Hans Eysenck's Biologically Based Factor Theory

A chance bureaucratic error led an 18-year-old German refugee to accidentally enroll in psychology at the University of London—launching one of the most prolific and controversial careers in psychology's history.

Chapter Overview

A Revolutionary Approach to Personality

Biological Foundation

Personality rooted in genetics and brain structure, not just psychology

Three Core Dimensions

Extraversion, neuroticism, and psychoticism—each with biological basis

Factor Analysis Meets Biology

Combining statistical methods with neuroscience and genetics

The Biological Evidence

Temperament Research

Fetal heart rate at 36 weeks predicts infant temperament and stress response. Prenatal maternal stress alters infant stress hormones, affecting personality development from before birth.

Behavioral Genetics

Twin-adoption studies and gene-by-environment research reveal heritability of personality traits. Genetic differences interact with environment to produce individual behaviors.

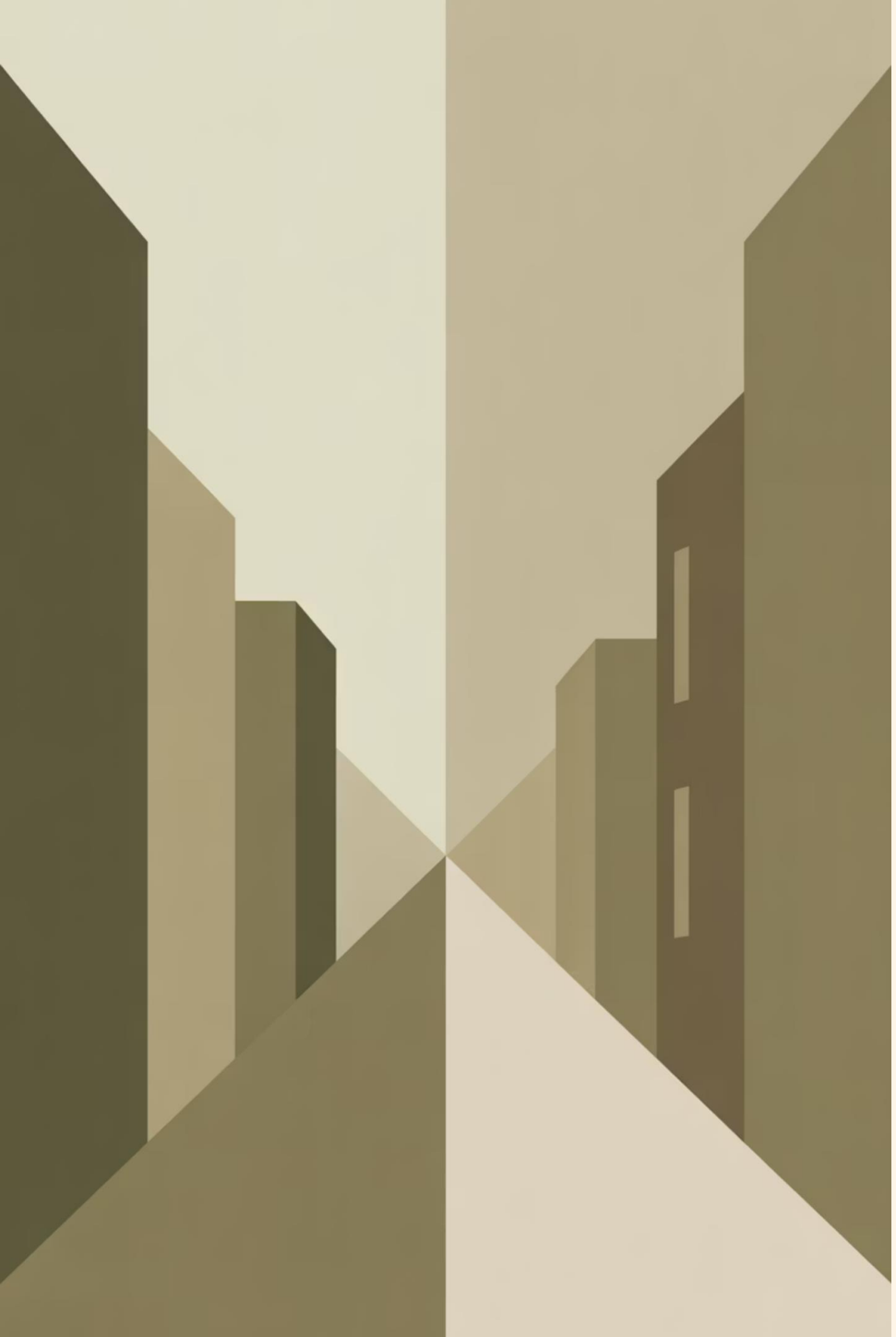
Brain Imaging Techniques

EEG Technology

Records electrical brain activity through skull electrodes, showing when brain activity occurs during tasks

Functional MRI

Tracks blood oxygen use to reveal where brain activity occurs, identifying active regions during specific tasks



The Accidental Psychologist

Born in Berlin in 1916 to theatrical parents, Eysenck saw little of them after their divorce when he was 4. Raised by his permissive grandmother, he grew up challenging authority—especially militaristic teachers in post-WWI Germany.

