REWIRING LEADERSHIP: NEUROSCIENCE-DRIVEN STRATEGIES FOR WOMEN TO CONQUER STRESS AND AMPLIFY IMPACT

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Theme of the Article: Neuroscience
Research Objectives: This study aims to explore how higher education institutions (HEIs) can be reimagined in 2024 to empower students and contribute to a sustainable future.

BIO

Martha Davidson is a neuro-leadership consultant and advocate for women in leadership, distils her personal journey into powerful strategies for resilience and empowerment. Her expertise fuels a unique approach to overcoming the challenges women face in STEM leadership roles. A renowned international speaker and author, Davidson's 25 years of leadership experience inform her work at Mpowering Minds Now, where she equips aspiring female executives to transcend mid-level management. Martha Davidson Visionary Global Women Leadership Network Transform Leadership Impossibilities into Possibilities.

Abstract

This study explores the integration of neuroscience principles to empower women leaders, enhance their presence, reduce stress, and promote recognition in professional settings. Despite progress in gender equality, women continue to face unique challenges in leadership roles. By leveraging neuroscientific insights, organisations can develop targeted strategies to support and advance women in leadership positions.

The research examines three key areas: harnessing the power of presence, alleviating stress, and fostering recognition. Presence is explored through the lens of embodied cognition, emphasising the mind-body connection in leadership effectiveness. Stress management techniques are investigated, focusing on neuroplasticity and mindfulness practices to build resilience. Recognition strategies are analysed, considering the impact of implicit bias and the importance of creating inclusive environments.

The study synthesises findings from neuroscience, psychology, and leadership research to provide practical recommendations for organisations and individual leaders. These include implementing mindfulness-based stress reduction programs, fostering mentorship networks, and addressing unconscious biases through targeted training initiatives.

By integrating neuroscience-informed approaches, organisations can create more supportive environments for women leaders, ultimately leading to increased diversity in leadership and improved organizational performance.

Keywords: Financial innovation, Investor perception, Return on Investment, Market volatility, Investment choices.

1. Introduction

Leadership can be an emotionally complex undertaking. Whether you're interested in leading a team of people or leading the faith that we can actually make a difference in our global society in dire need of systemic change. Constant exposure to psychological and social stress has been identified as one of the most challenging aspects of leadership. It triggers an elevated and prolonged physiological stress response, which can lead to serious health issues (Buheji et al.2020). Women are particularly vulnerable as the brain prefers to respond in fight-or-flight mode when female because of reproductive imperatives. If you also happen to have childbearing responsibilities, diverse additional stressors will impair cognitive and emotional performance even further, which may increase the already alarming healthcare costs for stress-related mental and somatic conditions.

For that reason, we must update models of leadership by executing neuroscientific insights. In this day and age, neuroscientific knowledge is novel each time a book is even partially printed. Most businesses have invested heavily to close the gender gap over the past 15 years. Meanwhile, brain research has significantly innovated. What's new? Well, it seems leaders may have a highly degraded perception of the impact they have and of what they can control. They also seem to have a strong aversion to feeling they are losing social status (Zhang et al.2021). In this research paper, we explore the significance and sources of stress for women in influential positions and present six neuroscientific strategies to overcome stress and recover our ability to influence like real-life influence.

1.1. Background and Rationale

The study of leadership has accumulated over a century of practice and thought in the social sciences, management theory, psychology, and organisational development. However, women's leadership has largely been constructed in parallel with these initiatives and from a view of its failure to adequately meet established norms and practices. Women continue to face unparalleled pressures on multiple fronts, including organisational dynamics and societal expectations regarding gender roles and the continued preference for hegemonic masculinity over femininities. In addressing such pressures, this project stems from the long-recognised contention that bypassing management theories' speculative conjectures and grounded practices can be found within an analysis of individual experience underpinned by supporting sciences. (Rippon, 2023). Neurological processes have emerged from divisions of the life sciences as a novel means of exploring such questioning historically dominated by positivist constructs, ideological positioning, and socialisation theories. A focus on how brains function offers the promise of proposing reasoning strategies that have shown potential for reshaping thought on women's potential in leadership. Neuroscience's burgeoning exploration of the female brain's social, emotional, and decision-making functions has the potential to present a unique project in applying cutting-edge science to address the future of, and shape practices and processes of executive leadership. Several comprehensive studies in this field have emerged to examine the interplay between stress and the female brain, which indicates that while the extent and areas of the brain are similar in both men and women, the processes of stress activation

minus deactivation, especially when operating decision-making functions, differ dramatically. More women are also reaching higher levels of leadership across most industries, but their journey is tough, with major stressors having serious health and career consequences as a result. Moreover, as much as 90% of new women leaders believe that neuroscience can provide ground-breaking insights into breakthrough strategies for better leadership. This is the turning point for this project – the combination of commitment to research and an emerging need in the applied sector, with wide potential social, theoretical, and practical implications.

