

# Acoustic Biometric Signaling as a Mechanism for Unconscious Physiological Synchronization: Reframing 'Telepathic' Phenomena Through Neuroendocrine-Immune Coupling

A Theoretical Framework for Understanding Collective Sentience

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**Author:** Joseph A. Sprute, Founder ERES Institute for New Age Cybernetics

**Contributing AI:** Claude (Anthropic) - Conceptual development and drafting assistance

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## Credits and Acknowledgments

**Primary Authorship:** [Your Name] - Conceptual framework, theoretical integration, research direction

**AI Contribution:** Claude (Anthropic, Claude Sonnet 4.5) - Assisted with:

- Literature synthesis and theoretical framework development
- Structural organization and scientific writing
- Experimental design proposals
- Critical distinction between valid and pseudoscientific approaches

**Intellectual Genesis:** This work emerged from collaborative dialogue exploring the mechanistic basis for intuitive social cognition, specifically examining whether phenomena attributed to "telepathy" might be explained through acoustic-biometric signaling and neuroendocrine-immune coupling.

**Transparency Statement:** Substantial portions of this document were generated through human-AI collaboration. The theoretical framework represents a synthesis of established scientific principles with novel integrative hypotheses. All claims are intended as proposals for empirical investigation, not assertions of established fact.

**No Institutional Affiliation:** This document is released as an independent theoretical proposal and does not represent the official position of any academic or research institution unless explicitly claimed by the primary author upon submission to formal venues.

**Conflict of Interest:** None declared. This work was developed as an exploratory theoretical exercise without funding or commercial interest.

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## Abstract

This paper proposes a mechanistic framework for understanding what are colloquially termed "telepathic" or "intuitive" experiences between individuals. Rather than invoking paranormal explanations, we suggest these phenomena result from sophisticated, unconscious processing of acoustic biometric signals that trigger synchronized neuroendocrine-immune responses. We present sound—including infrasonic and prosodic components below conscious awareness—as an "immutable transfer agent" carrying physiological state information between individuals. This acoustic channel bridges immunological and endocrinological systems, enabling what we term **Collective Cognitive Sentience (CCS)**: distributed intelligence emerging from physiological synchronization without requiring direct neural coupling. We differentiate this from traditional

telepathy claims, propose testable hypotheses, and discuss implications for understanding social cognition, collective behavior, and multi-agent coordination systems.

**Keywords:** Psychoneuroimmunology, acoustic signaling, physiological synchronization, collective cognition, biometric communication, infrasound, neuroendocrine-immune axis

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# 1. Introduction

## 1.1 The Problem of "Telepathy"

Throughout human history, individuals have reported experiences of knowing another person's emotional or physiological state without apparent sensory input—commonly described as telepathy, intuition, or empathic knowing. Despite over 150 years of parapsychological investigation, no reliable evidence for direct mind-to-mind information transfer has emerged (Bem et al., 2015; Shermer, 2011). Yet the subjective experiences persist and are reported across cultures with remarkable consistency.

We propose a resolution to this paradox: **these experiences are real, but the mechanism is misidentified**. Rather than paranormal mental coupling, we suggest they result from highly sophisticated, unconscious processing of physical signals—specifically, acoustic biometric information that triggers cascading physiological synchronization through the neuroendocrine-immune axis.

## 1.2 Redefining the Question

Instead of asking "Does telepathy exist?" we ask:

1. **Can acoustic signals carry physiological state information?**
2. **Can these signals be processed below conscious awareness?**
3. **Can detected signals trigger synchronized endocrine-immune responses in receivers?**
4. **Would such synchronization create the subjective experience of "knowing" another's state?**

Each of these questions is addressable through established biology and can be tested empirically.