> *"By such chance events is one's fate decided by bureaucratic stupidity"*

Escape from Nazi Germany

1934: The Ultimatum

Told he must join Nazi secret police to study physics at University of Berlin

1

Age 18: Flight

Fled Germany, finding refuge in England as Nazi tyranny intensified

2

1938: Wrong Exam

Took wrong entrance exam subjects—accidentally enrolled in psychology instead of physics

3

1940: PhD

Earned doctorate from University of London, launching revolutionary career

4

A Maverick's Career

Eysenck described himself as "a sanctimonious prig who didn't suffer fools gladly." During WWII, barred from military service as an enemy alien, he treated psychological patients at Mill Hill Emergency Hospital—despite having no clinical training.

His early factor analysis work revealed that two major dimensions—neuroticism and extraversion—could account for all traditional diagnostic categories.

800

The Most Prolific Writer in Psychology

800	75+	0
Journal Articles	Books Authored	Work at Home
Published throughout his career	*Many with popular appeal*	*Never took work home—remained a dedicated family man*

Controversial Stands

1

Psychotherapy Effectiveness

Claimed in 1952 that psychotherapy was no more effective than spontaneous remission or placebo treatments—maintained this view for life

2

IQ and Genetics

Defended Arthur Jensen's claim that IQ is largely genetically determined. His book "The IQ Argument" (1971) faced threats of arson against booksellers

3

Family Under Threat

After home vandalism by protesters, changed children's last names temporarily to ensure their safety

Four Criteria for Identifying Factors

01

Psychometric Evidence

Factor must be reliable, replicable, and consistently identified by independent researchers across laboratories

02

Heritability

Must possess genetic basis and fit established genetic model—eliminating learned characteristics

03

Theoretical Sense

Must align with deductive theory—data should be logically consistent with theoretical framework

04

Social Relevance

Must relate to socially relevant variables like drug addiction, criminality, health outcomes, or creativity

Hierarchy of Behavior Organization

Specific Acts

Individual behaviors or thoughts that may or may not be characteristic—like finishing one reading assignment

Habitual Responses

Behaviors that recur under similar conditions with reasonable consistency—like regularly completing assignments

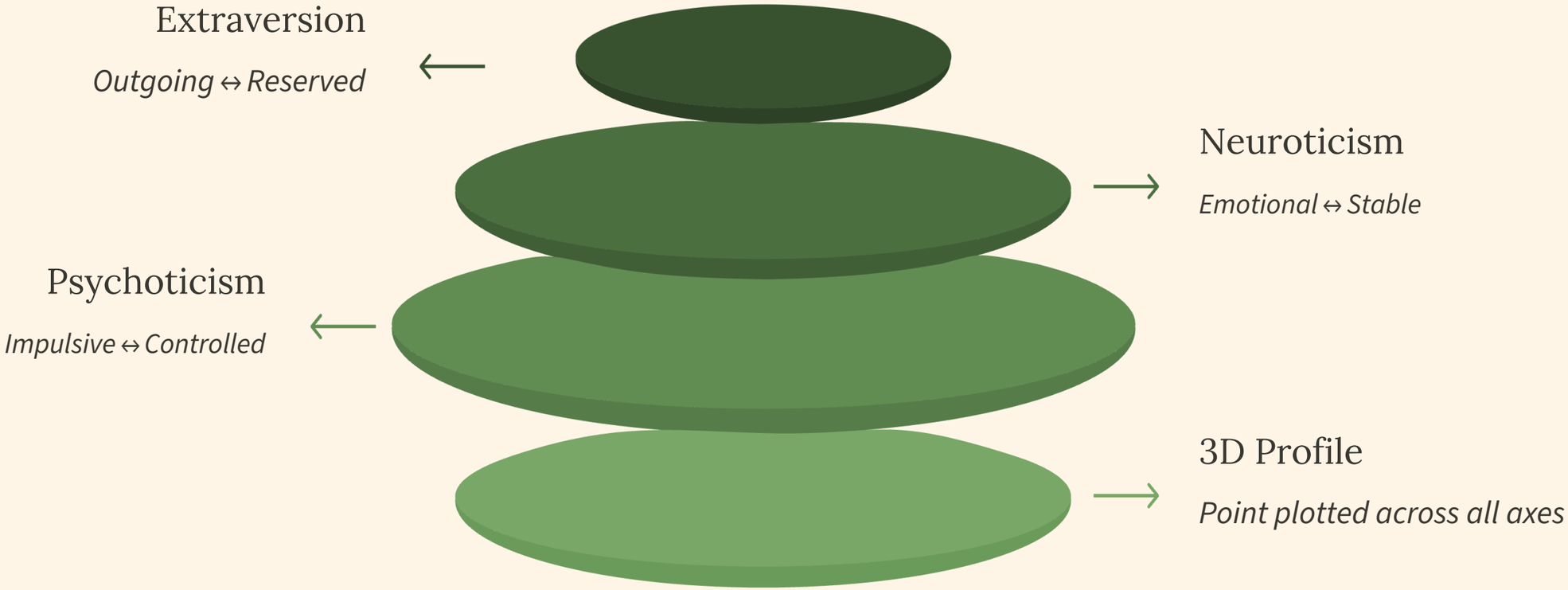
Traits

Semi-permanent dispositions extracted through factor analysis of habitual responses—like persistence

Types (Superfactors)

Several interrelated traits forming broad dimensions—like introversion comprising persistence, shyness, and other traits

Three Dimensions of Personality



Unlike the Five-Factor Theory, Eysenck identified only three superfactors—each bipolar, normally distributed, and biologically based. All three are part of normal personality structure, not limited to pathological individuals.

