OPERATIONAL MEASUREMENT OF THE COGNITIVE COHERENCE PARAMETER B IN THE OBSERVER-DEPENDENT THEORY OF EVERYTHING

Pankratov Anton Sergeevich

Independent researcher, Kazan, Russia

E-mail: anton.s.pankratov@gmail.com
ORCID: 0009-0002-4870-2995

UDC 530.145 + 159.9 + 519.2

ABSTRACT

The paper proposes an operational protocol for measuring the cognitive coherence parameter $B(O, C)$ introduced in the Observer-Dependent Theory of Everything (ODTOE) [1]. The parameter B is defined by the multiplicative formula $B = F^{w_1} \cdot E^{w_2} \cdot (1 - \sigma)^{w_3} \cdot \Lambda^{w_4}$, where F is attentional focus, E is emotional coherence, σ is the entropy of doubt, and Λ is empirical reinforcement. For each component, both instrumental (fMRI, EEG, heart rate variability, Implicit Association Test, eye-tracking, galvanic skin response) and non-instrumental (self-report scales, observation journals, behavioral markers) measurement methods are described. The error propagation formula for the integral parameter B is derived. A protocol for synchronous registration of all four components and a practical scale for business contexts are proposed. The quaternion structure of coherence is introduced, enabling diagnosis of deficit types. The dynamics of the B parameter and the phase portrait of the system are described. An inter-observer coherence measurement protocol for groups is formalized. Detailed observer profiles with complete calculations are provided. Limitations are discussed, including the problem of phantom coherence, the need for calibration of weight coefficients, test-retest reliability, and cultural and ethical aspects of measuring cognitive coherence.

Keywords: cognitive coherence, parameter B, ODTOE, operational measurement, heart rate variability, Implicit Association Test, attentional focus, Bayesian updating, quaternion, inter-observer coherence, observer profile.

I. INTRODUCTION

Cognitive coherence $B(O, C)$ is the central parameter of the Observer-Dependent Theory of Everything (ODTOE) [1], determining the probability that observer O constitutes configuration C. In the main work [1], the parameter B was introduced axiomatically through postulate P4:

$$P(E \mid B) = B^k \tag{P4.1}$$

where $P(E \mid B)$ is the probability of event E at a given coherence level B, $k > 0$ is a parameter depending on the complexity of the configuration. The definition of B is given by formula D1.1:

$$B(O, C) = F^{w_1} \cdot E^{w_2} \cdot (1 - \sigma)^{w_3} \cdot \Lambda^{w_4} \tag{D1.1}$$

where $F \in [0, 1]$ is the observer's attentional focus on configuration C; $E \in [0, 1]$ is emotional coherence; $\sigma \in [0, 1]$ is the degree of internal contradiction; $\Lambda \in [0, 1]$ is empirical reinforcement; $w_1 + w_2 + w_3 + w_4 = 1$ are the weight coefficients.

The multiplicative structure of (D1.1) ensures the weak-link property: zeroing any component leads to $B = 0$. This formula has until now remained a theoretical construct. The aim of this paper is to propose specific methods for measuring each component and a protocol for the integral assessment of B.

I.1. Why operational measurement of B is necessary

The empirical status of ODTOE as a scientific theory depends on the possibility of measuring its central parameter B. Without operationalization, formula (D1.1) remains a metaphor rather than an instrument. An operational definition converts B from the status of a theoretical construct to that of a measurable quantity subject to experimental verification, reproducibility, and falsification.

The problem of operationalizing subjective states has a long history. G.T. Fechner [18] in 1860 proposed the first quantitative law relating the intensity of sensation to a physical stimulus ($S = k \ln I$), laying the foundations of psychophysics. S.S. Stevens developed this program by proposing the power law ($S = kI^n$), demonstrating that subjective experiences admit measurement with predictable regularities. Formula (D1.1) continues this tradition: it does not postulate the measurability of a subjective state "directly," but defines B through a composition of components, each of which admits independent operationalization via objective indicators.

I.2. Connection with the quantum measurement problem

A fundamental feature of the parameter B is that the observer is simultaneously the subject and the object of measurement. This creates a structural analogy with the measurement problem in quantum mechanics: the act of measurement affects the measured quantity. The procedure for measuring B inevitably affects the observer's state: awareness of one's own coherence level can both increase it (through reflection and motivation) and decrease it (through anxiety about the result). This measurement reactivity is not a methodological defect but a fundamental property of the "observer–reality" system, central to ODTOE [1].

I.3. The place of B in the psychometric tradition

It should be emphasized that $B(O, C)$ is a contextual quantity. It measures the alignment of a specific observer O with a specific configuration C. The same person may possess high coherence in one context and low coherence in another [2]. Therefore, the measurement of B is situation-specific and is not a stable personality characteristic in the traditional psychometric sense.

This distinguishes B from classical psychometric constructs. The Big Five scales measure stable personality traits invariant with respect to context. Bandura's self-efficacy scales [22] are closer to B since they account for contextuality, but do not include physiological components (E) and do not formalize a multiplicative structure. Csikszentmihalyi's flow scales [25] describe a state that arises when $B > B_{\text{crit}}$, but do not operate with its component decomposition. The parameter B unifies the cognitive (F, σ), affective (E), and behavioral (Λ) levels into a single multiplicative model, which no existing psychometric instrument does.

II. MEASUREMENT OF COMPONENT F (ATTENTIONAL FOCUS)

II.1. Instrumental methods

Attentional focus F is operationalized through the registration of sustained neurophysiological patterns of directed attention. Positron emission tomography and functional magnetic resonance imaging (fMRI) record the activity of the dorsal attention network (DAN), which includes the superior parietal lobule and the frontal eye fields [3]. Electroencephalography (EEG) records alpha-rhythm desynchronization (8–12 Hz) in posterior cortical areas during directed attention, which correlates with the subjective feeling of concentration [4].

The value of F is normalized to the interval $[0, 1]$ through the ratio of the current indicator to the observer's individual baseline level established during calibration:

$$F = \frac{A_{\text{DAN}}(t)}{A_{\text{DAN}}^{\text{max}}} \tag{II.1}$$

where $A_{\text{DAN}}(t)$ is the current activity of the dorsal network, $A_{\text{DAN}}^{\text{max}}$ is the maximum activity recorded during the calibration task with full concentration.

II.2. Non-instrumental methods

For field conditions the following are applicable: a subjective concentration scale (0 — complete distraction, 10 — complete immersion in the task); the Continuous Performance Test (CPT) [5], which measures the number of target stimulus omissions and false alarms; the duration of uninterrupted work without distractions (recorded chronometrically). The validated Mindful Attention Awareness Scale (MAAS) [6] can also be used as a proxy measure of F in the context of mindfulness.