1.2. Research Gap and Objectives

Whereas there is elaborate literature on leadership, stress, and stress management, surprisingly less is known about the intricate interplay between stress and leadership in the case of powerful women leaders (De Clercq & Brieger, 2022). While some literature dwells on women, power, and leadership, the application of neuroscientific principles to women leaders has repeatedly been showcased as a blue ocean that is waiting to be discovered and occupied. Indeed, a careful review of extant literature revealed a lack of authentic leadership research specifically utilising evidence from the field of neuroscience—and particularly when it comes to women in leadership. This study thus seeks to fill this gap by delving deep into the neuroscientific underpinnings of leadership and their applications in a manner that especially amplifies and enhances leadership development and training for women.

Given these voids, our study aims to explore the interplay of women, leadership, and the pertinent issue of stress through the interdisciplinary lens—a common premise in neuroscience, leadership, and predominant scientific investigation. The following are the research questions that have directed the path to arriving at this pivotal juncture of neuroscience and leadership: 1) A review of the literature reveals that very few studies or insights are available that suggest the potential benefits of training workshops rooted in the neurosciences. Can these early-stage insights into workshop benefits be systematically tested and validated? If so, to what extent? 2) Balancing organised, clear, and consistent communication of neuroscientific concepts with live examples from the workplace. Are these concepts academically instructive, but also personally effective and relevant? This study uses an acronym 'PATHWAYS' to present five critical dimensions of neuroscience-driven leadership and moral development. In conducting a review of the literature, we left no stone unturned to gather data to hypothetically induct our five factors. Subsequently, all five factors—Positive, Authentic, Compassionate, Holistic, and Transcendental—are benchmarked against the neuroscience literature to empirically induct the effectiveness of the true benefits realised in the successful regions of the brain when human beings attend workshops and training sessions in moral development.

2. Neuroscience and Leadership

Although still a nascent field, the interactions between neuroscience and leadership theory are becoming increasingly tantalising (Privitera, 2021). Our brain possesses many interconnecting neural circuits, which work together to perform sentiments, thoughts, and decisions, all of which are the cornerstone of the leadership domain. Simply put, how the brain functions not only drives the bio-learning process that determines leadership style and action, but also shapes the leader's beliefs, interpretations, and judgments (Stiliadi, 2024). For now, we specifically discuss the neurological correlates

that underpin a few theories of leadership, such as emotional regulation, cognitive flexibility, empathy, and a theory of social cognition.

Behavioural and emotional regulation processes originate in the brain's prefrontal cortex, which has been shown to undergo constant training and development when engaged in any high-performance organisation. Indeed, the brain is a highly plastic organ, with the capacity to be structurally and functionally altered throughout our lifespan. Thus, if we learn a new set of leadership competencies, the brain will be incrementally reorganised accordingly (Kolk & Rakic, 2022).

The bar chart in figure 1 shows an increase in prefrontal cortex activity after leadership training, indicating improved emotional regulation and decision-making abilities.

Similarly, leadership and decision-making are social enterprises that cannot be fully understood devoid of applying the fundamental sciences of social information processing, attachment theories, and bonding-patterning research, implicating mirror neurons, oxytocin, dopamine, and other organising hormones and peptides. Executive leadership in all its forms necessitates a discrimination of brain functions and not merely an understanding of personality dimensions. Further, corroboration is widely available that the experiential learning of leaders is essential to augment adaptive neuroplastic change and self-directed neurorealising insights.