Extraversion: The Social Dimension

Extraverts

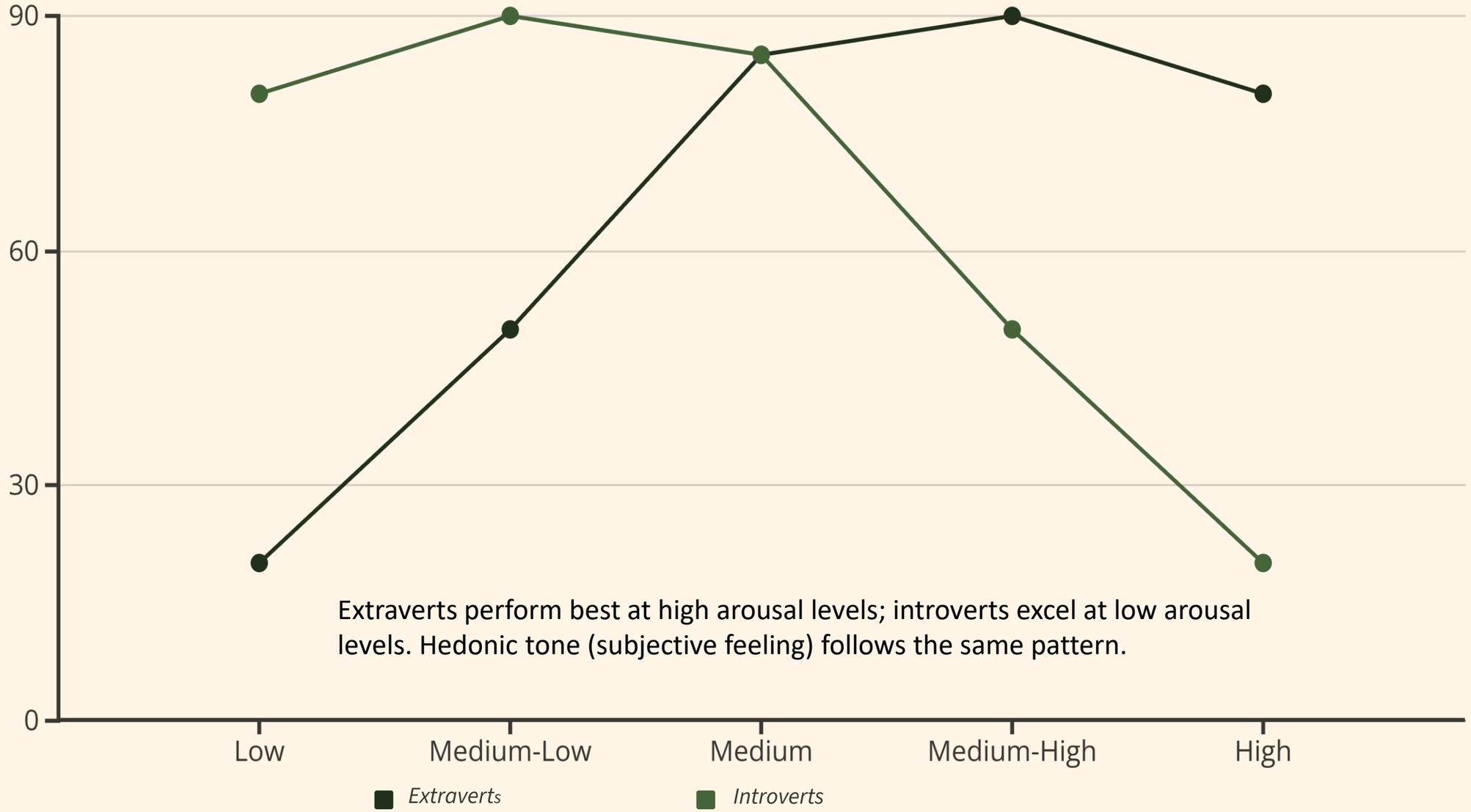
- *Sociable, impulsive, lively*
- *Quick-witted, optimistic*
- *Lower cortical arousal level*
- *Higher sensory thresholds*
- *Seek exciting stimulation*

Introverts

- *Quiet, passive, reserved*
- *Thoughtful, careful, controlled*
- *Higher cortical arousal level*
- *Lower sensory thresholds*
- *Avoid overstimulation*

The Biology of Extraversion

The primary difference between extraverts and introverts is cortical arousal level—a largely inherited physiological condition. People seek environments matching their natural arousal levels.



Extraverts perform best at high arousal levels; introverts excel at low arousal levels. Hedonic tone (subjective feeling) follows the same pattern.

Neuroticism: Emotional Reactivity

1

High Neuroticism

Tendency to overreact emotionally with difficulty returning to normal state. Highly reactive limbic system including amygdala and hypothalamus.

2

Physical Symptoms

Frequent complaints of headaches, backaches, and vague psychological problems like worries and anxieties.