Systematic meditation practice increases gray matter density in the prefrontal cortex [7] and is a validated method for increasing F. A meta-analysis of 47 studies confirmed a moderate but sustained effect of meditation on concentration and anxiety reduction [30].

II.3. Eye-tracking as a complementary measure of F

Eye-tracking technology provides objective behavioral correlates of attentional focus that do not require neuroimaging. Key parameters:

Fixation duration. Prolonged gaze fixations on the target object (> 200 ms) indicate deep cognitive processing and high F. Short saccadic fixations (< 100 ms) indicate superficial scanning and low F.

Saccade patterns. Ordered saccades (purposeful gaze shifts between relevant zones) correlate with high F. Chaotic saccades with frequent regressions are an indicator of defocusing.

Focus coefficient. The proportion of time the gaze spends in the area of interest (AOI) relative to the total observation time. Normalized to $[0, 1]$, this coefficient serves as a direct operational analog of F:

$$F_{\text{eye}} = \frac{t_{\text{AOI}}}{t_{\text{total}}} \tag{II.2}$$

Portable eye-trackers (Tobii Pro Glasses, Pupil Labs) allow registration of F_{eye} in field conditions with an accuracy of 0.5–$1.0°$ angular resolution.

II.4. The default mode network (DMN) as an inverse correlate of F

The default mode network (DMN), first described by Raichle and colleagues [19], is activated in the absence of directed attention — during mind-wandering, daydreaming, and undirected reflection. The DMN includes the medial prefrontal cortex, posterior cingulate cortex, and inferior parietal lobule.

The activation of the DMN and DAN is in reciprocal (anticorrelated) relationship: increased DMN activity is accompanied by decreased DAN activity, and vice versa. This means that DMN activity can be used as an inverse correlate of F:

$$F \approx 1 - \frac{A_{\text{DMN}}(t)}{A_{\text{DMN}}^{\max}} \tag{II.3}$$

where $A_{\text{DMN}}(t)$ is the current activity of the default mode network. High DMN activity ($A_{\text{DMN}} \to A_{\text{DMN}}^{\max}$) corresponds to $F \to 0$: the observer is immersed in undirected thinking. Suppression of the DMN ($A_{\text{DMN}} \to 0$) corresponds to $F \to 1$: full concentration on the task.

Practical significance: monitoring the DMN through fMRI or EEG correlates (increased alpha-rhythm power in medial structures) provides an additional channel for assessing F, particularly valuable in diagnosing chronic defocusing when the observer is unaware of the decline in their own focus.

II.5. Dorsal and ventral attention networks: differential roles

The classical model of Posner and Petersen [29] and its development by Corbetta and Shulman [3] distinguish two attention systems that make different contributions to the component F:

The dorsal attention network (DAN) provides voluntary, goal-directed attention (top-down). It includes the superior parietal lobule (SPL), intraparietal sulcus (IPS), and frontal eye fields (FEF). High DAN activity corresponds to voluntary focusing on the chosen configuration C — this is the "core" of F in formula (D1.1).

The ventral attention network (VAN) provides involuntary, stimulus-driven attention (bottom-up). It includes the temporoparietal junction (TPJ) and ventral frontal cortex (VFC). High VAN activity corresponds to reactive attention switching to unexpected stimuli — this is the mechanism of distraction that reduces F.

Operational consequence: F can be refined as the ratio of DAN activity to the total activity of both networks:

$$F_{\text{net}} = \frac{A_{\text{DAN}}}{A_{\text{DAN}} + A_{\text{VAN}}} \tag{II.4}$$

When $A_{\text{VAN}} \to 0$ (absence of distracting stimuli) $F_{\text{net}} \to 1$. When $A_{\text{VAN}} \gg A_{\text{DAN}}$ (constant distractions) $F_{\text{net}} \to 0$. Formula (II.4) is more informative than (II.1) because it accounts not only for the absolute level of concentration but also for the degree of resistance to distraction.

II.6. Practical protocol for calibrating F

Calibration of F establishes the individual boundaries $[F_{\text{min}}, F_{\text{max}}]$ for a specific observer. The protocol is performed once before a series of measurements.

Step 1. Baseline (F_{min}). The observer is in a resting state with eyes open, without a specific task, for 5 minutes. The mean DAN activity ($A_{\text{DAN}}^{\text{rest}}$), EEG alpha-rhythm power, and saccade pattern during free observation are recorded.

Step 2. Maximum focus (F_{max}). The observer performs a task requiring full concentration: solving arithmetic problems of increasing difficulty, or a modified Stroop test [23], for 5 minutes. The maximum DAN activity ($A_{\text{DAN}}^{\text{max}}$) is recorded.

Step 3. Normalization. The current value of F for any subsequent measurement is calculated as:

$$F = \frac{A_{\text{DAN}}(t) - A_{\text{DAN}}^{\text{rest}}}{A_{\text{DAN}}^{\text{max}} - A_{\text{DAN}}^{\text{rest}}} \tag{II.5}$$

with the constraint $F \in [0, 1]$. Recalibration is recommended every 3–6 months or after significant changes in the observer's health status.

III. MEASUREMENT OF COMPONENT E (EMOTIONAL COHERENCE)

III.1. Heart rate variability

Emotional coherence E is assessed through heart rate variability (HRV) indicators, galvanic skin response (GSR), and EEG rhythm coherence. HRV is the most accessible and well-studied biomarker: high HRV indicates parasympathetic nervous system activity and emotional alignment [8]. The specific indicator is RMSSD (root mean square of successive R-R interval differences), normalized to the observer's individual baseline level:

$$E = \frac{\text{RMSSD}(t)}{\text{RMSSD}_{\text{max}}} \tag{III.1}$$

Studies by the HeartMath Institute have shown that coherent breathing (5–6 cycles per minute, inhalation-to-exhalation ratio close to $62/38$) increases HRV by 30% [9]. Disruption of the systole-to-diastole ratio (norm close to $38/62$) is a clinical sign of reduced E.

III.2. Measurement accessibility

Portable sensors (Polar chest straps, fitness bands with optical PPG [10]) make the measurement of E accessible outside the laboratory. The accuracy of optical PPG sensors for assessing RMSSD is $r > 0.90$ compared to clinical ECG, provided the subject remains stationary [10].

III.3. Frequency analysis of HRV

The temporal indicator RMSSD (III.1) is one of several available methods for assessing E. Frequency analysis of HRV, standardized by Malik and colleagues [20], provides additional information through spectral decomposition of R-R interval variability.

