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EVALUATING THE CAPACITY TO SELF-REGULATE AMONG OPEN AND DISTANCE LEARNERS: A NEUROSCIENCE-INFORMED LENS

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Abstract

Open and Distance Learning (ODL) settings place significant demands on learners' capacity for self-regulation as they navigate stress and competing responsibilities. This study adopts a neuroscience-informed lens to examine self-regulation as a dynamic interplay of cognitive, emotional, and bodily processes, emphasizing learner's ability to shift from states of stress and overwhelm to calm, focused and active engagement. A total of 28 adult learners from Open University Malaysia participated in a 10-week online training program, *The Science of Safety for Self-Regulation*, followed by the administration of a Self-Regulation Capacity Survey. The survey measured participants' perceived ability to consistently regulate themselves during stressful moments across three interrelated domains: awareness, body-based practices, and mind-based practices.

Findings indicated moderate self-regulation capacity in the awareness and body-based practices, with specific challenges in dual awareness, particularly, maintaining regulation when past emotional patterns were triggered, and with using body-based practices for stress recovery. The mind-based practices received the lowest ratings, suggesting difficulties in consistently engaging self-compassion and psychological flexibility during stressful situations. These outcomes highlight the importance of an integrative framework, reinforced by the consistent practice of corrective experiences to counter maladaptive behaviors. Accordingly, this study recommends for ODL institutions to incorporate neuroscience-informed practices into curricula or learner support services to enhance academic engagement and persistence.

Keywords: self-regulation, neuroscience-informed, open and distance learning, dual awareness, emotional resilience, body-based practices, psychological flexibility, corrective experience

1 INTRODUCTION

1.1 The Role of Self-Regulation in Open and Distance Learning

Open and Distance Learning (ODL) has expanded access to higher education, particularly for adult learners juggling academic, professional, and personal roles. While the flexibility of ODL supports autonomy and self-paced learning, it also places greater responsibility on learners to direct their own learning journey. In this context, self-regulation becomes a critical competency. It encompasses the learner's ability to plan, monitor, and adapt cognitive, emotional, and behavioral strategies in pursuit of academic goals (Schunk & Zimmerman, 2023). The limited

interaction with instructors and peers further emphasizes the need for learners to rely on internal resources to maintain engagement and manage challenges independently (Panadero, 2017).

1.2 Reframing Self-Regulation through a Neuroscience-Informed Lens

While traditional models of self-regulation focus solely on cognitive strategies such as time management, goal-setting and motivation, a neuroscience-informed lens offers a more integrative understanding. Specifically, it emphasizes that self-regulation is not only a mental function but also a emotional and bodily processes involving the nervous system. The term *neuroscience-informed* refers to an approach that is guided by findings from brain and nervous system research particularly how physiological processes such as heart rate variability, respiratory rhythm, muscle tension, and sensory input interact with attention, emotion regulation, and motivation.

This lens demonstrates that self-regulation depends on the brain and body's ability to shift from states of stress and survival to states of calm, focus, and active engagement (Barrett, 2017; Porges, 2011; Siegel, 2020). In this view, self-regulation involves the capacity to recognize internal signals of dysregulation (e.g., anxiety, overwhelm, fatigue) and to restore balance through deliberate, body-based and mind-based practices. Techniques such as breath control, grounding, emotional reflection, and value-aligned action are understood as tools to engage the autonomic nervous system and promote a sense of safety and stability (Dana, 2018).

1.3 Neuroscience and Self-Regulation for ODL Learners

Neuroscience highlights that the brain functions as a predictive organ, constantly integrating internal sensations and external cues to assess safety and determine appropriate responses (Friston, 2010). Theories such as predictive coding, Polyvagal Theory, and the theory of constructed emotion explain how learning and engagement are enhanced when the nervous system is in a regulated, socially engaged state (Barrett, 2017; Porges, 2011, 2022).

Prolonged stress activation, however, can disrupt this balance, resulting in symptoms such as racing thoughts, anxiety, restlessness, irritability, exhaustion, emotional numbness, detachment, lack of motivation, and feelings of helplessness. These dysregulated states increase vulnerability to maladaptive coping behaviors such as procrastination, avoidance, emotional withdrawal, or excessive screen time, that may provide short-term relief but undermine the pursuit of long-term goals (Sirois & Tosti, 2012; Yang, Liu, Ding, Hong, & Jiang, 2023). Neuroscientific research further indicates that dysregulation activates brain regions involved in physical pain processing, reinforcing cycles of stress and physiological discomfort (Eisenberger, 2012). As a result, individuals may experience physical symptoms, such as

fatigue, headaches, gastrointestinal issues, muscle tension, or insomnia (Eisenberger, 2012; Hughes, Clark, Colclough, Dale, & McMillan, 2017; Van der Kolk, 2014).