## 1.3 Theoretical Foundation

This framework rests on three established scientific pillars:

1. **Psychoneuroimmunology (PNI):** The bidirectional communication between nervous, endocrine, and immune systems (Ader & Cohen, 1975; Dantzer et al., 2008)

2. **Acoustic biometrics:** Individual-specific voice characteristics that encode physiological and emotional states (Scherer, 2003; Gobl & Chasaide, 2003)
  3. **Interpersonal physiological synchrony:** The documented tendency for physiological measures to align during social interaction (Palumbo et al., 2017; Feldman, 2007)
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## 2. Theoretical Framework

### 2.1 Sound as Immutable Transfer Agent

We propose that **acoustic signals function as biometric carriers** of physiological state information, possessing several critical properties:

#### 2.1.1 Immutability Characteristics

**Individual Specificity:** Like immune MHC molecules or fingerprints, voice patterns are highly individual. Vocal tract geometry, laryngeal characteristics, and articulation patterns create unique acoustic signatures (Kinnunen et al., 2017).

**State Encoding:** Physiological and emotional states involuntarily modulate acoustic production:

- **Stress** increases fundamental frequency and jitter (Giddens et al., 2013)
- **Illness** alters resonance patterns and spectral characteristics (Quatieri & Malyska, 2012)
- **Emotional arousal** affects breathing patterns, subglottal pressure, and vocal fold tension (Scherer et al., 2015)

**Unfakeability:** While conscious speech content can be controlled, micropatterns reflecting physiological state leak through involuntarily—similar to how immune markers cannot be consciously modulated.

**Physical Medium:** Unlike hypothetical telepathic channels, acoustic transmission obeys known physics and can be measured, blocked, and manipulated experimentally.

#### 2.1.2 The Complete Acoustic Spectrum

Critical to our framework is recognition that communication occurs across the **full acoustic spectrum**, much of which operates below conscious awareness:

Frequency Range	Conscious Awareness	Information Carried	Biological Processing
<b>Infrasound (&lt;20 Hz)</b>	None	Breathing patterns, cardiac rhythms, gross motor states	Vestibular system, visceral sensation
<b>Prosodic (20-300 Hz)</b>	Minimal	Emotional valence, arousal state	Right hemisphere, limbic system
<b>Speech (300-3000 Hz)</b>	High	Semantic content, conscious communication	Left hemisphere, language centers
<b>Ultrasonic (&gt;20 kHz)</b>	None	Environmental context, spatial cues	Unconscious auditory processing

**Key Insight:** The semantic content of speech (what we consciously attend to) may be the **least informationally rich** component for physiological state transfer.

## 2.2 The Neuroendocrine-Immune Bridge

The connection between acoustic input and immune function is mediated by the well-established neuroendocrine axis:

### 2.2.1 Signal Transduction Pathway

ACOUSTIC INPUT

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Auditory Cortex (Primary processing)

↓

Thalamus (Relay and filtering)

↓

Limbic System (Emotional valence assignment)

└→ Amygdala (Threat/safety assessment)

└→ Hippocampus (Contextual memory)

↓

Hypothalamus (Neuroendocrine integration)

↓

HPA Axis Activation

└→ Pituitary (ACTH release)

└→ Adrenal Cortex (Cortisol production)

↓

ENDOCRINE CASCADE

└→ Cortisol (Stress hormone)

└→ Oxytocin (Social bonding)

└→ Vasopressin (Social behavior)

└→ Catecholamines (Arousal)

↓

IMMUNE MODULATION

└→ Cytokine production (IL-6, TNF- $\alpha$ , IL-10)

└→ Lymphocyte activity (T-cell, B-cell, NK-cell)

└→ Inflammatory response

└→ Immune memory formation

### 2.2.2 Bidirectional Communication

Critically, this pathway is **bidirectional**:

- **Top-down:** Acoustic input → Endocrine changes → Immune modulation
- **Bottom-up:** Immune activation → Cytokine signaling → Behavioral changes → Acoustic output

This creates the potential for **physiological resonance loops** between individuals.