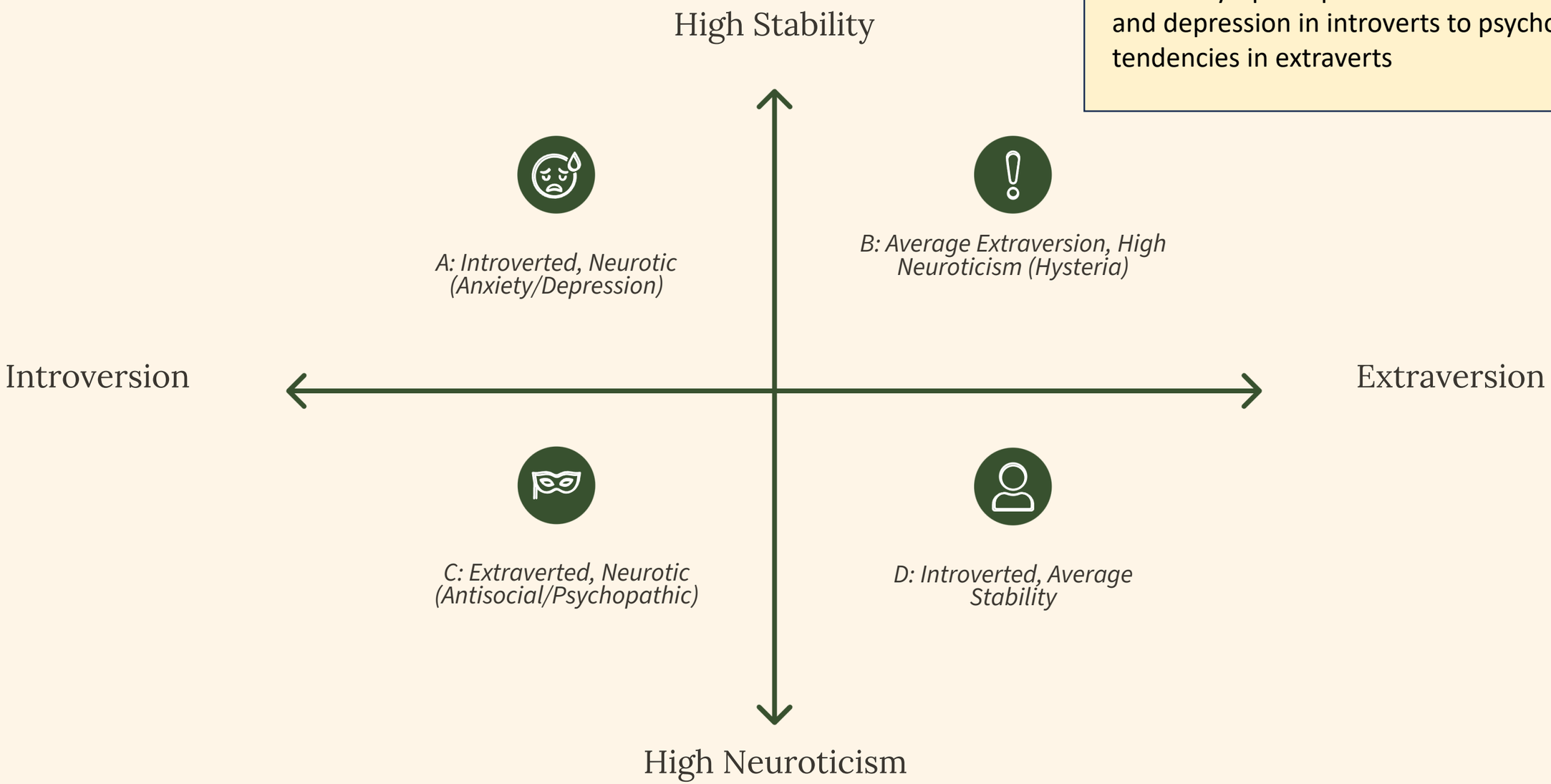
3

Diathesis-Stress Model

Genetic or acquired vulnerability interacts with stress. Higher N scores require lower stress levels to precipitate neurotic disorders.

Neuroticism Interacts with Extraversion

Because factors are independent (zero correlation), high neuroticism combines with different extraversion levels to produce distinct symptom patterns—from anxiety and depression in introverts to psychopathic tendencies in extraverts



Psychoticism: The Third Dimension

High Psychoticism

- *Egocentric and cold*
- *Impulsive and hostile*
- *Aggressive and suspicious*
- *Antisocial and nonconforming*

Low Psychoticism (Superego)

- *Altruistic and empathic*
- *Caring and cooperative*
- *Highly socialized*
- *Conforming and conventional*

Like neuroticism, psychoticism follows the diathesis-stress model: high P scores plus stress increase vulnerability to psychotic disorders.

Social Relevance of the Three Factors

Drug Use & Addiction

Personality dimensions predict substance use patterns and addiction vulnerability

Health Outcomes

Personality factors linked to cancer prevention, heart disease, and behavioral interventions

Criminality

Psychoticism and extraversion relate to criminal behavior and delinquent tendencies

Creativity

Psychoticism associated with creative thinking and artistic achievement

A Lasting Legacy

1 **Distinguished Scientist Award**

American Psychological Association

2 **Individual Differences Award**

International Society recognition

3 **Centennial Award**

Clinical Psychology Contributions

Eysenck died of cancer in 1997, having revolutionized personality psychology by grounding it firmly in biology and genetics.

