A Qualitative Study of Counseling Students' Experiences with Neurofeedback: Learning, Self-Efficacy, and Perceptions of Neurocounseling

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ABSTRACT

Neurofeedback is a neuroscience-based intervention that trains individuals to consciously regulate brain activity and has gained increasing attention in global mental health care. However, its integration into counselor education in Malaysia remains very limited. This qualitative study aims to explore the experiences of Master's students in Clinical Mental Health Counseling who participated in neurofeedback training. Guided by Kolb's Experiential Learning Theory and Bandura's Self-Efficacy Theory, the study examines how students engage with the training process, their confidence and sense of self-efficacy in applying neurofeedback, and their perceptions of its relevance to future counseling practice. Data were collected through semi-structured interviews with five participants and analyzed using thematic analysis. Three main themes were identified: (1) transformative learning experiences through hands-on neurofeedback training; (2) self-efficacy in understanding and applying the technique; and (3) perceptions of neurocounseling as a complement to talk therapy, particularly for clients with trauma or difficulty expressing emotions. While the training provided meaningful experiences, participants also reported challenges such as limited access to equipment and curriculum constraints. The findings indicate that experiential neurofeedback training fosters deep reflection, strengthens clinical confidence, and broadens students' perspectives on integrative counseling approaches. This study highlights the need for curriculum reform, faculty development, and institutional support to bridge existing training gaps, offering a valuable foundation for advancing neuroscience-informed counselor education in Malaysia.

Keywords: neurofeedback, experiential learning, self-efficacy, counselor education, neurocounseling, clinical mental health counseling

ABSTRACT

Neurofeedback merupakan intervensi berasaskan neurosains yang melatih individual megamall activity otak secara sedar, dan semakin mendapat perhatian dalam bidang kesihatan mental di peringkat global. Namun, integrasinya dalam pendidikan kaunseling di Malaysia masih sangat terhad. Kajian kualitatif ini bertujuan meneroka pengalaman pelajar Sarjana Kaunseling Kesihatan Mental Klinikal yang mengikuti latihan neurofeedback. Berpandukan Teori Pembelajaran Eksperiensial Kolb dan Teori Keberkesanan Kendiri Bandura, kajian ini meneliti bagaimana pelajar menghayati pengalaman latihan, menilai tahap keyakinan serta keberkesanan kendiri dalam penggunaan neurofeedback, dan membincangkan kesesuaiannya dalam amalan kaunseling masa hadapan. Data diperoleh melalui temu bual separa berstruktur dengan lima orang peserta dan dianalisis menggunakan kaedah analysis tematik. Tiga tema utama dikenal pasti: (1) pengalaman pembelajaran transformasi melalui latihan practical neurofeedback; (2) keberkesanan kendiri dalam memahami dan mengaplikasikan Teknik; dan (3) persepsi terhadap neurokaunseling sebagai pelengkap terapi lisan, khususnya bagi klien trauma atau yang sukar meluahkan emosi. Walaupun latihan ini memberikan pengalaman yang bermanfaat, peserta turut melaporkan cabaran seperti akses terhad kepada peralatan serta kekangan kurikulum. Hasil kajian menunjukkan bahawa latihan neurofeedback secara eksperiensial dapat memupuk refleksi mendalam, mengukuhkan keyakinan klinikal, dan memperluas perspektif pelajar terhadap pendekatan

kaunseling integratif. Kajian ini mencadangkan reformasi kurikulum, pembangunan tenaga pengajar, serta sokongan institusi bagi merapatkan jurang latihan sedia ada

Kata kunci: neurofeedback, pembelajaran berasaskan pengalaman, kecekapan kendiri, pendidikan kaunselor, neurokaunseling, kaunseling kesihatan mental klinikal

INTRODUCTION

The integration of neuroscience into mental health care has introduced new methods and perspectives within the counseling profession. One of these approaches is neurofeedback, a non-invasive technique that uses real-time monitoring of brain activity to support emotional and cognitive regulation (Panisch & Hai, 2020). While neurofeedback has been widely applied in clinical practice for conditions such as anxiety, attention-deficit/hyperactivity disorder (ADHD), trauma, and depression (Kober et al., 2021), its incorporation into counselor education remains limited. Counseling and mental health professionals are now expected to go beyond traditional talk therapy and engage with evidence-based tools that integrate physiological and psychological processes (Deits-Lebehn et al., 2020; Gennaro, 2019). This study seeks to explore Malaysian counseling students' experiences with neurofeedback training, 2 focusing on how they engage with the learning process, their confidence in applying the technique, and their perceptions of neurocounseling in future practice.

Research Background

Counselor education has increasingly adopted experiential learning strategies that bridge theoretical knowledge with practical application. These approaches are essential for cultivating competent mental health professionals who can respond effectively to diverse and complex client needs. Despite this evolution, exposure to neuroscience based or brain-informed interventions remains limited in many counselor training programs (Spears, Hammond, & Field, 2024). One such intervention is neurofeedback also known as electroencephalography (EEG) biofeedback, a non-invasive technique that provides real-time feedback on brainwave activity, enabling individuals to self-regulate their cognitive and emotional states (Kober, Schweiger, Witte, & Neuper, 2021).

Neurofeedback aligns with the framework of neuroscience-informed counseling, or neurocounseling, which integrates neurobiological understanding with traditional talk therapy to promote holistic, evidence-based client care (Field, Jones, & Russell-Chapin, 2016). For counseling students, neurofeedback offers not only insight into the brain's role in emotion and behavior, but also hands-on opportunities to observe and influence these processes in real-time, enhancing both self-awareness and clinical competence.

Internationally, particularly in the United States and Europe, universities have made significant strides in incorporating neurofeedback into counselor education (Romero et al, 2020). Graduate programs have begun embedding structured neurofeedback modules that include supervised practice, live demonstrations, and theoretical integration. These initiatives allow students to conduct neurofeedback sessions confidently and ethically, while deepening their understanding of emotional regulation and complementing conventional psychotherapy approaches (Bodie, Moon, Ma, & Parker, 2023; Ramey, George, & Russell-Chapin, 2022). This structured and immersive exposure stands in contrast to Malaysia, where such experiential training remains rare.

Compared to these international models, Malaysia is still in the early stages of developing neurocounseling. While Master of Clinical Mental Health Counseling programs provide strong foundations in core areas such as psychotherapy, assessment, and clinical diagnosis, they lack formal integration of neurofeedback training. Electroencephalography (EEG) biofeedback is not yet embedded in classroom or practicum components. Contributing factors include high equipment costs, limited availability of certified trainers, and inadequate infrastructure (Kelley, Luke, & Barnett, 2021).

As of 2023, fewer than 20 practitioners in Malaysia are certified by the Biofeedback Certification International Alliance (BCIA), with most being psychiatrists or clinical psychologists rather than counselors (Malaysian

Society for Clinical Psychology [MSCP], 2023). This professional gap underscores the limited involvement of counselors in neurofeedback service delivery unlike in countries such as the United States, where counselor participation is supported through established certification pathways, supervision, and institutional training opportunities.

Furthermore, Malaysian counselor education programs tend to prioritize traditional modalities such as Cognitive Behavioral Therapy (CBT), largely due to curriculum frameworks regulated by the Malaysian Qualifications Agency (MQA), which leave little room for emerging innovations (Abdul Rahman, Ismail, & Latif, 2021). In contrast, institutions abroad enjoy greater curricular flexibility, allowing for the integration of cutting-edge practices such as neurofeedback. Malaysian students interested in such training often must pursue it privately or overseas, which poses financial and logistical challenges (Che Ahmad, Teoh, & Omar, 2024; Chua, 2022). Consequently, students are deprived of experiential, neuroscience-informed learning that could enrich their therapeutic skill set in applying integrated mental health approaches.

In summary, although neurofeedback is gaining recognition internationally as a valuable tool in counselor training (Panisch & Hai, 2020; Kober et al., 2021), its adoption in Malaysia remains limited (Che Ahmad, Teoh, & Omar, 2024; Chua, 2022). The lack of structured access, trained faculty, and institutional support restricts students' ability to explore neurocounseling as a relevant and evidence-based complement to conventional counseling methods. To address this gap, the present study examines Malaysian counseling students' engagement with neurofeedback training, its impact on their self-efficacy, and their perceptions of neurocounseling in future practice, guided by the frameworks of experiential learning (Kolb, 1984) and self-efficacy development (Bandura, 1986).

Problem Statement

Mental health counselors are increasingly encountering clients with trauma, anxiety, and stress-related disorders, creating a pressing need for brain-based and trauma-responsive approaches to care. Neurofeedback (NFB), an evidence-based intervention that facilitates self-regulation by monitoring and modifying brain activity, has shown strong potential for integration into counseling practice (Hammond, 2011). Internationally, the incorporation of NFB and other neuroscience-informed strategies has been recognized as an important advancement in counselor education and training.

