

Infusing Neuroscience within Counselor Training: A Rationale for an Integrally-Informed Model

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The benefits of neuroscience to expand views of mental health appear both logical and inevitable. Neurobiological foundations, however, have often been eschewed by the counseling profession as reductionistic and dehumanizing. Various barriers have involved competing theoretical foundations, loyalty to epistemological assumptions, and lack of curricular frameworks to guide integration. As result, neuroscience has been poorly integrated into case conceptualization, treatment planning, and counselor training. The authors argue that integral theory (IT; Wilber, 2000) offers a useful theoretical framework for synthesizing the major epistemological approaches in counseling. A case vignette is provided that illustrates the use of IT's four quadrant model. The authors suggest that infusing an integrally-informed model can enhance counselor training and recognize the contribution of neurobiological factors through fostering an appreciation of multiple perspectives.

Keywords: counseling, pedagogy, neurobiology, neuroscience, integration, integral

The notion that neuroscience can be useful in counselor training has been met with various viewpoints primarily based on incompatible theoretical foundations and loyalty to epistemological assumptions. The differences in research methodologies and subsequent discrepancies in internal validity between neuroscience and psychotherapy have contributed to various divisions between disciplines. Rizq (2007) warned that advances in neuroscience pose significant philosophical challenges to models of the mind, as well as to the practice of counseling psychology. Because neuroscience *does not* inform us about the personal meaning and subjective significance of events and experiences, there has been rigorous discussion about how such a heavily scientific

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ideology can be congruent with humanistic counseling principles (e.g., Hansen, 2009). Kaplan and Coogan (2005) attributed such position to an unwillingness to account for the biological contribution in understanding human behavior; primarily because “each model speaks to a particular part of the elephant and is not robust enough to take a step back and look at the entire animal” (p. 17). As such, diagnostic training that includes the biological perspective in conceptualizing human behavior has been quite rare (Ingersoll & Marquis, 2014).

Mental health counseling has yet to articulate a framework for the applicability of neuroscience to counselor training. As Ivey, D’Andrea, and Ivey (2012) stated, there is no “curriculum that includes a serious discussion of how we can use neuroscience and cognitive science in counseling and therapy practice” (p. 59). Nevertheless, counseling scholars have begun to suggest various rationales for the applicability of neuroscience to practice within the literature (e.g., Bingaman, 2011; Myers & Young, 2012). Fortunately, integrative approaches in counseling that encompass multiple perspectives have emerged, thereby forging the way toward more inclusive assessment and intervention practices across various etiological domains. In this article, we first examine the barriers and possible misconceptions for infusing neuroscience into counselor training, and then discuss how such infusion can be integrative and transformative for counselor training. Later in this article, we will propose a framework for infusing neuroscience into counselor training curriculum through a progressive integrative pedagogy grounded in the metatheoretical approach of integral methodological pluralism (Wilber, 2000).

We emphasize at the outset that this article proposes an emerging conceptual framework to explore new concepts and ideas, and provide challenging scholarship through an integrative approach. Our intention is to serve counselor educators who may not be aware of what an integral approach to counseling encompasses, yet may be actively searching for innovative and comprehensive ways to effectively infuse neuroscience into case conceptualization and treatment planning, and possibly conduct research on its effectiveness. The article will sequentially address the following: (a) toward an informed view of neuroscience within counseling, (b) biological reductionism and the mind-brain connection, (c) integrating neuroscience within counseling, and (d) application of the integral model in case conceptualization.

Toward an Informed View of Neuroscience within Counseling

The neuroscience revolution has increasingly influenced the fields of medicine and mental health. Over the past 15 years, new techniques in genetics and brain imaging have led to groundbreaking research that has illuminated the biological underpinnings of experience. Currently, the neurosciences comprise a broad array of disciplines that are focused on understanding the brain and the nervous system to help advance understanding of human thought, emotion, and behavior (Bear, Connors, & Paradiso, 2006; Farmer, 2009). For example, in a seminal article, Eric Kandel (1998), one of the most influential neuroscientists of modern day, suggested “Insofar as psychotherapy or counseling is effective...it presumably does so through learning, by producing changes

in gene expression that alter the strength of synaptic connections” (p. 460). Yet, such interface between neuroscientific research and mental health extends beyond neuroscience, psychiatry, and the medically oriented end of the mental health spectrum. Since Kandel’s work, scholars and therapists have progressively deepened our appreciation of the biological foundations of human cognition, emotion, and behavior (e.g., Arden & Linford, 2009; Badenoch, 2008; Cozolino, 2010; Siegel, 2012). Although neuroscientists and therapists do not often collaborate when translating neuroscience theory and research into practice, they have recently developed some mutual interests. These combined efforts have resulted in novel and significant conceptions for how neuroscience can further inform counseling practice and has captured the attention of some organizations in the mental health profession.

