

Original Article

FAMILY PRACTICES FOR ENTREPRENEURIAL NEURO-CAPITAL DEVELOPMENT- A META-CLUSTER ANALYSIS

Bhargabi Hazarika ¹, Arup Barman ^{1*}

¹ Department of Business Administration, Assam University, Silchar- 788011, Assam, India

² Professor, Department of Business Administration, Assam University, Silchar- 788011,

Assam, India



ABSTRACT

To understand how family practices systematically shape entrepreneurial capacity through neuroplastic conditioning mechanisms, this concept paper advances a neuroscience-grounded theoretical framework. The concept of Entrepreneurial Neuro-Capital (ENC), which is described as the cumulative neurological and cognitive architecture created through early family-based experiential conditioning that permits entrepreneurial behaviour, perception, and performance, is introduced in this paper. Inhibitory family neuroplastic conditioning predominates in the empirical reality of most families, especially those operating under authoritarian norms, shame-based socialisation, chronic stress, and hyper-protective orientations. This is a central and novel argument of this paper. Positive family practices that are theoretically capable of building ENC are well-documented conceptually. These inhibitory behaviours, such as shame, severe punishment, long-term fear conditioning, and pressure as family practice to be perfect, may otherwise suppress the nervous system. With significant implications for entrepreneurial development policy, the research presents a thorough analytical case for why ENC impairments are the neurological norm rather than the exception.

Keywords: Entrepreneurial Neuro-Capital, Neuroplastic Conditioning, Family Practice, Inhibitory Practices

INTRODUCTION

The development of an entrepreneurial mindset is traditionally viewed through the lenses of strategic, economic, and psychological lenses [Shane and Venkataraman \(2000\)](#), [Baron \(2004\)](#). However, recent growing research in neuro-entrepreneurship suggests that the capacity for entrepreneurship is deeply rooted in the brain's neurobiological architecture. This architecture, termed Entrepreneurial Neuro-Capital (ENC), is the result of continuous interaction between the individual and their environment. The primary environment for this development is the "family ecology."

From a neuroscientific perspective, the family is not just a social unit but also the main site of neuroplastic conditioning [Doidge \(2007\)](#). Neural activity is stimulated by every interaction, conversation, emotional experience, and behavioural model encountered within the family system. Because of neuroplasticity, which is the brain's ability to rearrange its connections and structure in response to experience, these repeated stimulations result in long-lasting alterations in neural circuits [Hebb \(1949\)](#), [Kolb and Whishaw \(2015\)](#). The regulated routines, emotional environments, and social conventions that characterise a household are all included in family ecology. Family customs act as the "stimuli" that cause neuroplastic change in this environment. Family practices operate through implicit learning, social modelling, and repeated cognitive-emotional experiences, in contrast to formal education,

*Corresponding Author:

Email address: Prof. Arup Barman (abgeet@gmail.com)

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which often focuses on explicit knowledge. These experiences create the basis of what this paper characterises as ENC by scaffolding neuronal circuits, especially in the prefrontal cortex, amygdala, and reward systems.

However, positive neuroplastic conditioning does not always occur within the family. The fact that most families actively condition inhibitory neural patterns that suppress entrepreneurial capacity due to cultural norms of obedience, shame, punishment, and risk aversion is a crucial and understudied aspect of the relationship between families and entrepreneurship [Gershoff \(2002\)](#), [Tangney et al. \(2007\)](#), [LeDoux \(2015\)](#). Inhibitory neuroplastic conditioning is the norm rather than the exception and offers a compelling neuroscientific explanation for the low rates of entrepreneurship worldwide, as reported by the Global Entrepreneurship Monitor [Global Entrepreneurship Research Association \(2023\)](#). It is the base of theoretical exploration in this paper.

OBJECTIVES OF THE STUDY

The main objectives of the paper are-

- 1) To understand entrepreneurial neuro-capital (ENC) as a concept that contains meta-constructs.
- 2) To undertake a review-based analysis on family practices that serve as ecology and determinants in ENC formation.
- 3) To identify and develop metaclusters on family practices that enable the enhancement of ENC, and subsequent interpretation of content metrics.
- 4) Finally, to forward a brief overview of neuro-inhibitory practices in families that contradict ENC enrichment in the family.

METHODOLOGY

This paper adopts a mixed-methods review analysis approach. For concept design and construct identification, a scoping review and a systematic review approach were deployed. To identify meta-clusters of variables or components for ENC and family practices, a content-connection review was initially conducted using content interaction metrics. Thus, this is a purely qualitative, review-based, and classificatory analytical study aimed at identifying the ground for future research.

THEORETICAL FOUNDATION

THE MACRO-MICRO INTERFACE AND FAMILY ECOLOGY

A fundamental framework for understanding the family as an embedded developmental environment is provided by [Bronfenbrenner \(1979\)](#) ecological systems theory. According to this theory, the family is a micro-ecological system influenced by the macro-level entrepreneurial ecology, comprising institutions, markets, cultural norms, and social networks. The family translates these macro-level inputs into particular behaviours, values, emotional environments, and behavioural models that the growing child directly experiences [Aldrich and Cliff \(2003\)](#). According to [Kolb and Whishaw \(2015\)](#), the family, as a microsystem, is the key context for brain development during childhood and adolescence, periods when neuroplasticity is most active.

NEUROPLASTICITY

The brain is dynamic, changing as a result of repeated encounters. Family practices are crucial to the development of entrepreneurship due to neuroplasticity [Doidge \(2007\)](#), [Kolb and Whishaw \(2015\)](#). It is summed up in [Hebb \(1949\)](#) principle, "Neurons that fire together connect. The brain develops stronger neural circuits around anything a child encounters regularly, making those patterns more automatic over time.