In Malaysia, however, counselor education remains predominantly focused on traditional therapeutic modalities, particularly cognitive-behavioral therapy (CBT), with little to no emphasis on NFB or neuroscience-informed care (Kober et al., 2021). This stands in contrast to international standards, such as those outlined by the American Counseling Association (ACA) and the Council for Accreditation of Counseling and Related Educational Programs (CACREP), which emphasize neuroscience literacy and the integration of brain-based practices as essential elements of counselor preparation (Russell-Chapin, 2016; CACREP, 2016).

The lack of neuroscience-informed training in Malaysian counselor education creates a significant gap. Without exposure to emerging practices such as NFB, graduates risk developing outdated clinical competencies, limiting their readiness to deliver trauma-responsive and evidence-based care (Russell-Chapin, 2016; Bodie et al., 2023). At the same time, Malaysia's *Pelan Strategik Kesihatan Mental 2020–2025* highlights the need to modernize mental health care by strengthening evidence-based and technologically supported interventions (Ministry of Health Malaysia, 2020). Similarly, the Lembaga Kaunselor Malaysia (2021) underscores the importance of continuous professional development to ensure counselors remain competent in meeting evolving client needs. Without curriculum reform, Malaysia risks falling behind international standards and reducing access to innovative interventions that could strengthen national mental health services (Thibault & Raz, 2017; Aini Ismafairus et al., 2020).

This issue is further compounded by structural and systemic challenges. One barrier is curriculum rigidity. Counselor education programs are tightly regulated by the Malaysian Qualifications Agency (MQA), which prioritizes conventional modalities such as CBT, leaving limited room for the integration of emerging approaches like NFB (Abdul Rahman, Ismail, & Latif, 2021; Tan & Ng, 2022). As of 2021, an estimated 87%

of Malaysian master's-level counseling programs offered no neuroscience-related training, citing institutional constraints and a lack of curricular flexibility. By contrast, international institutions such as the University of California, Los Angeles (UCLA), have integrated practicum-based electroencephalography (EEG) biofeedback training into counselor education, demonstrating more progressive and flexible models of implementation (Hammond, 2018).

A second barrier is the shortage of trained instructors. Malaysia currently has fewer than 20 practitioners certified by the Biofeedback Certification International Alliance (BCIA), the majority of whom are psychiatrists or clinical psychologists trained privately or abroad (BCIA, 2023). A national survey by the Malaysian Society for Clinical Psychology (MSCP, 2023) revealed that only 15% of local psychologists had formal neurofeedback training, and only 12% of university psychology departments reported having qualified faculty to teach the subject (Malaysian Psychological Association, 2023). Without trained educators in counseling programs, access to neurofeedback training for students remains highly restricted.

The third constraint is financial. A clinical-grade neurofeedback system typically costs between RM 15,000 and RM 30,000, excluding software, practitioner training, and maintenance costs (Aini Ismafairus, Zulkifli, & Karim, 2020). Given the limited budgets of Malaysian public universities, investments in such equipment are often deprioritized. According to the Malaysian Society of Neurosciences (2022), fewer than 5% of public institutions currently possess dedicated neurofeedback facilities. These financial limitations mirror trends in other developing countries, where high technology costs hinder the adoption of neuroscience-based interventions (Thibault & Raz, 2017).

A fourth challenge is professional skepticism. Despite growing international recognition of NFB as an adjunctive intervention, skepticism persists among Malaysian counselor educators and practitioners. Concerns arise from mixed evidence regarding its effectiveness in certain conditions such as depression and PTSD, despite robust findings in ADHD and anxiety (Thibault & Raz, 2017; Hammond, 2011). Furthermore, NFB is often perceived as highly technical, requiring advanced neurophysiological knowledge and equipment that some view as beyond the traditional scope of counseling (Russell-Chapin, 2016). Others worry that adopting neuroscience-informed practices may conflict with the relational and person-centered ethos of counseling, contributing to fears of medicalization (Bodie et al., 2023). These identity concerns, coupled with limited expertise and resources, perpetuate reluctance to integrate NFB into Malaysian counselor education.

Taken together, these systemic, financial, and professional barriers significantly restrict opportunities for Malaysian counseling students to meaningfully engage with neurofeedback training. This highlights a critical gap in understanding how such training, when accessible, is experienced and internalized by students. To date, qualitative studies on the educational value of neurofeedback remain limited, particularly in Malaysia. While international research has documented both clinical and pedagogical benefits (Cook, Snow, & Barlow, 2020; Spears, Hammond, & Field, 2024), little is known about how Malaysian counseling students engage with, learn from, and conceptualize neurofeedback within their professional development. Addressing this gap, the present study seeks to explore the lived experiences of counseling students who undergo neurofeedback training, with particular attention to its influence on experiential learning, self-efficacy, and perceptions of neurocounseling. By doing so, this research aims to provide contextually relevant insights that can inform curriculum reform, guide faculty development, and support the integration of neuroscience-informed approaches in Malaysian counselor education.

Aim of the Research

The aim of this study is to explore Malaysian counseling students' experiences with neurofeedback training, focusing on how they engage with the learning process, their confidence in applying neuroscience-based interventions, and their perceptions of integrating neurocounseling into future practice.

Research Objectives

1. To explore how counseling students engage with and process their neurofeedback training experience.
2. To explore the impact of neurofeedback training on counseling students' self-efficacy in applying neuroscience-based interventions.

3. To explore counselling students' perceptions of neurocounseling and its role in their future practice after engaging in neurofeedback training.

Significance of the Research

This qualitative study exploring Malaysian counseling students' experiences with neurofeedback training holds substantial importance for advancing counselor education, clinical practice, and culturally responsive mental health care. As the first in-depth investigation of neurofeedback learning experiences in Malaysia, it addresses a critical gap in understanding how counseling students engage with training, reflect on their confidence in applying neuroscience-based interventions, and perceive the role of neurocounseling in future practice, a field still underrepresented in Malaysian training programs (Abdul Rahman et al., 2021). By centering on the lived experiences of postgraduate counselling students, the study provides pedagogical insights into how experiential exposure to neuroscience-based tools supports their learning processes, informs their confidence and readiness, and shapes their views on integrative clinical practice. This is particularly significant within the Malaysian context, where counselors are increasingly expected to adopt evidence-informed and holistic approaches to address complex mental health challenges.

For students, the study offers a reflective mirror into how hands-on training can bridge the theory-practice gap, cultivate neurobiological awareness, and promote embodied empathy in therapeutic contexts. It supports the development of students' professional identity as future neurocounselors and empowers them to explore beyond traditional talk therapies. Exposure to neurofeedback may also increase employability and readiness for multidisciplinary collaboration, as students become equipped with emerging competencies aligned with global mental health trends.

At the institutional level, the study informs curriculum reform by highlighting the feasibility and pedagogical value of incorporating neuroscience-informed modules into existing counselor education frameworks. It advocates for the Malaysian Qualifications Agency (MQA) to reconsider rigid curriculum standards and allow for innovation in teaching methods, especially in alignment with the Malaysian Psychological Association's (MPA, 2023) call for "next-generation therapy training." In a national landscape marked by a shortage of certified neurofeedback practitioners (Ng et al., 2022), these findings may guide universities to strategically invest in faculty training, infrastructure, and interdisciplinary partnerships to build neurofeedback capacity from within.

Professionally, the research contributes to the evolving field of neurocounseling by legitimizing it as a viable and culturally adaptable specialization in Malaysia. By surfacing students' perceptions of its benefits and challenges, the study offers a grounded foundation for integrating biofeedback and brain-based techniques into mainstream practice. Furthermore, by exploring sociocultural barriers such as language accessibility, technical skepticism, and educational unfamiliarity (Tan, 2023) the findings support the development of localized training resources and awareness campaigns to normalize neuroscience in counseling.

From a policy perspective, the study provides timely evidence for stakeholders such as the Ministry of Health (MOH), universities, and professional bodies to promote mental health workforce development grounded in contemporary, culturally relevant modalities. Insights from the study can inform national frameworks on counselor competencies and inform grant allocations, training schemes, and public-private partnerships aimed at expanding neurocounseling services across settings.

Ultimately, this research bridges the gap between Malaysia's growing interest in neuroscience-based therapies and the practical implementation of such approaches in counselor education and service delivery. It affirms that with strategic support, counseling students can become confident, ethical, and neuroscience-informed practitioners capable of responding to Malaysia's evolving mental health needs.