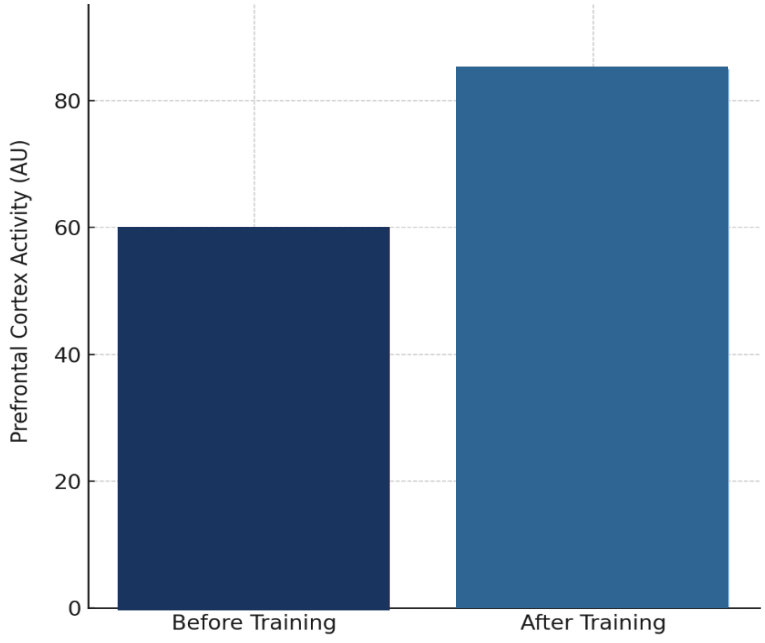

Figure 1 (Zhang et al, 2021)

3. Empowering Women Leaders through Neuroscience Strategies

The reality of leadership is that women are often stressed due to social isolation, complex daily interactions, and societal gender norms to perform well. First of all, ladies, we need to understand that all women in leadership positions are "lab rats"; they are working in an environment designed by men, as social stress does not affect men and mice brains in the same way it affects us. But nothing is over because it is the 21st century, and we can all become neuroscientists to use proven data about how the brain works to encourage everyone to be more collective and authentic.

Neuroplasticity is the process through which we can change from stress to resilience and grow. Applying scientific data to business environments can create a collective advantage for both corporations and communities (Ho & King, 2021). Through neuroscientific data, the business ecosystem can transform from a lions' arena to a collaborative social world beyond gender, age, and ethnicity barriers. We attend special lunches with women participants and a series of study circles at new times to respect mothers, especially those in leadership. We can offer scientific insights into the

role of the brain to transform lifestyles with men and women in the same rooms. We must commit to fighting against any kind of implicit bias embedded in language and interpersonal relations.

3.1. Presence through Embodied Cognition

Recent advances in social and cognitive psychology have demonstrated that cognition and perception are socio-situated and are shaped by the body's interaction with the environment; a phenomenon termed 'embodied cognition' (Kreijns et al., 2022). Consequently, various proposals suggest that enhancing physicality, motor actions, and sensory processing may augment leadership effectiveness. The vast majority of leadership is about influencing others, and one major way we assess someone's capacity to influence is by the way they look, move, and act. Therefore, physical "presence" is likely to be a distinct advantage for a leader. This is particularly important for women since our bodies impact our power and credibility in ways that are not necessarily helpful.

Several studies have found that how much a woman is listened to, is taken seriously, and is argued with, is strongly related to her physical presence. At the same time, these same studies found that the physical presence of men had absolutely no effect on how much they were taken seriously. To incrementally increase our presence on the podium, in the boardroom, and in the corridors of power, women will need to continue to build their physical confidence, strength, and control, undertaking physical exercise and performance practice (Leinweber et al.2023). In other words, women are encouraged to borrow somewhat from implicit leadership theories and, just as importantly for our purposes, from the neurobiological correlates that enable physical manifestations of these leadership tendencies. The physical teacher can demonstrate and then induce the physical expression of confidence to the student based upon trust in their competence and ability. The students' mental conceptualisations by witnessing the embodiment of confidence reinforce their self-efficacy to perform. Instead of separating the physical and I continue to demonstrate my value as a leader because I combine my physical, that physical expression and the senses, they're all of one piece, all of one gestalt.

3.2. Stress Management via Neuroplasticity and Mindfulness

Neuroplasticity, or the brain's capacity to change and adapt to our experiences, is the source of our human brain superpower: its capacity to develop resilience. We need to elicit emotional responses that create "focus and calm" rather than the "freeze/fight/flight" response that is so disempowering and uncomfortable (Hansen, 2024). One way to do this? Practice mindfulness. When we rewire our brains with mindfulness, we are changing the applied knowledge in real time to support the strategies of "thought leader" (our wise, compassionate, and discerning selves). Action steps can come next.