For ODL learners, who have competing responsibilities with limited resources, the absence of effective regulation strategies can heighten the perception of threat. In such states, disengagement may occur not because of deficits in willpower, intelligence, or motivation, but because the nervous system interprets the additional cognitive load as overwhelming. This threat response suppresses higher-order cognitive functions, impairing flexibility, attention, memory, and emotional resilience (Porges, 2011; Van der Kolk, 2014).

To address these challenges, this study adopts a neuroscience-informed lens to evaluate the self-regulation capacities of ODL learners across three interdependent domains: awareness, body-based, and mind-based practices. This framework highlights strategies to shift internal states through both bottom-up (physiological/emotional) and top-down (cognitive/emotional) approaches. By examining the dynamic interplay between bodily signals, emotional responses, and cognitive patterns, the study provides an integrative framework on supporting learner persistence and well-being in the demanding context of digital education.

2 METHODOLOGY

This study employed the Self-Regulation Capacity Survey to evaluate participants' capacity for self-regulation following their participation in a structured training program. The survey was administered two weeks after a ten-week course titled "*The Science of Safety for Self-Regulation"*, conducted during the January 2025 semester at Open University Malaysia (OUM). The program was designed to cultivate self-regulation through neuroscience-informed lens, integrating awareness, body-based, and mind-based practices.

A total of 28 adult learners from OUM voluntarily participated in the training and completed the survey. All participants were working adults managing the demands of academic study alongside professional and personal responsibilities. Participation in the survey was entirely voluntary and responses were collected anonymously.

The Self-Regulation Capacity Survey was developed based on the *Building Capacity module* taught within the training program and was designed to assess learners' self-regulation across three interrelated domains. Section A: Awareness Practices, which assessed the ability to recognize internal response patterns and external stressors. Section B: Body-Based Practices, which evaluated the use of physiological strategies to manage stress and regulate arousal. Section C: Mind-Based Practices, which measured the application of cognitive and mindset-oriented strategies for emotional and behavioral regulation.

Participants rated their level of capability for each item using a 5-point Likert scale, where 1 = *Not at all capable*, 2 = *Slightly capable*, 3 = *Somewhat capable*, 4 = *Quite capable*, and 5 = *Fully capable*. They were instructed to rate in the survey, how capable they felt in performing each strategy most of the time, rather than based on occasional experiences.

1.1 Section A: Awareness Practices

Awareness is the foundation of self-regulation. From a neuroscience-informed lens, awareness involves more than simply noticing what is happening in the present moment; it also includes recognizing how the body and mind may be reacting based on past experiences. This integrated capacity known as dual awareness enables learners to remain grounded in the here-and-now while observing how familiar emotional patterns may be shaping current responses. Dual awareness is supported by two key body-brain processes**:** neuroception and interoception.

Neuroception, a term introduced by Porges (2011), refers to the nervous system's *automatic, non-conscious process of evaluating safety or threat by continuously scanning both the environment and internal bodily cues*. Unlike perception, which is conscious and deliberate, neuroception operates beneath awareness, influencing physiological and behavioral responses in everyday situations. It is constantly monitoring subtle cues such as facial expressions, tone of voice, posture, or changes in bodily state to determine whether the body should mobilize for defense or relax into connection. When neuroception detects safety, it supports calm engagement; when it detects threat, it may trigger fight, flight, or freeze responses even in the absence of actual danger.

Interoception complements neuroception by providing access to *internal bodily signals*, such as changes in heart rate, breath rhythm, muscle tension, or digestive activity (Craig, 2009; Füstös, Gramann, Herbert, & Pollatos, 2013). These signals function as an internal sensory dashboard, offering moment-to-moment feedback about the body's physiological and emotional states. In the context of self-regulation, interoception acts as a *sensory mirror,* allowing learners to detect internal shifts before they escalate into cognitive or behavioral reactions. For instance, a tight chest may indicate rising anxiety, while a sinking stomach may reflect unprocessed shame or fear.

Together, neuroception and interoception form the physiological foundation of dual awareness. As learners become more attuned to these subtle signals, they enhance their ability to pause, reflect, and consciously name their internal experiences. Over time, this practice helps bring automatic, unconscious reactions, often rooted in earlier experiences into the realm of conscious awareness.