In 2009, changes to the Council for Accreditation of Counseling and Related Educational Programs (CACREP) accreditation standards anticipated that neuroscience would be relevant in preparing counselor trainees. As such, the CACREP standards require that all counselors have curricular experiences to promote the current understanding of behavior from a neurobiological perspective. Neurobiological behavior was specifically defined as, “The relationship among brain anatomy, function, biochemistry, and learning and behavior” (CACREP, 2009, p. 61). Following the publication of these standards, other mental health organizations have followed suite in promoting knowledge in the domain of neuroscience. For example, the American Mental Health Counselors Association’s (AMHCA, 2011) *Standards for the Practice of Mental Health Counseling* recommend that clinical counselors have training in the biological bases of behavior. As Makinson and Young (2012) expressed, this “marks a new direction for the training of professional counselors who have historically reacted ambivalently toward medical models” (p. 131). Based on the notion to adopt neurobiological behavior into counselor training, various mental health professions have integrated neurobiological concepts within counseling practice.

Mental health fields have embraced neuroscience in various ways. Primarily, several fields in particular have acknowledged that neuroscientific insights can help in client conceptualization and treatment planning. In social work, Applegate and Shapiro (2005) informed clinical social workers and social work educators about new research on the neurobiology of attachment and its implications for knowledge building and clinical practice, and Farmer (2009) asserted that advances in neuroscience continue to be a missing link in social work given its strong emphasis on the biopsychosocial model. In psychology, Lambert (2005) proposed a clinical neuroscience course for undergraduates interested in the mental health field. In the counseling literature, Tootle (2003) discussed the basic understanding of neuroscience for training marital, couple, and family therapists while Ivey and Zalaquet (2011) coupled neuroscience to multicultural and social justice counseling. Flagship journals of the American Counseling Association (i.e., *Counselor Education and Supervision* and *Journal of Counseling and Development*) and of the AMHCA (i.e., *Journal of Mental Health Counseling*), have published several articles incorporating neurobiological constructs (e.g., Kindsvatter & Geroski, 2014; Makinson & Young, 2012; Myers & Young, 2012) within the context of psychopharmacology (e.g.,

Ingersoll, 2000; Kaut, 2011). In addition, the first text on the ways in which neuroscience can inform counseling practice was published (McHenry, Sikorski, & McHenry, 2013). Although these efforts help expand our understanding of the brain-behavior relationship, there remains a void for conceptual or empirical articles related to infusing neuroscience into counselor training.

Biological Reductionism and the Mind-Brain Connection

As introduced earlier, neuroscientific advances pose significant philosophical and epistemological challenges to the models of mind. This can be one reason why the counseling profession has not seen more discourse on models and methods to infuse neuroscience into counselor training. It is important that counselor educators engage in the current dialogue on how biological reductionism can be an influence on mental health. For example, a concern that a neuroscientific approach will add another layer of objectification to human experience has been advanced in counseling (Hansen, 2012). The literature on the convergence of neuroscience and mental health counseling also appears limited to the biological etiology of psychopathology, which can foster views that reduce human nature and suffering to biochemical malfunctions. Such perspective can lead to medical-model thinking which presumes that the pharmacological manipulation of brain biology can achieve healthy behavioral change. Taking this notion to an extreme, reductionism can presume that the brain or the physical level will be more explanatory; therefore, it eliminates from the vocabulary of science any reference to mental terms such as *think*, *feel*, and *meaning-making* (Bickle, 2003). Although there has been minimal empirical demonstration on the prevalence of dualism among mental health clinicians, these concerns can contribute, in part, to the assumption of *a priori* distinction(s) between the human and natural sciences. Thus, we avoid adopting a false choice of either/or regarding the infusion of neurobiological knowledge into counseling and view the mind and brain holistically.