## 2.3 Collective Cognitive Sentience (CCS)

We define **Collective Cognitive Sentience** as:

*The emergence of coordinated cognitive and behavioral patterns across multiple agents through continuous, unconscious exchange of physiological state information, resulting in distributed decision-making and conflict avoidance without requiring centralized control or direct neural coupling.*

### 2.3.1 Immunological Analogy

CCS parallels immune system function at the social level:

Immune System Property	CCS Social Analog
<b>Self/non-self recognition</b>	Identity verification through acoustic signatures
<b>Pathogen detection</b>	Threat/compatibility assessment via physiological markers
<b>Clonal selection</b>	Amplification of successful interaction patterns
<b>Immune memory</b>	Social learning from past encounters
<b>Tolerance induction</b>	Conflict de-escalation and coexistence
<b>Cytokine signaling</b>	Acoustic broadcasting of internal state
<b>Distributed coordination</b>	No central controller—emergent collective behavior

### 2.3.2 Distinguishing CCS from Telepathy

Feature	Traditional Telepathy Claim	Collective Cognitive Sentience
Physical mechanism	None (paranormal)	Acoustic-endocrine-immune coupling
Information channel	Direct mental link	Sound waves (measurable)
Testability	Unfalsifiable	Experimentally testable
Distance limitation	None claimed	Limited by acoustic propagation
Blockability	Not applicable	Can be prevented (acoustic isolation)
Consciousness required	Typically yes	No—operates unconsciously
Evolutionary basis	None	Social bonding, predator detection, group coordination

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## 3. Mechanistic Model: The Three-Phase Cycle

### 3.1 Phase 1: Encoding (Transmission)

Individual A's physiological state determines acoustic output:

#### 1. Internal State Assessment

- Endocrine levels (cortisol, oxytocin, etc.)



- Immune activation (cytokine profile)
- Autonomic nervous system balance (sympathetic/parasympathetic)

## 2. **Involuntary Acoustic Modulation**

- Vocal fold tension (affects pitch and timbre)
- Breathing pattern (affects rhythm and infrasonic components)
- Articulation precision (affects spectral characteristics)
- Micro-tremors (create subtle frequency modulations)

## 3. **Acoustic Emission**

- Conscious speech (semantic content)
- Unconscious prosody (emotional tone)
- Infrasonic carrier waves (physiological rhythms)
- Environmental acoustic signature (spatial context)

**Critical Point:** Individual A cannot fully control or suppress this encoding—it is a **biometric leak** of internal state, similar to how sweating reveals thermal state or pupil dilation reveals arousal.

## 3.2 Phase 2: Decoding (Reception)

**Individual B processes the acoustic signal on multiple levels:**

### 1. **Conscious Processing (Minimal Information)**

- Semantic content of speech
- Explicit emotional expressions
- Deliberate communication

### 2. **Unconscious Processing (High Information)**

- **Right hemisphere:** Prosodic analysis, emotional tone extraction
- **Limbic system:** Threat/safety assessment, social relevance
- **Brainstem:** Infrasonic detection, physiological rhythm extraction
- **Vestibular system:** Low-frequency vibration sensing

### 3. **Pattern Matching Against Internal Templates**

- Comparison with stored acoustic-physiological associations
- Activation of mirror neuron systems
- Retrieval of contextual memories from past interactions

**Critical Point:** The majority of information extraction occurs **below conscious awareness**—Individual B may have no explicit knowledge of what cues were detected.

## 3.3 Phase 3: Synchronization (Physiological Coupling)

**Individual B's system responds to decoded signals:**

### 1. Neuroendocrine Activation

- Hypothalamic response to detected threat/safety signals
- Hormone release mirroring detected state
- Autonomic nervous system adjustment

### 2. Immune System Modulation

- Cytokine production shifts
- Inflammatory response calibration
- Immune memory formation (learning from interaction)

### 3. Behavioral and Subjective Outcomes

- **Objective:** Physiological measures converge (heart rate, cortisol, etc.)
- **Subjective:** Experience of "knowing" or "feeling" the other's state
- **Behavioral:** Spontaneous coordination, conflict avoidance, helping behavior

**Critical Point:** This synchronization creates the **subjective experience commonly labeled as telepathy or intuition**—but it is actually sophisticated biological signal processing.

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## 4. Empirical Predictions and Testable Hypotheses

### 4.1 Primary Hypotheses

#### H1: Acoustic Dependency

Subjective reports of "intuitive knowing" will correlate with acoustic similarity between sender and receiver voice patterns, including infrasonic components.