Low-frequency component (LF, 0.04–0.15 Hz) reflects the combined activity of the sympathetic and parasympathetic nervous systems, as well as the baroreceptor reflex.

High-frequency component (HF, 0.15–0.40 Hz) predominantly reflects parasympathetic (vagal) activity and respiratory sinus arrhythmia.

The LF/HF ratio is interpreted as an indicator of sympathovagal balance. A low LF/HF (< 1.5) indicates parasympathetic dominance and high emotional coherence. A high LF/HF (> 2.0) indicates sympathetic activation characteristic of stress and emotional misalignment.

The operational formula for E via frequency analysis:

$$E_{\text{freq}} = \frac{1}{1 + \alpha \cdot \text{LF/HF}} \tag{III.2}$$

where α is a calibration coefficient determined from a pilot sample. When LF/HF $= 0$ (pure parasympathetic dominance) $E_{\text{freq}} = 1$; when LF/HF $\to \infty$ (pronounced stress) $E_{\text{freq}} \to 0$.

Measurement standards [20] recommend: minimum recording duration for frequency analysis — 5 minutes; for 24-hour monitoring — 24 hours; ECG sampling rate — at least 250 Hz; artifacts (ectopic contractions, motion interference) should constitute less than 5% of the total recording.

III.4. Galvanic skin response as an additional marker

Galvanic skin response (GSR), or electrodermal activity (EDA), records changes in skin electrical conductance caused by sweat gland activity under sympathetic nervous system control. GSR provides an additional channel for assessing E, independent of heart rate.

Tonic skin conductance level (SCL) reflects the overall arousal level. A high SCL indicates sympathetic activation and, as a rule, reduced E.

Phasic skin conductance responses (SCR) are brief (1–5 s) increases in conductance in response to stimuli. Frequent spontaneous SCRs (in the absence of external stimuli) indicate anxiety and internal misalignment.

Operational formula:

$$E_{\text{GSR}} = 1 - \frac{\text{SCL}(t) - \text{SCL}_{\text{min}}}{\text{SCL}_{\text{max}} - \text{SCL}_{\text{min}}} \tag{III.3}$$

The integral estimate of E can use a weighted combination of indicators: $E = \alpha_1 E_{\text{RMSSD}} + \alpha_2 E_{\text{freq}} + \alpha_3 E_{\text{GSR}}$ with $\alpha_1 + \alpha_2 + \alpha_3 = 1$.

III.5. HeartMath coherence ratio

The HeartMath Institute developed a specialized indicator — the coherence ratio, based on the ratio of the spectral peak power in the 0.04–0.26 Hz range to the total HRV spectral power [9]. A high coherence ratio (> 0.5) indicates an ordered, sinusoidal HRV pattern characteristic of states of emotional alignment.

Mapping the HeartMath coherence ratio to E in formula (D1.1):

$$E_{\text{HM}} = \frac{\text{CR}(t)}{\text{CR}_{\text{max}}} \tag{III.4}$$

where CR is the coherence ratio, CR_{max} is the maximum value recorded during calibration (coherent breathing in a 62/38 rhythm). HeartMath software (Inner

Balance, emWave) automatically calculates CR in real time, making this indicator the most practical for field measurements of E.

III.6. The golden ratio 62/38 in the cardiac cycle

The systole-to-diastole ratio in a healthy heart is close to $38/62$ — the inverse golden ratio ($1/\varphi \approx 0.618$). Systole (contraction phase) occupies approximately 38% of the cardiac cycle, diastole (relaxation and filling phase) — approximately 62%. This ratio is physiologically justified: a longer diastole ensures adequate coronary blood supply to the myocardium, which occurs predominantly during this phase.

Disruption of the 38/62 ratio is a clinical marker of cardiovascular stress. During tachycardia, diastole shortens disproportionately, the ratio shifts to $45/55$ and beyond, leading to myocardial ischemia and reduced HRV. In ODTOE terms: deformation of the systole/diastole ratio directly correlates with reduced E.

An analogous 62/38 ratio is observed in the optimal inhalation-to-exhalation ratio during coherent breathing [9], in sleep structure (62% deep sleep and REM / 38% light sleep in the optimal cycle), and defines the rhythm of activation protocols [27].

IV. MEASUREMENT OF COMPONENT σ (ENTROPY OF DOUBT)

IV.1. Implicit Association Test

Internal contradiction σ admits measurement through the discrepancy between the observer's explicit declarations and implicit attitudes. The instrumental approach: a modified Implicit Association Test (IAT) [11], adapted to the measurement context. The greater the discrepancy between what a person declares and how they react at the subconscious level, the higher σ:

$$\sigma = \frac{|D_{\text{expl}} - D_{\text{impl}}|}{\max(D_{\text{expl}}, D_{\text{impl}})} \tag{IV.1}$$

where D_{expl} is the explicit assessment (what the observer says), D_{impl} is the implicit assessment (latent reaction in the IAT).

IV.2. Non-instrumental diagnostics

The practical approach: structured reflection in which the observer records anxious thoughts and checks them for factual validity (cognitive behavioral therapy methods, CBT) [12]. Markers of high σ in behavior: frequent decision changes, inability to formulate priorities, chronic anxiety in the absence of objective threats.

IV.3. The problem of phantom coherence

Phantom coherence (S_{phant}) [2] — a situation where σ is high but the observer is unaware of it — presents a particular diagnostic challenge and requires external validation: behavioral experiments, analysis of performance outcomes, independent audit. Diagnosis of phantom coherence is impossible by self-assessment methods; objective indicators (IAT, analysis of discrepancy between forecasts and outcomes) are necessary.

IV.4. Festinger's theory of cognitive dissonance and formalization through σ

Festinger's theory of cognitive dissonance [21] describes the psychological discomfort arising from simultaneously holding incompatible cognitions (beliefs, attitudes, knowledge). In ODTOE terms, Festinger's cognitive dissonance receives quantitative formalization through the component σ.

Festinger identified three strategies for dissonance reduction: (a) changing one of the conflicting elements; (b) adding new cognitions that reconcile the contradiction; (c) reducing the significance of the conflicting elements. Each of these strategies can be reformulated as an operation that reduces σ: strategy (a) corresponds to eliminating the contradiction between D_{expl} and D_{impl}; strategy (b) introduces intermediate cognitions that reduce the absolute value of the discrepancy; strategy (c) switches the context C in which B is measured.

The fundamental difference of the ODTOE formalism: in Festinger's classical theory, dissonance is considered in isolation, whereas in formula (D1.1) σ is multiplicatively linked to the remaining components. High σ does not merely create discomfort — it zeroes out the entire parameter B, suppressing the observer's ability to constitute configurations.

