

## THEORY

# The New ABCs: A Practitioner's Guide to Neuroscience-Informed Cognitive-Behavior Therapy

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*Cognitive-behavioral therapy models are evolving to take into account the impact of physiological responses on client distress and the secondary role of conscious cognitions and beliefs in perpetuating distress and dysfunction. This article presents an accessible and practical description of a neuroscience-informed cognitive-behavior therapy model, in the hope that readers will learn how to apply this model in practice.*

Cognitive-behavioral therapy (CBT) is the most commonly used evidence-based practice in the treatment of mental disorders (Field, Farnsworth, & Nielsen, 2011; Society of Clinical Psychology, 2014). Despite its ubiquity, CBT is not without limitations. For instance, mental health counselors who practice conventional CBT may experience a state of befuddlement when clients report no noticeable environmental antecedents or triggering events related to their maladaptive emotional and behavioral reactions. Clients may report no insight into their emotional experiences (“I don’t know why I feel this way”), lack of knowledge of their thought patterns (“I don’t know what I was thinking”), or scant awareness of their behaviors (“I just blacked out”) until after they experience emotional and behavioral consequences. Clients may have told the counselor that they lacked awareness of their behavior until it was too late, after the response had occurred. Presuming no deceit, this absence of awareness may cast uncertainty on a counselor’s ability to effectively practice conventional CBT. The emerging field of neuroscience provides reassurance by supplying information that clinicians can use in addressing such dilemmas.

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Findings from neuroimaging studies suggest that CBT has the potential to promote changes in the structure and function of such brain areas as the prefrontal cortex and amygdala, among many others (e.g., Linden, 2006, 2008; Siegle, Ghinassi, & Thase, 2007). As a result, conventional CBT models have been adapted to incorporate findings about the processes that change the structure and function of the brain during CBT (e.g., Clark & Beck, 2010; David, Szentagotai, Eva, & Macavei, 2005). Given how frequently CBT is used in clinical practice, the increased focus on neuroscience in the counseling literature, and trends emerging in the CBT literature, it is important for mental health counselors to consider neuroscience-informed practices. The purpose of this article is to synthesize studies of neuroscience and conventional CBT models to propose a new model of neuroscience-informed cognitive-behavioral practice.

### THE OLD ABCS: CONVENTIONAL CBT APPROACHES

Conventional CBT is best defined as a group of therapeutic approaches that share the common belief that thoughts, beliefs, and cognitions cause emotional and behavioral experiences rather than external events. Two seminal models emerged in the 1950s and 1960s: Rational Therapy, later renamed Rational-Emotive Behavior Therapy (REBT), developed by Albert Ellis (1957, 1962), and Cognitive Therapy, developed by Aaron Beck (1967). Both models proposed that dysfunctional emotional and behavioral responses were caused directly by dysfunctional thinking, known as cognitive distortions (Beck) or irrational beliefs (Ellis). Treatment therefore focused on confronting, disputing, and restructuring maladaptive thought patterns into more adaptive patterns that would lead to more adaptive emotional and behavioral responses. While more contemporary models of CBT place less emphasis on the centrality of thoughts, such as Marsha Linehan's Dialectical Behavior Therapy (Linehan, 1993) and Steven Hays's Acceptance and Commitment Therapy (Hays, Strosahl, & Wilson, 2003), thought continues to be a central focus of many traditional CBT models today. Beck and Haigh's most recent update (2014) re-envision all mental disorders as best defined and differentiated by their underlying cognitions and schemas.

#### *The ABCDE Model*

The REBT framework of Albert Ellis (1962) operates as one of the most straightforward and well-known models for explaining the connection between events, thoughts, beliefs, cognitions, emotions, and behaviors. Central to REBT is the ABCDE analysis popularized by Ellis (1962) as a way to perform a step-by-step chain evaluation of client responses to the environment. For Ellis, the chain of emotional distress and behavioral dysfunction begins when a person encounters an activating event (A) in the environment, also known as an antecedent, precipitant, or trigger. The person first responds by interpreting the activating event based on beliefs (B) the person already holds in relation to the event, also referred to as thoughts or cognitions. If irrational, these beliefs

create emotional distress and dysfunctional behavioral consequences (C). To prevent this dysfunctional behavior from occurring, Ellis proposed that a person can be taught to identify and dispute these irrational beliefs (D), resulting in new and more rational emotional and behavioral responses (E). The goal of counseling, according to Ellis (1962), is to modify a person's irrational beliefs to prevent emotional distress or dysfunctional behavior. Beck's model (1967) has similar goals.