However, this is reciprocal. Entrepreneurial brain pathways are developed through autonomy, curiosity, and repeated reinforcement. Avoidance circuits are created by repeated fear, humiliation, and punishment. These circuits are equally strong, automatic, and possibly more difficult to reverse [LeDoux \(2015\)](#), [McEwen \(2007\)](#). As a result, the family is not only shaping behaviour but also shaping brain architecture daily.

MIRROR NEURONE SYSTEMS AND SOCIAL LEARNING THEORY

According to [Bandura \(1997\)](#) social learning theory, a large portion of human behaviour is acquired through observation and vicarious experience. Mirror neuron systems, neural circuits that fire both when a person acts and when they watch someone else perform the same action, mediate this process at the neurological level [Rizzolatti and Craighero \(2004\)](#). Children watch how their parents deal with failure, resolve disputes, take risks, and make financial decisions within the family. According to [Bandura \(1997\)](#) and [Schmitt-Rodermund \(2004\)](#), when parents regularly exhibit fear of failure, they consequently react with shame to errors and engage in risk avoidance. The child internalises these patterns by mirroring neural activation and adopts them as their default behavioural templates for future situations [López-Escobar et al. \(2020\)](#).

ENTREPRENEURIAL NEURO-CAPITAL (ENC) DEFINITION AND DIMENSIONS

CONCEPTUAL DEFINITION

Entrepreneurial neurocapital is a novel concept and may be defined as the architectural arrangement of neurocognitive and emotional attributes that relate to entrepreneurial inclination. The cumulative neurological, cognitive, and emotional architecture that provides an individual with the neural capacities required for entrepreneurial perception, judgement, resilience, and action is known as Entrepreneurial Neuro-Capital (ENC). This architecture is conditioned through repeated family-based experiential inputs during critical developmental periods. Building on [Becker \(1964\)](#) human capital theory and extending it to the neurological basis of human capital, ENC is a multifaceted construct at the nexus of neuroscience, psychology, and entrepreneurship.

- **Opportunity Recognition (ENC1)** The ability of the brain to use pattern recognition and environmental scanning to identify, assess, and rank entrepreneurial prospects [Baron \(2006\)](#), [Shane and Venkataraman \(2000\)](#), [Krueger \(2000\)](#).
- **Risk Calibration (ENC2)** The ability of the brain to use calibrated prefrontal-amygdala control to precisely evaluate, tolerate, and react to uncertainty and possible losses [Bechara et al. \(1994\)](#), [Kahneman and Tversky \(1979\)](#), [Hsu et al. \(2005\)](#).
- **Emotional Resilience (ENC3)** The neurobiological capacity of established HPA-axis and limbic regulatory circuits to control emotional reactions to stress, adversity, and setbacks [Siegel \(2012\)](#), [McEwen \(2007\)](#), [Southwick and Charney \(2012\)](#)
- **Cognitive Flexibility (ENC4)** Prefrontal neuroplasticity facilitates executive functions for adaptive thinking, mental set-shifting, and creative problem-solving [Diamond \(2013\)](#), [Kolb and Whishaw \(2015\)](#), [Arnsten \(2015\)](#).
- **Strategic Foresight (ENC5)** The brain's ability to integrate the prefrontal and hippocampus regions for long-term goal orientation, scenario planning, and prospective thinking [Fuster \(2008\)](#), [Suddendorf and Corballis \(2007\)](#), [Haber and Knutson \(2010\)](#).
- **Execution Discipline (ENC6):** Goal-directed behaviour, impulse control, and sustained motivational engagement are all facilitated by self-regulatory brain abilities [Mischel et al. \(1989\)](#), [Duckworth et al. \(2007\)](#), [Baumeister and Tierney \(2011\)](#).
- **Social Intelligence (ENC7)** The ability of evolved theory-of-mind and mirror neuron systems to comprehend, anticipate, and impact social dynamics [Rizzolatti and Craighero \(2004\)](#), [Adolphs \(2009\)](#), [Gallagher and Frith \(2003\)](#).
- **Innovation Drive (ENC8)** Dopaminergic reward circuits facilitate the brain's inclination for diverse thinking, creative inquiry, and novelty-seeking [Gruber et al. \(2014\)](#), [Dayan and Balleine \(2002\)](#), [Amabile \(1996\)](#).
- **Ethical Stability (ENC9)** Developed ventromedial prefrontal circuitry that enables consistent moral reasoning and value-congruent decision-making [Cushman \(2013\)](#), [Greene et al. \(2001\)](#), [Damasio \(1994\)](#).
- **Stress adaptation (ENC10)**, HPA control, and neural stress inoculation provide the neurobiological capacity to sustain cognitive and behavioural functioning in the face of acute or chronic stress [McEwen \(2007\)](#), [Sapolsky \(2004\)](#), [Lupien et al. \(2009\)](#).

