2017; Shulz, 2016). Efferent signals are then sent back down to the body to direct the functioning of the organs and organ systems as needed. These bi-directional pathways are the foundation of homeostasis and ongoing allostatic processes (Craig, 2009).

The various dimensions of interoception have been the focus of a robust body of clinical research and literature over the past decade. Previous researchers have found decreased levels of interoceptive awareness among people with a variety of mental health concerns, including depressive and chronic pain disorders (Fissler et al., 2016), eating disorders (Merwin, Zucker, Lacy & Elliot, 2010) as well as suicidal behaviors (Forrest, Smith, White, & Joiner, 2015). Scholars have also proposed a relationship between interception and drug cravings and addiction (Gray & Critchley, 2007; Paulus & Stewart, 2014). Interoceptive awareness has been both the outcome of interventions as well as mediating variables to effective treatment (Fissler et al., 2016).

In one study, de Jong et al. (2016) used interoceptive awareness as a variable in evaluating Mindfulness-Based Cognitive Therapy (MBCT) and found that participants demonstrated significantly greater self-regulation, emotional awareness, and ability to focus on the distress and worry of pain and discomfort than a control treatment-as-usual group. The ability to not distract from the emotional pain was found to mediate the effects of MBCT, which suggests that interoceptive awareness skills may be foundational to the success of other intervention programs.

The current body of literature supports the continued study and use of interoceptive awareness in the development of interventions (e.g., de Jong et al., 2016) and thus we consider it a valuable component to nCBT training.

## Purpose of the Study

Preliminary data exists regarding the credibility and effectiveness of nCBT. However, little is currently known about the impact of nCBT training on practitioner knowledge of core nCBT concepts and processes. Thus, the primary aim of this study was to assess training effectiveness by measuring changes in participants' nCBT knowledge. A secondary aim of this study was to assess potential changes in participants' interoceptive awareness. As indicated above, interoceptive awareness is a person's ability to tune into their physiological and emotional states, a skill that is essential in the nCBT model (Field et al., 2015; Mehling et al., 2012). We believe that counselors must possess interoceptive awareness themselves if they are to effectively foster this ability in their clients. Therefore, we were interested in knowing if the nCBT training helped enhance practitioners' interoceptive awareness. Our research questions guiding this study were: (1) to what extent does nCBT training increase practitioner knowledge of the method and (2) does nCBT training enhance practitioner interoceptive awareness?

## Method

We selected a quantitative single-group repeated-measures research design to explore whether the three-day training in nCBT resulted in enhanced nCBT knowledge and interoceptive awareness. We examined changes in knowledge from pre-training to immediately post-training. We examined changes in interoceptive awareness from pre-training to 30-days post-training.

## Participants

We recruited mental health professionals for a three-day nCBT training workshop offered at a public university in the Northwestern United States. For entry into the study, we required participants to (1) be licensed as mental health professionals, (2) be currently providing clinical services to clients, and (3) possess some familiarity with traditional CBT. Applicants completed a brief online survey detailing how they believed they met the inclusion criteria for the study. As an incentive, participants received the three-day training at no-cost and received 18 continuing education clock-hour credits.

A total of 42 participants (81.0% female, 19.0% male) consented to participate in the study. Ages ranged from 27-68 ($M$ = 41.05, $SD$ = 10.93). The majority of the sample was White (88.1%), with 4.8% Latino/a, and 7.8% Native American or Alaska Native. The majority of the participants classified their professional identity as mental health counselor (81.0%, $n$ = 34), with 4.8% ($n$ = 2) identifying as a substance abuse counselor, 2.4% school counselor ($n$ = 1), 9.5% other ($n$ = 4), and 2.4% ($n$ = 1) who did not answer. Years of professional experience ranged from 0.5 to 35 ($M$ = 6.64, $SD$ = 6.87). Overall, 90.5% ($n$ = 38) of participants completed both the baseline and post-test assessments and 73.8% ($n$ = 27) completed both the baseline and 30-day follow-up assessments. We found no differences between those who completed the follow-up assessment and those who did not in regards to gender, age, ethnicity, and years in practice for either the post-test or 30-day follow-up assessments.

## Procedure

After institutional review board (IRB) approval and in accordance with the American Counseling Association (ACA) Code of Ethics (2014), we sent out recruitment emails containing information about the purpose of the study to counseling listservs, the state counseling association

where the university training site was located, and other counseling networks (e.g., alumni list of the counseling program at the university where the training occurred). Our recruitment email included information about incentives and the ability to withdraw from the study at any time. We selected applications on a first-come basis, and closed registration after the target of 40 participants was reached. We capped participation at approximately 40 participants, as we were concerned that a larger training group compromise the ability to provide adequate observation and feedback during the small group role-play exercises integrated into the training. We placed additional participants on a wait-list, in case of early drop-out, and ended up allowing 42 participants to attend the training.