A new bridge between biological and psychological processes has slowly erased the old distinction between mind and body. More scholars today believe that the mind-brain problem has become an outdated dichotomy primarily because contemporary neuroscience focuses on the mind-brain interactions and suggests that mental phenomena arise from the brain while proposing that subjective experience also affects the brain (Andreasen, 2001). Kandel (1995) influenced such notion when he concluded that the mind and brain do inform each other. Such conception of mind and brain—supported by scientific evidence for neuroplasticity—strongly suggests that the mind and brain change physically from moment to moment through experience (see McHenry et al., 2013 for a review). Thus, mind and brain can be studied holistically, and understood as being inseparable areas of investigation.

Some scientists now view the brain as a social organ. Human connections shape neural connections, and each contribute to the mind (Schore, 2012; Siegel, 2012). That is, the mind is no longer contained within the individual brain; instead, it is linked to the brain processes in other people. Through the development of interpersonal neurobiolo-

gy, Siegel (2012) argued that biological determinism is inherently flawed because brain structure and function is shaped by one's interactions with the environment. Subsequently, Siegel proposed a more inclusive conceptualization of the mind, "A core aspect of the mind is an embodied and relational process that regulates the flow of energy and information" (p. 2). The conception has contributed to the emerging paradigm shift in understanding the brain within the scientific community; a shift that viewed the brain as an electrochemical system to a network that combines the social properties of the brain (Rossouw, 2011).

The aforementioned principles have played a part in altering the traditional view that the brain functions via isolated components toward the notion that the brain functions as a system. This shift in understanding is useful because it provides a foundation to view the biological basis of behavior as inseparable from other domains and lends itself to integrative models. We suggest that the counseling field would both appreciate and find useful an integrated system comprised of neurobiological, psychological, cultural, and social constructs. Insofar, as a "reductionist perspective alone is unlikely to offer singular solutions to the more complex conditions that afflict the cognitive and affective integrity of the human brain" (Kaut, 2011, p. 209), neuroscience can offer a heuristic view into the etiology and nature of such conditions. As Ivey et al. (2012) suggested, for neuroscience to be more widely accepted in counselor training, the profession may need to increase its efforts to develop and implement a fully integrated and multidisciplinary approach to helping clients.

Integrating Neuroscience within Counseling

One controversial theme in the mental health field concerns whether the counseling process should be fundamentally conceptualized as art or science. Of historical importance is that during the mid-20th century, when scientific orientations to counseling were prominent, founding humanists argued that the counseling process warranted ideological grounding in the humanities, not in the reductive forces of science (DeCarvalho, 1990). However, with evidence to support a cross-disciplinary movement in counseling and mental health, concerns about the position of a humanistic ideology within counselor education remains (Hansen, 2007; MacCluskie 2011). Hansen (2009) eloquently argued that scientific presumptions have abandoned the humanistic foundations of counseling, and suggested that the scientific paradigm, which he described as reductive and dehumanizing, is an unfitting ideology for the counseling profession. A review of interviews with senior contributors published in the *Journal of Counseling and Development* indicated a clear tension between the continued alignment with the philosophical orientation of human development, prevention, and wellness on the one hand and the need to increase knowledge of the medical model and focus on pathology on the other hand (Gale & Austin, 2003). That is, by identifying biological etiologies of emotional problems, counseling is viewed as a healthcare activity that is more aligned with the medical model (Hansen, 2007). Nevertheless, we believe that the controversy about competing epistemologies that thwart integration of mind and brain, but focus

instead on static models of truth can be tied to the difficulty some students have in understanding the role of the neurosciences in client issues. This may be due to a lack of constructivist understanding of the material which relies on abstraction across paradigms (Ingersoll & Brennan, 2001). Thus, instead of trying to solve the dialectic between science and humanities through separation, the counseling profession can face the challenge of developing an integrative framework (Guterman, Martin, & Kopp, 2012).

Integrative counseling approaches have been viewed favorably among counselor educators. Psychotherapy integration is characterized by attempts to combine concepts and counseling interventions from more than one theoretical approach. Such process is characterized by openness to various ways of integrating diverse theories and techniques (Stricker, 2010). Concerning the perception of integrative counseling approaches, a national survey of counselor educators who were also members of the Association for Counselor Education and Supervision (ACES) revealed that a majority of participants reported that integration in counseling is very important (Marquis, Hudson, & Tursi, 2010). The foundation for a neurobiological integration within counseling has emerged (Ivey & Zalaquet, 2011).