THEORETICAL APPROACH AND LITERATURE REVIEW

This chapter provides a theoretical application and comprehensive review of the literature that supports and contextualizes the present study. It begins with a discussion of the core psychological theories that underpin

neurofeedback training namely Kolb's Experiential Learning Theory and Bandura's Self-Efficacy Theory. These models frame how counseling students learn from hands-on experience and develop confidence in applying new therapeutic tools. Following this, the chapter explores the theoretical basis of neurofeedback itself, including foundational principles, physiological mechanisms, and its clinical applications. The second part of the chapter provides a literature review on the integration of neurofeedback in mental health practice and counselor training, with an emphasis on identifying key research gaps and justifying the current study.

Experiential Learning Theory (Kolb, 1984)

Kolb's Experiential Learning Theory (ELT) (1984) serves as the foundational framework for understanding how counseling students acquire neurofeedback competencies through direct experience and reflection. The four-stage cyclical process - Concrete Experience, Reflective Observation, Abstract Conceptualization, and Active Experimentation - provides a robust structure for clinical skill development (Kolb & Kolb, 2017). In neurofeedback training, this manifests as students' hands-on experience with EEG equipment (Concrete Experience), their analysis of brainwave-emotion correlations (Reflective Observation), and their integration of neuroscientific principles with counseling theory and practice (Abstract Conceptualization). While traditional applications of ELT emphasize Active Experimentation through clinical implementation, the Malaysian context presents unique challenges that necessitate theoretical adaptation (Abdul Rahman et al., 2021). Research demonstrates that modified ELT approaches remain effective when infrastructure limitations prevent full implementation of the learning cycle (Morris, 2020), particularly in neuroscience-informed counselor education (Lemberger-Truelove & Bowers, 2020).

Self-Efficacy Theory (Bandura, 1997)

Bandura's Self-Efficacy Theory (1997) complements and extends Kolb's framework by focusing on learners' confidence in applying acquired skills. This theoretical perspective becomes particularly valuable when assessing learning outcomes in situations where direct clinical application is not immediately possible. Self-efficacy beliefs - individuals' judgments about their capabilities to execute specific behaviors - serve as crucial predictors of future skill implementation (Bandura, 1997). In neurofeedback training, students' developing confidence in using these techniques and their perceptions of neurocounseling's effectiveness provide meaningful indicators of learning success (Larson et al., 2019). The theory's emphasis on cognitive mediation aligns with contemporary understandings of how experiential learning translates into professional practice (Schwarzer & Luszczynska, 2015), especially in emerging therapeutic domains like neurocounseling (Kaplan et al., 2020). When combined with ELT, self-efficacy measures offer a pragmatic solution for assessing learning outcomes in resource-constrained environments while maintaining theoretical rigor (Lent et al., 2008).

The interrelationship between these theories creates a comprehensive framework for examining neurofeedback training. While Kolb's model explains the learning process, Bandura's theory provides crucial insights into learners' readiness to apply their knowledge. This integrated approach is particularly relevant in Malaysian counselor education, where it addresses both the cognitive and motivational aspects of professional development (Abdul Rahman et al., 2021). Together, these theoretical perspectives offer a nuanced understanding of how counseling students develop both competence and confidence in emerging neurocounseling approaches, even when immediate clinical application opportunities are limited

Neurofeedback

Neurofeedback, also known as electroencephalography (EEG) biofeedback, is a non-invasive, brain-based intervention that trains individuals to regulate their own brainwave activity. It involves monitoring brain signals in real-time and providing feedback typically through visual or auditory cues when optimal neural patterns are detected. Over time, this process enables individuals to develop greater control over cognitive, emotional, and physiological states (Hammond, 2011; Sherlin et al., 2011).

As a form of applied psychophysiology, neurofeedback is grounded in the understanding that brainwave activity corresponds with various mental functions. For example, beta waves are associated with alertness and

concentration, while alpha waves relate to calmness and relaxation. By using software and sensors to detect these signals, neurofeedback systems reward the brain when it produces desired wave patterns, such as increasing alpha during relaxation training or reducing theta in attention-enhancement protocols (Strehl, 2014).

Neurofeedback has been applied across a wide range of clinical and non-clinical settings. It has demonstrated effectiveness in treating conditions such as attention-deficit/hyperactivity disorder (ADHD), anxiety disorders, depression, epilepsy, insomnia, and post-traumatic stress disorder (PTSD) (Kober et al., 2021; Panisch & Hai, 2020). More recently, its use has extended to performance optimization in athletes, musicians, and high-functioning professionals (Gruzelier, 2014). As the practice gains empirical support, interest in integrating neurofeedback into counselor training has grown, particularly in the context of self-regulation, trauma recovery, and holistic mental health care.

Despite these promising applications, neurofeedback remains underutilized in counselor education, particularly in Malaysia. A deeper understanding of its theoretical foundations can help justify its integration into counseling practice and pedagogy. The following section outlines the foundational theories that support neurofeedback as a science-informed and learner-centered intervention.

Foundational Theories

Neurofeedback is grounded in robust psychological and neuroscientific principles that enhance its standing as an effective mental health intervention. Its core mechanism can be understood through operant conditioning, the behavioral learning model introduced by Skinner (1938), where real-time feedback reinforces desired brainwave patterns. Recent reviews of EEG neurofeedback reaffirm that participants learn to self-regulate neural activity through continuous reinforcement of targeted brainwave bands, such as increasing beta waves for enhanced attention (Sherlin et al., 2011; Strehl, 2014).

This behavioral foundation is supported by neuroplasticity, the brain's ability to reorganize itself in response to training (Doidge, 2007). Empirical studies since 2020 have demonstrated that repeated neurofeedback sessions produce lasting changes in brain connectivity and function. For example, connectivity-based EEG neurofeedback has been shown to significantly strengthen emotion regulation pathways, including amygdala-prefrontal cortex interactions (Dehghani et al., 2022).

Self-regulation theory further illuminates how neurofeedback fits within counseling models. By making neural signals visible and controllable, neurofeedback strengthens clients' capacity to monitor and manage emotional and attentional states (Hammond, 2011). Contemporary research supports this by demonstrating that real-time fMRI neurofeedback enables participants to self-modulate neural regions related to emotion regulation such as the anterior cingulate cortex and insula through reinforced self-regulation practices (Al-Khazraji et al., 2025).

Finally, biofeedback theory underpins neurofeedback's broader classification. As an advanced form of biofeedback, it harnesses EEG-generated physiological data to facilitate behavioral learning and regulation. This approach is validated by studies in functional near-infrared spectroscopy (fNIRS) neurofeedback, which report significant improvements in emotion regulation across various populations (Fang et al., 2025).

Together, these four theoretical pillars; operant conditioning, neuroplasticity, self-regulation, and biofeedback which create a cohesive foundation for neurofeedback. They explain how structured, feedback-based training empowers individuals to achieve voluntary control over brain activity, leading to improved attention, emotional balance, and resilience. These evidence-based principles validate the integration of neurofeedback into counseling education and justify ongoing research into its application within professional development.

Basic Concepts, Physiological Basis, and Clinical Applications

Neurofeedback operates by detecting electrical activity in the brain through electroencephalography (EEG) and providing real-time feedback to help individuals self-regulate their brainwave patterns. The basic concept relies on the principle that when individuals receive immediate visual or auditory reinforcement for producing

desired neural activity, they can learn to increase or decrease specific brainwave frequencies voluntarily (Thibault, Lifshitz, & Raz, 2018). This process supports enhanced cognitive, emotional, and behavioral functioning over time.

The physiological foundation of neurofeedback lies in the analysis of distinct brainwave frequency bands, each of which corresponds to specific mental states (Kamiya, 2011; Gruzelier, 2018). These bands summarized in Table 1 below range from deep sleep-related delta waves to high-level cognitive gamma waves.:

Table 2.1 Brainwave Frequency Bands and Their Associated Mental States

No	Brainwave Band	Frequency Range (Hz)	Associated Mental States
1	Delta	0.5–4 Hz	Deep sleep and unconscious processes
2	Theta	4–8 Hz	Drowsiness, creativity, and daydreaming
3	Alpha	8–12 Hz	Relaxed alertness and meditative states
4	Beta	12–30 Hz	Active thinking, focus, and problem-solving
5	Gamma	30–100 Hz	High-level cognitive processing and consciousness

By targeting specific waveforms, neurofeedback can promote or inhibit certain brain states to meet therapeutic goals. For instance, sensorimotor rhythm (SMR) training (12–15 Hz) is commonly used to enhance attentional control and reduce hyperactivity in individuals with attention-deficit/hyperactivity disorder (ADHD) (Gevensleben et al., 2014; Arns, Heinrich, & Strehl, 2020). Similarly, alpha-theta training, which encourages a shift from relaxed awareness to deeper meditative states, has proven effective in trauma recovery and emotional processing, particularly among clients with post-traumatic stress disorder (PTSD) (Gruzelier, 2018).