CONCEPTUAL PATHWAYS

The family is where it all starts. Every day, repetitive, and seemingly routine interactions within a family, such as how parents handle failure, whether curiosity is encouraged or suppressed, whether a child is given autonomy or is always under supervision, risk is discussed as opportunity or danger, all these behaviours are more than just social encounters. These are all neurological occurrences that work as neuroplastic stimuli. Repeated family experiences physically rewire the developing brain through neuroplasticity, strengthening some circuits and suppressing others. This subtle process creates a neural architecture that the child carries into adulthood without ever realising that it was built [Doidge \(2007\)](#), [Kolb and Whishaw \(2015\)](#), [Hebb \(1949\)](#). This paper refers to the cumulative effect of lifelong, family-based neuroplastic conditioning, which forms Entrepreneurial Neuro-Capital. It is the neural architecture that determines a person's ability to recognise opportunities, tolerate risk, be emotionally resilient, think creatively, and execute with discipline [Siegel \(2012\)](#), [Shonkoff et al. \(2012\)](#). Moreover, this neural architecture was developed during the earliest and most neuroplastically sensitive years of human development in family settings rather than in classrooms or startup ecosystems. [Shane and Venkataraman \(2000\)](#), [Baron \(2004\)](#), [Global Entrepreneurship Research Association \(2023\)](#). Thus, the link between family practice and entrepreneurial success is not merely symbolic but may also be empirical. It is quantitative, neurological, and starts long before one is willing to adopt "entrepreneurship" as a career.

- **Decomposition of Entrepreneurial Neurocapital Clusters by Family Practices**

Neuro-capital clusters are a dynamic composition of neuro-cognitive and neurosensitive behavioural elements.

Table 1

Table 1 Entrepreneurial Neurocapital Clusters by Family Practices					
ENC	ENC-1	ENC-2	ENC-3	ENC-4	ENC-5
Family Practice Cluster	Opportunity recognition	Risk calibration	Emotional Resilience	Cognitive flexibility	Strategic Foresight
	ENC-6	ENC-7	ENC-8	ENC-9	ENC-10
	Execution Discipline	Social Intelligence	Innovative Drive	Ethical Stability	Stress Adaption
COGNITIVE CONDITIONING FP1-FP10	FP1 Problem-Solving Dialogue	FP2 Open to ambiguity	FP3 Encouragement of questioning	FP4 Intellectual autonomy	FP5 Analytical discussions
	FP6 Reading Culture	FP7 Curiosity reinforcement	FP8 Decision participation	FP9 Critical thinking	FP10 Learning from mistake
EMOTIONAL CLIMATE FP11-FP20	FP-11 Emotional validation	FP-12 Conflict resolution style	FP13 Psychological safety	FP14 Expression freedom	FP15 Stress handling capacity
	FP16 Affection consistency	FP17 Punishment intensity	FP18 Shame usage	FP19 Encouragement frequency	FP20 Fear conditioning
RISK SOCIALIZATION FP21-FP30	FP21 Attitude to failure	FP22 Experimental encouragement	FP23 Risk-taking ability	FP24 Safety prioritization	FP25 Unpredictability
	FP26 Loss framing	FP27 Opportunity Framing	FP28 Financial risk exposure	FP29 Independence in decisions	FP30 Control vs autonomy
VALUE AND DISCIPLINE FP31-FP40	FP31 Work ethic modelling	FP32 Delay gratification	FP33 Routine discipline	FP34 Moral consistency	FP35 Accountability Norms
	FP36 Time management	FP37 Persistence reinforcement	FP38 Perfectionism pressure	FP39 Goal orientation	FP40 Reward for effort vs outcome
SOCIAL CAPITAL TRANSMISSION FP41-FP50	FP41 Networking exposure	FP42 Communication modelling	FP43 Trust-building norms	FP44 Authority interaction style	FP45 Negotiation exposure
	FP46 Leadership modeling	FP47 Social diversity exposure	FP48 Reputation awareness	FP49 Cooperation vs competition	FP50 Social risk taking

Based on the above metrics, the family practices constitute a meta-cluster that triggers the enrichment of entrepreneurial capital through dynamic mechanisms and arrangements. The arrangements can be plotted using the metrics in [Table 1](#), which show that 50 micro-practices undertaken by families fall under the 5 meta-clusters. They are as follows-

1) Cognitive conditioning

The brain's thinking architecture is something the first category of family practices works directly on. The prefrontal cortex circuit that controls planning, reasoning, and flexible cognition is continually activated in families that engage their children in real conversations, encourage questions, recognise curiosity, and permit independent decision making [Diamond \(2013\)](#). Though seemingly extraordinary, these parenting actions are actually ordinary, everyday habits that accumulate neurologically throughout childhood, ultimately shaping the analytical, opportunity-detecting, and strategic-thinking mind this field requires.

2) Emotional Climate (FP11–FP20)

Among the five categories, emotional climate may have the most significant neurological impact, as the emotional climate of the family environment shapes the brain's stress-regulating systems, limbic circuits, and prefrontal-amygdala connections in ways that determine a person's lifelong capacity for resilience, risk tolerance, and affective decision-making Siegel (2012), McEwen (2007). The most damaging inhibitory practices for the nervous system fall into this category, such as shame, punishment, and fear conditioning.

3) Socialisation of risk (FP21–FP31)

A family's mindset and dialogue about how to conduct oneself around risk and failure are among the more direct determinants of entrepreneurial neural development. Families that encourage kids to view failure as a lesson and a growth path, teaching kids about taking sensible risks, experimentation, and necessary independence, prepare the prefrontal system and orbitofrontal cortex for resilience and risk tolerance. They model taking sensible risks, and allow failures and experimentation to become valuable lessons. Instead, kids who are loss-framed, over-controlled and over-protective are not resilient. They learn the opposite from their family Kahneman and Tversky (1979), Sapolsky (2004), Seligman (1972).