IV.5. The Stroop test and decision latency as behavioral markers of σ

The Stroop test [23] is a classical instrument for measuring cognitive conflict, in which the subject names the ink color of a word that denotes a different color. The Stroop interference (increased reaction time under incongruent conditions) is a direct behavioral analog of σ: it measures the conflict between automatic (word reading) and voluntary (color naming) processes.

Operational formula:

$$\sigma_{\text{Stroop}} = \frac{t_{\text{incongr}} - t_{\text{congr}}}{t_{\text{incongr}}} \tag{IV.2}$$

where t_{incongr} is the mean reaction time under incongruent conditions, t_{congr} is the mean reaction time under congruent conditions. With complete absence of conflict $\sigma_{\text{Stroop}} = 0$; with maximum interference $\sigma_{\text{Stroop}} \to 1$.

An additional behavioral marker is decision latency. An observer with high σ demonstrates increased choice time between alternatives, especially when the alternatives involve conflicting values. Decision time in standardized dilemmas, normalized to the individual baseline level, provides an additional estimate of σ without specialized equipment.

IV.6. Taxonomy of behavioral indicators of σ

For practical diagnostics, a systematization of observed behavior by σ levels is useful:

σ **Level**	**Behavioral markers**	**Cognitive manifestations**	**Physiological correlates**
Low (< 0.2)	Rapid decision-making, consistency of actions, calm confidence	Clear priority system, alignment of words and actions	Low EDA, low LF/HF, absence of Stroop interference
Medium (0.2–0.5)	Periodic hesitation, plan changes 1–2 times per project, moderate anxiety	Awareness of contradictions but ability to resolve them	Moderate SCR, elevated LF/HF during decision-making
High (> 0.5)	Chronic indecisiveness, frequent decision changes, choice avoidance, procrastination	Inability to formulate priorities, parallel mutually exclusive goals	High SCL, frequent spontaneous SCR, pronounced Stroop interference

V. MEASUREMENT OF COMPONENT Λ (EMPIRICAL REINFORCEMENT)

V.1. Bayesian framework

Empirical reinforcement Λ is defined through the history of preceding observations and the degree of their correspondence to expectations, formalized within a Bayesian framework [13]. Specifically: Λ is the posterior estimate of the probability of success, updated with each new observation using Bayes' formula:

$$\Lambda_{n+1} = \frac{\Lambda_n \cdot P(\text{data} \mid \text{success})}{\Lambda_n \cdot P(\text{data} \mid \text{success}) + (1 - \Lambda_n) \cdot P(\text{data} \mid \text{failure})} \tag{V.1}$$

If out of N previous attempts k led to the expected result, $\Lambda \approx k/N$ (with a non-informative prior distribution).

V.2. Practical method

Keeping an observation journal: recording intentions (what was planned) and actual results (what happened) with subsequent calculation of the proportion of matches. Degradation of Λ manifests as devaluation of experience: the person ceases to see the connection between effort and outcome, which corresponds to the "reduced personal accomplishment" component in the Maslach burnout model [14].

V.3. Detailed example of Bayesian updating of Λ

Consider an observer starting with a completely non-informative prior distribution — a beta distribution $\beta(1,1)$, for which $\Lambda_0 = \mathbb{E}[\beta(1,1)] = 0.5$. The observer undertakes 10 attempts at constituting configuration C, of which 8 end in success and 2 in failure.

After each observation, the beta distribution parameters are updated: success adds 1 to the parameter α, failure adds 1 to the parameter β. The sequence of updates (with observation order: S, S, F, S, S, S, F, S, S, S):

Step	**Outcome**	$\beta(\alpha,\beta)$	$\Lambda = \alpha/(\alpha{+}\beta)$	$\delta\Lambda$
0	—	$\beta(1,1)$	0.500	—
1	Success	$\beta(2,1)$	0.667	+0.167
2	Success	$\beta(3,1)$	0.750	+0.083
3	Failure	$\beta(3,2)$	0.600	−0.150
4	Success	$\beta(4,2)$	0.667	+0.067
5	Success	$\beta(5,2)$	0.714	+0.048
6	Success	$\beta(6,2)$	0.750	+0.036
7	Failure	$\beta(6,3)$	0.667	−0.083
8	Success	$\beta(7,3)$	0.700	+0.033
9	Success	$\beta(8,3)$	0.727	+0.027
10	Success	$\beta(9,3)$	0.750	+0.023

Final value: $\Lambda_{10} = 9/(9+3) = 0.750$. Variance of the estimate: Var $= \alpha\beta/[(\alpha+\beta)^2(\alpha+\beta+1)] = 9\cdot 3/(144\cdot 13) \approx 0.014$, standard deviation ≈ 0.12. A characteristic feature: each subsequent success contributes less to Λ (decreasing $\delta\Lambda$), which formalizes the intuitive "habituation to success."

V.4. Temporal weighting: priority of recent events

The simple formula $\Lambda = k/N$ assumes equal contribution of all past observations. In practice, recent events exert a greater influence on the subjective assessment of reinforcement than distant ones. This requires the introduction of an exponential decay window.

Let observations be indexed by time: $x_i \in \{0, 1\}$ ($1 =$ success), t_i is the time of observation. The weighted estimate of Λ:

$$\Lambda_{\text{w}} = \frac{\sum_{i=1}^{N} x_i \cdot e^{-\lambda(t_{\text{now}} - t_i)}}{\sum_{i=1}^{N} e^{-\lambda(t_{\text{now}} - t_i)}} \tag{V.2}$$

where $\lambda > 0$ is the decay parameter. When $\lambda = 0$ the formula reduces to k/N; when $\lambda \to \infty$ only the last observation is taken into account. The characteristic memory time $\tau = 1/\lambda$: events older than 3τ contribute less than 5%.

For practical purposes, $\tau \approx 30$ days (business context) or $\tau \approx 7$ days (intensive training programs) is recommended. An observer with a series of recent successes will have $\Lambda_{\text{w}} > \Lambda$, which better reflects their current subjective state.

V.5. Connection with Bandura's self-efficacy theory

Bandura's self-efficacy theory [22] postulates that a person's belief in their own ability to perform a task is a key predictor of their behavior and outcomes. Bandura identified four sources of self-efficacy: (a) mastery experiences; (b) vicarious experience; (c) verbal persuasion; (d) physiological and emotional states.