Another widely researched protocol is slow cortical potential (SCP) training, which targets slow shifts in cortical excitability. SCP training has demonstrated efficacy in managing epilepsy, mood disorders, and emotional dysregulation (Strehl et al., 2017). These protocols illustrate the clinical flexibility of neurofeedback in addressing a wide range of neuropsychological conditions.

In the field of counselling, neurofeedback is increasingly recognized as a complementary, non-pharmacological approach that promotes self-awareness, emotional regulation, and resilience. It empowers clients to become active participants in their own mental health journey by offering an experiential method of understanding and altering internal states (Swingle, 2015). This aligns with humanistic and client-centered therapeutic values, making neurofeedback an appealing addition to integrative mental health practices.

Neurofeedback Training and Professional Implementation

Training in neurofeedback varies widely across disciplines, institutions, and regions. Internationally, the Biofeedback Certification International Alliance (BCIA) sets the standard for professional neurofeedback practice. Its certification process includes didactic education, supervised clinical hours, and formal competency evaluations to ensure ethical and effective application (BCIA, 2022). This structured pathway is widely recognized in countries such as the United States, Canada, and parts of Europe.

In contrast, neurofeedback training in Malaysia and other developing counseling contexts remains largely informal and fragmented. Most local training opportunities are delivered through short-term workshops or private providers, rather than embedded within accredited university curricula (Abdul Rahman, Ismail, & Latif, 2021). Moreover, while psychologists and psychiatrists in Malaysia are increasingly incorporating neurofeedback into clinical practice, counselors often face limited access to certified training, supervision, and EEG equipment (van Boxtel et al., 2023). This professional gap has implications not only for ethical delivery but also for the broader integration of neuroscience into holistic mental health care.

The need to formally integrate neurofeedback into counselor education is underscored by the growing relevance of neuroscience-informed practice. According to Demos (2019), practitioner competence in neurofeedback hinges on more than theoretical understanding as it requires direct, hands-on engagement with EEG technology and real-time brainwave interpretation. Experiential learning environments are critical for building the clinical confidence and decision-making skills necessary for neurofeedback to be applied responsibly and effectively.

However, as Hammond (2011) and others have noted, few counselor training programs either in Malaysia or globally offer such immersive learning opportunities. The absence of structured neurofeedback training contributes to ongoing skepticism, technical discomfort, and underutilization among counselors. Bridging this gap would enhance the clinical applicability and cultural acceptance of neurofeedback, especially in regions with rising demand for non-pharmacological and neuroscience-informed therapeutic approaches (Thibault & Raz, 2017).

Incorporating neurofeedback into counselor education not only promotes professional competence but also aligns with global movements toward integrative, evidence-based mental health services. As counseling continues to evolve, ensuring access to structured neurofeedback training will be essential in preparing the next generation of counselors for more holistic and technologically advanced client care.

LITERATURE REVIEW

This literature review critically examines the role of neurofeedback in mental health practice and counselor education, with particular focus on global trends, its educational integration, barriers to adoption in Malaysia, and prevailing research gaps. This synthesis provides a comprehensive foundation for understanding the significance and innovation of the present study within both local and international contexts.

Global Perspectives on Neurofeedback in Mental Health Practice

Neurofeedback has gained increasing recognition globally as an evidence-based intervention for various mental health conditions, particularly those involving self-regulation deficits. Meta-analytic findings by Arns, Heinrich, and Strehl (2020) report moderate to large effect sizes in the treatment of attention-deficit/hyperactivity disorder (ADHD), with improvements often sustained at follow-up, highlighting the long-term viability of neurofeedback protocols. Beyond ADHD, studies have also demonstrated efficacy in reducing symptoms of anxiety, depression, and trauma-related disorders when standardized neurofeedback protocols are applied (van Boxtel et al., 2023; Gruzelier, 2018).

In response to its growing empirical support, prestigious institutions such as the Semel Institute for Neuroscience and Human Behavior at UCLA and Harvard Medical School have integrated neurofeedback into clinical training and research environments (Ros et al., 2020; Sokhadze et al., 2021). These initiatives reflect a broader trend toward neuroscience-informed mental health care, emphasizing the role of brain-based technologies in complementing traditional therapeutic approaches.

However, despite these advances, the global implementation of neurofeedback faces several practical and systemic challenges. One key issue is the lack of standardized treatment protocols. As Hammond (2018) notes, there is considerable variation across clinical sites in terms of EEG parameter selection, session frequency, and duration, leading to inconsistencies in outcomes and difficulties in replication. Furthermore, Thibault, Lifshitz, and Raz (2018) emphasize the financial burden associated with neurofeedback, with treatment cycles costing between USD $2,000 to $5,000, making access difficult even in well-resourced health systems. These cost-related barriers disproportionately affect clients in lower-income communities and contribute to unequal access to this emerging form of care.

In summary, while neurofeedback continues to show strong therapeutic potential, its global application is still limited by economic, logistical, and methodological constraints. These limitations underscore the importance of ongoing research, policy innovation, and clinician training to make neurofeedback more accessible, affordable, and standardized across mental health care systems worldwide.

Neurofeedback in Counselor Training and Education

The integration of neurofeedback into counselor education marks an emerging yet underdeveloped frontier in professional mental health training. As the counseling field increasingly embraces neuroscience-informed practices, neurofeedback presents a practical method for bridging theoretical knowledge with experiential learning. Neurofeedback, often delivered through electroencephalography (EEG) biofeedback, enables trainees to observe real-time brainwave activity and regulate their emotional and cognitive states. This aligns closely with experiential learning models and strengthens counseling students' clinical skills.

Cook, Snow, and Barlow (2020) identified three core competencies essential for effective neurofeedback training within counselor education: (1) technical proficiency in operating EEG systems, (2) ethical decision-making in applying neuroscience-based interventions, and (3) the ability to integrate neurobiological insights into client case conceptualization. Their findings indicated that hands-on neurofeedback training significantly enhanced students' self-efficacy, outperforming traditional didactic instruction. These results underscore the pedagogical value of experiential learning environments in building clinical confidence, an outcome aligned with Kolb's Experiential Learning Theory (Kolb, 1984).

A significant advancement in this area is seen in a three-round Delphi study conducted by Spears, Romero, Robertson, and Prasath (2024), which developed 108 core competencies necessary for counseling students to practice neurofeedback ethically and effectively. These competencies spanned technical skills, session structuring, client communication, and integration with counseling techniques. Notably, the study emphasized preparing students to "independently conduct neurofeedback sessions from start to finish" and to "integrate counseling skills with neurofeedback sessions" (Spears et al., 2024) highlighting the depth of integration required within counselor education.

In parallel, interdisciplinary programs in the United States have piloted innovative approaches to neurofeedback training. For instance, one educational intervention combined Science, Technology, Engineering, Arts, and Mathematics (S.T.E.A.M.) education with mindfulness-based stress reduction (MBSR), virtual reality (VR), and neurofeedback to train school counselors in immersive, real-world learning environments (Min et al., 2023). These integrated models promote technical competence, reflective practice, and engagement with neurocounseling principles fostering both cognitive and emotional readiness among trainees.

These examples signify a shift in perception from neurofeedback as a purely clinical or diagnostic tool to its recognition as an experiential learning modality within counselor education. Institutions across the United States, and to a lesser extent in Europe, have begun embedding neurofeedback modules into practicum-based courses, aligning neuroscience with professional counseling competencies (Bodie, Moon, Ma, & Parker, 2023; Ramey, George, & Russell-Chapin, 2022). Such efforts demonstrate that experiential neurofeedback training not only supports skill acquisition but also promotes the development of professional identity and clinical adaptability among counseling students.

Despite its potential, the adoption of neurofeedback in counselor education remains highly uneven across regions. Mehler et al. (2023) found that over 60% of graduate-level clinical psychology programs in countries such as Japan and South Korea offer structured coursework on neurotechnologies, including neurofeedback. In contrast, fewer than 15% of institutions in Southeast Asia incorporate such training into counseling or psychology curricula. This disparity stems from various factors, including limited access to EEG equipment, a shortage of qualified instructors, and a lack of institutional investment in neuroscience-based teaching.

In Malaysia, the situation is particularly constrained. A national survey by Abdul Rahman, Ismail, and Latif (2021) revealed that 92% of Malaysian counseling programs do not offer any neuroscience-related modules. This omission is primarily due to regulatory frameworks established by the Malaysian Qualifications Agency (MQA), which emphasize traditional therapeutic models such as Cognitive Behavioral Therapy (CBT) and Person-Centered Therapy (PCT). Consequently, Malaysian counseling students are rarely exposed to brain-based approaches like neurofeedback, despite its growing relevance in global mental health practice.

The absence of formal neurofeedback training in Malaysian counselor education presents multiple challenges. First, it limits students' development of self-efficacy in applying neuroscience-informed techniques. Second, it restricts engagement with integrative, client-centered practices increasingly endorsed in global frameworks. Third, it prevents the profession from advancing alongside innovations that are transforming the delivery of psychological services worldwide.