4) The Value and Discipline Encoding

The values and disciplines that a family encodes in a child through daily practice are more than moral lessons; they are neurological habits being wired into the brain's motivational and self-regulatory systems. Coaching work ethics, discipline, and self-control promotes the prefrontal and basal ganglia circuits that executive discipline and strategic foresight depend upon Mischel et al. (1989), Duckworth et al. (2007), Diamond (2013). According to Dweck (2006), a family's reward system for effort vs outcome is perhaps the most important factor in whether a child develops a growth neural connection to success or a threat neural connection

METRICAL ANALYSIS OF FAMILY PRACTICE AND ENC

A thorough mapping of all fifty Family Practice variables (FP1–FP50) onto their basic ENC dimensions, neurological mechanisms, and category origins is shown in the following matrix. This matrix executes the theoretical road from family practices to the production of entrepreneurial neuro-capital, acting as the analytical centre of the conceptual framework.

Table 2

Table 2 Metrics of FP Domain and ENC Dimensions		
FUNCTIONAL CLUSTER	FP DOMAIN VARIABLES	LINKED ENC DIMENSIONS
COGNITIVE CONDITIONING	FP1-FP10	ENC1 ENC4 ENC5 ENC6 ENC8 ENC9
EMOTIONAL CLIMATE	FP11-FP20	ENC3 ENC4 ENC7 ENC9 ENC10
RISK SOCIALIZATION	FP21-FP30	ENC3 ENC5 ENC6 ENC9
VALUE AND DISCIPLINE	FP31-FP40	ENC2 ENC4 ENC7 ENC8 ENC9
SOCIAL CAPITAL TRANSMISSION	FP41-FP50	ENC2 ENC4 ENC7 ENC8 ENC9

Source: Compiled by Authors

Different categories of family practices contribute to the enrichment of entrepreneurial neurocranial formation, which triggers entrepreneurial orientation and behavioural DNAs. The cluster format for entrepreneurial neuro-capital formation depends on the family practices shown in Table 3, Table 4, Table 5, Table 6, and Table 7. Table 3 presents 10 family practices associated with cognitive conditioning that subsequently affect the formation of entrepreneurial neuro-capital (ENC).

Table 3

Table 3 Cognitive Conditioning – ENC Mapping		
ENC	FP DOMAIN	Causal Attributes
ENC1	FP1 FP5 FP8 FP9	These family practices sharpened the brain's prefrontal region, increasing its ability to recognise patterns more accurately and faster. The most essential pattern recognition is opportunity recognition, which is what an entrepreneur's mind requires Diamond (2013), Baron (2006), Dweck (2006)
ENC4	FP2 FP6	This practice repeatedly challenges the brain to adaptive thinking, bringing flexibility, shifting direction of approach when sometimes it is not working and at the time of failing, that entrepreneurship mind's demands Arnsten (2015), Wolf (2018)

ENC5	FP2 FP6	The ability to think ahead is strategic foresight. This practice makes the neural circuits think ahead and plan scenarios for long-term vision by training the prefrontal cortex, which is responsible for planning and reasoning, and the hippocampus, which stores experience to help in future thinking Fuster (2008) , Suddendorf and Corballis (2007)
ENC6	FP4 FP8 FP9	This practice, together, develops execution discipline by encouraging an internal sense of control and self-regulation. Children exhibit strategic behaviour, being responsible and aware of the consequences of a situation when they are independent thinkers and encouraged to take part in decision-making within the family environment. Deci and Ryan (2000) , Mischel et al. (1989)
ENC8	FP3 FP7	These practices foster innovation drive by reshaping how people respond to uncertainty and new ideas. Families that encourage questioning and curiosity create a learning environment that feels valuable and safe for new exploration. This repetition is linked to strengthening the dopaminergic reward system, which is associated with creative exploration, motivation, and novelty seeking. Gruber et al. (2014) , Dayan and Balleine (2002)
ENC9	FP10	Families that take mistakes as learning opportunities instead of failure build the neural foundation of ethical accountability, which nurtures the neural circuits to accept responsibility without shame and helps in value-congruent decision-making Dweck (2006) , Cushman (2013)

Source: Compiled by Authors

Table 4 presents another 10 ongoing family practices associated with the emotional climate category; among these, some practices positively enhance Entrepreneurial Neuro-Capital (ENC), while others inhibit it.

Table 4

Table 4 Emotional Climate-ENC Mapping		
ENC	FP DOMAIN	Causal Attributes
ENC3	FP11 FP12 FP13 FP14 FP15 FP16 FP19	These practices enhance the emotional resilience level and regulate the stress management system by developing the HPA axis and reducing amygdala reactivation, which helps in handling stress without breakdown Siegel (2012) , Feldman (2017) , Schultz (1998)
ENC3	FP17 FP20	Contrary to earlier practices, this family's practices suppress emotional resilience by increasing cortisol and enhancing avoidance circuits Gershoff (2002) , LeDoux (2015) .
ENC2	FP18 FP20	These family practices activate the amygdala threat circuit and insula and disrupt risk calibration, i.e., under-objectified safe situations, the brain can perceive danger and feel unsafe Brown (2010) , Cacciotti and Hayton (2015) .
ENC7	FP12 FP14	These practices regulate and strengthen the prefrontal-amygdala neural circuits, enabling better social intelligence and social competence Gottman and Silver (2015) , Adolphs (2009) .
ENC8	FP13	The Amygdala threat response is suppressed by this family practice of psychological safety, in which the brain feels safe, fostering innovation and open-mindedness Edmondson (1999) , Siegel (2012) .
ENC10	FP15	A family's stress-regulation pattern, characterised by calm adults, helps build a child's stress-adaptation capacity by facilitating the internalisation of cortisol calibration Siegel (2012) , McEwen (2007) , Lupien et al. (2009) .
ENC9	FP16 FP17	Strengthening the prefrontal circuits, a stable emotional mind, and moral reasoning is built by consistent affection, while harsh punishment disrupts prefrontal circuits and promotes avoidance rather than ethical stability Feldman (2017) , Cushman (2013) , Gershoff (2002) .
ENC6	FP19	Reward pathways are activated by frequent encouragement; the brain begins to link effort to reward, thereby creating motivation and, over time, building executive discipline Schultz (1998) , Duckworth et al. (2007) .