We believe that Hansen's (2014) critical appraisal of humanism within the counseling culture serves as a valid and important contribution to counselor training. As Hanson noted, practitioners and educators have an obligation to appraise the culture critically before participating in it. Yet, the infusion of neuroscience into counseling can still function harmoniously with the principles of humanism and foster a constructivist approach toward integration in counselor training practices. What would be useful, therefore, is a methodology that allows us to honor the efficacy of each epistemological approach, while recognizing that each approach is optimal in specific situations and less so in others (Marquis, 2007). Thus, an integrative framework can help students and counselors integrate insights from various fields of human knowledge in a complementary way, and provide a model for integrating neuroscience into the client conceptualization process.

Application of the Integral Model in Case Conceptualization

A progressive view for organizing counseling and psychotherapy uses an integrative paradigm called integral theory. The theory evolved from integral methodological pluralism (IMP), a model which embraces the partial truths contained in both the positivist and postpositivist positions and then relocates them into a framework that grounds their integration (Wilber, 2000). According to Marquis (2008), IMP "is a (potentially) revolutionary pluralism because it honors the validity of each discipline/counseling theory and its associated set of methodologies and techniques while simultaneously recognizing the incompleteness and blind spots of each discipline/counseling theory" (p. 39). Wilber's (2000) integral theory is an evolving metaparadigm, an overarching framework that links, separates, and contextualizes other theories (Edwards, 2009). A metatheory is inherently evaluative of theory; it can identify dominant, neglected, and emergent perspectives; often hidden and marginalized

(Edwards, 2009). Thus, IMP represents the most pragmatic and inclusive theoretical formulations of any integral or meta-theoretical approach today.

The integral paradigm appears congruent with counselor training based upon its humanistic foundation and postmodern epistemology. Murray (2009) observed that the integral approach has some roots in humanism. Both approaches value multiple lines of human capacities and needs, acknowledge how each person has a unique set of them, and speaks to the possibility of fully realizing these capacities and needs. In addition, several characteristics that represent the central features of integral pedagogy appear consistent with counseling's constructivist-developmental approach: exploring multiple perspectives; weaving together the domains of self, culture, and nature; combining critical thinking with experiential feeling; and including multiple ways of knowing, neither being mutually exclusive nor exhaustive (Murray, 2009). Thus, integral theory has been useful for educators and practitioners oriented toward integrative counseling, and can offer counselor training another progressive approach to learning rooted in humanistic values.

Scholars have applied the integral theory to various mental health specialties. These applications use principles of integral theory to form an integrally-informed pedagogy that overlap with progressive approaches to counselor education pedagogy such as constructivism (Murray, 2009). A special issue of the journal, *Counseling and Values*, was dedicated to integral counseling for practitioners to apply a cross-disciplinary framework in their work with clients (see Ingersoll, 2007). Also, using a sample of mental health educators and practitioners, there has been comparative evaluative research indicating preference for the Integral Intake (II; Marquis, 2002) over other various idiographic intake instruments (Marquis, 2008). The following summary of the integral model is brief and incomplete; thus, the interested reader is referred to Wilber (2000) for a deeper understanding.

The quadrant model represents one element of the integral paradigm. The quadrant model is part of Wilber's (2000) AQAL metatheoretical framework. AQAL is an acronym for all quadrants and all levels, which in turn is shorthand for all quadrants, all levels, all states, all lines, and all types. Integral theory emphasizes multiple perspectives (i.e., the assumption that truth is likely to be closer when knowledge is gathered from multiple points of view) (Forman, 2010). A good way to begin to understand how integral theory conceptualizes from multiple perspectives is to begin with the quadrants which is the focus of the section. Wilber has outlined a 2-axis, 4-quadrant framework to provide a comprehensive conceptual structure from which a counselor can simultaneously perceive and understand multiple perspectives in counseling and psychotherapy (see Figure 1).