On the first day of the training, we distributed an informed consent document that explained the purpose of the study and attendee rights as research participants. A member of the research team collected baseline surveys and allocated a unique identification number to participants to maintain confidentiality. All participants completed the pre-knowledge questionnaire and an interoceptive awareness survey at the beginning of the training. Participants completed a post-knowledge questionnaire immediately after the training and the interoceptive measure 30-days after the training.

**Training**

Because there are no established studies on nCBT training protocols, we developed our training based on best practices established in empirical CBT training outcome studies. In these studies, researchers found that CBT training can result in improvements in practitioner knowledge, skills, confidence, and even client outcomes (Bennett-Levy, Hawkins, Perry, Cromarty, & Mills, 2012; Westbrook, Segwick-Taylor, Bennett-Levy, Butler, & McManus, 2008). Bennett-Levy et al. (2012) found that both in-person and online training formats were generally effective, though

in-person training had higher rates of practitioner completion compared with online formats. In general, researchers emphasized the importance of self-practice and self-reflective activities during training (Bennett-Levy, McManus, Westling, & Fennell, 2009; Spendelow & Butler, 2016).

Our nCBT training was three-days (18 hours). The content aligned with the nCBT treatment manual (Beeson et al., 2017). The first three authors delivered the training. Two of the three training instructors were the original developers of the nCBT approach and have had extensive experience with nCBT training and conducting nCBT research. The third trainer was a contributing member to the nCBT research team and was a faculty member at the university offering the training. All three trainers, along with a fourth contributor, wrote the nCBT treatment manual prior to the training. The three-day training included instructional strategies such as didactic lecture, role-plays, small group discussions, and self-reflective exercises.

Day one of the training included a review of conventional CBT theory and techniques and an introduction to neuroscience principles most relevant for understanding the nCBT model. Neuroscience concepts addressed included basic neuroanatomy, principles of brain development and information processing, and essential functions of the embodied nervous system. Day two of the training covered phases one and two of the nCBT approach. Phase one focuses on attending to physiological reactions and includes development of the therapeutic relationship, assessment, conceptualization, and treatment planning. Phase two focuses on building the brain from the bottom-up and includes Wave 1 interventions (e.g., affective modeling, sensory-based coping, mindful awareness, anchoring, systematic desensitization, and bio/neuro feedback). Day three of the training included a review of phase three, connecting the bottom to the top. Phase three interventions were discussed and demonstrated, including connecting behaviors and emotions to physiological states, fostering self-acceptance and compassion, sensory-based exploration, and

imagery, reappraisal, and exploring implicit schema. Treatment fidelity was also discussed on the final day of the training.

**Measures**

Training participants completed three questionnaires: a demographic questionnaire, an nCBT knowledge quiz, and interoceptive awareness assessment. The brief demographic questionnaire designed for this study included participant characteristics (e.g., age, gender, race/ethnicity) and aspects of professional identity (e.g., licensure, professional practice setting). The 10-question multiple choice quiz, designed specifically for this study, assessed nCBT knowledge. Items included knowledge-based questions about CBT, nCBT waves, brain development, brain anatomy, and information processing (see Appendix A). This instrument was a revision of the five-item multiple-choice quiz used in the Field et al. (2016) study.

We measured interoceptive awareness using the Multidimentional Assessment of Interoceptive Awareness (MAIA; Mehling et al., 2012). The MAIA is a 32-item self-report instrument that measures body awareness in a multidimensional manner, capturing both beneficial and maladaptive aspects of the construct (Mehling et al., 2012). Each item is scored on a 5-point scale ranging from 1 (*Never*) to 5 (*Always*). Items load on one of 8 subscales: Noticing (e.g., I notice when I am uncomfortable in my body), Not-Distracting (e.g., I distract myself from sensations of discomfort), Not-Worrying (e.g., I start to worry that something is wrong if I feel any discomfort), Attention Regulation (e.g., I can maintain awareness of my inner bodily sensations even when there is a lot going on around me), Emotional Awareness (e.g., I notice how my body changes when I am angry), Self-Regulation (e.g., When I feel overwhelmed I can find a calm place inside), Body Listening (e.g., I listen for information from my body about my emotional state), and Trusting (e.g., I trust my body sensations). The MAIA has demonstrated construct validity

and internal consistency with Cronbach's alphas ranging from .66-.82 for the 8 subscales (Mehling et al., 2012). Cronbach's alphas for several subscales in the original sample were < .70. For the current study, we chose to combine the 32 items into total scale to reduce the probability of Type I error. Cronbach's alpha for the current sample's total scale was .91.