Source: Compiled by authors

Table 5 categorised the next ten family practices that are directly associated with the risk socialisation, which are the most direct determinants of entrepreneurial neuro-capital

Table 5

Table 5 Risk Socialisation – ENC Mapping Table		
ENC	FP DOMAIN	Causal Attributes
ENC1	FP27 FP 29	These practices train the brain to search for possibilities rather than threats, building the capacity toward opportunity recognition by default Higgins (1997) , Baron (2006) .
ENC2	FP21 FP22 FP23 FP24 FP25 FP26 FP28	These practices collectively condition orbitofrontal risk-reward circuits toward balanced appraisal. The excessive safety and loss framing enhance threat sensitivity and reduce risk perception away from opportunity Kahneman and Tversky (1979) , Bandura (1997) , Sapolsky (2004)
ENC3	FP21 FP25 FP26	These practices strengthen amygdala tolerance for uncertainty. while loss-dominated actively suppresses resilience by strengthening threat-appraisal circuits Dweck (2006) , Schultz (1998) .
ENC5	FP27 FP28	These practices activate prefrontal-hippocampal planning circuits, which condition the brain toward long-range probabilistic thinking that strategic foresight requires Fuster (2008) , Bechara et al. (1994) .
ENC6	FP29 FP30	Decision independence builds an internal locus of control, while over-control produces learned helplessness. The difference between a brain that believes its effort matters and one that has stopped trying Deci and Ryan (2000) , Seligman (1972) .
ENC8	FP22 FP23	These practices activate dopaminergic exploration circuits through mirror-neuron internalisation, thereby neurologically orienting the brain toward creative risk-taking Dayan and Balleine (2002) , Rizzolatti and Craighero (2004) .
ENC10	FP24	Excessive prioritisation of safety suppresses healthy cortisol calibration by limiting exposure to manageable challenges. It produces a nervous system that overreacts to the normal discomfort of entrepreneurial life Sapolsky (2004) , Lupien et al. (2009)

Table 6 encompasses the next 10 family practices within the meta-cluster of value and discipline encoding. These neurological habits lead to strengthening the foundation of entrepreneurial neuro-capital

Table 6

Table 6 Value and Discipline Encoding -ENC Mapping		
ENC	FP DOMAIN	Causal Attributes
ENC3	FP38 FP39 FP40	Persistence-reinforcement and effort-based reward build approach-oriented motivational circuits, while excessive pressure from perfectionism activates threat monitoring that suppresses resilience and conditions fear of visible failure Dweck (2006) , Flett and Hewitt (2002) , Duckworth et al. (2007) .
ENC5	FP32 FP34 FP37	These practices activate prefrontal planning circuits that prime the brain for long-range directional thinking required for strategic foresight Mischel et al. (1989) , Haber and Knutson (2010) , Fuster (2008) .
ENC6	FP31 FP32 FP3 FP34 FP36 FP37 FP40	These practices strengthen prefrontal inhibitory control and basal ganglia motivational circuits, which support the sustained execution of goal-directed effort and the discipline required Bandura (1997) , Diamond (2013) , Mischel et al. (1989) , Duckworth et al. (2007) .
ENC7	FP35 FP36	These practices activate the ventromedial prefrontal circuits for social norm adherence and interpersonal trustworthiness, the neurological foundation of the integrity on which social intelligence depends Cushman (2013) , Zak (2012) .
ENC8	FP39	Excessive perfectionism suppresses dopaminergic exploration circuits, and the brain stops innovating when failure carries unbearable social consequences Flett and Hewitt (2002) , Curran and Hill (2019) .
ENC9	FP31 FP35 FP36	These family practices enhance the ventromedial prefrontal ethical reasoning circuits that lead to value-congruent decision-making, which ethical stability requires Cushman (2013) , Bandura (1997) .

Source: Compiled by Authors

Table 7 presents the fifth and concluding family practices under social capital transmission. The family practices in this category shape the neural system that builds entrepreneurial neurocapital.

Table 7

Table 7 Social Capital Transmission -ENC Mapping		
ENC	FP DOMAIN	Causal Attributes
ENC1	FP41 FP 46	These practices boost the brain's social pattern-recognition circuits—and build the capacity to spot opportunities within human needs and relationships Adolphs (2009) , Doidge (2007) .
ENC2	FP45 FP48 FP50	These practices suppress the social threat appraisal circuits and build the interpersonal risk calibration that entrepreneurial negotiation and networking demand Gallagher and Frith (2003) , Zak (2012) , Leary (2010) .
ENC4	FP42 FP46	These practices challenge default social schemas and reinforce adaptive language-processing circuits that foster the cognitive flexibility entrepreneurial leadership requires Hickok and Poeppel (2007) , Doidge (2007) .
ENC5	FP47	Observing leadership behaviours within the family activates mirror neuron systems, internalising neural schemas for vision and long-range initiative that directly build strategic foresight Rizzolatti and Craighero (2004) .
ENC7	FP41 FP42 FP43 FP44 FP45 FP47 FP48 FP49 FP50	These practices build the social pattern recognition and interpersonal intelligence that entrepreneurship fundamentally requires Adolphs (2009) , Rizzolatti and Craighero (2004) , Zak (2012) .
ENC9	FP43 FP44 FP49	These practices condition oxytocin-mediated prosocial circuits and orbitofrontal consequential thinking, building the integrity and ethical conduct that a sustainable entrepreneurial reputation depends upon Zak (2012) , Cushman (2013) , Baumrind (1991) .