In the traditional ABCDE model, a client needs the requisite ability to think before acting or responding emotionally, since treatment is solely focused on restructuring conscious thought. It is an extremely difficult task for clients to master their emotions and behavior by mastering control of their thinking. At its worst, this goal is unrealistic and can set clients up for failure, moving them further away from building self-efficacy and empowering their capacity to change. The ABCDE model has therefore been modified by numerous authors (e.g., David, 2003; DeSilvestri, 1989; DiGiuseppe, 1986; Dryden, 1984; Maultsby, 1984).

As early as 1984, Maultsby proposed that in a process driven largely by physiology, individuals react almost instantly to an activating event before thinking occurs. Even Ellis later considered his model to be overly simplistic and not wholly representative of what induces or perpetuates client emotional distress and behavioral dysfunction (David, 2003; Ellis, 1994). Recent advances in neuroscience support a richer and more complex understanding of a person's ability to think before acting, and emphasize the role of physiology in behavioral response (Makinson & Young, 2012; Miller & Cohen, 2001; Porges, 2001). Mental health counselors should therefore consider their use of conventional CBT, such as REBT, in light of several important findings in the field of neuroscience.

## INTRODUCTION TO NEUROSCIENCE

A client's difficulty in thinking before responding emotionally or behaviorally can be understood by examining the brain and how people respond under conditions of stress, threat, or an intensely pleasurable stimulus. The following description is a simplified version of how the brain operates; the brain itself is a complex organ that requires foundational and sustained scholarship to fully understand its operation.

### *Brain Development and Evolution*

In terms of evolution, the human brain developed from the inside out (Kolb & Whishaw, 2011). The brain stem, which connects the base of the brain to the spinal column, is the most evolutionarily primitive region. It supports vital life-sustaining processes, such as cardiac, respiratory, and digestive functions. Just above the brain stem is the limbic region of the brain, which supports the emotions. Although not a formal system per se, this collection of both cortical (the folded upper portion of the brain) and subcortical (below the folded cortex) brain structures work together as the emotional, reactive,

and reward-based area of the brain that helps to manage lower regions of the brain and enhance survival. This limbic area also supports some systems for remembering details that will aid in survival. Lastly, the most recent area of the brain to evolve is the cortex, sometimes called the neocortex. This outermost folded layer of the brain contains the sensory areas of the brain and the frontal and pre-frontal cortex, which is responsible for conscious thought, planning, and organizing information and shifting between tasks (executive functioning), and thinking about thinking (metacognition). This is the rational portion of the brain. The brain region that coordinates all these areas is the thalamus. It effectively sits in the center of the brain among the limbic constructs and serves as the primary relay station for all information coming in through the senses (except smell, olfaction) and up from the body. These brain areas are thought to have developed together with human evolution, from reptiles (brain stem) to mammals (limbic system) to humans (neocortex). Similarly, the brains of humans following conception also develop from the inside out, following this evolutionary pattern (Kolb & Whisaw, 2011).

To summarize this theory of brain development, the functions of the brain developed in sequential order: First came the core mechanisms that keep us alive. Next came the primary emotional responses, reward processes, and foundational memory to enhance survival of the individual in the environment. Third came conscious thought, executive functioning, and metacognition, which assist with regulating emotions, setting the world in context, and thinking rationally. Thus capacity for rational thought does not precede core physiological arousal or foundational emotion, memory, and behaviorally reactive processes. The same may hold true in day-to-day brain functioning, since physiological and emotional responding often occur before conscious thought. Thus, neuroscience contradicts a central tenet of Ellis's original (1962) ABCDE model. Beliefs do not always occur before consequences.

### *How the Brain Responds to Antecedents*

The relevance of brain development is apparent when considering how humans mentally process various types of antecedents. Under everyday circumstances, when there is no actual or perceived acute stressor, sensory information from the body and the outside world are brought into the thalamus and sent out to the relevant cortical areas and limbic regions, where the information is processed in terms of the person's vast web of past experiences and memories. The rational part of the brain (prefrontal cortex) then works to regulate the limbic regions and helps to inform how the person will respond, sending appropriate messages to the motor cortex and out to the body through the brainstem. This top-down processing (also called "the high road," "thinking slow," or "Systems 2 thinking"; Kahneman, 2011) allows the brain to make conscious, rational, and well-planned decisions about how to respond to the stimuli.