<p style="text-align: center;">Subjective-Individual “I”</p> <p>Psychological & Phenomenological:</p> <ul style="list-style-type: none"> -Emotions -Self-identity -Beliefs -Cognitions <p style="text-align: center;">Upper Left (UL)</p>	<p style="text-align: center;">Objective-Individual “It”</p> <p>Behavioral & Physiological:</p> <ul style="list-style-type: none"> -Empirical -Chemical -Biological -Neurobiological <p style="text-align: center;">Upper Right (UR)</p>
<p style="text-align: center;">Subjective-Collective “We”</p> <p>Cultural & Worldview:</p> <ul style="list-style-type: none"> -Philosophical -Ethical -Religious -Cultural <p style="text-align: center;">Lower Left (LL)</p>	<p style="text-align: center;">Objective-Collective “Its”</p> <p>Ecological & Social:</p> <ul style="list-style-type: none"> -Environmental -Political -Educational -Legal; Economic <p style="text-align: center;">Lower Right (LR)</p>

Figure 1. The four quadrants of integral theory applied to counseling.

According to Marquis (2007), counselors would appropriately explore four primary perspectives both subjectively and objectively during assessment and psychotherapy. These four perspectives are represented in the quadrant model by four basic pronouns: “it”, “I”, “we”, and “its” and each pronoun represents a domain in the model: the behavioral “it” as the objective language of scientific method (UR); the individual “I” as the subjective, phenomenological experience (UL); the cultural “we” as the intersubjective shared experience of life (LL); and the societal “its” as the interobjective aspects of collectives or groups (LR).

In describing phenomena, two major quadratic distinctions can be made depending on the perspective taken by a counselor. The first major distinction is between viewpoints that examine things subjectively and objectively. The left side of the model represents the subjective, whereas the right side represents the objective. The second distinction is made between the individual and the collective perspective. The individual perspective is represented in the upper half of the model and the collective in the lower. The use of the quadrant model becomes a meta-cognitive process that helps us organize our thinking about client problems. Thus, counselors have used integral theory with clients to understand presenting complaints by quadrant (e.g., Ingersoll, 2002). The

following case vignette illustrates an application of the quadrant model in counseling and highlights the neurobiological contribution to the etiology and conceptualization of the client's problem.

Case Vignette

Maria is a married 31 year-old Latina. She works as a Licensed Practical Nurse in a large urban hospital. Maria has always been a high achiever in school and work. She has very high standards for herself and is often self-critical when she fails to meet them. Lately, she has struggled with significant feelings of worthlessness and shame due to her decreased performance at work.

For the past several weeks, Maria has felt unusually fatigued and has found it increasingly difficult to concentrate on her duties. Her coworkers have noticed that she is often irritable and withdrawn, contrary to her typically upbeat and friendly disposition. She has called in sick on several occasions, which is completely unlike her. On those days Maria stays in bed most of the day, watching TV or sleeping.

Maria's husband has noticed changes as well. She has shown little interest in sexual intimacy, and has had difficulties falling asleep. Her insomnia has been keeping him awake, as she tosses and turns for an hour or two after she goes to bed. He often overhears her having tearful phone conversations with her closest friend, which worries him. When he tries to get her to talk about what's bothering her, she withdraws with an abrupt "everything's fine."

Although she has never attempted suicide, Maria has found herself increasingly thinking about death. She gets frustrated with herself because she believes she has every reason to be happy, yet cannot seem to avoid believing she is hopeless every day.

Integral Quadratic Assessment

Integral quadratic assessment encourages one to consult all four quadrants when developing a conceptualization about a client or client system. As a methodology, it can help counselors explore presenting issues by quadrant, (see Figure 2) and see the way in which they generate different ideas about Maria how she cognitively organizes these ideas, and how the behavioral quadrant (UR) becomes included in the conceptualization process. Borrowing some questions from Marquis (2007), the following depicts an informal verbal method of assessment of Maria framed around the four-quadrants.