To address these gaps, researchers have called for curriculum innovation, faculty capacity building, and international collaboration to introduce structured neurofeedback training into counselor education, particularly in underrepresented regions such as Southeast Asia (Demos, 2019; Hammond, 2011). Embedding neurofeedback into formal training programs could enhance student engagement, foster reflective practice, and position the counseling profession to meet future demands for integrative and evidence-based mental health interventions.

Barriers in Malaysian Counselor Education

The implementation of neurofeedback in Malaysian counselor education faces three major structural challenges: curriculum rigidity, shortage of qualified trainers, and financial constraints.

Curriculum rigidity remains the primary obstacle. Public universities in Malaysia are governed by strict guidelines from the Malaysian Qualifications Agency (MQA), which emphasizes core competencies in traditional therapeutic models such as Cognitive Behavioral Therapy and Person-Centered Therapy (Ng, Wong, & Khalid, 2022). These regulations leave minimal room for integrating emerging neuroscience-based techniques like neurofeedback. The procedural requirements for introducing new modules requiring multiple levels of approval often discourage curriculum innovations (Ng et al., 2022).

Next, there is a significant shortage of qualified neurofeedback trainers. As of 2023, there are fewer than 20 practitioners in Malaysia certified by the Biofeedback Certification International Alliance (BCIA), and most practice in the private sector, such as at New Mind Brain Health Centre, rather than within public academic institutions (BCIA, 2023; Malaysian Psychological Association, 2023). This scarcity of certified faculty creates a barrier to adopting neurofeedback training within counselor education programs (Abdul Rahman, Ismail, & Latif, 2021).

A third major barrier is financial cost. Clinical-grade neurofeedback systems, including EEG hardware, software, and certified practitioner training, are estimated to cost between RM 15,000 and RM 30,000 (Aini Ismafairus, Zulkifli, & Karim, 2020). Given the budget constraints of public universities, investment in such specialized technology is often not prioritized, especially without external grants or institutional support (Tan, 2023).

Moreover, some educational stakeholders exhibit attitudinal resistance toward neurofeedback, perceiving it as overly medical or incompatible with traditional counseling philosophies. This cultural resistance contributes to hesitancy in adopting neuroscience-based components within counselor education (Tan, 2023; van Boxtel et al., 2023).

These combined barriers—administrative, resource-based, and cultural highlight the urgent need for targeted policy intervention, funding strategies, and cross-sector collaboration. Addressing these challenges is critical to aligning Malaysian counselor training with international best practices in neuroscience-informed mental health education (Mehler et al., 2023).

Identified Research Gaps

Although neurofeedback has garnered increasing attention in clinical psychology and psychiatry over the past decade, significant gaps remain in its integration within counselor education particularly concerning how students are trained, mentored, and prepared to implement this modality in practice. Much of the current literature focuses predominantly on clinical outcomes for specific diagnoses such as ADHD, PTSD, and anxiety (Coben, Myers, & Evans, 2021; Arns et al., 2020), yet gives limited attention to how neurofeedback

is taught or how trainees experience the learning process. This leaves a critical void in the educational discourse surrounding neurofeedback as a component of professional counseling training.

Moreover, although theoretical frameworks such as Kolb's Experiential Learning Theory and Bandura's Self-Efficacy Theory are widely acknowledged for their relevance to counselor education, few empirical studies have systematically applied these models to investigate counseling students' engagement with neurofeedback. A review by Mehler et al. (2023) notes that despite growing interest in neurocounseling, research remains scarce on how experiential neurofeedback training impacts self-confidence, clinical reasoning, and skill generalization among trainees especially in culturally diverse or under-resourced settings.

In the Southeast Asian and Malaysian contexts, the research gap is even more pronounced. The Malaysian Psychological Association (2023) emphasized the urgent need to develop local evidence to support "next-generation therapy training," citing the absence of neuroscience-informed content in most postgraduate counseling programs. To date, no published qualitative studies in Malaysia have explored how counseling students perceive, process, or integrate neurofeedback into their understanding of clinical practice. This lack of local scholarship limits both curriculum development and the profession's capacity to adapt to global advancements in mental health technologies.

Several structural barriers contribute to this gap. These include rigid curriculum frameworks enforced by regulatory bodies, which restrict the inclusion of innovative modalities (Ng, Wong, & Khalid, 2022); a shortage of Biofeedback Certification International Alliance (BCIA) certified instructors who can provide hands-on guidance (BCIA, 2023); and cost-related challenges such as the high expense of EEG systems (Aini Ismafairus, Zulkifli, & Karim, 2020). Furthermore, cultural skepticism and hesitancy among academic faculty have resulted in minimal support for introducing brain-based interventions in counseling classrooms (Tan, 2023).

In summary, the current body of literature emphasizes clinical efficacy over educational application, overlooking how neurofeedback training shapes the development of future counselors. This study aims to fill that gap by exploring the lived experiences of Malaysian postgraduate counseling students who participated in neurofeedback training. By investigating their perceptions, learning processes, and self-efficacy, the research contributes essential insights that can inform future curriculum enhancements and promote the integration of neuroscience-informed practices in counselor education.

METHODOLOGY

Research Design

This study employed a qualitative phenomenological research design to explore participants' subjective experiences of neurofeedback training. Phenomenology, as a qualitative tradition, seeks to uncover the meaning individuals assign to a specific phenomenon as experienced in their everyday lives. This approach was chosen because it enables the researcher to delve deeply into the thoughts, emotions, and insights of counseling students following their direct engagement with neurofeedback. The phenomenological framework facilitated an understanding of how students interpreted their learning process, perceived their confidence in applying neurofeedback-related techniques, and envisioned the role of neurocounseling in their future practice (Creswell & Poth, 2018).

Participants and Sampling

Participants were selected using purposive sampling, which is commonly used in qualitative research to deliberately recruit individuals who possess specific knowledge, experiences, or characteristics relevant to the phenomenon under investigation (Creswell & Poth, 2018). In this study, purposive sampling was chosen to ensure that all participants had direct, experiential engagement with neurofeedback training as part of a structured workshop. This sampling method allowed the researcher to target individuals who could offer rich, first-hand insights into the learning processes, self-efficacy development, and perceptions of neurocounseling that emerged from this novel exposure.

The sample consisted of five postgraduate students enrolled in the Master of Clinical Mental Health Counselling program at University Pendidikan Sultan Idris (UPSI). All participants had no prior exposure to neurofeedback techniques before attending this neurofeedback training workshop facilitated by a certified practitioner at New Mind Brain Health Centre. The decision to include only five participants is consistent with the principles of phenomenological research, which emphasizes depth over breadth. According to existing literature, phenomenological studies typically involve between 3 to 10 participants, enabling researchers to conduct detailed, reflective analysis of individual experiences (Smith et al., 2009; Guest et al., 2020). In this study, thematic saturation was achieved with five participants, as recurring themes and subthemes emerged consistently across the dataset.

Research Setting

The study was conducted in collaboration with New Mind Brain Health Centre, a neurofeedback training facility operated under the direction of Dr. Koo Kian Yong, a certified neurofeedback practitioner and principal instructor at New Mind Academy. The workshop was conducted at the centre's premises, which are equipped with clinical-grade EEG systems and neurofeedback interfaces. The training involved practical demonstrations, hands-on use of neurofeedback devices, and real-time brainwave monitoring. All participants were interviewed after completing the training workshop at this facility. The selection of this site was critical, as it provided the structured experiential environment necessary to meet the study's research objectives.

Data Collection Procedure

The data for this study were collected exclusively through semi-structured interviews, conducted within two weeks after the participants completed the neurofeedback training. The use of semi-structured interviews is well-suited to qualitative, phenomenological research designs, as it enables participants to express their lived experiences in a flexible yet focused manner. This approach also ensures that key areas relevant to the research objectives are thoroughly explored (Kallio et al., 2016).

Each interview was conducted through a secure online platform, depending on the participants' availability, and lasted approximately 40 to 60 minutes. Prior to each session, informed consent was obtained from the participants, including permission for audio recording. All interviews were recorded and subsequently transcribed verbatim to facilitate rigorous thematic analysis.

The interview protocol was developed to elicit in-depth insights into participants' experiences and reflections regarding neurofeedback training. Specifically, the questions aimed to explore their initial reactions to the workshop, their understanding of the neurofeedback process, the influence of the training on their self-efficacy as future counseling professionals, and their perceptions regarding the integration of neurocounseling into future mental health practices.