The brain's processing system shifts when faced with a threat, actual or perceived. In those circumstances, the brain relies on the more primitive regions to ensure survival. Instead of initially sending this information up

through the cortex, the thalamus communicates the signals to the amygdala immediately, which causes the release of powerful hormones. When these chemicals are sent down through the nervous system into the body, the body responds by releasing adrenaline (i.e., epinephrine). Adrenaline activates the sympathetic nervous system and causes physiological changes in the body: Heart rate increases, breathing becomes shallower, and muscles tense. The pituitary gland, the master brain control gland, also releases hormones that cause the production of cortisol, which then floods the body. Although adaptive in small quantities (e.g., supplying quick bursts of energy, improving memory functioning, suppressing inflammation), it can have adverse effects over the long term. The dual release of epinephrine followed by cortisol is characterized as the *fight or flight* response (Cannon, 1914; Selye, 1936). The body is preparing itself for action; releasing the hormones is part of a survival mechanism. On the opposite end of the spectrum, the *freeze* response occurs when the brain and body determine that fight or flight will not be functional in that particular circumstance. In the freeze response, the body physically shuts down and disables a person's behavioral response to the stressor, thus making a final effort to survive. Porges (2001) proposed that the freeze response was caused by one of the two branches of the parasympathetic nervous system, which serves the inverse functions of the sympathetic nervous system, thus decreasing heart rate, slowing breathing, etc.

This process occurs routinely whenever a person is faced with an actual or perceived threat or an intensely pleasurable stimulus. The ability to engage the prefrontal cortex or thinking part of the brain under these circumstances is compromised (Miller & Cohen, 2001). The neocortex is bypassed largely because conscious thought would slow the flow of information, requiring more steps before the message is sent down the brain stem and a person can respond with adaptive behavior to avert a potential threat. When startled, a person is thus likely to respond instinctively, only later thinking about the event. An automatic response can also occur when a person's memory systems are activated without an obvious threat or environmental trigger. Clients therefore may respond to perceived threats by activating subcortical brain regions without actively engaging the rational, executive, thinking part of the brain before responding emotionally and behaviorally. A variety of names has been given to this expedited, automatic process, among them "the low road," "bottom-up processing," "thinking fast," and "Systems 1 thinking" (Kahneman, 2011).

To use a clinical example, imagine that an arriving client complains of having panic attacks and feeling paranoid when walking home during the day. A year earlier, the client had been mugged while walking home from work late at night and has since deliberately chosen a different path home, avoided certain sections of town, and avoided working any late hours. Each of these strategies is a cognitive, top-down decision, chosen by the client to mitigate anxiety and fear. But even after taking these additional steps to stay safe, the client may still experience a racing heartbeat, shallow breathing, and near-constant hypervigilance when walking home. The client may also feel unable to control these emotional and physiological responses, despite making every effort to do

so. In such instances, reinforcing the client's cognitive strategies, such as positive self-talk or planning for contingencies, may still not resolve the perpetual problem of physiological and emotional arousal during the walk home.

In this mugger scenario, the client is engaging in bottom-up processing, allowing the brain to function quickly, efficiently, and with less conscious thought. A person's brain did not evolve, nor does it currently function, to prioritize thinking before acting or to engage in metacognition when physiologically flooded and emotionally dysregulated. Conscious awareness, if it does occur, happens after the client has already responded behaviorally or emotionally. Training clients to modify thoughts before responding is asking clients to change the way their brains naturally operate—a monumental task. An enhanced model is therefore needed, one that integrates current research from neuroscience into the practice of CBT and accounts for automatic responding, implicit memory, and the role of the counselor in breaking automatic cycles of responding.

### THE NEW ABCS: A NEUROSCIENCE-INFORMED COGNITIVE-BEHAVIORAL APPROACH

The Waves of the New ABCs (Waves) is an original conceptual model of neuroscience-informed CBT that uses the ABCDE model as a foundation for describing a continuous process of internal and external stimuli that result in emotions, behaviors, and thoughts. The model was developed from close readings of the neuroscience (e.g., Porges, 2001) and interpersonal neurobiology (e.g., Schore, 2012; Siegel, 2012) literature along with contemporary approaches to CBT that incorporate neurobiological understandings of behavior (e.g., Clark & Beck, 2010; Makinson & Young, 2012; Siegle, Ghinassi, & Thase, 2007). This section provides an overview of the Waves before describing treatment recommendations.