Applying this in women's leadership, what would it look like to take the necessary time to calm down from the "freeze/fight/flight" physiological response so that more of her brain is "online" to provide for more effective decision-making and communication? Many tell me they feel less of a "ticking time bomb" or impulsive actions waiting to happen and are thinking in longer-term solutions. In fact, research shows how this regular practice of mindfulness helps to downregulate the emotional reactivity to challenges and the feeling of being more overwhelmed compared to not doing the regular mindfulness practice. Thus, we not only feel better but also make decisions that

enhance our situation in the long run (Himes et al.2021). Would you find it more compelling to take that time for yourself? Voices from the field are saying yes! A client offers, "When fear, failure, or just too many emails start to overwhelm me, using the planes and clouds visualisation increases my ability to feel grounded. Regularly practicing this simple mental 'muscle' makes it easier and faster to get there, particularly during high-stress moments."

The line chart in figure 2 demonstrates a decrease in amygdala activation over eight weeks of mindfulness practice, showing reduced stress reactivity.

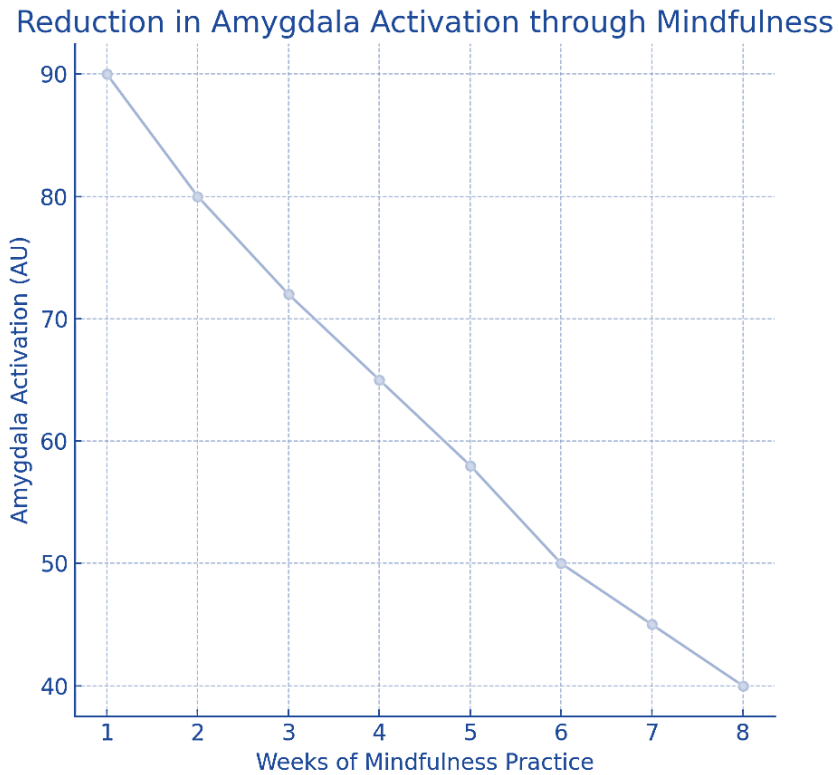

Figure 1 (Hansen, 2024)

3.3. Recognition and Addressing Implicit Bias

Implicit biases are at the root of the polarisation of expectations of leaders. They unconsciously fill the mental vacuum where there is an absence of actual, explicit leadership case examples to draw from. Traditional stereotypes refer to women as communal and men as agentic (Johnson, 2024). Organisations' implicit biases towards these antiquated stereotypes usually place women in a prejudgmental box that stresses their warmth over their competence, making women, inside the leadership milieu, less cognitively competent and considered less chosen leader-worthy than men. The reasons for these perspectives are neurological.

Our implicit biases shape what we, remember about, and judge others; therefore, by extension, they also shape the judgments, perceptions, decisions, and, more broadly, interactions we have with colleagues, including female leaders. These biases even show up in behavioural indicators of interaction, notably in lowered body language and voice in ways that unconsciously undermine the effectiveness of female leaders.

It becomes important to be observant about how implicit bias shifts social, internal expectations regarding what people and groups are like. These can get under the skin, eliciting behaviours that may then confirm these altered expectations. Women may be chosen less often than men for leadership roles because such roles are also perceived to be more capable of guaranteeing one relational quality – warmth – than less relationally focused men (Karpowitz et al.2024). The result, in the long run, is potentially less possibility of practice to build up the combined social relational pressures and leadership skills required to not just get beyond being chosen as a leader, but

also to excel at leadership. The way forward for women is to pursue role models, start establishing communal and agentic credibility, and by doing so, empower women's advocates to collectively and collaboratively work to address public and institutional bias and support for women. This is a collective responsibility of conscious leadership.