Key Takeaways

1 **Biology Matters**

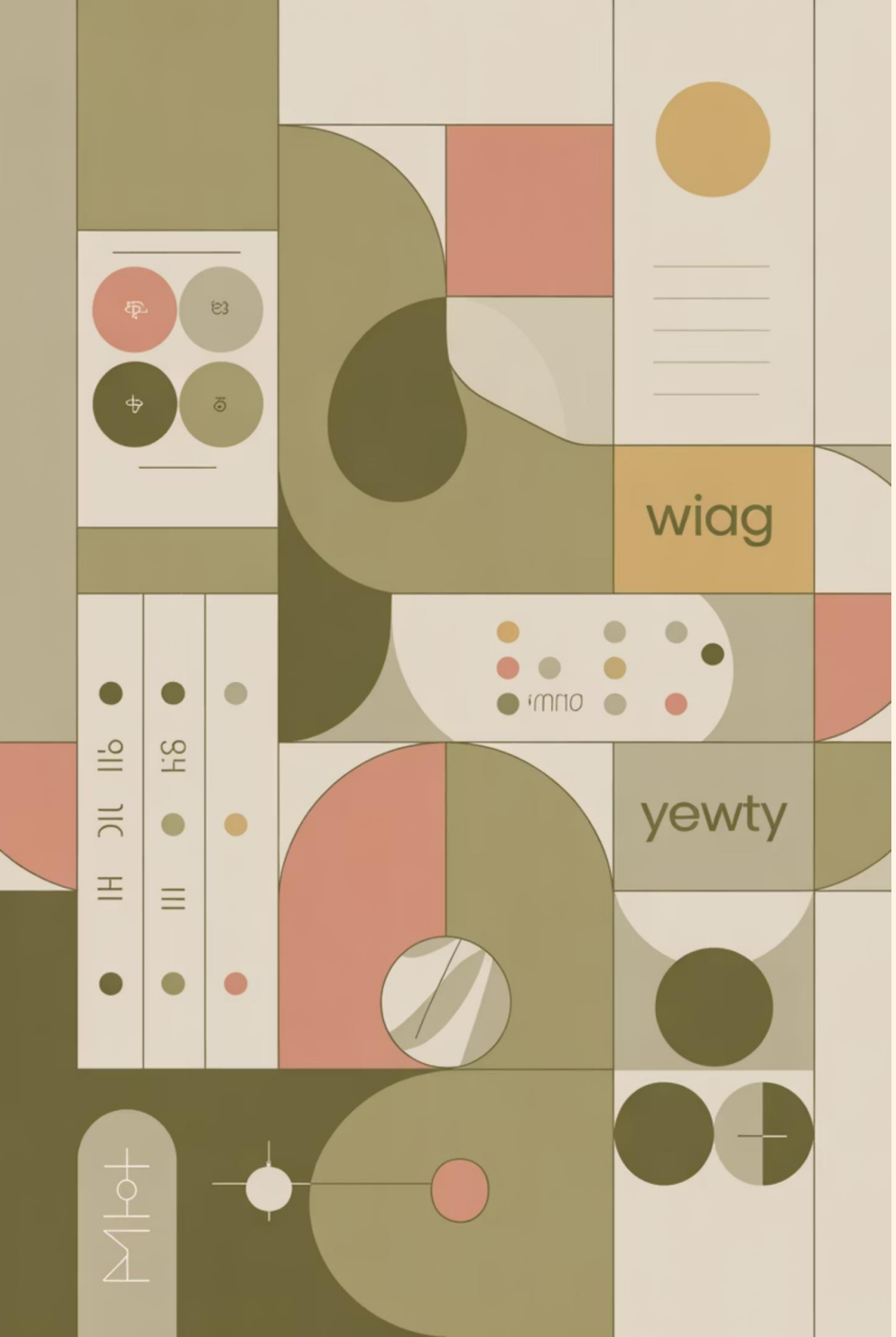
Personality dimensions have genetic basis and biological substrates in brain structure and function

2 **Three Core Factors**

Extraversion, neuroticism, and psychoticism—each independent, bipolar, and normally distributed

3 **Empirical Rigor**

Factors must meet four criteria: psychometric evidence, heritability, theoretical sense, and social relevance



Measuring Personality

Eysenck developed four personality inventories to measure his superfactors, evolving from the Maudsley Personality Inventory through increasingly sophisticated instruments.

Evolution of Assessment

01

Maudsley Personality Inventory (MPI)

First inventory (1959) assessed only Extraversion and Neuroticism, but showed problematic correlation between factors.

02

Eysenck Personality Inventory (EPI)

Added lie scale to detect faking. Measured E and N independently with near-zero correlation (1964, 1968).

03

Eysenck Personality Questionnaire (EPQ)

Introduced Psychoticism scale (1975). Available in adult and junior versions.

04

EPQ-Revised

Final refinement (1993) addressed criticisms of the Psychoticism scale.

Biological Bases of Personality

Eysenck argued that personality factors P, E, and N have powerful biological determinants, with approximately three-fourths of variance accounted for by heredity and one-fourth by environmental factors.