This new model of the Waves is a comprehensible way to understand complex neurobiological activity. It is important that the model is easily understood by both practitioners and clients, since effective counseling requires that both understand and believe in the intervention selected so that both expect change to occur (Anderson, Lunnen, & Ogles, 2010). In the Waves model, two central interactional brain processes, named *Wave1* and *Wave2*, are identified. In the following elaborated description of the model, the clinical example of the mugging is used to explain the two processes.

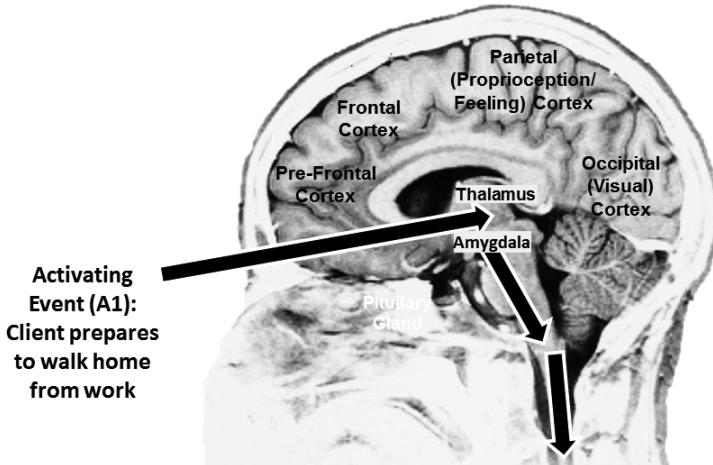
#### *Wave1*

The first Wave is characterized by bottom-up processing systems in the human brain that promote efficiency and speed in how information is processed so that the person can instinctually feel and act without thinking. This, which normally happens very quickly and outside of conscious awareness, is referred to as *Wave1*. *Wave1* has three components (Figure 1): the activating event (A1), brain activity from the bottom up (B1), and primary consequences throughout the nervous system (C1).

Figure 1. A visual representation of bottom-up, automatic, unconscious information processing in the human brain (Wave 1) when perceiving threat or intensely pleasurable stimulus in the environment. The figure narrative illustrates the mugging example in the text.

## Wave 1

**Brain from the Bottom-Up (B1): Implicit memory association with antecedent (mugging) leads to increased cortisol and adrenaline production that bypasses prefrontal cortex**



**Consequences throughout the nervous system (C1): Increased heart rate, sweaty palms, shallow breath, emotional response (anxiety), urges to act (freeze response)**

**Activating event (A1).** The human body constantly collects sensory information from various internal and external objects. In the Waves, A1 represents the occurrence of an event that creates sensory stimuli for the individual. Potential activating events are people, places, things, situations, and a person's stored implicit memories. In the example, the activating event occurs when the client who has survived a mugging prepares to walk home from work.

**Brain from the bottom-up (B1).** Once the activating event has been converted to sensory stimuli, the human brain interprets the stimuli. This is accomplished in the bottom parts of the brain, before a message is quickly sent through the nervous system. This form of automatic responding routes messages away from the neocortex, and thus the top part of the brain is not needed to respond physiologically, generate emotions, or motivate behavior. The client's preparations to walk home from work (A1) activate implicit memories of the previous mugging, stimulating a threat response. This triggers anxiety (B1) and initiates the release of increased amounts of epinephrine and cortisol.

**Primary consequences throughout the nervous system (C1).** After the lower networks of the brain process the sensory stimuli, the body responds to the brain's messages. In this stage, primary emotions may be generated that are directly related to how the lower parts of the brain processed the sensory stimuli.



If the stimuli were interpreted as dangerous or threatening, the lower regions might send instructions through the brain stem to the rest of the nervous system to increase heart rate, respiration, and perspiration while promoting a fight or flight response. Sensory stimuli that are associated with previous experiences of intense pleasure may be sought compulsively, as occurs with many types of substance abuse. Because stimuli in this stage are often associated with danger and threat, many behavioral consequences will take the form of survival skills and reflexes that are largely outside the individual's conscious control. In the mugging example, the client's heart begins to race, the palms sweat, breathing becomes shallower, and the client may respond by feeling unable to walk home (a freeze response).