**Statistical Analysis**

We conducted all analyses using SPSS version 24.0 (IBM, 2016). Prior to analysis, we examined variables for extreme cases and for normality at baseline and follow-up assessments. We found no outliers and variables were within the normal range for skew and kurtosis. To assess changes in knowledge, we conducted a series of 2 (baseline; post-training) x 2 (response correct; response incorrect) chi square analyses. To assess for changes in interoceptive awareness, we conducted a paired *t*-test from baseline to the 30-day follow-up. We set the significance level at $p < .05$. We calculated effect size using Phi ($\varphi$) for chi square analyses with .1 considered small, .3 considered medium, and .5 considered large (Cohen, 1969). We computed effect size for *t*-tests using Cohen's *d* statistic, with .2 considered small, .5 considered medium, and .8 considered large (Cohen, 1969). We controlled for Type 1 error by using the Holm-Bonferroni procedure (Holm 1979). We selected this method as it corrects for Type I error as effectively as the traditional Bonferroni procedure, but retains more statistical power (Bender & Lange, 2001; Eichstaedt, Kovatch, & Maroof, 2013; Wright, 1992).

**Power Analysis**

We conducted an *a priori* power analysis using the G*Power 3.1.3 program (Faul, Erdfelder, Lang, & Buchner, 2007) for goodness-of-fit 2 x 2 chi square analysis and for a matched pairs *t*-test. A sample size of 32 was needed for power of $\geq 0.80$ to detect a medium to large effect for the 2 x 2 chi square analysis with an alpha level of .05. A sample size of 16 was needed for

power of $\geq$ 0.80 to detect a medium to large effect size for a matched pairs *t*-test (dependent means) with an alpha level of .05. Thus, our post-training sample size of 38 exceeds the sample size needed for the chi square analyses and our 30-day follow-up sample size of 27 exceeds the sample size needed to provide adequate power for the matched pairs *t*-test.

## Results

Means, standard deviations, and contrasts for knowledge of nCBT at baseline and post-training are presented in Table 1. The table also depicts a statistically significant increase in knowledge for the majority of items, with effect sizes in the medium to large range. Training appeared to enhance trainee knowledge of nCBT's conceptual model, with over 90% of participants answering almost all the questions correctly post-training. Namely, most participants answered questions related to nCBT outcome targets, brain structures responsible for threat detection, response styles to threat, bottom-up processing, brain development, and Wave1 and Wave2 interventions correctly after the training (all *p*s < .05; $\varphi$ = .25 to .54).

Of the three items that were not statistically significant, two of the items (items 1 and 9) had the highest percentage of correct responses at baseline (78.9% and 89.5%) and increased to 92.1% of participants with correct responses. These items assessed practitioner knowledge of the conventional CBT conceptual model (item 1) and knowledge of physiological outcomes related to sympathetic nervous system arousal (item 9). Participants already had a high level of knowledge in these domains and this baseline level of knowledge may account for lack of statistical significance in the change from baseline to post-training.

Table 1

*Percent of Knowledge Quiz Items Answered Correctly at Baseline and Post-Training Assessments*

| Knowledge Quiz Item | Baseline | Post-Training | $\chi^2(1)$ | $\varphi$ |
|---|---|---|---|---|
| 1. When counselors conceptualize client distress from a conventional CBT perspective, they tend to focus on modifying _____ first in order to promote change in other areas of experiencing. | 89.5% | 92.1% | 0.16 | .05 |
| 2. When counselors conceptualize client distress from an nCBT perspective, they should focus on modifying _____ first in order to promote change in other areas of experiencing. | 57.9% | 94.7% | 14.27*** | .43 |
| 3. Which of the following is **not** a response style assessed in the nCBT model? | 44.7% | 94.7% | 22.51*** | .54 |
| 4. In the nCBT counseling model, which of the following processes constitutes Wave1? | 60.5% | 68.4% | 0.52 | .08 |
| 5. In the nCBT counseling model, which of the following processes constitutes Wave2? | 28.9% | 65.8% | 10.34*** | .37 |
| 6. In the nCBT counseling model, what types of interventions are useful during Wave1 and Wave 2? | 73.7% | 94.7% | 6.33** | .29 |
| 7. The brain develops from the _____ to the _____ and from the _____ to the _____ . | 76.3% | 100.0% | 10.21*** | .37 |
| 8. Which of the following brain structures is responsible for threat detection in our environment? | 73.7% | 92.1% | 4.55* | .25 |
| 9. Activation of the sympathetic nervous system associated with which of the following physiological outcomes: | 78.9% | 92.1% | 2.66 | .19 |
| 10. Bottom-up processing refers to which of the following: | 73.7% | 94.7% | 6.33** | .29 |