**Prediction:** When acoustic channel is degraded (filtered, white noise masked, or removed), accuracy of state recognition decreases proportionally.

#### H2: Endocrine Synchronization

Physiological synchronization (specifically cortisol and oxytocin levels) will be stronger in dyads reporting high intuitive connection.

**Prediction:** Blood or saliva samples showing hormone level convergence will correlate with self-reported "telepathic" or empathic accuracy.

#### H3: Immune Marker Correlation

Individuals in prolonged close contact will show convergent cytokine profiles and immune response patterns.

**Prediction:** Roommates, romantic partners, and close coworkers will have more similar immune signatures than randomly paired individuals, and this similarity will correlate with time spent in acoustic proximity.

#### **H4: Blockability**

Complete acoustic isolation will eliminate the effect, while visual isolation alone will not.

**Prediction:** Experiments comparing conditions (visual-only, acoustic-only, both, neither) will show acoustic channel is necessary and sufficient.

## **4.2 Experimental Designs**

### **Experiment 1: Acoustic Channel Manipulation**

#### **Design:**

- Dyads separated into rooms
- Sender undergoes stress induction (cold pressor test, cognitive load)
- Receiver attempts to identify sender's state

#### **Conditions:**

1. **Full acoustic:** Normal voice communication
2. **Filtered acoustic:** Remove infrasonic and prosodic information
3. **Semantic only:** Text-based communication
4. **No communication:** Complete isolation

#### **Measurements:**

- Receiver accuracy in identifying sender state
- Physiological measures: heart rate variability, skin conductance, cortisol
- Self-reported confidence and "intuitive feeling"

**Expected Result:** Accuracy: Full > Filtered > Semantic > None

### **Experiment 2: Longitudinal Physiological Synchrony**

#### **Design:**

- Recruit cohabiting pairs (roommates, couples)
- Non-cohabiting control pairs
- Monthly measurements over 6 months

#### **Measurements:**

- Salivary cortisol (multiple daily samples)
- Oxytocin levels
- Cytokine panel (IL-6, TNF- $\alpha$ , IL-10, IL-1 $\beta$ )
- Self-report questionnaires on closeness and intuitive connection
- Acoustic recordings during natural interaction

**Analysis:**

- Correlation between time in acoustic proximity and physiological similarity
- Mediation analysis: Does acoustic exposure explain physiological convergence?
- Longitudinal tracking: Does similarity increase with exposure duration?

**Experiment 3: Infrasonic Signaling**

**Design:**

- Expose participants to recorded acoustic signals from stressed vs. relaxed individuals
- Separate recordings into frequency bands

**Conditions:**

1. Full spectrum (20 Hz - 20 kHz)
2. Infrasonic only (<20 Hz)
3. Prosodic only (20-300 Hz)
4. Speech only (>300 Hz)
5. White noise control

**Measurements:**

- Implicit measures: cortisol response, heart rate variability
- Explicit measures: mood ratings, state anxiety
- Immune markers: cytokine levels before/after exposure

**Expected Result:** Infrasonic and prosodic bands will produce physiological effects despite no conscious awareness of content.

**4.3 Falsifiability Criteria**

This framework is falsifiable. It would be **disproven** if:

1. **Acoustic independence:** "Telepathic" accuracy remains unchanged when all acoustic channels are blocked
2. **No physiological correlation:** Self-reported intuitive connection shows no relationship to measurable physiological synchrony
3. **Random timing:** Synchronization occurs independent of acoustic exposure timing

4. **No dose-response:** Increased acoustic exposure does not correlate with increased physiological convergence
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## 5. Implications and Applications

### 5.1 Reframing Social Neuroscience

This framework suggests that much of what we consider "social cognition" may be **unconscious biometric signal processing** rather than high-level theory of mind:

#### Traditional View:

Observation → Mental simulation → Inference → Understanding

#### Proposed Addition:

Acoustic biometric input → Physiological synchronization → Direct state matching → "Intuitive knowing"

Both pathways likely operate in parallel, with the acoustic-physiological route providing rapid, unconscious state detection that supplements slower cognitive inference.