In ODTOE terms, Bandura's self-efficacy is closest to the component Λ: both constructs describe the influence of past experience on expectations of future success. However, the ODTOE formalism makes several extensions: (i) Λ is formalized through Bayesian updating (V.1), which provides mathematical precision unavailable to verbal self-efficacy scales; (ii) Λ is included in the multiplicative formula (D1.1), showing that self-efficacy without focus (F) and emotional coherence (E) does not lead to the constitution of configurations; (iii) Bandura's source (d) — physiological states — in ODTOE is separated into a distinct component E.

V-bis. QUATERNION STRUCTURE OF COHERENCE

V-bis.1. Quaternion representation of B

The components of formula (D1.1) form a four-dimensional structure isomorphic to the algebra of quaternions [27]. The observer's coherence is represented as a quaternion:

$$q_B = \Lambda + F\mathbf{i} + E\mathbf{j} + (1 - \sigma)\mathbf{k} \tag{V-bis.1}$$

where Λ is the scalar (real) part, and F, E, $(1 - \sigma)$ are the components of the imaginary part. The norm of the quaternion determines the overall "coherence amplitude":

$$|q_B| = \sqrt{\Lambda^2 + F^2 + E^2 + (1 - \sigma)^2} \tag{V-bis.2}$$

The maximum value $|q_B| = 2$ is achieved when $\Lambda = F = E = 1$, $\sigma = 0$.

The observer's state is a point in four-dimensional space. Movement toward coherence is movement toward the center of symmetry. The observation process is described by a quaternion rotation: the state of the system Ψ is transformed according to:

$$R = q_B \cdot \Psi \cdot \overline{q_B} \tag{V-bis.3}$$

where $\overline{q_B} = \Lambda - F\mathbf{i} - E\mathbf{j} - (1-\sigma)\mathbf{k}$ is the conjugate quaternion.

V-bis.2. Gimbal lock analogy

The quaternion structure clarifies the mechanism of the "weak link" in formula (D1.1). Zeroing one component is analogous to the loss of a degree of freedom in a three-axis gimbal (gimbal lock): two axes align, and the system loses one rotational degree of freedom. Compensation through the remaining axes is impossible.

F-deficit (defocusing): $q_B = \Lambda + 0 \cdot \mathbf{i} + E\mathbf{j} + (1-\sigma)\mathbf{k}$. The observer cannot direct their coherence at a specific configuration — the system "rotates in a plane" without the possibility of orientation. Diagnostics: chaotic saccades (II.3), high DMN activity (II.4), low F_{net} (II.5).

E-deficit (emotional disconnection): $q_B = \Lambda + F\mathbf{i} + 0 \cdot \mathbf{j} + (1-\sigma)\mathbf{k}$. The observer acts mechanically, without engagement. Diagnostics: low RMSSD (III.1), high LF/HF (III.3), high SCL (III.4).

σ-dominance (entropy of doubt): $q_B = \Lambda + F\mathbf{i} + E\mathbf{j} + 0 \cdot \mathbf{k}$. Diagnostics: high Stroop interference (IV.5), IAT discrepancy (IV.1), behavioral markers from table IV.6.

Λ-deficit (devaluation of experience): $q_B = 0 + F\mathbf{i} + E\mathbf{j} + (1-\sigma)\mathbf{k}$. A pure imaginary quaternion — the observer rotates but has no "anchor." Diagnostics: $\Lambda < 0.2$ from the observation journal (V.2), learned helplessness [15].

V-bis.3. Diagnostic implications

The quaternion structure allows visualization of the observer's state as a vector in four-dimensional space and identification of the axis of maximum deficit. Projections of the quaternion onto each axis (Λ, $F\mathbf{i}$, $E\mathbf{j}$, $(1-\sigma)\mathbf{k}$) directly show which component requires priority intervention. The axis with the minimum projection determines the type of blockade and the target of intervention.

VI. DYNAMICS OF PARAMETER B

VI.1. Belief evolution equation

The main ODTOE theory [1] defines the belief dynamics equation:

$$\frac{dB}{dt} = \gamma \cdot \tanh(\beta \cdot \hat{\delta}) \cdot \hat{\delta} \cdot B(1 - B) \qquad \text{(VI.1)}$$

where $\gamma > 0$ is the coupling constant (the observer's learning rate), $\hat{\delta}$ is the defect operator (discrepancy between expected and observed), $\beta > 0$ is the transition steepness parameter. The factor $B(1-B)$ ensures logistic dynamics: the rate of change is maximal at $B = 0.5$ and tends to zero as $B \to 0$ and $B \to 1$.

VI.2. Measurement implications

Equation (VI.1) has direct consequences for the measurement protocol. To estimate dB/dt the following are required:

A series of measurements $B(t_i)$. A minimum of three points at equal intervals for estimating the first derivative by the finite difference method: $dB/dt \approx [B(t_{i+1}) - B(t_{i-1})]/(2\Delta t)$.

Registration of events $\hat{\delta}$. A journal of significant discrepancies between expectations and outcomes, classified by sign ($+$ for positive surprise, $-$ for negative) and amplitude.

Trajectory $B(t)$. A series of $M \geq 5$ measurements of B at intervals of 1–2 weeks allows construction of a trajectory and determination of whether the observer is in a growth phase ($dB/dt > 0$), stagnation ($dB/dt \approx 0$), or degradation ($dB/dt < 0$).

VI.3. Phase portrait: B vs dB/dt

The phase portrait — a plot of dB/dt versus B — is a diagnostic tool that allows visualization of observer dynamics without explicit knowledge of the parameters of equation (VI.1).

Characteristic regions of the phase portrait:

Decay zone ($B < B_{crit}$, $dB/dt < 0$): the observer is degrading. Without external intervention $B \to 0$. Trajectories tend toward the stable fixed point $B = 0$.

Self-reinforcement zone ($B > B_{crit}$, $dB/dt > 0$): the observer is developing. Trajectories tend toward the stable fixed point $B = B^*$ (an attractor depending on $\hat{\delta}$).

Unstable equilibrium ($B = B_{crit}$, $dB/dt = 0$): a saddle point. Small perturbations push the observer either into the decay zone or the self-reinforcement zone.

VI.4. Bifurcation at B_{crit}

The transition through B_{crit} is a saddle-node bifurcation. When $\hat{\delta} > 0$ (positive experience) the value of B_{crit} decreases, facilitating the transition. When $\hat{\delta} < 0$ (negative experience) B_{crit} increases, impeding activation. Practical consequence: the activation protocol should begin with tasks guaranteeing $\hat{\delta} > 0$ (structured small wins [27]) to lower B_{crit} and facilitate threshold crossing.