As this internal awareness grows, learners become more adept at recognizing new, more adaptive responses. They begin to notice moments when they stay grounded under pressure, breathe through discomfort, or choose intentional actions instead of falling back into habitual reactions. Learners are encouraged not only to track their triggers and old patterns, but also to the moments when they respond differently, when they pause instead of react, breathe instead of brace, or stay present instead of shutting down. These small shifts are evidence of growth. These small shifts reflect progress toward increased psychological flexibility, emotional regulation, and resilience.

Ultimately, this approach helps learners build the capacity to observe both what was and what is becoming, to witness the interplay between past patterns and present choices. This evolving capacity supports what Siegel (2020) calls *mindsight,* the capacity to reflect on internal experience while staying anchored in the here-and-now. In this way, awareness becomes both a mirror and a compass: a mirror to understand past patterns, and a compass to guide present-moment choices toward more intentional, emotionally balanced behavior in daily life.

To evaluate learners' capacity for the awareness practise, participants were asked to rate their ability to apply the following practices consistently, using statements that begin with "I am capable" and emphasize what they are able to do most of the time. These items specifically target competencies in trigger awareness, emotional awareness, interoception, and dual awareness. The corresponding survey items are presented in Table 1**.**

Table 1: Survey Items for Awareness Practices

Code	Survey Item	Subdomain
A1	I am capable of recognizing which situations usually make me feel stressed or uncomfortable, most of the time.	Trigger awareness
A2	I am capable of identifying what emotions I am feeling during stressful moments, most of the time.	Emotional awareness
A3	I am capable of noticing physical sensations in my body (e.g., muscle tension or heartbeat) when I feel stressed, most of the time.	Interoceptive awareness
A4	I am capable of staying focused and regulating myself in the present, even when I feel discomfort from the past experiences, most of the time	Dual awareness-present regulation influenced by past triggers
A5	I am capable of recognizing when something I feel or do in the present is shaped by experiences from the past, most of the time	Dual awareness-recognizing the past in the present

2.2 Section B: Body-Based Practices

Self-regulation is not solely a cognitive ability, it is also an embodied process shaped by continuous feedback loops between the body and brain. While cognitive strategies support top-down regulation, the body's sensory systems offer powerful bottom-up regulation for shifting internal states and support emotional regulation. Three primary systems, interoception, exteroception, and proprioception**,** form the physiological foundation for bottom-up regulation. To cultivate these capacities, the training program introduced a structured series of body-based practices. Grounded in neuroscience, these practices aim to help learners both detect signs of stress and actively shift their physiological state to restore calm, focus attention, and safety. (Dana, 2018; Lehrer & Gevirtz, 2014; Siegel, 2020).

2.2.1 Interoception: Tracking and Shifting Internal States

Interoception refers to the brain's ability to perceive internal bodily signals such as heart rate, respiration, muscle tension, and gut sensations. Section A, interoception acts as a sensory mirror, allowing individuals to detect internal signals that indicate stress or emotional arousal. In the context of body-based practices, interoception becomes a tool for active regulation.

Techniques such as body scanning**,** breath tracking**,** temperature tracking, and emotion tracking help learners work directly with their internal sensations. For example, slowing the breath can downregulate a racing heart, while consciously softening tense muscles can reduce feelings of anxiety. These small, targeted physiological adjustments send signals of safety to the brain, helping to regulate the autonomic nervous system and shift the body out of defensive states (Craig, 2009; Mehling et al., 2011).

2.2.2 Exteroception: Grounding Through External Senses

Exteroception involves processing stimuli from the external environment through the five senses, sight, sound, touch, taste, and smell. This system plays a crucial role in anchoring attention and establishing a sense of environmental safety, particularly during emotional distress or sensory overload.

Regulatory strategies that activate exteroception include listening to calming sounds**,** using pleasant scents**,** applying soothing textures**,** exposing the skin to cool water**,** noticing colors or light, or focusing on physical contact**.** These sensory inputs help redirect attention outward, reduce internal overwhelm, and create a felt sense of grounding and stability (Barrett & Simmons, 2015; Porges, 2011; Serino & Haggard, 2010).

2.2.3 Proprioception: Regulating Through Movement and Position

Proprioception is the internal sense of the body's position, movement, and muscular effort. This system supports regulation through intentional physical engagement, such as stretching, walking**,** shaking**,** bouncing, or applying deep pressure.