Three Threads of Evidence

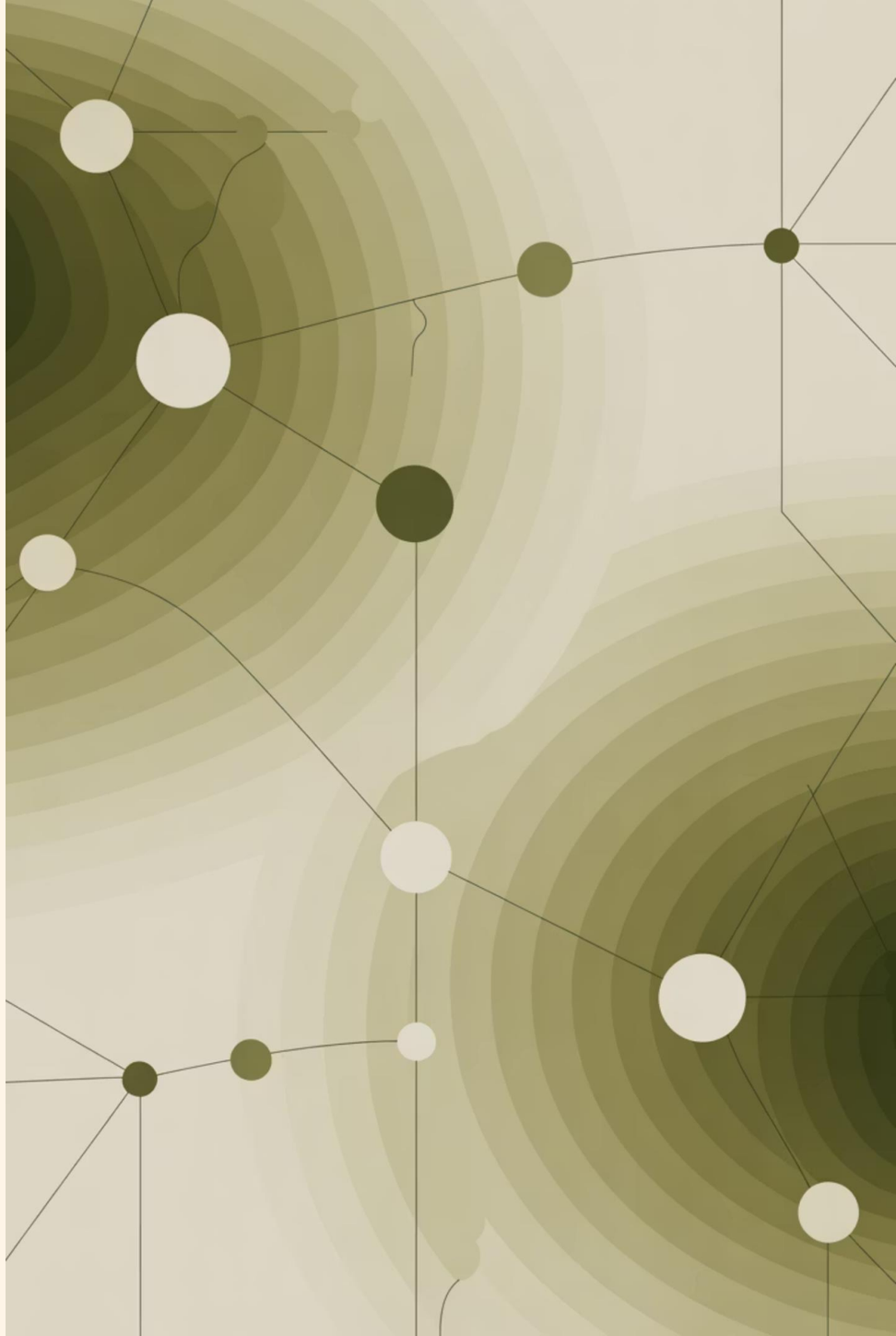
- *Nearly identical factors found across diverse cultures worldwide*
- *Individuals maintain positions on personality dimensions over time*
- *Twin studies show higher concordance in identical versus fraternal twins*

The Five-Step Model

1. DNA
   Genetic personality determinants
2. Limbic System
   Biological intermediaries
3. P, E, N
   Psychometric trait constellations
4. Lab Studies
   Conditioning, sensitivity, memory
5. Social Behavior
   Criminality, creativity, relationships

Personality as Predictor

Eysenck's model suggests P, E, and N combine with genetic determinants and biological intermediates to predict diverse social behaviors and health outcomes.



Extraversion and Learning

Introverts

Lower cortical arousability means greater sensitivity to stimuli. Prefer and excel with passive reception learning.

Extraverts

Higher arousal thresholds drive demand for novelty and change. Thrive with active discovery learning.

Studies ignoring personality factors often reach erroneous conclusions about learning effectiveness.

Psychoticism and Creativity

Creative Potential

Many children show creativity, nonconformity, and unorthodox ideas.

Persistence Factor

High P scorers resist criticism from parents and teachers.

Adult Outcomes

High P + creativity = genius. Without persistence, creative potential fades.

Troublemakers: Two Paths

High Extraversion

Seen as charming rogues. Misdemeanors forgiven. Grow into productive adults with positive outcomes.

High Psychoticism

Viewed as spiteful and disruptive. Continue having learning problems, criminal involvement, and friendship difficulties.