**Wave2**

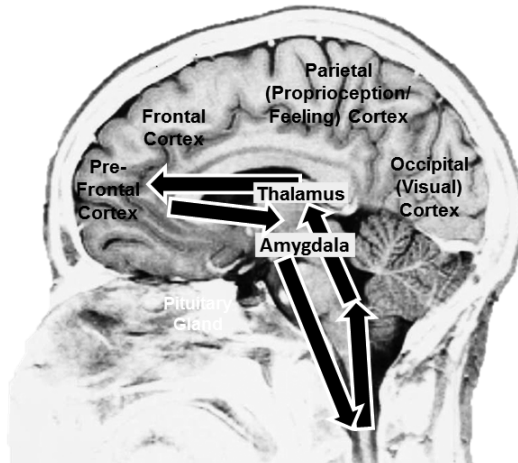
Wave2 is best described as the top-down processing systems in the human brain. In Wave2, physiological and behavioral consequences from Wave1 are sent to the thalamus and then the neocortex. The cortex assists with making well-reasoned and rational evaluations of Wave1, resulting in new emotions, behaviors, and physiological consequences. Wave2 also has three components (Figure 2): awareness of Wave1 (A2), brain activity from the top down (B2), and secondary consequences throughout the nervous system and limbic system (C2).

**Figure 2. A visual representation of second wave information processing in the human brain (Wave 2), starting at the brainstem. The figure narrative illustrates the mugging example in the text.**

**Wave 2**

**Awareness (A2) message sent from Limbic Area to Neocortex regarding physiological response and/or behavior**

**Brain from the Top-Down (B2; Neocortex): Beliefs about physiological response, behavior, or stimulus/ antecedent ("I can't believe this is happening again")**



**Consequences throughout the Nervous System and Limbic System (C2): Secondary emotions such as shame, secondary physiological response such as tears**



**Awareness (A2).** The crash of Wave1 is likely to result in an individual's awareness of Wave1 consequences. Though the person becomes aware of feelings and behaviors, this is likely not until the initial response has occurred. In the mugging example, the client becomes aware of their physiological state (racing heartbeat, sweaty palms, shallow breathing), and behavioral response (feeling unable to leave).

**Brain from the top down (B2).** Aware of the current situation, the top parts of the brain process new sensory input in order to evaluate, critique, problem-solve, and plan for a response. The person might reappraise feelings and behaviors and subsequent thoughts that may be present. This process is likely to be influenced by current developmental levels of certain brain regions and networks. For example, if the prefrontal cortex is not very well-developed (e.g., infants and young children), the executive functioning needed to make conscious sense of Wave1 may be limited. This phase may also include many false evaluations that can lead to creation of cognitive distortions and mental mistakes that, if practiced long enough, begin to emerge in future Wave1 processes (i.e., become automatic thoughts). It may be very difficult to consciously change responses to sensory stimuli in cases when messages are automatically rerouted from the limbic area to the brainstem and nervous system without being sent to the neocortex. In the mugging example, the client chastises him- or herself (B2) for the inability to control physiological responses (racing heartbeat, sweaty palms, shallow breathing) and behavioral responses (feeling unable to leave; C1).

**Secondary consequences throughout the nervous and limbic systems (C2).** After sensory stimuli are processed by the upper networks of the brain (the cortex), top-down networks communicate with the limbic system, creating an emotional response, before messages are sent down to the brain stem and throughout the nervous system, initiating physiological response. These integrated emotional responses (conscious feelings) are generated by both parts of the limbic system and related cortex and may be secondary emotions that are related to how a person appraises sensory stimuli taking place in the upper parts of the brain. To conclude the mugging example, the client feels shame and begins to silently weep (C2) after an appraisal (B2) of their physiological responses (racing heartbeat, sweaty palms, shallow breathing) and the behavioral responses (feeling unable to leave).