Proprioceptive input offers consistent feedback about the body's spatial orientation, promoting physical containment, postural awareness, and neuromuscular integration. These practices are particularly effective for releasing hyperarousal, re-establishing a sense of agency, and supporting autonomic regulation (Goble, 2010; Proske & Gandevia, 2012).

2.2.4 Multisensory Integration for Enhanced Regulation

Many somatic practices intentionally engage multiple sensory systems simultaneously, enhancing their regulatory potential. For example, mindful walking outdoors combines proprioceptive movement, interoceptive breath awareness, and exteroceptive interaction with the environment. Similarly, practices such as yoga, expressive movement, pilates, and self-soothing touch integrate all three systems to create a comprehensive, body-centered approach to self-regulation.

These multisensory practices promote neural integration and support a shift toward safety and balance across physiological, emotional, and cognitive domains. As learners develop the capacity to adjust their internal states in real time, they become more adept at interrupting stress responses before they escalate into overwhelm or avoidance (Critchley & Harrison, 2013).

To evaluate learners' capacity in body-based self-regulation, participants were asked to rate their ability to consistently apply the following practices. Each statement begins with "I am capable" and emphasizes what learners are able to do most of the time**.** These items assess key competencies in interoceptive**,** exteroceptive, and proprioceptive regulation, the foundational sensory systems involved in bottom-up self-regulation. The corresponding survey items are presented in Table 2**.**

Table 2: Survey Items for Body-based Practices

Code	Survey Item	Subdomain
B1	I am capable of using breathing techniques to calm myself down when I feel stressed, most of the time.	Interoceptive regulation – breath
B2	I am capable of releasing muscle tension or changing my posture to reduce stress, most of the time.	Interoceptive regulation – tension
B3	I am capable of using sounds, scents, or visual cues in my environment to help myself feel grounded, most of the time.	Exteroceptive grounding
B4	I am capable of using physical movement (e.g., walking, stretching) to release stress, most of the time.	Proprioceptive regulation
B5	I am capable of choosing a body-based technique that fits what I need when I feel dysregulated, most of the time.	Body-based strategy matching
B6	I am capable of using body-based techniques to recover from stress or overwhelm, most of the time.	Recovery regulation

2.3 Section C: Mind-Based Practices

Mind-based practices involve intentionally working with thoughts, emotions, mindset and beliefs to support self-regulation in learning. These top-down strategy engages the brain's higher-order functions such as reflection, emotional awareness, and value-driven action which become more accessible when the nervous system is in a regulated state (Arnsten, 2009; Siegel, 2020). This section focuses on two core self-regulation capacities: self-compassion and psychological flexibility.

Self-Compassion refers to the capacity to respond to personal challenges, setbacks, or moments of suffering with kindness, care, and nonjudgment, rather than self-criticism. It involves recognizing one's imperfections and emotional pain as part of the shared human experience, rather than viewing them in isolation. This includes offering understanding and support to oneself during times of difficulty, while acknowledging pain and failure without exaggeration or avoidance (Neff, 2003, 2021).

Neuroscientific research shows that self-compassion activates brain areas associated with safety, caregiving, and emotion regulation, such as the insula and the ventromedial prefrontal cortex (Gilbert, 2010). Learners practicing self-compassion can express inner affirmations such as *"This is hard and I'm doing my best","Asking for help doesn't mean I'm weak,"* and *"It's okay to make mistakes,"* which reflect an attitude of gentleness and acceptance toward oneself.

Psychological Flexibility (PF) refers to the capacity to stay present and take action aligned with one's core values, even in the presence of difficult thoughts, emotions, or bodily sensations (Hayes, Levin, Plumb-Vilardaga, Villatte, & Pistorello, 2013; Hayes, Luoma, Bond, Masuda, & Lillis, 2006). PF is closely linked to executive functioning, emotion regulation, and self-

regulation processes, all of which contribute to adaptive functioning under stress (Doorley, Goodman, Kelso, & Kashdan, 2020).

Neuroscientific research indicates that PF engages multiple brain systems. The anterior cingulate cortex (ACC) plays a central role in conflict monitoring and error detection, supporting an individual's ability to notice distressing thoughts or sensations without automatically reacting (Bush, Luu, & Posner, 2000). The insula, particularly the anterior insula, is involved in interoceptive awareness helping individuals accurately sense and interpret bodily states such as tension or discomfort (Craig, 2009). These brain areas work in coordination with the ventromedial prefrontal cortex (vmPFC) and dorsolateral prefrontal cortex (dlPFC), which are associated with emotion regulation, decision-making, and the suppression of habitual responses (Etkin, Büchel, & Gross, 2015).