*Note*. $n = 38$.
*$p < .05$; **$p < .01$; ***$p < .001$

For the third non-statistically significant item (item 4), the percentage of correct responses were relatively low for both baseline (60.5%) and post-training (68.4%). This item assessed knowledge regarding Wave 1 processing. Results indicated low rates of baseline knowledge in this area and suggest that the training did not improve knowledge in this domain. It is also interesting to note that the item assessing knowledge of Wave 2 processing (item 5) was statistically significant. Although post-training knowledge of Wave 2 processing (65.8%) was similar to rates for Wave 1 processing (68.4%), this item had the lowest baseline knowledge rate (28.9%) and results suggest that the training considerably increased knowledge of Wave 2.

We were also interested in the impact of the nCBT training on practitioner interoceptive awareness. Results indicated a statistically significant increase in interoceptive awareness from baseline ($M$ = 3.43, $SD$ = .52) to the 30-day follow-up ($M$ = 3.56, $SD$ = .54), $t(26) = -2.18$, $p < .04$, Cohen's $d = -.23$. The effect size, however, was small. Results suggest that although the increase in interoceptive awareness was statistically significant, there may be limited clinical significance in the actual change from baseline to follow-up.

## Discussion

This study was the first to formally evaluate the effectiveness of nCBT training from pre- to post-training. We specifically aimed to assess (1) the extent to which the nCBT training increased practitioner knowledge of the method and (2) the extent to which the nCBT training enhanced participants' interoceptive awareness. We found that the three-day training in nCBT resulted in statistically significant increases in practitioner knowledge in most areas and statistically significant increases in interoceptive awareness. There were, however, areas of knowledge that did not increase in a statistically significant manner that may warrant attention in future trainings. Further, although there was a statistically significant increase in participants'

interoceptive awareness, we would have liked to have seen a greater increase in raw scores to indicate a practical change in the clinicians' multidimensional body awareness.

**Research Question 1: nCBT Knowledge**

Results from the current study indicated an overall increase in nCBT knowledge, with post-training scores on the knowledge quiz ranging from 92.1% to 100%. These results are consistent with research supporting the effectiveness of in-person CBT trainings that emphasize self-reflection and experiential exercises (Bennett-Levy et al., 2009, 2012; Spendelow & Butler, 2016). For example, the Bennett-Levy et al. (2009) study found that experiential exercises during an in-person training assisted trainees with interpersonal skill development. Another study by Davis, Thwaites, Freeston, and Bennett-Levy (2015) found improvements in technical skills (e.g., efficient use of time, eliciting key cognitions) and interpersonal empathic skills (e.g., empathic attunement, communication) as a result of a 10-week guided self-reflection training that included both self-practice and reflection. Of note, the participants ($N$ = 14) in the Davis et al. (2015) study were all seasoned practitioners, with an average of nine years of direct client experience following their initial CBT training. Practitioners in the current study also had substantial experience in direct client contact ($M$ = 6.64, $SD$ = 6.87).

We did not, however, find statistically significant increases for question items one (knowledge of the conventional CBT conceptual model), four (knowledge of Wave 1 processing), and nine (knowledge of physiological outcomes related to sympathetic nervous system arousal). One explanation for this lack of a statistically significant change was that participants already understood these concepts at baseline. Pre-test scores indicate that this explanation appeared to be most plausible for the CBT conceptual model (question one) and for reduced prefrontal activity that occurs during sympathetic activation (question nine). Because we required participants to be

familiar with CBT to meet inclusion criteria for the study, we expected practitioners to possess preexisting knowledge of CBT.

The lack of statistical significance on item four was more concerning. Although statistically significant, question 5 also had a comparatively low correction rate. These two questions assessed Wave1 and Wave2 processing, essential components of the nCBT model (Beeson et al., 2017). The findings indicate a need to modify and/or enhance the training approach for these newer and perhaps more complex concepts.