Source: Compiled by Authors

ANALYTICAL DISCUSSION AND INTERVENTION

THE ASYMMETRY THESIS: WHY ARE INHIBITORY FPS PREDOMINANT IN ACTUAL FAMILY SETTINGS

Positive family practices, such as encouragement, exposure to risk, and opportunity framing, have been a core tenet of entrepreneurship socialisation research [Carr and Sequeira \(2007\)](#), [Schmitt-Rodermund \(2004\)](#), [Aldrich and Cliff \(2003\)](#). This paper raises questions on both theoretical and empirical grounds. This paper shows what families really do in the real world, not in theory. Families in most parts of the world are not raising entrepreneurs; this is not an accusation; it is an observation based on the neuroscience of how families actually function. This paper posits that inhibitory family neuroplastic conditioning practices are more common, more emotionally powerful, and more neurologically enduring than positive ENC-building practices within the domain of family practices across various cultural, socio-economic, and institutional contexts. This asymmetry is not an accident or a coincidence; it arises from three very specific, deeply rooted reasons. It is due to evolutionary stress-response systems, collectivist cultural norms, and structural poverty. Humans evolved in an environment where the priority was survival, not growth. The brain was active to scan threats first and opportunities second. This evolutionary logic gets passed into parenting, and the brain naturally tilts families towards threat conditioning. Moreover, in most of the world, the dominant cultural value is the group over the individual. Families in this context put children to fit in, obey, not stand out, not bring shame to the family name. Curiosity questioning authority, taking risks are not so cherished. So the culture itself instructs families to use shame, control and conformity pressure as a parenting tool. The third one is depicted when families are poor, living under economic stress. Children in this environment absorb chronic fear and unpredictability through daily life, which conditions their brains towards anxiety and avoidance, not boldness for an entrepreneurial mindset.

The brain does not treat good and terrible experiences equally; this is by design, not a flaw. The negativity bias is a well-established asymmetry in the brain's processing of negative versus positive stimuli. Humans have evolved over millions of years to pay more attention to threats over the reward, provides the neurobiological foundation for this asymmetry [Baumeister et al. \(2001\)](#), [Rozin and Royzman \(2001\)](#) The neurologically threatening stimuli produce stronger, faster and more durable neural imprint than equivalent positive stimuli because amygdala labels threat associated memories with increased emotional salience which encourages long term potential of avoidance circuits. [LeDoux \(2015\)](#), [Ohman and Mineka, \(2011\)](#). As a result, the brain has an innate bias that causes it to process negative experiences more intensely, deeply, and permanently than positive ones. This means the effect of occasional but intense experiences of shame (FP18), harsh punishment (FP17), or fear conditioning (FP20) can neurologically suppress the effects of sustained but lower-intensity positive practices. This is what is termed as toxic stress - the neurobiological condition that fundamentally alters the brain's development trajectory by [Shonkoff et al. \(2022\)](#)

NEUROSCIENCE OF INHIBITORY FAMILY PRACTICES: MECHANISMS OF ENC SUPPRESSION SHAME-BASED SOCIALISATION (FP18) AS A NEUROLOGICAL BARRIER TO ENTREPRENEURSHIP

One of the most powerful neurobiological inhibitory factors in family practice is 'Shame'. At the neurological level, shame causes a self-threat appraisal pattern in the anterior cingulate cortex (ACC), insula and orbitofrontal cortex that is fundamentally different from guilt. Instead of causing a particular behavioural correction, it causes a negative self-evaluation [Tangney et al. \(2017\)](#), which results in withdrawal motivation, a behavioural tendency to retreat, hide and avoid circumstances, which is a contrast to the approach motivation necessary for entrepreneurial behaviour [Cacciotti and Hayton \(2015\)](#)

According to [Brown \(2010\)](#), Shame is the primary deterrent to risk-taking and vulnerability in human behaviour. Shame flourishes in silence and secrecy that suppresses entrepreneurial identity formation in the family environment. According to [Tangney et al. \(2007\)](#), shame-prone people exhibit greater externalising blame, greater interpersonal avoidance, and significantly lower persistence after failure. These neurologically mediated patterns directly suppress the ENC dimensions EN2 EN3, and ENC8 [Leung and Cohen \(2011\)](#)

HARSH PUNISHMENT (FP17) AS TOXIC STRESS

One of the most researched inhibitory family practices in developmental science is harsh and inconsistent punishment. Physical punishment lowers cognitive function and inhibits self-regulation, as demonstrated by [Gershoff \(2002\)](#) meta-analysis of 88 studies involving over 36000 children. Neuroscience links these effects to a particular biological mechanism. The brain's stress hormone, cortisol, is released chronically when a child receives frequent punishment. Chronic high cortisol levels are literally harmful to the prefrontal cortex [McEwen \(2007\)](#), [Arnsten \(2015\)](#). [Hackman et al. \(2010\)](#) confirmed this through neuroimaging, demonstrating that children from high-stress, punitive family environments have measurably smaller prefrontal grey matter volume. The prefrontal cortex is precisely the brain region responsible for planning, flexible thinking and self-control, the neural foundations of ENC4, ENC5, and ENC6. This is what [Shonkoff et al. \(2012\)](#) refer to as toxic stress, which occurs when the stress response system is frequently and intensely triggered without sufficient adult support. Deficits in ENC3 and ENC10 are closely correlated with their neurological imprint, which includes a dysregulated stress response system, decreased hippocampal volume and increased amygdala reactivity. In the context of entrepreneurship, toxic stress trains the brain to sense survival rather than opportunity, and to detect threat before possibility.