Data Analysis

Thematic analysis was used to analyzed the transcribed interview data. This method was selected because it provides a flexible yet rigorous framework for identifying and interpreting patterns of meaning across qualitative datasets. The analysis followed Braun and Clarke's (2006) six-phase model: familiarization with the data, generation of initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. The researcher began by reading all transcripts multiple times to gain an overall sense of the data. Initial codes were then developed from significant statements and grouped into broader

themes that captured the essence of participants' shared experiences. The themes were continuously refined and cross-validated across transcripts to ensure accuracy and internal consistency.

Trustworthiness of the Research

To ensure methodological rigor in this qualitative exploration of counseling students' experiences with neurofeedback training, the study adhered to Lincoln and Guba's (1985) four trustworthiness criteria: credibility, dependability, confirmability, and transferability. These criteria are particularly critical in phenomenological research where participants' subjective experiences form the core of data interpretation.

Credibility was established through member checking, allowing participants to review their individual interview transcripts and clarify or confirm the interpreted meanings derived from their narratives (Birt et al., 2016; Shenton, 2004). This step was essential given the technical nature of neurofeedback, ensuring that students' experiential accounts especially on concepts like brainwave regulation and mind-body integration were accurately captured and did not reflect researcher misinterpretation.

Dependability was maintained through the consistent use of a semi-structured interview protocol across all participants. This uniform approach allowed for comparability while still accommodating individualized reflection on unique experiences. In addition, detailed documentation of the research process including coding, theme development, and analytic decisions provided a clear audit trail, supporting claims of dependability (Nowell et al., 2017).

Confirmability was reinforced by the researcher's engagement in ongoing reflexivity. While participants were not asked to maintain journals, the researcher documented her reflections and potential biases in a reflexive journal throughout the data collection and analysis process. Given the researcher's own interest and academic background in neurocounseling, reflexivity was essential to minimize interpretive bias and ensure that participant voices not researcher expectations guided the emergence of themes (Creswell & Poth, 2018).

Transferability was addressed through rich, thick description of the study setting, participant demographics, and training context. Since this study focused on a specific population; Master's in Clinical Mental Health Counseling students at University Pendidikan Sultan Idris (UPSI) who had no prior exposure to neurofeedback but participated in a structured training workshop; the contextual details provided will help readers assess whether the findings may be applicable to similar educational or clinical training environments (Shenton, 2004).

Overall, these strategies enhanced the trustworthiness of the study, ensuring that the findings offer a credible, dependable, and transferable contribution to the emerging field of neurocounseling education.

FINDINGS

Table 4.1 Research Findings for Research Question 1: Neurofeedback Training Experience Among Counseling Students

Research Question 1	Themes	Subthemes
Neurofeedback Training Experience Among Counseling Students	Initial Curiosity & Excitement	Pre-training interest
		Motivation to Explore
		Novel Learning appeal
	Hands-On Learning & Demonstration	Experiential exposure
		Observational learning
		Practice-based engagement
	Realization of Mind-Body	Emotion-brain link

	Connection	Self-regulation insight
		Neurobiological awareness
	Reflective Engagement	Reflective learning
		Conceptual understanding
		Supervisory processing

Table 4.2 Research Findings for Research Question 2: Self-Efficacy in Applying Neurofeedback

Research Question 2	Themes	Subthemes
Self-Efficacy in applying Neurofeedback	Increased Confidence with Exposure	Practical assurance
		Skills belief
		Application confidence
	Barriers: Technical & Accessibility	Equipment limitations
		Technical barriers
		Resource concern
	Supportive Factors for Self-Efficacy	Peer support
		Supervisor influence
		Personal drive

Table 4.2 Research Findings for Research Questions 3: Perceptions of Neurocounseling in Future Practice

Research Question 3	Themes	Subthemes
Perceptions of Neurocounseling in Future Practice	Value as Complementary Evidence-Based Tool	Hope through evidence
		Vaildating practice
		Trust-building
	Curriculum Integration & Recommendation	Curriculum relevance
		Practical module needs
		Skill-based learning
	Application to Diverse Clients	Suitability for trauma
		Support for low-expressive client
		Individualised care approach

DISCUSSION, CONCLUSION AND RECOMMENDATION

Neurofeedback Training through Experiential Learning Process

Research Objective 1 aimed to explore counseling students' learning experiences during neurofeedback training. The thematic findings Initial Curiosity and Excitement, Hands-On Learning and Demonstration, Realization of Mind-Body Connection, and Reflective Engagement illustrate how neurofeedback functioned as a meaningful experiential learning platform. These results align with Kolb's Experiential Learning Theory

(1984), which emphasizes learning through concrete experience, reflective observation, abstract conceptualization, and active experimentation.

Theme 1: Initial Curiosity and Excitement

Participants' initial feelings of excitement and curiosity demonstrate the role of intrinsic motivation in adult learning, especially when introduced to novel and neuroscience-based content. This motivational openness aligns with Mehler et al. (2023), who reported that neuroscience-informed learning approaches tend to increase engagement due to their innovative nature and perceived scientific relevance.

The findings are also consistent with Knowles' (1980) andragogical principles, which emphasize that adult learners are most responsive to educational content that is relevant, problem-centered, and applicable to real-life contexts. The novelty of neurofeedback, coupled with its connection to scientific inquiry, likely appealed to the participants' internal drive to learn and discover, as also observed in the early stages of other experiential learning contexts.

In relation to Kolb's (1984) Experiential Learning Theory, the participants' curiosity reflects the initial stage of the learning cycle, concrete experience where interest and emotional engagement prepare learners for deeper processing and reflection. Their engagement was not only intellectual but also personal, as they perceived the topic to be meaningful and applicable to their future roles as counselors.

This heightened interest can also be contextualized by considering the limited exposure many counseling students in Malaysia have had to neuroscience-based tools such as neurofeedback. As noted by Gruzelier (2018), the integration of neurofeedback in mental health training remains relatively underutilized, making it an intellectually stimulating and novel experience for counseling students. The sense of discovery and relevance reported by participants likely reflects a gap in traditional curricula, reinforcing the value of incorporating neuroscience-informed tools in counselor education (Marzbani et al., 2016).

Theme 2: Hands-On Learning and Demonstration

The experiential component of the neurofeedback training, particularly live demonstration and peer modeling, played a crucial role in enhancing participants' understanding. This aligns with Kolb's Experiential Learning Theory (1984), which emphasizes that learning is most effective when individuals actively engage in concrete experiences. Participants benefited from observing peers in real-time neurofeedback scenarios, which also reflects Bandura's (1997) Social Learning Theory, highlighting that individuals learn not only through doing but also by watching others perform tasks and witnessing outcomes.

Peer involvement made the learning process more memorable and personally meaningful, especially when learners observed brainwave-based interactions, such as controlling games or visualizing EEG feedback. This experiential exposure supported both conceptual clarity and emotional engagement, two key aspects known to enhance retention and application. These findings are supported by Cook et al. (2020), who found that incorporating hands-on neurofeedback activities significantly increases student confidence and understanding. Similarly, Larsen et al. (2019) reported that observational and participatory learning in biofeedback settings enhances learner self-efficacy and engagement.

Given that most counseling curricula still offer limited exposure to neuroscience-based modalities, such interactive strategies help bridge the gap between abstract concepts and practical application. This approach not only builds competence but also increases learners' motivation to integrate such tools into future counseling practice (Gruzelier, 2018; Marzbani, Rezaei, & Rahmani, 2016).

Theme 3: Realization of the Mind-Body Connection

A key insight emerged as participants began recognizing the connection between emotional regulation and observable brainwave patterns. This awareness illustrates a shift from abstract understanding to embodied experience, aligning with the concept of transformational learning. Participants observed real-time feedback loops where calming the mind influenced the continuity of video or game elements demonstrating how internal

emotional states directly impact neurophysiological activity. Such experiential engagement aligns with Kolb's (1984) notion of reflective observation and active experimentation in learning, allowing participants to internalize the mind-body connection in a tangible way.

This theme also highlights the development of self-regulation skills. Participants did not merely understand emotional control as a cognitive task but began perceiving it as an active process of brain training. These reflections mirror the findings of Fisher et al. (2022) and Gruzelier (2018), who emphasized neurofeedback's capacity to deepen self-awareness and enhance therapeutic insight by making the invisible (brain activity) visible and modifiable. Through this process, learners gained a more intuitive understanding of how regulating one's mental state affects brainwave patterns, supporting the integration of somatic and cognitive awareness.

Furthermore, the training fostered neurobiological literacy a deeper understanding of how brain functions relate to mental and emotional processes. One participant's realization that individuals can take control of their own brain regulation reflects the empowering nature of such learning. This resonates with Schultz et al. (2021), who advocate for incorporating neuroscience education into counseling training programs to equip future professionals with the tools to understand clients from both psychological and physiological perspectives.

Overall, the internalization of brain-based learning through experiential feedback not only supported cognitive development but also nurtured a sense of agency and insight, which are critical in forming competent, self-aware practitioners.