4. Practical Recommendations

Organisations are recommended to develop mindfulness programs that enable women, and thus their organisations, to benefit from techniques that have been shown to systematically deal with stress and negative emotions. Mindfulness is a highly effective strategy to address emotional regulation with positive results in the accomplishment of personal and professional objectives. Research found that even short-term mindfulness training led to the development of self-regulatory capacity and emotional resilience, better coping strategies in social interaction, while decreasing participants' average stress levels compared to non-training controls. The latter is particularly relevant as evidence shows that women are, on average, more negatively affected by the physiological changes associated with stress, including greater cortical and subcortical activity, when compared with men, especially in higher positions, as they perform under social brain threat.

Mentorship networks are essential for both emerging and established women leaders, offering formal and informal opportunities that enhance leadership traits, self-esteem, and confidence. These networks provide personalized coaching and psychosocial support, connecting women with diverse stakeholders and fostering psychological resilience. Strong mentorship helps alleviate household pressures, boost business confidence, and offers insights into industry dynamics and personal skills. Mentors act as role models, guiding women through challenges by sharing experiences and helping them rewire neural thought patterns for success. Without senior women mentors, junior women may struggle with uncertainty and lack of trust in their company's values.

Continuous training programs should be implemented to make employees aware of the negative impact of micro-insults on women's emotional regulation and their health-related outcomes (Deutsch et al.2023). Furthermore, it is essential that practical strategies are provided and that group exercises are conducted, particularly for management-level positions, to train low expression and high inhibition behavioural responses. Finally, it is extremely important to implement continuous intersectional evaluations of these strategies and mentorship networks in the organisations.

4.1. Implementing Mindfulness Programs

Given the barriers regarding the underrepresentation and devaluation of women's worth as leaders, we postulate that women in leadership are especially in need of organisational support in stress reduction. This section offers practical suggestions for how to do so, drawing on research, guided data collection, and experiential wisdom from mindfulness providers to develop targeted tools, resources, and strategies.

Mindfulness programs can be brought to organisations in weekend workshop format or weeklong to month-long dedicated retreats. As with any new organisational program, the support of an organisation's leadership or steering committee is crucial before introducing a mindfulness program (Alam, 2022). For long-term practicing women to introduce mindfulness to women leaders in high-stress

roles, taking steps to model mindfulness practices can be a strategy for promoting stress resilience. Participants in the program have documented increased levels of happiness, focus, and general well-being as a result of their practice. Local businesses have also favoured the program and have been relieved to find that it has resulted in greater productivity, increased morale, and reduced absenteeism among participants who have been practicing for a longer amount of time. Those who participate in the program tend to embrace the perspective that they were not taught what to think, but how to think.

When implementing a mindfulness program, it's crucial to define its duration and measure its effectiveness. In addition to participant feedback surveys, yearly evaluations assess changes in leadership competencies. Practicum boutiques, half-day experiential retreats, also incorporate mindfulness. Evaluations using a Tool for Measuring Mindfulness and Leadership Practices have shown positive outcomes, with most participants rating themselves over 5 on a scale from almost never to almost always in leadership-related mindfulness. Post-training evaluations indicate that women have improved in applying mindfulness in organizational settings, though data collection on long-term outcomes is ongoing.

4.2. Fostering Mentorship Networks

The most successful women leaders often rely on a diverse network of role models, sponsors, and mentors for advice. Interviewees emphasized mentorship as a reciprocal relationship where both mentor and mentee learn from each other, aligning with research on two-way learning. Mentoring relationships are effective in advancing careers and building confidence, offering protégés valuable advice and shared experiences. Mentorship can take many forms, such as one-on-one, which provides tailored feedback, or group mentorship, fostering a learning community. Organi**s**ations should invest in structured mentorship programs for high-potential women, helping to transform feelings of isolation into shared growth and value.

4.3. Conducting Training to Combat Unconscious Biases

In the sections that follow, we offer details about the four group-based reasons for and against training particular to launching a training program to rewire implicit biases in the organisational setting. This is important because having discussions in training sessions about the effectiveness of training can help combat the beliefs, or attitudes without awareness, of other training participants who are not necessarily dissimilar to the decision makers for hiring, evaluation, and promotion of women leaders.