Experimental determination of B_{crit} is carried out through longitudinal monitoring: the value of B at which the sign of dB/dt consistently changes is an empirical estimate of B_{crit} for the given observer in the given context. Preliminary data [24] suggest that $B_{\text{crit}} \approx 0.15$–$0.25$ with equal weights.

VII. INTEGRAL MEASUREMENT PROTOCOL

VII.1. Synchronous registration

The determination of B by formula (D1.1) requires synchronous registration of all four components. Correctness is ensured by two conditions: (a) simultaneity of registration, so that the procedure for measuring one component does not affect the others; (b) preliminary calibration of weight coefficients w_1–w_4 on a pilot sample with the constraint $w_1 + w_2 + w_3 + w_4 = 1$.

The implemented protocol: neuroimaging (fMRI/EEG for F), cardiovascular monitoring (HRV for E), an implicit test (IAT for σ), and Bayesian accounting of prior observations (journal for Λ) are launched in parallel.

VII.2. Error formula

The multiplicative structure of (D1.1) has a characteristic property with respect to errors. The relative error of the integral parameter is determined by the sum of weighted relative errors of the components:

$$\frac{\delta B}{B} = w_1 \cdot \frac{\delta F}{F} + w_2 \cdot \frac{\delta E}{E} + w_3 \cdot \frac{\delta(1-\sigma)}{1-\sigma} + w_4 \cdot \frac{\delta \Lambda}{\Lambda} \tag{VII.1}$$

The component with the maximum weight coefficient sets the priority for experimental accuracy. With equal weights ($w_i = 0.25$) all components contribute equally to the error.

VII.3. Numerical example

Consider an observer with the following indicators (with equal weights $w_i = 0.25$):

$F = 0.7$ (above-average concentration); $E = 0.8$ (high HRV); $\sigma = 0.3$ (moderate doubt, $1 - \sigma = 0.7$); $\Lambda = 0.6$ (6 successes out of 10 attempts).

Then $B = 0.7^{0.25} \cdot 0.8^{0.25} \cdot 0.7^{0.25} \cdot 0.6^{0.25} = 0.915 \cdot 0.946 \cdot 0.915 \cdot 0.880 \approx 0.697$.

With errors $\delta F = \delta E = \delta(1-\sigma) = \delta\Lambda = 0.05$: $\delta B/B = 0.25 \cdot (0.05/0.7 + 0.05/0.8 + 0.05/0.7 + 0.05/0.6) \approx 0.068$, i.e., $\delta B \approx 0.047$.

VIII. PRACTICAL SCALE (WITHOUT INSTRUMENTATION)

For business contexts and everyday application, a simplified self-assessment along four axes is acceptable (with $w_1 = w_2 = w_3 = w_4 = 0.25$):

Component	Self-assessment question (0–10)	What it measures
F	How focused am I on this task right now?	Concentration
E	How aligned are my emotions with what I am doing?	Emotional engagement
$1 - \sigma$	How confident am I that I am doing the right thing?	Absence of internal contradictions
Λ	How much does my past experience confirm that this is possible?	Reliance on experience

Simplified formula:

$$B_{\text{appl}} = \frac{F}{10} \cdot \frac{E}{10} \cdot \frac{10 - \sigma}{10} \cdot \frac{\Lambda}{10} \tag{VIII.1}$$

The result is a number from 0 to 1. Interpretation: at $B < 0.1$ the observer is in the zone of critical coherence reduction (analogous to learned helplessness [15]); at $B > 0.5$ the system operates in directed observation mode; $B = 1$ is structurally unattainable (a consequence of Ashby's law of requisite variety [16]).

IX. INTER-OBSERVER COHERENCE

IX.1. Group coherence formula S

When working with groups of observers (teams, organizations), the task arises of measuring not only individual B_i but also the degree of belief alignment within the group. Inter-observer coherence S [24] is defined as:

$$S = 1 - \frac{2}{n(n-1)} \sum_{i=1}^{n} \sum_{j=i+1}^{n} |B_i - B_j| \tag{IX.1}$$

where n is the number of observers in the group, B_i is the coherence value of the i-th observer. When $S = 1$ all observers have the same coherence; when $S = 0$ the spread is maximal.

IX.2. Practical protocol for group measurement

Step 1. Each group member completes an individual questionnaire (Section VIII) or undergoes instrumental diagnostics (Sections II–V) to determine their B_i.

Step 2. The mean value $\bar{B} = \frac{1}{n}\sum_{i=1}^{n} B_i$ and standard deviation $\sigma_B = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(B_i - \bar{B})^2}$ are calculated.

Step 3. S is calculated using formula (IX.1). For a rapid approximate estimate: $S \approx 1 - 2\sigma_B/\bar{B}$ (assuming a normal distribution of B_i).

Step 4. Interpretation: $S > 0.8$ — high group coherence, the team operates in automatic coordination mode [24]; $0.5 < S < 0.8$ — moderate coherence, synchronization is required; $S < 0.5$ — low coherence, significant discrepancies in beliefs and values.

IX.3. Diagnostics of team coherence

In addition to the aggregated indicator S, component-level diagnostics is useful. For each component (F, E, σ, Λ), the within-group spread is calculated. The maximum spread indicates the source of group misalignment:

High spread in F: team members focus on different aspects of the task. Intervention: clarification of shared goals and priorities.

High spread in E: differing emotional engagement. Intervention: group synchronization practices (joint coherent breathing, team rituals).

High spread in σ: some participants are confident in the direction, others doubt it. Intervention: open discussion of doubts, clarification of values.

High spread in Λ: different past experience and confidence levels in success. Intervention: sharing success stories, mentoring.

X. OBSERVER PROFILES

X.1. Calculation methodology

To illustrate the operational application of formula (D1.1), four observer profiles with complete calculations at equal weights $w_i = 0.25$ are presented. For each profile, $B = F^{0.25} \cdot E^{0.25} \cdot (1-\sigma)^{0.25} \cdot \Lambda^{0.25}$ is calculated.

X.2. Profile 1: Athlete in a flow state

Context: a professional athlete during competition, experiencing a flow state [25].

Components: $F = 0.95$ (near-absolute concentration on the current action, suppressed DMN); $E = 0.90$ (high HRV, emotional alignment with activity, RMSSD in the upper quartile); $\sigma = 0.05$ (minimal doubts, absence of Stroop interference, IAT congruence); $\Lambda = 0.85$ (extensive winning history, Λ_w accounting for recent successes).

Calculation: $1 - \sigma = 0.95$.