Theme 4: Reflective Engagement

Beyond the development of technical skills, the neurofeedback training prompted participants to engage in reflective thinking about the future integration of neuroscience into their counseling practice. Participants reported taking time to consider how understanding brain activity could enhance their therapeutic approach. This depth of reflection aligns with Kolb's (1984) Experiential Learning Theory, specifically the stage of abstract conceptualization, where learners interpret experiences to generate new insights and personal meaning. The reflective process also resonates with Mezirow's (1991) Transformative Learning Theory, which highlights how adult learners shift perspectives through critical reflection.

Participants' evolving views on professional identity and openness to integrating neurofeedback reflect a broader trend in counselor development toward embracing interdisciplinary practices. This is consistent with findings by Tollerud and Vernon (2019), who emphasized that reflective practice helps counselors evaluate the relevance of emerging technologies and integrate them ethically. Similarly, Spears et al. (2024) argued that reflection enhances ethical responsiveness and adaptability, key traits in a rapidly changing mental health landscape.

The data also revealed that reflection was not limited to personal insight but extended into supervisory contexts. One participant expressed motivation to engage more deeply with their supervisor after the training. This supports existing literature emphasizing supervision as a critical space for meaning-making and ethical growth (Borders et al., 2014). By initiating dialogue with their supervisors, participants demonstrated growing clinical maturity and a desire to contextualize their learning within professional practice.

Contextually, these reflections may be attributed to the novelty of neurofeedback in the Malaysian counseling curriculum. For many participants, this training marked their first exposure to neuroscience-informed approaches, offering a compelling opportunity to rethink traditional therapeutic roles. As highlighted by Schultz et al. (2021), incorporating brain-based perspectives into counselor education encourages a more holistic, integrative framework for mental health care. This shift in mindset underscores the potential of neurofeedback not only as a technique, but as a catalyst for professional identity development and long-term reflective engagement.

Neurofeedback's Impact on Counseling Students' Self-Efficacy

This section discusses findings from Research Objective 2, which explored how neurofeedback training influenced participants' self-efficacy as future counselors. The three themes that emerged—Increased

Confidence with Exposure, Barriers: Technical and Accessibility, and Supportive Factors for Self-Efficacy—are discussed in relation to Bandura's (1997) Self-Efficacy Theory, which posits four primary sources: mastery experiences, vicarious learning, verbal persuasion, and emotional regulation.

Theme 1: Increased Confidence Through Mastery Experience

The theme Increased Confidence with Exposure highlights how direct engagement with neurofeedback tools facilitated a growing sense of mastery among participants. This finding aligns with Bandura's (1997) Self-Efficacy Theory, which identifies mastery experiences such as successful hands-on tasks as the most potent source of self-efficacy development. As participants interacted with EEG equipment, received real-time feedback, and interpreted their own brainwave data, they reported increased confidence in both using the technology and applying it within clinical contexts.

This confidence was not limited to technical proficiency but extended into perceived readiness for real-world application. Participants began viewing themselves as capable of incorporating neuroscience-informed strategies into future counseling sessions. This supports findings by Cook et al. (2020), who reported that hands-on neurofeedback training significantly improves students' preparedness to implement new, science-based modalities in therapeutic practice. Similarly, Larsen et al. (2019) found that experiential learning in neurofeedback settings cultivates both competence and self-trust among trainees, reinforcing the importance of practice-based exposure in clinical education.

The participants' reported confidence also reflects the experiential learning cycle proposed by Kolb (1984), particularly the transition from active experimentation to abstract conceptualization. By engaging directly with neurofeedback systems, students were not only learning through doing, but also integrating those experiences into a broader understanding of their professional capabilities.

Contextually, this development is significant given the minimal exposure most Malaysian counseling students have to neuroscience-based interventions. Even with limited training duration, the structured format of the workshop incorporating demonstration, self-assessment, and reflection offered participants meaningful learning encounters. This suggests that even brief, focused training modules can foster self-efficacy and open pathways for innovation in mental health practice, especially when learners are given opportunities to interact with novel tools in a supportive environment.

Theme 2: Perceived Barriers: Technical, Resource, and Institutional

Despite reported gains in confidence, participants also identified several barriers that limited their ability to fully internalize and apply neurofeedback techniques. These challenges were not rooted in a lack of motivation or capability, but rather in external and systemic factors such as environmental constraints, technical complexity, and limited access to resources. For example, financial limitations and insufficient equipment availability were seen as major obstacles, aligning with the findings of Ng et al. (2022), who reported that infrastructural deficits and budgetary constraints are common challenges in implementing technology-based training in counselor education across Southeast Asia.

In addition, several participants reported persistent uncertainty about the technical aspects of neurofeedback, indicating that brief exposure was insufficient to build full competence. This observation reflects Bandura's (1997) assertion that self-efficacy may weaken when individuals encounter repeated difficulty without adequate support or mastery experiences. It also suggests that while initial engagement can increase confidence, sustained training and scaffolded learning are necessary to solidify practical competence.

Technical complexity emerged as a notable concern, particularly among participants with less prior exposure to psychological technology. This supports Mehler et al. (2023), who emphasized the importance of tiered, user-friendly neurofeedback training that progressively builds learners' understanding and confidence. The unfamiliarity and steep learning curve associated with EEG-based software tools indicate a need for more structured onboarding processes and longer-term support mechanisms to ensure meaningful skill acquisition.

From an experiential learning standpoint, the challenges reported may relate to limitations in the active experimentation and abstract conceptualization stages of Kolb's (1984) model. Without repeated practice, feedback, and opportunities to reflect, participants may struggle to move beyond initial exposure toward integrated, usable knowledge. Therefore, while neurofeedback training offers strong potential for counselor development, its effectiveness is contingent upon the presence of sufficient infrastructure, clear instructional design, and sustained learner support.

Theme 3: Social and Internal Supports in Self-Efficacy Development

While participants encountered barriers during their neurofeedback training, they also identified key facilitating factors that supported the development of their self-efficacy. Aligned with Bandura's (1997) Self-Efficacy Theory, two significant social influences such as social modeling and verbal persuasion emerged prominently. Peer support during demonstrations and collaborative discussions helped create a psychologically safe environment where learners could observe success in others and receive encouragement. This finding is consistent with Spears et al. (2024), who emphasized the importance of peer interaction and social engagement in cultivating self-belief among trainee mental health professionals.

Supervisor involvement also played a critical role in reinforcing confidence through validation and clarification. Access to expert guidance and structured learning environments contributed to participants' belief that they could eventually master the techniques. This form of verbal persuasion, especially when offered by experienced professionals, is noted by Bandura (1997) as a key source of efficacy enhancement. Structured supervision provided the necessary scaffolding for learners to test, refine, and validate their developing skills in a supportive context.

In addition to social factors, intrinsic motivation was also a strong facilitator. Several participants credited their growing confidence to a genuine interest in the subject matter, suggesting that internal curiosity served as a protective factor against external barriers. This observation supports Tollerud and Vernon (2019), who argue that intrinsically motivated learners are more resilient and more likely to integrate new practices into their professional identity.

Collectively, the training fostered self-efficacy through a multi-layered approach involving mastery experiences, peer collaboration, supervisory feedback, and personal drive. These findings align with broader literature advocating for experiential, scaffolded, and context-sensitive training models in counselor education (Cook et al., 2020; Mehler et al., 2023). At the same time, participants maintained a realistic awareness of technical limitations and structural constraints, reflecting a maturing professional perspective. This tempered confidence is essential for the ethical and responsible integration of neuroscience into counseling practice.

Counseling Students' Perceptions of Neurofeedback in Future Practice

The third research objective focused on how participants perceived the role of neurofeedback in shaping their future professional identity, attitudes, and integrative practice. Three themes emerged like Value as a Complementary Evidence-Based Tool, Curriculum Integration and Recommendation, and Application to Diverse Clients. These findings point to a growing openness among trainees to incorporate neuroscience-informed techniques into holistic, client-centered care.

Theme 1: Neurofeedback as a Complementary and Evidence-Based Tool

Participants consistently perceived neurofeedback as a valuable complement to traditional talk therapy, particularly due to its empirical foundation and capacity to provide visible, real-time feedback. This perception reflects a growing appreciation for data-driven modalities that enhance therapeutic engagement by making abstract emotional processes tangible. The integration of neurofeedback into counseling sessions was seen as a way to instill hope in clients who may feel discouraged, and to increase motivation through the visual display of progress. These findings support Fisher et al. (2022), who argue that neuroscience-based interventions can improve transparency and engagement, especially among clients who are resistant to or fatigued by purely verbal approaches.