**Research Question 2: Interoceptive Awareness**

Although pre and post interoceptive awareness scores had a statistically significant increase, the size of the effect was small. The practical significance of this finding was therefore likely small. Given the relative importance of interoception in nCBT, we would prefer participants to experience greater changes in interoceptive awareness. In future trainings, we plan to include more direct and intentional training exercises to enhance participants' own levels of interoceptive awareness. We also acknowledge a need for future studies that investigate the connection between counselor interoceptive awareness and client outcome more directly. We found no published studies at the time of writing that examined the impact of counselor interoceptive awareness on client outcome. Currently, investigations into the importance of counselor interoceptive awareness have been limited to conceptual papers (e.g., Duquette, 2017).

**Limitations and Directions for Future Research**

Although this study adds to the literature on the effectiveness of nCBT training for mental health professionals, certain limitations should be considered. The sample was limited in diversity, with the majority of participants identifying as Caucasian and residing in the Pacific Northwest. To enhance generalizability, future research should include more diverse ethnic, cultural, and

geographic groups. Further, generalizability of results was limited by the nature of the quasi-experimental design. Although typical for Stage I interventions (Onken et al., 2014), lack of a control group limited our ability to measure extraneous variables that may have impacted post-training scores and responses. Future utilization of a randomized-control trial approach would strengthen the validity of the results of this study.

An additional limitation of the study was the absence of measures of practical significance. Although results were generally statistically and clinically significant, we do not know if the participants experienced any functional changes that meaningfully impacted their clinical work. Prior CBT studies have failed to detect a significant relationship between expert ratings of trainee competence and client-reported outcome (e.g., Branson, Shafran, & Myles, 2015), and further studies are therefore needed to establish whether trainee participants' skills are associated with improvements in client outcome.

Finally, we focused our research primarily on nCBT knowledge and counselor interoceptive awareness. We do not know if participants' knowledge or interoceptive awareness translated to more effective application of nCBT. One of the next steps in nCBT training research could be collecting follow-up data on participants' demonstration of nCBT skills, and the connection between nCBT knowledge, skills, and interoceptive awareness with client outcome.

**Implications for Counselor Training and Counselor Education**

As noted in the beginning of this manuscript, knowledge of neuroscience as it relates to mental health is now considered part of counselors' foundational knowledge (CACREP, 2015). Despite this inclusion, many counselors are at risk for believing neuromyths and/or inaccurately applying neuroscience concepts in practice, at least in part because of the limited neuroscience-informed models and trainings currently available within the counseling profession (Field et al.,

2019). Our findings provide some evidence that effectively training counselors in neuroscience-informed frameworks and concepts is possible. We suggest counselor educators wishing to provide foundational education and/or professional development in neuroscience topics incorporate self-reflective activities and application opportunities, following the research of Bennett-Levy et al. (2009) and Spendelow and Butler (2016). Self-reflective activities could particularly be beneficial in helping practitioners develop interoceptive awareness. Because many counselors are not familiar with neuroscience jargon, practice during the training could help increase confidence in the concepts and expose areas of confusion that need to be clarified before participants leave the training. For example, while mindfulness is being increasingly integrated into counselor training (e.g., Daniel, Borders, & Willse, 2015), interoceptive awareness is a fairly new concept that is only beginning to gain attention within the counseling and psychotherapy community. Trainees may need a primer on the concept of interoceptive awareness, strategies for enhancing it, and guidance for its potential utility during the counseling process. Counselors may need examples for how to describe their own interoceptive awareness to clients, in order to model mindful awareness of internal states for their clients.

An additional implication of this research is the consideration of extended consultation following the initial training (Rakovshik, McManus, Vazquez-Montes, Muse, and Ougrin, 2016). Although our results indicated positive increases in knowledge, we recognize that post-training retention of knowledge can be enhanced with follow-up contact. Rakovshik, et al. (2016) found that providing training with ongoing consultation resulted in superior competence ratings when compared with both training without consultation and no training. Providing extended consultations may help practitioners gain a deeper understanding of the more complex and/or novel aspects of a model (e.g., Wave1 and Wave2 processes in nCBT) and to develop more sustained

increases in knowledge and skill. Counselor educators could have counselors record their sessions with clients and watch those during the consultation time (Rakovshik et al., 2016; Simons et al., 2010). In order to make the consultations more convenient, and thus possibly enhancing follow-through, we recommend the use of confidential on-line meeting platforms more so than face-to-face meetings.

## Conclusion

One of the consensus issues for advancing the future of counseling outlined in the 20/20 counseling vision was the concern that many current best practices in counseling have been developed by professionals in other mental health disciplines (Kaplan & Gladding, 2011). The committee called for counselors to develop and research new approaches. Further, neuroscience is a relatively new field informing counseling practice and counselors generally lack sufficient training and knowledge in this area.