$B = 0.95^{0.25} \cdot 0.90^{0.25} \cdot 0.95^{0.25} \cdot 0.85^{0.25}$

$= 0.9872 \cdot 0.9740 \cdot 0.9872 \cdot 0.9601 = 0.9107$

Quaternion: $q_B = 0.85 + 0.95\mathbf{i} + 0.90\mathbf{j} + 0.95\mathbf{k}$, $|q_B| = \sqrt{0.85^2 + 0.95^2 + 0.90^2 + 0.95^2} = \sqrt{3.3375} \approx 1.827$.

Conclusion: $B = 0.91 \gg B_{\text{crit}}$. The observer is deep within the self-reinforcement zone. All components are balanced; gimbal lock is absent.

X.3. Profile 2: Entrepreneur before launch

Context: an entrepreneur 2 weeks before the launch of a new product.

Components: $F = 0.80$ (high task concentration, but with periodic distractions for operational matters); $E = 0.60$ (moderate HRV, pre-launch anxiety reduces emotional coherence, elevated LF/HF); $\sigma = 0.50$ (significant doubts: "Is this the right product? Is this the right time?" noticeable Stroop interference); $\Lambda = 0.40$ (limited experience of successful launches, 2 successes out of 5 attempts).

Calculation: $1 - \sigma = 0.50$.

$B = 0.80^{0.25} \cdot 0.60^{0.25} \cdot 0.50^{0.25} \cdot 0.40^{0.25}$

$= 0.9457 \cdot 0.8801 \cdot 0.8409 \cdot 0.7953 = 0.5566$

Conclusion: $B = 0.56 > B_{\text{crit}}$, but with limited margin. Axis of maximum deficit: Λ and σ. Recommendation: structured small wins ($\hat{A}_\Lambda$) and value clarification ($\hat{A}_\sigma$).

X.4. Profile 3: Burnout patient

Context: a middle manager diagnosed with professional burnout [14].

Components: $F = 0.20$ (inability to concentrate for more than 10 minutes, high DMN activity, chaotic saccades); $E = 0.30$ (low RMSSD, emotional detachment, high LF/HF > 3.0, cardiac cycle desynchronization); $\sigma = 0.80$ (deep cognitive dissonance: "I hate this job, but I can't leave," pronounced Stroop interference); $\Lambda = 0.15$ (devaluation of past experience, series of failures, $\Lambda_w < \Lambda$ due to recent setbacks).

Calculation: $1 - \sigma = 0.20$.

$B = 0.20^{0.25} \cdot 0.30^{0.25} \cdot 0.20^{0.25} \cdot 0.15^{0.25}$

$= 0.6687 \cdot 0.7401 \cdot 0.6687 \cdot 0.6224 = 0.2061$

Conclusion: $B = 0.21 \approx B_{\text{crit}}$. The observer is at the boundary of the decay zone. All components are suppressed, especially F and $(1 - \sigma)$. Quaternion diagnostics reveals a double gimbal lock along the $F\mathbf{i}$ and $(1 - \sigma)\mathbf{k}$ axes. Intervention must be systemic: simultaneous action on all four components through the activation operator $\hat{A}$ [27].

X.5. Profile 4: Practicing meditator

Context: a person with a regular meditation practice (> 2 years), practicing coherent breathing [30].

Components: $F = 0.85$ (high voluntary concentration, trained DAN, suppressed DMN, ordered saccades); $E = 0.90$ (high RMSSD, low LF/HF, systole-to-diastole ratio close to 38/62, high HeartMath coherence ratio); $\sigma = 0.10$ (clear value system, minimal cognitive dissonance, IAT congruence); $\Lambda = 0.70$ (sustained positive meditative experience, but without pronounced external reinforcement in material terms).

Calculation: $1 - \sigma = 0.90$.

$B = 0.85^{0.25} \cdot 0.90^{0.25} \cdot 0.90^{0.25} \cdot 0.70^{0.25}$

$= 0.9601 \cdot 0.9740 \cdot 0.9740 \cdot 0.9147 = 0.8330$

Conclusion: $B = 0.83 \gg B_{\text{crit}}$. High coherence with a moderate deficit in Λ (the scalar part of the quaternion is somewhat lower than the imaginary components). Recommendation: integration of meditative experience with practical activity to increase Λ.

X.6. Comparative table of profiles

Profile	F	E	σ	Λ	B	**Diagnosis**
Athlete in flow	0.95	0.90	0.05	0.85	0.91	Full coherence
Entrepreneur	0.80	0.60	0.50	0.40	0.56	σ/Λ-deficit
Burnout	0.20	0.30	0.80	0.15	0.21	Systemic deficit
Meditator	0.85	0.90	0.10	0.70	0.83	Λ-deficit

The table demonstrates the key property of formula (D1.1): the multiplicative structure makes B sensitive to the minimum component. The athlete and meditator with similar values of F and E have different B due to the difference in Λ. The entrepreneur with high F remains in the zone of moderate coherence due to doubts ($\sigma = 0.5$) and insufficient reinforcement ($\Lambda = 0.4$). The burnout observer demonstrates suppression of all components — a classic pattern of $B \to 0$ [27].

XI. DISCUSSION AND LIMITATIONS

XI.1. Validity of components

The components F, E, σ, Λ do not currently have generally accepted validated scales developed specifically for formula (D1.1). However, each relies on instruments with established construct validity: CPT and MAAS for F [5, 6]; RMSSD for E [8]; IAT for σ [11]; Bayesian updating for Λ [13]. Until a standardized integral instrument is developed, the formula remains a conceptual model with high explanatory but limited predictive power.

XI.2. Phantom coherence

Self-assessment of coherence is unreliable by definition: an observer with high phantom coherence ($S_{\text{phant}} \gg S_{\text{true}}$) is unaware of their own deficit [2]. For critical applications (clinical, managerial decisions), external validation through objective indicators is necessary.

XI.3. Direction of causality

The direction of the causal relationship (high coherence $\to$ successful performance or vice versa) has not been strictly established and requires longitudinal interventional studies. Available data [9, 27] indicate a bidirectional relationship: coherence promotes performance, and success increases coherence (positive feedback, formalized in the belief dynamics equation [1]).

XI.4. Calibration of weights

Calibration of weights w_1–w_4 is a separate experimental task. Their specific values do not follow from ODTOE axiomatics and are subject to empirical determination on representative samples. The preliminary hypothesis of equal weights ($w_i = 0.25$) is adopted as the null model pending empirical data.

XI.5. Test-retest reliability

Any operational instrument for measuring B must demonstrate acceptable test-retest reliability: repeated measurements of the same observer under comparable conditions must yield consistent results. For instrumental methods (HRV, EEG), test-retest reliability is established in the literature: RMSSD demonstrates $r = 0.7$–0.9 for repeated measurements at 1–7 day intervals [20]; alpha desynchronization — $r = 0.6$–0.8 [4].