Personality and Disease

Beginning in the 1960s, Eysenck investigated whether personality factors could predict mortality from cancer and cardiovascular disease.

Four Personality Types

Type I

Hopeless/helpless, nonemotional reaction to stress. Much higher cancer mortality.

Type II

React with anger, aggression, emotional arousal. Much higher heart disease mortality.

Type III

Ambivalent, shifting between Type I and Type II reactions. Very low death rates.

Type IV

Value autonomy for well-being and happiness. Very low death rates.

Studies in Yugoslavia and Germany found consistent patterns linking personality types to disease outcomes.

Biopsychosocial Model

Diseases result from interactions of multiple factors, not single causes. Eysenck developed complex models including 11 biological and 7 psychosocial factors.

Risk Factors Include

- *Family history, age, gender, ethnicity*
- *Smoking, diet, lifestyle*
- *Personality dimensions and stress reactions*

Neurophysiological Evidence

If personality has biological basis, two assumptions must hold: neurophysiological differences should exist between personality extremes, and dimensions should be universal across cultures.

Cortical Arousal Levels

Alpha Waves (8-13 Hz)

Lowest arousal level. Associated with drowsiness and relaxation.

Beta Waves (14-35 Hz)

Higher arousal. Associated with alertness and wakefulness.

Introverts show lower thresholds and greater reactivity to sensory stimulation than extraverts—it's reactivity, not baseline, that distinguishes them.

The Tone Task Study

Beauducel and colleagues (2006) tested students on a monotonous 60-minute task: pressing buttons after hearing target tones every 3 seconds.

60

Minutes

Duration of tedious tone task

3

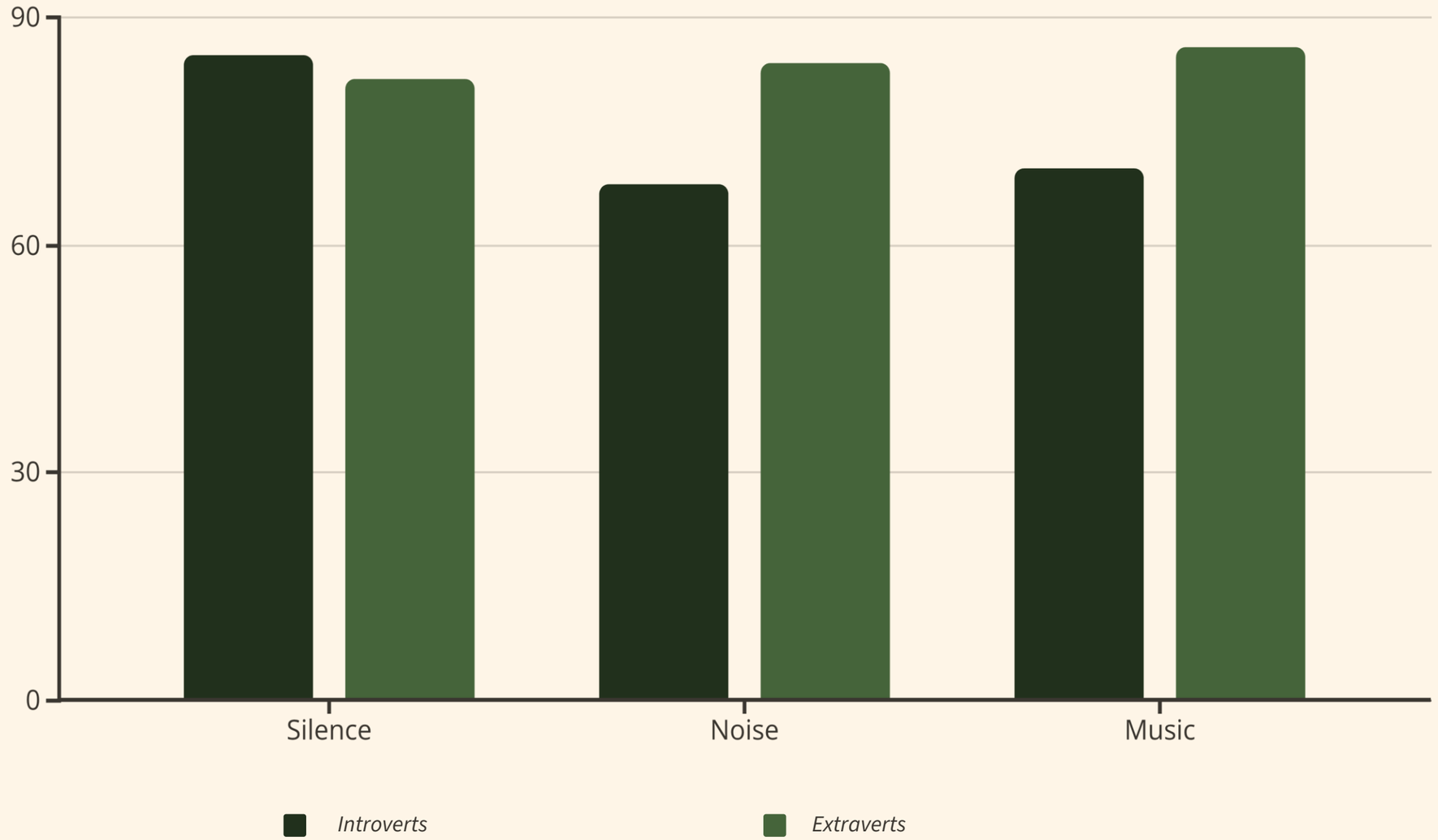
Seconds

Interval between tones

Results confirmed predictions: extraverts showed lower cortical arousal and worse performance on the understimulating task.