<p style="text-align: center;">Subjective-Individual “I”</p> <p>Psychological & Phenomenological: -Negative cognitive schemas -Vulnerability to depression -Existential crisis -Spirituality</p> <p style="text-align: center;">Upper Left (UL)</p>	<p style="text-align: center;">Objective-Individual “It”</p> <p>Behavioral & Physiological: -Sleep, diet, exercise -Alcohol or substance use; current use of prescription medication -Medical history -Neurotransmitter; hemispheric imbalance</p> <p style="text-align: center;">Upper Right (UR)</p>
<p style="text-align: center;">Subjective-Collective “We”</p> <p>Cultural & Worldview: -Family system -Interpersonal; cultural values -Attachment issues</p> <p style="text-align: center;">Lower Left (LL)</p>	<p style="text-align: center;">Objective-Collective “Its”</p> <p>Ecological & Social: -Environmental stressors -Sexism -Social justice issues; social skills</p> <p style="text-align: center;">Lower Right (LR)</p>

Figure 2. Areas for exploration in the case of Maria.

Experience as felt from the inside (UL). The quadrant represents the subjective, phenomenological experience of an individual. A counselor may use various theoretical perspectives to work with Maria on her subjective, phenomenological experience related to her depression. The cognitive theory of depression and vulnerability, humanistic principles, existential crises, and spiritual issues can all be relevant for exploring Maria’s concerns. For example, a cognitive behavioral therapist would explore any negative automatic thoughts Maria can have about her life, underlying presumptions that establish her rules for living, and core beliefs about herself and the world that maintain her depressed mood (Beck, 2011).

Behavior as seen from the outside (UR). The quadrant represents the objective perspective of the individual and is behavioral and physiological. One approach to UR quadratic assessment would be to note different patterns in Maria's behavior such as sleep, diet, alcohol or substance use, and exercise. It would be important to assess any medical disorders and past and current use of medication. In addition, the assessment would identify the current and ongoing stressors in Maria's life. Empirically based research has revealed that chronic exposure to stressful life events results in an increase in neurotoxic stress hormones that might ultimately lead a reduction in serotonin, a neurotransmitter critically involved in affect (McEwen, 2005). Thus, psychiatric consultation can be indicated for Maria.

At a neurobiological level, a counselor may ask Maria questions that address the degree to which her emotional system contributes to depressive symptoms. For example, learning of Maria's stress, and knowing its profound effect on the sympathetic nervous system, Maria's counselor may surmise functional and structural alterations in the brain to a point of inevitable changes in mood. Global negative and ridged thinking evident in depression, as well as withdrawal as a coping strategy correlate with imbalances within the prefrontal cortex (Cozolino, 2010). As Maria ruminates, corresponding correlative changes in her brain arise as frontal lobe activation becomes biased toward the right hemisphere, which relates to suspiciousness, negativity, and emotions related to depression and anxiety (Siegel, 2012). Conversely, less activation occurs in the left hemisphere, which relates to positive affect, prosocial behavior, and assertiveness (Nikolaenko, Egorov, & Freiman, 1997). Using an interpersonal neurobiology model, intervention would include cognitive therapies and/or relaxation training to integrate Maria's left-right hemispheric processing (Cozolino, 2010).

The groups experience from the inside (LL). The quadrant represents what is called the intersubjective perspective or the intersubjective aspect of one's being. In this quadrant, the counselor may ask Maria to focus on themes and values of living placed on her through her family system, or explore the possibility that Maria's upbringing can lead to an attachment issue that increases Maria's vulnerability to depression (Siegel, 2012). Narrative therapy, and interpersonal variables related to depression (Segrin, 2000) can be explored. For example, therapeutic discussion can focus on the value Maria attaches to following rules, edicts, and norms espoused by her integrated sense of cultural values.

The groups behaviour from the outside (LR). The quadrant represents the interobjective perspective. In this quadrant, the counselor may take an approach that emphasizes the fact that client issues cannot be understood outside of the world in which they live. Socioeconomic status, environmental stressors, racism, sexism, classism, and social skills can be explored. For example, the counselor may direct Maria's attention to the powerful forces of financial and employment stressors, the times in which she lives, and both the positive and potentially negative stressors in home and community.

Integral Approach as a Teaching Tool

The primary goals for teaching the integral quadrant model aim to foster an appreciation of the neurosciences and aid in the conceptualization process. Using the quadrant model reflects a metacognitive process (i.e., thinking about thinking) to help counseling students improve their skills in case conceptualization; especially in the etiology and assessment of a client's problem. Because case conceptualization in counseling and psychotherapy has been characterized as a cognitive process, the application of integral theory is consistent with the cognitive process of integrative complexity (Suefeld, Tetlock, & Streufert, 1992). Such process often requires one to create more alternatives for explanation (differentiation) and the ability to create more complex connections among these alternatives (integration). Thus, we believe that quadratic assessment can foster an appreciation of neuroscience and subsequently provide a cognitive map to help counseling students develop a higher level of skill in case conceptualization. Counselor educators may elect to teach the following two learning objectives or principles that underlie the application of the integral quadrant model.