For non-instrumental methods (self-report), the test-retest reliability of the integral parameter B is determined by the minimum reliability among the components. When using the MAAS scale ($r \approx 0.8$ [6]) for F, HRV ($r \approx 0.8$) for E, IAT ($r \approx 0.5$–0.7 [11]) for σ, and the observation journal for Λ, the overall reliability of B is limited by the least stable component — the IAT. This determines the priority of developing alternative methods for measuring σ with higher reliability.

Minimum requirements for test-retest reliability for clinical applications: $r > 0.7$; for research — $r > 0.6$; for screening — $r > 0.5$.

XI.6. Cultural and demographic factors

The operationalization of B through specific instruments inevitably introduces cultural and demographic specificity:

Age. RMSSD systematically decreases with age (by approximately 3–5 ms per decade [20]). Normalization of E must account for age-specific norms; otherwise, older observers will be systematically underestimated on E.

Sex. Women on average demonstrate higher RMSSD at younger ages, but the difference diminishes after menopause [20]. Gender-specific norms are necessary for a correct assessment of E.

Culture. Self-report scales are subject to cultural biases: in collectivist cultures, self-assessment of F and Λ may be systematically lower compared to individualist cultures. The IAT demonstrates culture-specific patterns of implicit attitudes. Calibration of weights w_1–w_4 may require cultural adaptation.

Clinical populations. Observers with ADHD are systematically reduced in F; observers with depression — in E and Λ; observers with anxiety disorders — in σ (elevated). Clinical application of B requires differential diagnostics: whether low B is a consequence of a clinical condition or situational misalignment.

XI.7. Ethical aspects of measuring cognitive coherence

Measuring B affects deep aspects of the observer's mental life, which raises specific ethical questions:

Informed consent. The observer must understand what exactly is being measured, how the results will be used, and what the limitations of the method are. Measuring B without informed consent is ethically unacceptable, even when using non-instrumental methods.

Confidentiality. The results of measuring B are sensitive data. The σ component effectively reflects the observer's internal contradictions, and the IAT reveals implicit attitudes that the observer may not be aware of. Disclosure of these data to third parties (employers, colleagues) creates a risk of discrimination.

Risk of stigmatization. A low value of B should not be interpreted as a "diagnosis" or "verdict." The parameter B is a contextual, dynamic quantity that can be changed through targeted interventions [27]. Using B for selection (hiring, promotion) without accounting for contextuality and dynamics is ethically problematic.

Right not to know. The observer has the right to refuse information about their own B, especially if this information may negatively affect their state (the measurement reactivity paradox, I.2).

XI.8. Comparison with existing psychometric constructs

To determine the place of B in the landscape of existing measurement instruments, a systematic comparison is presented:

Big Five. The five-factor personality model measures stable dispositions (extraversion, agreeableness, conscientiousness, neuroticism, openness). The fundamental difference: Big Five is a trait model, B is a state model tied to context C. A correlation between the Big Five and B is possible (e.g., low neuroticism may correlate with low σ) but is not identical: the same conscientious person may have $B = 0.9$ in one context and $B = 0.2$ in another.

Bandura's self-efficacy scales [22]. The construct closest to Λ. The difference: Bandura's self-efficacy is a subjective assessment, whereas Λ is formalized through Bayesian updating based on objective data (outcome journal). Moreover, Λ is only one of the four components of B.

Flow scales (Flow State Scale, FSS) [25]. They describe the phenomenology of the flow state: absorption, sense of control, time transformation. In ODTOE terms, flow is a consequence of $B > B_{\text{crit}}$, not an independent construct. B explains the mechanism of flow rather than describing its symptoms.

Mindful Attention Awareness Scale (MAAS) [6]. Measures awareness in everyday life. Can be used as a proxy for F but does not account for the other three components of B.

Uniqueness of B. None of the existing instruments combines the cognitive (F, σ), affective (E), and behavioral (Λ) levels into a single multiplicative formula with the weak-link property. This makes B a fundamentally new construct, not reducible to existing scales, although it uses them as data sources for individual components.

XII. CONCLUSION

The cognitive coherence parameter $B(O, C)$, central to ODTOE, admits operational measurement through a composition of four components, each of which can be registered independently. Focus F is measured by neuroimaging (fMRI/EEG), eye-tracking, monitoring of the DAN-to-VAN activity ratio, or attention scales (MAAS, CPT). Deactivation of the default mode network (DMN) serves as an inverse correlate of F [19]. Emotional coherence E is registered through heart rate variability (RMSSD, LF/HF frequency analysis [20]), galvanic skin response (GSR), and the HeartMath coherence ratio. The systole-to-diastole ratio of 38/62 is a physiological marker of optimal E. The entropy of doubt σ is assessed by the Implicit Association Test (IAT), the Stroop test [23], analysis of decision latency, and CBT methods. Festinger's theory of cognitive dissonance [21] receives quantitative formalization through σ. Empirical reinforcement Λ is computed through Bayesian updating with temporal weighting based on the observation journal and is connected to Bandura's self-efficacy theory [22].

The quaternion structure of coherence $q_B = \Lambda + F\mathbf{i} + E\mathbf{j} + (1 - \sigma)\mathbf{k}$ [27] enables deficit-type diagnostics through the gimbal lock analogy. The dynamics equation (VI.1) determines the temporal evolution of B and allows construction of a phase portrait with bifurcation at B_{crit}.

The synchronous registration protocol provides an integral assessment of B with controlled error (formula VII.1). The practical scale (Section VIII) allows application of

B assessment in business contexts without instrumentation. Inter-observer coherence S (Section IX) extends measurement to the group level.

Detailed observer profiles (Section X) demonstrate the practical application of formula (D1.1): from an athlete in flow ($B = 0.91$) to a burnout patient ($B = 0.21$), illustrating the sensitivity of the multiplicative structure to the minimum component.

Main limitations: the absence of standardized instrumentation, the problem of phantom coherence, the need for weight coefficient calibration, test-retest reliability requirements (especially for the σ component), cultural and demographic factors, ethical aspects of measuring deep cognitive states, and the need for comparison with existing psychometric constructs. Each of these limitations defines a direction for further research.

Operational measurement of B moves ODTOE from the domain of purely theoretical models to the domain of empirically testable theories, continuing the tradition of operationalizing subjective states initiated by Fechner [18] and developed by Kahneman [26].

CONFLICT OF INTEREST

The author declares no conflict of interest.

FUNDING

This work was carried out without external funding.

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