Learners practising PF may express inner affirmations like *"It's discomfort, but I'm not going to resist it," "It is safe to feel discomfort," "I can sit with this feeling,"* and *"I commit to practices every day,"* reflecting a mindset of acceptance coupled with committed action. Over time, practicing these skills may enhance neural connectivity between regulatory and emotional centers, fostering resilience, emotional balance, and more adaptive coping (Miller & Cohen, 2001; Ryan & Deci, 2024)

These mind-based practices work best when the body is in a state of calm. However, in moments of intense stress or strong emotions, access to cognitive functions can be impaired. In such cases, learners may benefit from first using body-based practices (see Section B) to calm the nervous system, before engaging in cognitive or emotional reflection. Ultimately, while physiological signals alert us to stress, it is the learner's cognitive interpretation and response shaped by mindset, beliefs, and mental habits that shapes long-term self-regulation.

To evaluate learners' capacity for the mind-based practise, participants were asked to rate their ability to apply the following practices consistently, using statements that begin with "I am capable" and emphasize what they are able to do most of the time. These items specifically target competencies for self-compassion and psychological flexibility. The corresponding survey items are presented in Table 3**.**

Table 3: Survey Items for Mind-based Practices

Code	Survey Item	Subdomain
C1	I am capable of treating myself with kindness when I face difficulty, most of the time.	Self-compassion
C2	I am capable of accepting my mistakes or failures without harsh self-judgment, most of the time.	Self-compassion
C3	I am capable of staying with discomfort without trying to resist, fix or avoid it, most of the time.	Psychological flexibility – tolerance with discomfort
C4	I am capable of noticing my thoughts without letting them control my actions, most of the time.	Psychological flexibility – cognitive defusion
C5	I am capable of taking small steps toward my goals, even when I don't feel like it, most of the time.	Psychological flexibility – values-based action
C6	I am capable of staying committed to my self-regulation practices, even when motivation is low, most of the time.	Psychological flexibility – persistence

3 FINDINGS AND DISCUSSION

3.1 Demographic Profile of Respondents

A total of 28 adult learners participated in the study, with the majority identifying as female (64.3%, $n = 18$) and the remaining 35.7% ($n = 10$) as male. Participants ranged in age from 28 to 54 years, with most falling within the 30 to 40 age brackets. This demographic profile aligns with typical characteristics of open and distance learning (ODL) populations, which often comprise mid-career adults balancing multiple life roles (Kahu & Nelson, 2018; Lee & Choi, 2011).

Participants assessed their capacity for self-regulation across three domains, Awareness Practices (Section A), Body-Based Practices (Section B), and Mind-Based Practices (Section C), using a 5-point Likert scale ranging from 1 (not at all capable) to 5 (fully capable). Crucially, the scale measured what participants were capable of doing *most of the time*, emphasizing consistent, sustained application rather than occasional effort. This distinction is essential for understanding the reliability of their self-regulation strategies under everyday stressors.

3.2 Section A: Awareness Practices

Participants demonstrated relatively moderate capacity in awareness practices. The highest-rated items were A1 (recognizing stress triggers), A2 (identifying emotions), and A3 (noticing physical sensations), with mean scores between 3 and 4. These results indicate that learners are quite capable of recognizing early signs of stress, reflecting a developing capacity in emotional and interoceptive awareness, which plays a key role in prompting timely regulation (Mehling et al., 2011; Price & Hooven, 2018)

In contrast, the lowest-rated items were A4 and A5, both of which pertain to dual awareness, the ability to stay present while recognizing the influence of past experiences on current responses with mean scores between 2 and 3. These results suggest that learners may struggle to remain regulated when past emotional patterns are activated. As dual awareness represents a more advanced regulatory skill, its development often requires repeated practice. Strengthening this capacity through repeated practice and support may improve learners' resilience and their ability to manage stress over time (Ogden, Pain, & Fisher, 2006; Porges, 2011; Siegel, 2020)

3.3 Section B: Body-Based Practices

Participants demonstrated varying levels of capacity in engaging body-based practices. The highest-rated items were B1 (using breathing techniques to calm stress), B2 (releasing muscle tension or adjusting posture), and B3 (using environmental cues such as sounds or scents to feel grounded), with mean ratings falling between 3 and 4. These results suggest that participants are developing the ability to utilize interoceptive and exteroceptive techniques for down-regulating stress. Breathing techniques, especially slow or controlled breathing, have been consistently shown to reduce physiological arousal and promoting calm (Zaccaro et al., 2018). Similarly, somatosensory grounding through visual, auditory, or olfactory cues has been associated with reduced anxiety and increased bodily awareness (Price & Hooven, 2018).