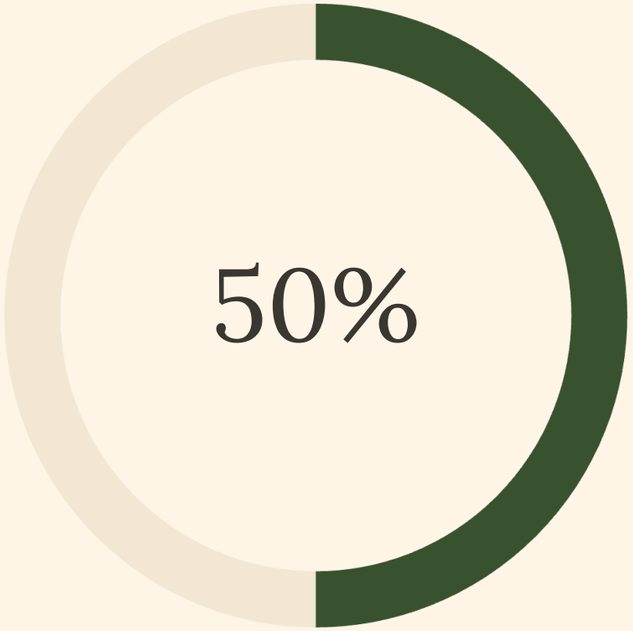
Optimal Arousal Environments

Dobbs and colleagues (2011) tested 118 students on cognitive tasks under three sound conditions: silence, noise, and music.



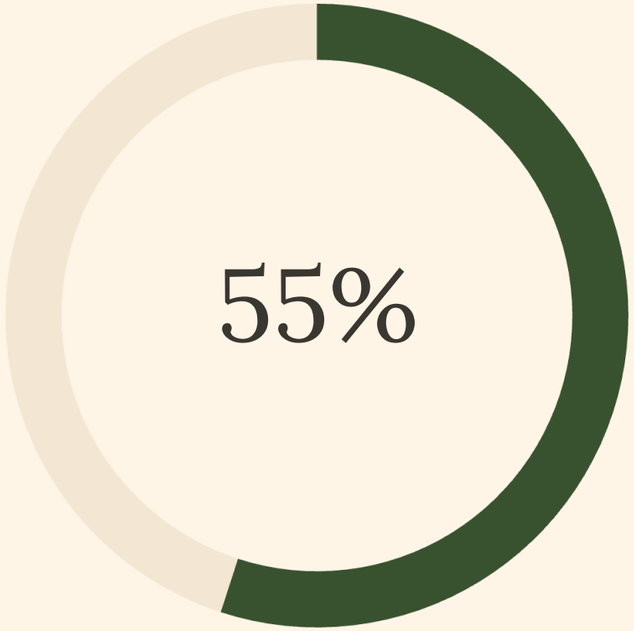
Extraverts performed better in noise and music conditions. Introverts were distracted by stimulation, confirming Eysenck's optimal arousal theory.

Genetic Evidence



Extraversion Heritability

Genetic makeup explains 50-60% of individual differences



Neuroticism Heritability

Genetics account for 50-55% of variance

Twin studies show identical twins correlate around 0.50 for extraversion, while fraternal twins correlate 0.20-0.25. Specific genes producing neurotransmitters like serotonin have been identified.

Neuroticism's Neural Basis

Eysenck hypothesized neuroticism results from increased limbic system activity—particularly the amygdala and hypothalamus—involved in emotion and motivation.

Meta-Analysis Findings

- *More grey matter in left amygdala of high-N individuals*
- *Reduced neural connections to control regions*
- *Overactive "on switch" with weak "off switch"*

Physiological Reactivity

Brumbaugh and colleagues (2013) measured 169 adults watching emotional TV scenes while wearing vests monitoring heart rate, skin conductance, and respiration.

1. 2 seconds

   Low-N peak reactivity

2. 4–5 seconds

   High-N peak reactivity

3. 3–4 seconds

   Low-N returns to normal

4. 9 seconds

   High-N returns to normal

High neuroticism individuals showed stronger, longer-lasting physiological responses to negative stimuli, especially in skin conductance.

Theory Evaluation

95%

Research Generation

Comprehensive model spanning genetics to social behavior produces extensive research

75%

Falsifiability

Makes specific predictions; mixed results with some confirmed, some not

85%

Knowledge Organization

Explains biological origins and individual differences from birth

40%

Practical Application

Limited guidance for practitioners despite strong explanatory power

90%

Parsimony

Three major dimensions provide elegant, economical explanation

Concept of Humanity

Determinism vs. Free Choice

Leans toward determinism, but both biology and environment shape final personality.

Causality

Chain runs from DNA to limbic system to traits to consequences.

Unconscious Influences

People largely unaware of how genetics and brain processes affect behavior.

Nature and Nurture

Biology sets floor and ceiling; environment determines where we fall within that range.

Individual Differences

Focus on uniqueness while demonstrating universal personality structure across cultures.