FEAR CONDITIONING (FP20) AS AN ENTREPRENEURIAL PARALYSIS

According to [LeDoux \(2015\)](#) groundbreaking research on fear neuroscience and fear conditioning, the classical conditioning of neutral stimuli with aversive consequences causes persistent neural alterations in the prefrontal cortex, hippocampus, and amygdala. There are several ways that fear conditioning takes place in family settings, such as verbal transmission of threat narratives about failure, social judgment and financial loss, direct exposure to parental fear responses and fear that through observation of anxious or frightened parents [Rachman \(2004\)](#), [Muris and Field \(2010\)](#)

Family-based fear conditioning has serious and specific effects on entrepreneurship. A thorough analysis by [Cacciotti and Hayton \(2015\)](#) establishes that fear of failure is the central psychological obstacle to entrepreneurship. A typology demonstrates how various fear profiles, such as fear of failing, fear of losing security, and fear of being judged, activate the amygdala, producing the behavioural output of avoidance, which leads to pulling back, delays, making excuses, or simply never starting. The neuroplastic nature of the entrepreneurship barrier is evident in the fact that these fears are neurologically conditioned threat responses that trigger amygdala-based avoidance, even in an objectively safe entrepreneurial environment.

PERFECTIONISM PRESSURE (FP) AS AN INHIBITION TO INNOVATION

When perfectionism is transmitted as a parental standard, it becomes neurologically dangerous and fundamentally antagonistic to experimentation and innovation in entrepreneurship. The brain enters a permanent performance-monitoring state when a child learns that falling short of the expected standard will result in rejection, embarrassment, or disapproval [Frost et al. \(1990\)](#), [Hewitt and Flett \(1991\)](#). This state is characterised by anxiety, hypervigilance, and an increasing avoidance of any situation where failure is possible.

According to a Study of 41,641 students, [Cueean and Hill \(2019\)](#) observed that a generation that is neurologically more terrified of visible failure than any before it results from parental pressure to achieve. [Flett et al. \(2016\)](#) directly linked decreased creativity and invention to the brain stopping exploration and instead protecting itself. Fundamentally, entrepreneurship necessitates the opposite, what [McGrath \(1999\)](#) refers to as failing forward or the willingness to attempt new things, fail visibly and try again. The difference between an entrepreneur and a non-entrepreneur may frequently depend more on which neurological pattern their family conditioned them into

EXCESSIVE SAFETY PRIORITISATION (FP24), LOSS FRAMING (FP26), AND PARENTAL OVER-CONTROL (FP30)-ADDITIONAL INHIBITORY PRACTICES:

The strongest neuroscience evidence supports Shame, punishment, fear conditioning and perfectionism, but three other inhibitory practices, i.e., excessive safety prioritisation, loss framing and parental overcontrol, also deserve the same attention.

Excessive Safety Prioritisation (FP24) - Families that place an excessive emphasis on safety deprive their children's stress response system of the moderate challenges it needs to calibrate properly, a process known as stress inoculation [Sapolsky \(2004\)](#). Thus, the brain never learns to differentiate between real threats and manageable risks, resulting in individuals who overreact to the normal uncertainties. According to [Lupien et al. \(2009\)](#), children who grew up in overly protective environments exhibit dysregulated cortisol responses to new stressors as adults, thereby compromising ENC1.

Loss Framing (FP26) -The brain is inherently more sensitive to losses than gains, established by [Kahneman and Tversky \(1979\)](#). However, families that constantly discuss risk in terms of what might go wrong, be lost, or fail. On the surface, this appears reasonable and cautious. However, from a neurological perspective, it is about programming the brain's risk-evaluation circuits to give more weight to negative than to positive automatically [Kahneman and Tversky \(1979\)](#). According to [Tom et al. \(2007\)](#), loss-averse people show greater neural reactivity in brain areas that control financial risk decisions, which means possible losses seem more real and dangerous than equivalent gains. The direct result of entrepreneurship is that these people do not assess opportunities neutrally. The cost of trying is always perceived as greater than the worth of success. That is how their family neurologically trained them to be

Parental Over-Control (FP30)-The most crucial neurobiological lesson that one's actions and choices produce results is never experienced by the child when parents have control over every decision, every outcome, and every mistake. The brain stops believing that effort leads anywhere because it never develops consistently during childhood. [Seligman \(1972\)](#) referred to this phenomenon as learned helplessness. According to [Odenweller et al. \(2014\)](#), this shows into adulthood as low self-confidence and low autonomous motivation. Entrepreneurship, which is basically the purest act of believing your own efforts can create something, becomes neurologically unthinkable for a brain that was never allowed to discover that it could

THE NEUROLOGICAL JUSTIFICATIONS FOR LOW RATES OF GLOBAL ENTREPRENEURSHIP

Global entrepreneurial activity rates have remained relatively stable at 12-14% worldwide despite decades of institutional growth, policymaking, and entrepreneurship education [Global Entrepreneurship Research Association \(2023\)](#). According to [Bosma et al. \(2022\)](#), this rate has remained stable over 20 years of tracking. This raises a question: why has so much intervention changed so little? The ENC framework provides a clear answer: institutional barriers are not the main cause; it is neurological and is being passed down through generations at the family level more quickly than any policy can reach it.