## COUNSELING WITH THE NEW ABCS

While recent revisions to conventional models of CBT mention the importance of bottom-up processing (i.e., Clark & Beck, 2010; Makinson & Young, 2012)—Wave1 in the Waves of the New ABCs model—most studies recommend a primarily top-down approach—Wave2 of this proposed model (e.g., Clark & Beck, 2010; Makinson & Young, 2012). Cognitive restructuring is still relevant, as top-down processing can be very useful during the second wave of client responding (Wave2), when clients can be helped to reappraise their emotional distress and dysfunctional behavior (Wave2, part B) after phys-

iological arousal has been soothed (Wave1, part A). Top-down interventions are most advantageous after the major moment of crisis has passed, leaving room for clients to reappraise their response to the situation in a calm, relaxed state. Top-down interventions are not useful during the initial response phase (Wave1) because of the restricted ability for conscious awareness and reappraisal that occurs when information is sent quickly and automatically to the nervous system, bypassing the opportunity for conscious thought in the neocortex. Clients with difficulties regulating affect or controlling their behavior are more likely to need assistance with addressing Wave1 consequences initially, before appraisal of their past actions can be addressed. Such clients may benefit from interventions that help them to build awareness, tolerance, and acceptance of Wave1 consequences during future episodes, in addition to interventions that help them to change these consequences. While REBT is effective and useful in addressing Wave2 processes, targeting Wave1 processes within an REBT model may be able to enhance its effectiveness, utility, and accuracy by giving counselors a means to address both the explicit consequences that might bring someone into counseling (Wave2) and the implicit waves that might cause these consequences to occur (Wave1).

The goal of neuroscience-informed CBT is to help clients to respond differently to antecedents, with the hope that they will develop more regulated emotional states and functional behavioral responses. Counseling with the New ABCs can be conceptualized in three fluid phases: attending to physiological reactions (A), building the brain from the bottom up (B), and connecting the bottom to the top (C). Phases A and B are most useful during Wave1, while phase C is most useful during Wave2.

### ***A: Attending to Physiological Reactions***

The first phase of treatment with the Waves focuses intentionally on the client's physiological reactions. The goal of this phase is to help clients unconsciously attune to physiological responding and emotional activation, which requires interventions other than traditional talk therapy. There are a number of models for facilitating attunement to physiological states, though many of these still require conscious awareness, such as relaxation or taking one's pulse when upset. Any methods that require conscious thought are less useful at helping clients attune to physiology during Wave1 interventions, since stress, threat, or excitement messages are not sent to the neocortex until after the nervous system has already been activated. More productive approaches aim to modify a client's unconscious attunement to physiology. In the mugging example, clients would be guided in how to become attuned to their physiological states and connect physiological to emotional responses (i.e., how a client feels physically when anxious or panicked). Among the beneficial approaches to developing physiological awareness are mindfulness, biofeedback and neurofeedback, and healthy coping behaviors that activate the senses.

*Mindfulness* helps the client to develop unconscious attentional attunement to parts of the body or the breath. By drawing attention to physical sen-

sation rather than cognitive evaluation, mindfulness has been found to target brain areas that connect the limbic system and the neocortex, essentially sending messages about sensory information to the neocortex (Brefczynski-Lewis, Lutz, Schaefer, Levinson, & Davidson, 2007; Siegel, 2007). Mindful clients become more cognizant of sensory stimuli, which can result in reduced sensitivity to threat detection during emotional arousal (Farb, Anderson, & Segal, 2012).

*Biofeedback* and *neurofeedback* are advanced technical procedures, requiring specialized training and experience. Technology based on heart-rate monitoring, quantitative electroencephalography (qEEG), and functional magnetic resonance imaging (fMRI) has the potential to retrain the unconscious bottom-up regulatory processes that occur during Wave 1 in a way that is not available to top-down approaches, such as forms of talk therapy (Linden, 2008). During sessions, clients are exposed to how their brain and body react to certain sensory stimuli, which can help them moderate how their own brain responds.

Another common cognitive-behavioral intervention is healthy replacement behavior. This technique can be modified to better address physiological unconscious awareness by facilitating powerful sensory-based experiences that help a client to become attuned to sensory input and physiology earlier in the process. During a recent webinar on this topic, a participant reported that the tactile sensation of a frozen water bottle seemed to help a client with social anxiety to moderate both emotional state and physiological response during case conference meetings, rather than becoming overwhelmed by past triggering memories of feeling enclosed in a small room. The counselor gradually faded this procedure using systematic desensitization by slowly asking the client to last for longer periods in the meeting without the device. This is an excellent example of how grounding methods can enhance attunement to physiological responding and thus help clients to regulate affect and physiological response. In this example, keeping a client's attention in the here-and-now prevented memories of past events from triggering emotional and behavioral responding. Attunement to the present moment of physiological experience is particularly important for clients with trauma histories, who may be prone to dissociative episodes. Another example of healthy replacement behavior, used in Dialectical Behavior Therapy (Linehan, 1993), is holding ice. This similarly distracts clients from self-injuring by engendering the same sensations of physical discomfort (and probable endorphin secretion) without the need to self-injure.