The ability of neurofeedback to provide real-time evidence of brain activity resonated strongly with participants, who viewed this as both clinically informative and professionally reassuring. Participants noted that it could enhance their understanding of client functioning and serve as a complementary intervention grounded in scientific evidence. This aligns with Schultz et al. (2021), who emphasized the importance of integrating neurobiological literacy into counselor education to support more holistic and evidence-informed practice. Moreover, the participants' reflections suggest that neurofeedback not only benefits client outcomes but also boosts practitioner confidence by offering a credible, measurable foundation for their interventions.

Additionally, neurofeedback was recognized as a tool that promotes client empowerment. Participants observed that clients could gain a sense of control over their emotional states by understanding and regulating their brainwave patterns. This perspective is consistent with therapeutic models that emphasize autonomy and active client participation, and it reflects the broader shift in mental health practice toward collaborative and strengths-based interventions (Gruzelier, 2018). The use of real-time feedback encourages clients to become active agents in their healing, potentially fostering a stronger therapeutic alliance and sustained behavior change.

Overall, these findings underscore the perceived value of neurofeedback as a neuroscience-informed adjunct to traditional counseling. They suggest that such integration not only aligns with emerging trends in mental health care but also meets the dual goal of improving client outcomes and enhancing counselor efficacy.

Theme 2: Curriculum Integration and Professional Preparedness

A prominent suggestion among from participants was the formal integration of neurofeedback into the counselor education curriculum. Participants viewed neurofeedback as a timely and relevant competency aligned with the evolving demands of the mental health profession. They advocated for systemic curriculum reform to incorporate neuroscience-informed practices as core components of training. This suggestion aligns with Schultz et al. (2021), who emphasized the need to include neurobiological frameworks in counselor education to prepare practitioners for modern, evidence-based practice. Proposals such as establishing formal attachments with neurofeedback centers to fulfill academic credit hours reflect a forward-thinking approach to bridging classroom learning with clinical application.

Participants also expressed a strong preference for practical, hands-on modules over purely theoretical instruction. They emphasized the value of experiential training in deepening applied understanding and preparing students for real-life counseling scenarios. This supports Kolb's (1984) Experiential Learning Theory, which posits that knowledge is best constructed through active engagement and reflective practice. The emphasis on practical exposure is also echoed by Mehler et al. (2023), who found that experiential methods in neuroscience education significantly enhance learner confidence, skill acquisition, and professional readiness.

Additionally, participants highlighted the need for institutional investment in neurofeedback infrastructure. Suggestions included the establishment of dedicated neurofeedback laboratories within universities, equipped with appropriate tools, software, and technical support. Such recommendations underscore the importance of long-term planning and resource allocation to ensure the sustainability and effectiveness of neurofeedback integration in counselor training. This call for infrastructure mirrors challenges reported by Ng et al. (2022), who noted that limited access to technology remains a significant barrier to implementing neuroscience-based training in Southeast Asia.

In summary, participants envisioned a more progressive and applied training environment where neurofeedback is not only taught conceptually but experienced in practice. Their insights reflect a broader shift toward integrative, competency-based counselor education, rooted in both technological innovation and experiential learning principles

Theme 3: Applicability to Diverse and Underserved Client Populations

Participants identified neurofeedback as a particularly adaptable intervention for diverse and underserved client populations, especially those with trauma histories, limited verbal expression, or neurological

conditions. In hospital and clinical settings, clients often struggle to articulate their emotional experiences, an issue participants felt neurofeedback could address effectively. This aligns with existing research by Fisher et al. (2022), which highlights neurofeedback's capacity to bypass verbal processing and engage clients through direct neurophysiological feedback.

For clients such as children, adolescents, or individuals with developmental or cognitive impairments, neurofeedback was perceived as a supportive tool that offers nonverbal channels of therapeutic engagement. Participants described its effectiveness in reaching clients who are otherwise disengaged or unable to communicate their experiences, echoing findings by Hammond (2011), who advocates for neurofeedback in pediatric and trauma-sensitive contexts. The tool's visual and interactive nature enhances accessibility, making it a viable complement to traditional counseling approaches.

Moreover, participants recognized the precision and personalization that neurofeedback can offer. By tailoring interventions based on real-time brain data, counselors can move toward more individualized treatment plans, an approach supported by Gruzelier (2018), who emphasized neurofeedback's cross-diagnostic utility and its relevance in addressing a broad spectrum of mental health conditions, including anxiety, ADHD, and PTSD. This reflects a shift toward data-informed practice, aligning with contemporary trends in integrative care and personalized treatment planning.

The theme also underscores a growing recognition of ethical inclusivity in mental health services. Participants viewed neurofeedback as a way to reach clients underserved by conventional talk therapy, particularly those from marginalized or high-risk groups. This vision reflects the evolving identity of counselors as adaptable, interdisciplinary practitioners. It is consistent with Spears et al. (2024) and Tollerud and Vernon (2019), who advocate for the incorporation of innovative, science-informed approaches into counselor training to better meet the diverse needs of clients.

Ultimately, participants saw neurofeedback not only as an advanced technique but also as a symbol of progress in counselling broadening access, enhancing effectiveness, and reinforcing the counselor's role in delivering equitable and modern mental health care.

Integration Across Findings

The findings across all three research objectives suggest a synergistic impact of neurofeedback training on counseling students' development. Experiential learning facilitated deeper cognitive processing and personal engagement with the material (Objective 1), which in turn enhanced students' self-efficacy and perceived competence (Objective 2). This progression ultimately contributed to the development of new knowledge, practical skills, and heightened professional self-awareness, shaping students' attitudes and identities as future practitioners (Objective 3). Within this context, neurofeedback functioned not merely as a technical intervention but as a pedagogical tool that engaged the affective, cognitive, and behavioral dimensions of learning. This multidimensional transformation reflects contemporary educational paradigms that prioritize the cultivation of reflective, competent, and ethically grounded professionals (Tollerud & Vernon, 2019; Spears et al., 2024).

CONCLUSION

This study explored the experiential learning, self-efficacy development, and evolving professional perceptions of Clinical Mental Health Counseling students following neurofeedback training. The findings demonstrate that neurofeedback, when delivered through hands-on and reflective engagement, can significantly enhance students' understanding of brain-based processes, boost their confidence in applying neuroscience-informed tools, and shape their evolving counselor identities. Grounded in Kolb's Experiential Learning Theory and Bandura's Self-Efficacy Theory, the results confirm that practical exposure to neurofeedback fosters meaningful internalization, professional motivation, and reflective capacity. Ultimately, the training contributed to students viewing neurocounseling as a valuable and ethical addition to the future of integrative mental health practice.

Limitations of the Research

While this study provides valuable insights into counseling students' experiences with neurofeedback training, several limitations must be acknowledged. First, the sample was limited to five participants from a single public university, which may affect the transferability of the findings to other educational or cultural contexts. Second, all participants enrolled voluntarily, suggesting a potential selection bias, as they may have already held a favorable disposition toward neuroscience or innovative training methods.

Third, the study did not include long-term follow-up, which limits understanding of how participants' perceptions, confidence, or application of neurofeedback might evolve over time or within actual clinical practice. Fourth, data collection relied exclusively on semi-structured interviews, without triangulation from other sources such as reflective journals, classroom observations, or supervisor evaluations. This may constrain the depth and credibility of interpretive findings.

Additionally, the findings are inherently context-bound, as they reflect the specific neurofeedback protocol, tools, and facilitation style employed by Dr. Koo Kian Yong and his team during the workshop. Lastly, the training was conducted as a single-session experience, which, while sufficient to initiate learning, may not fully capture the complexity or progression of neurofeedback competency development over time.

Implications of the Research

The findings have important implications for counselor education, training, and practice. For academic institutions, the results suggest that integrating experiential neuroscience components into the counseling curriculum can enhance engagement, skill acquisition, and readiness for innovative practice. Curriculum developers and decision-makers should consider allocating space for introductory neurofeedback modules, particularly those emphasizing hands-on application and critical reflection. For clinical supervisors, the study underscores the importance of fostering guided discussions around neuroscience tools to support ethical integration. Furthermore, the research supports the broader professional movement toward neurocounseling, reinforcing the idea that technological literacy and neurobiological insight should be foundational elements in the training of future counselors.

Recommendations for Future Research

Future studies should expand on this work by including larger, more diverse samples across multiple institutions to enhance generalizability. Longitudinal research designs would also be valuable in tracking the lasting impact of neurofeedback training on professional identity, clinical competence, and client outcomes. Additionally, researchers are encouraged to explore the integration of reflective journals, peer supervision sessions, and practical assessments to triangulate qualitative findings. Comparative studies between students exposed to neurofeedback and those trained through traditional methods could yield insights into differences in clinical confidence, skill retention, and openness to neuroscience-based tools. Finally, exploring the perspectives of faculty members and curriculum developers may offer a systemic understanding of barriers and enablers to incorporating neurocounseling into higher education.

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