First, all four quadrants must be explored to fully understand a client. Because each perspective provides different information, one cannot understand the reality of a quadrant through the lens of another (Marquis, 2007). All quadrants evolve together, and to ignore or dismiss one or more of these dimensions fosters a reductionist practice. Although the UL quadrant is a main focus of psychotherapy, it cannot be considered in isolation from the other perspectives (Ingersoll & Marquis, 2014). Students may benefit from developing a level of cognitive integration to be able to reflect upon issues from multiple perspectives and then assimilate these insights. For example, a counselor trainee with low differentiation would conceptualize Maria's depressed mood as resulting solely from neurobiological abnormality, while a counselor trainee who exhibits high differentiation would conceptualize Maria's depressed mood as resulting from a neurobiological imbalance in neurotransmitter or hemispheric integration, faulty cognitions, a recent loss, and an inadequate resolution of the need for intimacy. For differentiation, a counselor trainee could merely list the potential determinants of Maria's depression, reflecting low integration, or specify how the differentiated etiologic sources relate to and affect each other, reflecting high integration.

Second, all quadrants interact with each other. Although each perspective can have benefits in and of itself, students may be encouraged to conceptualize a client based on the interaction among quadrants. The integration of all perspectives produces a synergistic effect that ultimately leads to enhanced conceptualization, assessment, and treatment planning. For example, Maria's change in mood (UL) can be associated with functional changes in her brain (UR). While she ruminates over thoughts, as discussed previously, Maria's counselor may recommend therapies drawing from interpersonal neurobiology, such as cognitive-behavioral and narrative therapy (UL) which activate left cortical processing and improve activity of top-down processes in the frontal cortex

(UR) through conscious control of thought and feelings (UL) (Cozolino, 2010; Ochsner & Gross, 2007). In addition, early separation can predispose Maria to a decrease in neurotransmitters associated with healthy attachments (LL; Siegel, 2012). Thus, past attachment patterns and their effect on the current therapeutic relationship can be explored.

We acknowledge that integral theory can be out of the comfort zone for some counselor educators who value conventional pedagogies. The integral model seems to be more congruent with those who like theories, abstractions, and progressive pedagogies that explicitly value the whole self. Nevertheless, there is much to gain from working with integral principles, including a more systemic and flexible understanding of classroom and instructional dynamics (Murray, 2009). As communities of integral educators evolve in counselor training, we anticipate that the value of infusing the neurobiological factors that underlies mental health issues will be increasingly understood and accepted as part of the client conceptualization process. In the meantime, a few suggestions for when to introduce the integral quadrant model seem warranted. Regarding the sequence, the integral model can be introduced early in the curriculum because counseling theories are often presented in the early phases of training. In addition, as Ingersoll (2002) suggested, instructors can easily infuse the quadrant model in psychopathology and differential diagnosis courses. Students can also be encouraged to engage in self-reflection within their own quadrants of experience when learning integral theory. The application of such framework intuitively holds promise for counselor training. However, empirical investigation of the framework is needed and encouraged to determine the extent of its applicability.

Conclusion

Because more scientists and scholars now view the brain as an integrated system, integral counseling has increasingly become relevant in capturing the role of neuroscience in the assessment and treatment of mental health disorders. Using an integrally-informed model to infuse neuroscience into counselor training provides a humanistically grounded framework to help counseling students organize case conceptualization. Nevertheless, adversaries of reductionism continue to express concerns that scientific paradigms have abandoned the humanistic foundations of counseling. Yet, such well-intended and valuable caution continues to be redefined by notions which suggest that biological determinism is inherently flawed, while integrative approaches to practice become more accepted. It is vital to the counseling profession that we continue to appreciate multiple perspectives and recognize that the only way to truly conceptualize a client's problem is through a balanced, inclusive, and integral perspective. Understanding the ways in which the biological, psychological, cultural, and social factors affect the brain can help us become more integrally-informed educators and practitioners.

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