### ***B: Building the Brain from the Bottom Up***

The second phase of treatment with the Waves operates to break automatic reactions driven by the lower parts of the brain and create new neuronal pathways or circuits that connect the lower parts of the brain to the top. Continued mindfulness, biofeedback, and neurofeedback techniques along with systematic desensitization can be helpful. In the mugging example, the counselor could explore implicit memories and associations related to the client's physiological reactions (e.g., the previous mugging experience) while continuing to build adaptive regulatory practices. Systematic desensitization

could be used to gradually expose the client to thoughts and images of the past mugging while also asking the client to become attentive to physiological responses during the exercises and give voice to physiological states.

### ***C: Connecting the Bottom to the Top***

The third phase of treatment with the Waves operates to balance the activity in the lower parts of the brain (e.g., the limbic system) with the top parts (e.g., the neocortex). Here newer CBT strategies that focus on acceptance are helpful, in addition to conventional CBT approaches to modify cognitions. At this phase, the client can receive psychoeducation about Wave1 and Wave2 and begin to connect automatic responses in Wave1 to new conscious awareness in Wave2. In the mugging example, the client could be helped to recognize that he or she only becomes aware of physiological, behavioral, and emotional responding to the potential threat in the environment during a panic attack or freeze response. Continuing to use systematic desensitization, the client could eventually be coached to walk home in small increments (e.g., parking nearby in the mornings to reduce the length of the route), while attending to the physiological responses during the walk. The client could learn to anticipate and accept physiological arousal upon preparing to walk home without increasing the intensity of responding by becoming overwhelmed by the arousal. Following this acceptance, the client could learn to engage in productive self-talk about their ability to walk home, the relatively low chance of being mugged again due to changes in the time of day and route selected, and the past history of successful efforts to walk home.

## **CONCLUSION**

The purpose of this article was to provide an accessible description of a treatment model that addresses how the brain operates, in an attempt to help practitioners to be more effective with clients in their clinical work. Future models of CBT will likely gravitate toward including interventions that target physiological and emotional responses during Wave1 activation while retaining conventional interventions that target conscious thought during Wave2 activation. Integrating approaches is needed to achieve this type of comprehensive model; practitioners are encouraged to consider receiving specialized training in the practice of mindfulness, biofeedback, or neurofeedback, or another form of unconscious body awareness when providing CBT services. Although psychoeducation on the workings of the brain, such as the Waves model, may be useful to clients, it does not address the need to prepare clients adequately for bottom-up, automatic responses occurring in the moment of an activating event or trigger. By helping clients to respond differently at an unconscious and automatic level in those moments through the use of such in vivo approaches as systematic desensitization, practitioners can build success experiences and thus start a causative chain reaction of providing tangible evidence for client change. This instills hope, which can make conventional efforts to modify the irrational beliefs occurring during Wave2 activation more successful.

Future treatment protocols and empirical research are needed to validate the concepts presented here and explore other ways in which neuroscience can help promote human development, resilience, and wellness. Useful studies of this proposed neuroscience-informed CBT model could include examinations into clinician allegiance and client expectancy of change occurring when using the model (i.e., belief and buy-in to the “myth” and “ritual” of the selected intervention; Anderson et al., 2010). Studies of allegiance and expectancy may be more useful than efficacy studies that compare current CBT models in experimental conditions (e.g., randomized controlled trials), since meta-analyses have found no substantial differences in treatment effect between therapeutic models once confounding variables such as therapist or researcher allegiance have been controlled (e.g., Wampold et al., 1997). For example, only marginal differences in treatment effect were found once allegiance effects were controlled for in a meta-analysis of cognitive therapies compared with other psychotherapies in the treatment of depression (Wampold, Minami, Baskin, & Tierney, 2002). Meta-analyses of component studies have also found no substantial differences between variations of a single therapeutic model (e.g., cognitive-behavior therapy vs. behavior therapy alone; Ahn & Wampold, 2001). Finally, while the Waves of the New ABCs offer a conceptual framework for helping to understand human experience, the intent was not to present the Waves as a prescriptive model or evidence-based treatment; the model merely integrates the current body of knowledge. Although treatment recommendations are provided, the list is not exhaustive.

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