The purpose of this study was in line with the 20/20 research vision and the gap in neuroscience related trainings, as we aimed to examine the impact of a three-day nCBT training on nCBT knowledge and interoceptive awareness. Overall, our findings supported the impact of the training on nCBT knowledge and levels of interoceptive awareness. The results and the limitation of our design also provided insights and opportunities to enhance future trainings and pursue the next steps in research.

References


American Counseling Association. (2014). *ACA code of ethics and standards of practice.* Alexandria, VA: Author.

Beck, A. T., & Haigh, E. A. P. (2014). Advances in cognitive theory and therapy: The generic cognitive model. *Annual Reviews Clinical Psychology, 10,* 1-24. Doi: 10.1146/annurev-clinpsy-032813-153734.

Beeson, E. T., & Field, T. A. (2017). Neurocounseling: A new section of the Journal of Mental Health Counseling. *Journal of Mental Health Counseling, 39,* 71-83. https://doi.org/10.17744/mehc.39.1.06

Beeson, E. T., Field, T. A., Jones, L. K., & Miller, R. M. (2017). *nCBT: A semi-structured treatment manual*. Boise, ID: Boise State University.

Bender, R., & Lange, S. (2001). Adjusting for multiple testing - when and how? *Journal of Clinical Epidemiology, 54,* 343-349.

Bennett-Levy, J., McManus, F., Westling, B. E., & Fennell, M. (2009). Acquiring and refining CBT skills and competencies: Which training methods are most effective? *Behavioural and Cognitive Psychotherapy, 37,* 571-583. doi: 10.1017/S1352465809990270

Bennett-Levy, J., Hawkins, R., Perry, H., Cromarty, P., & Mills, J. (2012). Online cognitive behavioural therapy training for therapists: Outcomes, acceptability, and impact of support. *Australian Psychologist, 47,* 174-182. doi:10.1111/j.1742-9544.2012.00089.x

Branson, A., Shafran, R., & Myles, P. (2015). Investigating the relationship between competence and patient outcome with CBT. *Behaviour Research and Therapy, 68,* 19-26. doi: 10.1016/j.brat.2015.03.002

Berntson, G. G., Cacioppo, J. T., & Quigley, K. S. (1993). Cardiac psychophysiology and autonomic space in humans: Empirical perspectives and conceptual implications. *Psychological bulletin*, *114*, 296.

Cohen, J. (1969). *Statistical power analysis for the behavioural sciences*. New York: Academic Press.

Council for Accreditation of Counseling and Related Educational Programs (CACREP). (2015). *2016 CACREP Standards*. Retrieved from www.cacrep.org

Craig, A. D. (2009). How do you feel--now? The anterior insula and human awareness. *Nature Review Neuroscience, 10*, 59-70. doi:10.1038/nrn2555

Craig, A. D. (2002). How do you feel? Interoception: the sense of the physiological condition of the body. *Nature Reviews Neuroscience, 3*, 655-666.

Daniel, L., Borders, L. D., & Willse, J. (2015). The role of supervisors' and supervisees' mindfulness in clinical supervision. *Counselor Education and Supervision, 54*(3), 221-232. doi: 10.1002/ceas.12015

Davis, M. L., Thwaites, R., Freeston, M. H., & Bennett-Levy, J. (2015). A measurable impact of a self-practice/self-reflection programme on the therapeutic skills of experienced cognitive-behavioural therapists. Clinical Psychology and Psychotherapy, 22, 176-184. doi: 10.1002/cpp.1884

de Jong, M., Lazar, S. W., Hug, K., Mehling, W. E., Hölzel, B. K., Sack, A. T., Peeters, F., Ashih, H., Mischoulon, D., & Gard, T. (2016). Effects of mindfulness-based cognitive therapy on body awareness in patients with chronic pain and comorbid depression. *Frontiers in Psychology, 7*, 1-13. doi:1-.3389/fpsyg.2016.00967

Duquette, P. (2017). Increasing Our Insular World View: Interoception and Psychopathology for Psychotherapists. *Frontiers in neuroscience, 11,* 135. doi: 10.3389/fnins.2017.00135

Eichstaedt, K. E., Kovatch, K., & Maroof, D. A. (2013). A less conservative method to adjust for familywise error rate in neuropsychological research: the Holm's sequential Bonferroni procedure. *NeuroRehabilitation, 32,* 693-696. doi:10l3233?NRE-130893

Ellis, A. (1957). Rational psychotherapy and individual psychology. *Journal of Individual Psychology, 13,* 38–44.