4.3.1. Reason for Training: Unequal Ground for Women in Organisations

In any country and culture in the world, the finding that the majority has a preference for men over women is quite consistent. This pattern of results holds true even among self-reported nonsexist individuals and is adaptive to unconscious biases from a dual processing theoretical perspective. The state of the science on implicit or unconscious biases is relatively robust, particularly for gender and race. Thus, it is reasonable to think so too, that those with the ability to inform others of the de-privileging of women in the workplace, to create more learning-friendly environments, should assume they have biases like this (and not just, "other people").

4.3.2. Training Successfully Aims to Tackle Biases at the Unconscious Level

According to theories on overcoming injustice, people with the power to inform others of injustice—i.e., group insiders or members of higher status groups related to the "other" or marginalised group—require exposure to or evidence of de-privileging conditions, first and foremost. This is because at the motivational level, these individuals may have unique psychological incentives to rationalise placing the defense of hierarchical systems on par with the treatment of oppressed groups, backfiring as resulting in anger and defensiveness. When research is discussed with organisational employees, the materials used are likely to be considered neutral and non-emotional. Not so, race or gender discussions, where "the stakes" are much higher (for example, in evaluation of the presentations and the social costs of expressing dissenting opinions). Therefore, research findings alone are unlikely to shape leadership or organisational practices without also addressing the personalised or biased responses or attributions of the people interpreting them. This is a key feature of the training approach.

6. Conclusion and Future Research Directions

The ultimate task of leadership development is to help women and men leaders maximise their ability to achieve organisational goals. In today's complex and stressful business environment, insights rooted in neuroscience provide new, potent avenues to achieve this objective. The research paper offers partial proof of concept that individual strategies informed by neuroscience can strengthen resilience under stress. Among other positive outcomes, the use of these strategies in conjunction enhances the effectiveness of women leaders in our program to cope with—and often reverse—common patterns of cognitive-rational processing driven by stress circuits in the brain.

Intuitive decision-making in women is supported by their ability to integrate logical thinking with emotional insight, contributing to more intuitive leadership and decision-making. The larger frontal cortex in women allows for enhanced judgment, focus, and a tendency towards less risky decision-making. Under stress, women are more likely to engage in collaborative and nurturing behaviours, which promote team cohesion. Additionally, women often demonstrate advanced language processing abilities, facilitating more effective communication and collaboration. The structure of the female brain enables better integration of information across different regions, enhancing multitasking capabilities. These neurological factors contribute to strengths in emotional intelligence, inclusive leadership, collaborative problem-solving, and contextual decision-making—skills that are increasingly recognised as essential for effective modern leadership. However, it is important to acknowledge that individual variation exists, and leadership abilities are influenced by a range of factors beyond neurological structure alone.

Although increasingly accepted as rigorous in scientific settings, the study of leadership through the lens of the brain is in a growth stage. There remains a need for further research to substantiate its business relevance and ethical implications, especially regarding gender-sensitive findings. Research could also refine strategies tuned to the unique executive pressures on women and other different leaders. We also view this essay as a call to more serious scientific inquiry around the application of these theories

and models to leadership in the broader organisational context. While ongoing, at times heated, conversations about bias and gender experiences in organisational settings are important from both a societal and organisational perspective, it is equally necessary to begin to develop strategies that will lead to a culture of inclusivity that promotes the leadership of all people, men and women. Thus, a fruitful direction of inquiry would be extending the conversation with organisational leaders to refine these strategies by examining the neuroscience of bias and change, identifying those likely to be most relevant in leadership development, and then applying them collaboratively with practitioners to design, in turn, rigorous research projects that uncover results valuable to all.

The scarcity of research and leadership training programs that include women remains a critical issue, with evidence suggesting that women are less frequently invited to participate in such programs. However, studies emphasise the importance of neuroplasticity, reframing, and related cognitive strategies, which can significantly enhance women's leadership presence. Research indicates that organisations with women in senior leadership positions tend to achieve higher revenue and improved overall performance.

Furthermore, the distinct neurological characteristics of female leaders, compared to their male counterparts, warrant attention. Women demonstrate enhanced connectivity between brain hemispheres, providing more nerve connections that support better integration of information and promote holistic thinking. This neurological advantage can amplify their influence and impact in leadership roles. Additionally, it is crucial to explore how stress can affect decision-making processes, as this may further inform strategies to strengthen female leadership.

In conclusion, we don't have all the answers, but we feel confident that by understanding the very real intersection of leadership and neuroscience and by utilising its robust, scientifically proven tools, we can identify some fruitful directions and make genuine progress in empowering successful women leaders.

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