According to [Acs et al. \(2018\)](#), the entrepreneurship gap is the difference between a society's entrepreneurial potential and its entrepreneurial output. The gap arises from a mixture of individual-level, institutional, and cultural factors, they argue. Nonetheless, the ENC framework introduces a neurologic element into this account: it suggests that the entrepreneurship gap is a neuro-capital gap. The gap results from the systematic presence of family-level inhibitory practices across all populations. Such predominance results in insufficient neurological architecture required for entrepreneurial perception and action. [Szerb et al. \(2019\)](#) also show that this gap is the most systematic and severe in developing economies. Developing economies are chronically marked by the systemic prevalence of blocking family practices. The use of punitive parenting is common [Lansford et al. \(2005\)](#). Similarly, [Ho \(1994\)](#) notes that socialisation is shame-based. Most significantly, [Evans and Kim \(2013\)](#) found that chronic stress due to poverty is most common.

NEURO-BEHAVIOURAL INTERVENTIONS

The central argument of this paper leads to one unavoidable conclusion: entrepreneurial capacity is neurologically built or broken in the family home during the earliest years of brain development, and the most meaningful intervention is not a startup program or a university course. It is what happens between a parent and a child in ordinary daily life.

The most direct intervention is to shift family practices away from inhibitory neuroplastic conditioning toward ENC-building practices. This does not require families to understand neuroscience. It requires them to understand one simple truth: their responses to their child's failures, curiosity, questions, and risks are not emotionally neutral. Every response is a neurological event that either strengthens or suppresses the brain circuits on which entrepreneurship depends [Siegel \(2012\)](#), [Doidge \(2007\)](#). A parent who shames a child for a mistake is not just delivering a lesson; they are conditioning an amygdala toward fear of failure that may persist for decades [Tangney et al. \(2007\)](#), [LeDoux \(2015\)](#). A parent who reframes that same mistake as useful information is building something neurologically different and far more valuable, a brain that treats failure as data rather than verdict [Dweck \(2006\)](#).

Practically, this means families need support to replace the most prevalent inhibitory practices with neurologically constructive alternatives. Shame-based discipline can be replaced with accountability without humiliation, holding a child responsible for their

behaviour without attacking their identity [Brown \(2010\)](#), [Tangney et al. \(2007\)](#). Harsh punishment can be replaced with consistent, calm boundary-setting that maintains prefrontal development rather than flooding it with cortisol [Gershoff \(2002\)](#), [McEwen \(2007\)](#). Excessive safety prioritisation can be replaced with deliberate exposure to manageable challenge, allowing children to experience discomfort, failure, and recovery in a supported environment that builds genuine stress resilience rather than fragility [Sapolsky \(2004\)](#), [Lupien et al. \(2009\)](#). Over-control can be replaced with progressive autonomy, gradually expanding the child's decision-making space so the brain develops the internal locus of control and self-regulatory capacity that execution discipline requires [Deci and Ryan \(2000\)](#), [Seligman \(1972\)](#). Loss framing can be replaced with opportunity framing, consistently presenting challenges in terms of what could be learned and gained rather than what could go wrong [Kahneman and Tversky \(1979\)](#), [Higgins \(1997\)](#).

The intergenerational dimension of enabling neuro-enhanced intervention cannot be ignored. Parents who were themselves raised with inhibitory conditioning will not change their parenting simply by being told to because their own parenting schemas are neurologically automatized patterns inherited from their own developmental experience [Siegel \(2012\)](#), [Bandura \(1997\)](#). Meaningful family-level intervention, therefore, requires not just information but experiential support — parenting programs that create the same psychological safety, failure tolerance, and growth orientation for parents that parents are being asked to create for their children. A parent cannot give their child a neurological environment they have never themselves experienced. The intervention must reach both generations simultaneously to break the intergenerational cycle of ENC-deficit transmission that this paper identifies as a primary driver of the global entrepreneurship gap [Shonkoff et al. \(2012\)](#), [Global Entrepreneurship Research Association \(2023\)](#).

CONCLUSION

This paper has sought to address something that entrepreneurship research generally refrained from saying: ‘most families worldwide are not building entrepreneurial capacity in their children, and it is being suppressed’. Families are neuroplastically conditioning children away from the very traits that entrepreneurship demands, i.e., resilience, risk tolerance, curiosity and the courage to act under uncertainty, but not through shame, severe punishment, fear conditioning, perfectionism pressure, excessive control and overprotection.

According to [Global Entrepreneurship Research Association \(2023\)](#), 33-55% of non-entrepreneurs worldwide are deferred from ever starting because of fear of failing. Despite decades of institutional effort, the entrepreneurship gap remains wide. [Acs et al. \(2018\)](#), [Bosma et al. \(2022\)](#), and [Szerb et al. \(2019\)](#). The ENC framework in this paper provides a detailed neurobiological explanation for why the true barrier is not institutional. It is being developed inside the growing brain through family practice. A family is not just the social environment a child encounters; it is the first neurological environment, where the brain's architecture for recognising opportunities, accepting risk, and sustaining effort is developed or inhibited, and where personality is shaped. What should and should not be practised by families to enrich neuro-capital for the generation of entrepreneurship? As the global entrepreneurship gap has remained the same for years, until entrepreneurship research and policy take it seriously and start addressing the root cause: what happens within families during the years that matter most neurologically. Understanding this process is not only academically important; it is also one of the most urgent research and policy needs in entrepreneurial development elsewhere in the world.

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