Ellis, A. (1994). *Reason and emotion in psychotherapy: Revised and updated*. New York, NY: Birch Lane Press.

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods, 39,* 175-191**.**

Field, T. A., Beeson, E. T., & Jones, L. K. (2015). The new ABCs: A practitioner's guide to neuroscience-informed cognitive-behavioral therapy. *Journal of Mental Health Counseling, 37,* 206-220. doi:10.17744/mehc.37.3.02

Field, T. A., Beeson, E. T., & Jones, L. K. (2016). Neuroscience-informed cognitive behavior therapy in clinical practice: A preliminary study. *Journal of Mental Health Counseling, 38,* 139-154. doi: 10.17744/mehc.38.2.05

Field, T. A., Beeson, E. T., Jones, L. K., & Miller, R. (2017). Counselor allegiance and client expectancy in neuroscience-informed cognitive-behavior therapy: A 12 month qualitative follow-up. *Journal of Mental Health Counseling, 39,* 351-365. doi:10.17744/mehc.39.4.06

Field, T. A., Miller, R., Beeson, E. T., & Jones, L. K. (2019). Treatment fidelity in neuroscience-informed cognitive behavior therapy: A feasibility study. *Journal of Mental Health Counseling.*

Fissler, M., Winnebeck, E., Schroeter, T., Gummersback, M., Huntenburg, J. M., Gaertner, M., & Barnhofer, T. (2016). An investigation of the effects of brief mindfulness training on self-reported interoceptive awareness, and the ability to decenter, and their role in the reduction of depressive symptoms. *Mindfulness, 7,* 1181-1181. doi: 10.1007/s12671-016-0559-z

Forrest, L. N., Smith, A. R., White, R. D., Joiner, T. E. (2015). (Dis)connected: An examination of interoception in individuals with suicidality. *Journal of Abnormal Psychology, 124,* 754-763. doi:10.1037/abn0000074

Garfinkel, S. N., Seth, A. K., Barrett, A. B., Suzuki, K., & Critchley, H. D. (2015). Knowing your own heart: distinguishing interoceptive accuracy from interoceptive awareness. *Biological Psychology, 104,* 65-74.

Gray, M. A., & Critchley, H. D. (2007). Interoceptive basis to craving. *Neuron, 54*(2), 183-186.

Holm, S. (1979). A simple sequentially rejective multiple test procedure. *Scandanavian Journal of Statistics, 6,* 65–70.

Kaplan, D. M., & Gladding, S. T. (2011). A vision for the future of counseling: The 20/20 principles for unifying and strengthening the profession. *Journal of Counseling & Development, 89,* 357-372. https://doi.org/10.1002/j.1556-6678.2011.tb00101.x

LeDoux, J. E., & Pine, D. S. (2016). Using neuroscience to help understand fear and anxiety: A two-system framework. *The American Journal of Psychiatry, 173,* 1083-1093. https://doi.org/10.1176/appi.ajp.2016.16030353

McRae, K., Misra, S., Prasad, A. K., Periera, S. C., & Gross, J. J. (2012). Bottom-up and top-down emotion generation: Implications for emotion regulation. *Social Cognitive & Affective Neuroscience, 7*, 253-262. doi:10.1093/scan/nsq103

Mehling, W. E., Price, C., Daubenmier, J. J, Acree M., Bartmess E., Stewart A. (2012) The Multidimensional Assessment of Interoceptive Awareness (MAIA). *PLoS ONE 7*. doi:10.1371/journal.pone.0048230

Merwin, R. M., Zucker, N. L., Lacy, J. L., & Elliott, C. A. (2010). Interoceptive awareness in eating disorders: Distinguishing lack of clarity from non-acceptance of internal experience. *Cognition and Emotion, 24*, 892-902.

Ochsner, K. N., & Gross, J. J. (2005). The cognitive control of emotion. *Trends in Cognitive Sciences, 9*, 242-249. doi:10.1016/j.tics.2005.03.010

Onken, L. S., Carroll, K. M., Shoham, V., Cuthbert, B. N., & Riddle, M. (2014). Reenvisioning clinical science: Unifying the discipline to improve the public health. *Clinical Psychological, Science, 2*, 22-34. doi:10.1177/2167702613497932.

Paulus, M. P., & Stewart, J. L. (2014). Interoception and drug addiction. *Neuropharmacology, 76*, 342-350.