By contrast, the lowest-rated items were B4 (movement), B5 (matching strategies to one's needs), and B6 (using body-based techniques for recovery practices), which received mean ratings between 2 and 3. These practices often require higher proprioceptive awareness and the ability to select contextually appropriate techniques. The lower ratings suggest that learners may have limited exposure to or confidence in these practices, particularly during moments of dysregulation. This indicates that movement-based and recovery-oriented body regulation strategies may not yet be fully integrated into participants' everyday routines, despite well-established benefits for releasing tension and restoring physiological balance (Porges, 2022; Price & Hooven, 2018; Van der Kolk, 2014) .

3.4 Section C: Mind-Based Practices

Among the three domains, participants demonstrated the lowest overall capacity in this area. All items in this section were rated between 2 and 3, indicating a limited ability to consistently engage in psychological regulation. Although participants show emerging strengths in awareness and body-based practices, they appear to struggle with sustaining emotional flexibility, cognitive adaptability, and self-compassion in the face of challenges. This gap is noteworthy, as developing these skills is essential for building emotional resilience, effectively

tolerating discomfort, and maintaining alignment with long-term values and goals (Doorley et al., 2020; Kashdan & Rottenberg, 2010)

3.5 Neuroscience-Informed Lens to Self-Regulation Discussion

This study reinforces the importance of adopting an integrative framework for self-regulation, involving three interdependent domains: awareness, body-based, and mind-based practices. Awareness practices assist learners in identifying early signs of stress. Body-based practices help regulate the autonomic nervous system and stabilize physiological responses through interoceptive, exteroceptive, and proprioceptive inputs (Dana, 2018). Mind-based practices, including self-compassion and psychological flexibility, support adaptive emotional responses and values-based decision-making, particularly in the face of internal or external adversity (Barrett, 2017; Ryan & Deci, 2024).

Beyond the acquisition of self-regulation practices, the concept of corrective experiences plays a vital role in consolidating and strengthening these skills. Corrective experiences occur when individuals come to understand or emotionally experience an event or relationship in a different and unexpected way (Castonguay & Hill, 2012). From a neuroscience lens, such moments disrupt the brain's threat-prediction cycle and introduce new information derived from bodily signals and cognitive appraisals, facilitating a shift into a more regulated state (Barrett, 2017). In this process, learners could re-experience old conflictual situations in a new, healing way. These experiences offer new evidence of safety, agency, and resilience, thereby helping to change maladaptive coping behaviors and promote greater psychological flexibility (Ogden et al., 2006; Porges, 2022).

The benefits of corrective experiences, however, are only realized through consistent practice**,** which is essential for sustaining long-term behavioral change. Self-regulation is not an innate trait but a learned and trainable capacity that develops gradually through repeated application. Neuroscience highlights that lasting behavioral change is not the result of intense efforts but from small, repeated actions integrated into daily routines, which reinforces new neural pathways (Garland, Froeliger, & Howard, 2014; Neff & Germer, 2018; Siegel, 2020). Over time, repeated engagement with such corrective experiences promotes neuroplasticity**,** the brain's capacity to reorganize its structure and function in response to the experiences.

4 CONCLUSIONS

This study examined the self-regulation capacity of open and distance learners through a neuroscience-informed lens across three interdependent domains: awareness, body-based, and mind-based practices. While participants demonstrated developing skills in recognizing stress and emotional cues, their ability to sustain regulation particularly through dual awareness remained limited. Similarly, although participants engaged moderately with body-based practices, they still lacked confidence in using movement and body-based techniques for stress recovery. Mind-based practices, such as self-compassion and psychological flexibility, were also inconsistently applied.

This study reinforces that self-regulation is not merely a cognitive process but a dynamic interplay of cognitive, emotional, and bodily processes. Strengthening this capacity requires an integrative framework alongside the consistent practice of corrective experiences to counter maladaptive behaviors such as procrastination, withdrawal, or avoidance. Although such behaviors may offer short-term relief, they ultimately impair cognitive flexibility and emotional resilience, undermining the pursuit of long-term academic goals. These insights call for ODL institutions to adopt neuroscience-informed practices into curricula or learner support services. Future research should explore the long-term impact of such interventions and develop scalable strategies to address the diverse needs of ODL learners.

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