Raio, C. M., Orederu, T., Palazzolo, L., Shurick, A., & Phelps, E. A. (2013). Cognitive emotion regulation fails the stress test. *Proceedings of the National Academy of Sciences, 110*, 15139-15144. doi:10.1073/pnas.1305706110

Rakovshik, S. G., McManus, F., Vazquez-Montes, M., Muse, K., & Ougrin, D. (2016). Is supervision necessary? examining the effects of internet-based CBT training with and without supervision. *Journal of Consulting and Clinical Psychology, 84*, 191. doi: 10.1037/ccp0000079

Schulz, S. M. (2016). Neural correlates of heart-focused interoception: a functional magnetic resonance imaging meta-analysis. *Philosophical transactions of the Royal Society of London. Series B, Biological Sciences*, *371*.

Simons, A. D., Padesky, C. A., Montemarano, J., Lewis, C. C., Murakami, J., Lamb, K., . . . Beck, A. T. (2010). Training and dissemination of cognitive behavior therapy for depression in adults: A preliminary examination of therapist competence and client outcomes. *Journal of Consulting and Clinical Psychology, 78*, 751-756.

Spendelow, J. S., & Butler, L. J. (2015) Reported positive and negative outcomes associated with a self-practice/self-reflection cognitive-behavioural therapy exercise for CBT trainees, *Psychotherapy Research, 26*(5), 602-611. doi: 10.1080/10503307.2015.1058983

Tsakiris, M., & Critchley, H. (2016). Interoception beyond homeostasis: affect, cognition and mental health. *Philosophical Transactions B: Biological Sciences, 371*, a20160002.

Westbrook, D., Sedgwick-Taylor, A., Bennett-Levy, J., Butler, G., & McManus, F. (2008). A pilot evaluation of a brief CBT training course: Impact on trainees' satisfaction, clinical skills and patient outcomes. *Behavioural and Cognitive Psychotherapy, 36*, 569-579.

Wright, S. P. (1992). Adjusted p-values for simultaneous inference. *Biometrics*, *48*, 1005–1013.

# Appendix A: nCBT Knowledge Quiz

Thank you for attending the workshop on nCBT, and your willingness to participate in this research project. Please answer the following questions about this new nCBT.

1. When counselors conceptualize client distress from a conventional CBT perspective, they tend to focus on modifying _____ first in order to promote change in other areas of experiencing.
    a. Behaviors/actions
    b. Cognitions/thoughts
    c. Emotions/physiological responses

2. When counselors conceptualize client distress from an nCBT perspective, they should focus on modifying _____ first in order to promote change in other areas of experiencing.
    a. Behaviors/actions
    b. Cognitions/thoughts
    c. Emotions/physiological responses

3. Which of the following is **not** a response style assessed in the nCBT model?
    a. Avoid
    b. Attack
    c. Approach

4. In the nCBT counseling model, which of the following processes constitutes Wave1?
    a. Trigger, implicit memories activated, emotional and physiological consequences
    b. Trigger, conscious awareness, emotional and physiological consequences
    c. Trigger, emotional and physiological consequences, conscious awareness

5. In the nCBT counseling model, which of the following processes constitutes Wave2?
    a. Conscious awareness, physiological consequences, beliefs about the event
    b. Conscious awareness, emotional arousal, beliefs about the event
    c. Conscious awareness, beliefs about the event, physiological consequences

6. In the nCBT counseling model, what types of interventions are useful during Wave1 and Wave 2?
    a. Wave1: cognitive restructuring and mindfulness, Wave2: body awareness
    b. Wave1: body awareness, Wave2: cognitive restructuring
    c. Wave1: cognitive restructuring and mindfulness, Wave2: behavior modification

7. The brain develops from the _____ to the _____ and from the _____ to the _____ .
    a. Outside to the Inside; Bottom to the Top

b. Inside to the Outside; Bottom to the Top
c. Inside to the Outside; Top to the Bottom

8. Which of the following brain structures is responsible for threat detection in our environment?
a. Hypothalamus
b. Hippocampus
c. Amygdala

9. Activation of the sympathetic nervous system associated with which of the following physiological outcomes:

a. Heart rate increases; Breathing increases; Glucose production increases; Digestion decreases; and Executive functioning of the prefrontal cortex decreases

b. Heart rate decreases; Breathing decreases; Glucose production decreases; Digestion increases; and Executive functioning of the prefrontal cortex increases

c. Heart rate increases; Breathing increases; Glucose production increases; Digestion decreases; and Executive functioning of the prefrontal cortex increases

10. Bottom-up processing refers to which of the following:

a. Using our "thinking brains" to rationally think through situations when interpreting information

b. Breaking down visual stimuli in our environments to their most basic components before interpreting them

c. Using information coming in from the senses and body to form interpretations