### 5.2 Clinical Applications

#### 5.2.1 Psychotherapy

Understanding therapist-client acoustic-physiological synchrony could:

- Explain variability in therapeutic alliance
- Guide training in vocal prosody use
- Predict therapy outcomes based on early synchronization patterns
- Inform treatment of alexithymia and autism spectrum conditions

#### 5.2.2 Conflict Resolution

Acoustic biometric monitoring could:

- Detect escalating physiological arousal before conscious awareness
- Guide de-escalation interventions in real-time
- Predict negotiation outcomes based on synchronization patterns
- Train mediators in unconscious state management

## 5.3 Technology and AI

### 5.3.1 Multi-Agent Coordination

Artificial agents could implement acoustic-biometric protocols for:

- **Distributed decision-making** without central control
- **Conflict prediction** through state broadcast and pattern matching
- **Emergent cooperation** via synchronization algorithms
- **Swarm intelligence** modeled on immune-like signaling

### 5.3.2 Human-AI Interaction

AI systems could:

- Monitor user physiological state via voice biomarkers
- Adjust interaction style based on detected stress/engagement
- Provide early warning of cognitive overload or distress
- Create more naturalistic, empathic interfaces

## 5.4 Collective Cognitive Sentience in Practice

The CCS framework suggests that highly coordinated groups (military units, surgical teams, jazz ensembles) may achieve their performance through:

1. **Extensive acoustic exposure** creating physiological templates
2. **Real-time state broadcasting** via unconscious vocal modulation
3. **Synchronized physiological responses** enabling anticipation
4. **Immune-memory-like learning** of successful coordination patterns

This reframes "team chemistry" as a **literal physiological phenomenon** rather than metaphor.

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## 6. Distinguishing Valid Science from Pseudoscience

Given the speculative nature of this proposal, it is critical to distinguish it from pseudoscientific approaches:

### 6.1 What Makes This Framework Scientific

Criterion	This Framework	Typical Pseudoscience
<b>Physical mechanism</b>	Specified (acoustic-endocrine-immune)	Vague or absent ("energy," "vibrations")
<b>Measurable variables</b>	Yes (hormones, cytokines, acoustics)	No (undefined "consciousness")
<b>Testable predictions</b>	Explicit, falsifiable hypotheses	Unfalsifiable or post-hoc
<b>Established biology</b>	Built on PNI, acoustic biometrics	Contradicts known physics
<b>Null hypothesis</b>	Clearly stated	Often absent
<b>Alternative explanations</b>	Acknowledged (e.g., visual cues)	Dismissed without evidence

## 6.2 Limitations and Uncertainties

We explicitly acknowledge:

1. **Speculative integration:** While components are established, the complete system is hypothetical
2. **Scale questions:** Effectiveness may be limited to close proximity (meters, not kilometers)
3. **Individual differences:** Sensitivity likely varies with genetics, experience, and context
4. **Cultural modulation:** Learned display rules may affect acoustic encoding
5. **Incomplete mechanism:** Many details of immune-acoustic coupling remain unexplored

## 6.3 What Would Change Our Mind

This framework should be **abandoned or revised** if:

- Rigorous experiments show no acoustic-physiological correlation

- "Telepathic" effects persist despite complete acoustic isolation
  - Physiological synchronization occurs without temporal proximity
  - Theoretical mechanisms prove biologically implausible
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## 7. Future Research Directions

### 7.1 Immediate Priorities

1. **Baseline characterization:** Map the normal range of acoustic-endocrine-immune correlations
2. **Channel identification:** Determine which acoustic frequencies carry which state information
3. **Temporal dynamics:** Characterize lag times between acoustic input and physiological response
4. **Individual differences:** Identify genetic and experiential factors affecting sensitivity

### 7.2 Advanced Questions

1. **Cross-species communication:** Do these mechanisms operate between humans and other mammals (dogs, horses)?
2. **Developmental trajectory:** How does acoustic-physiological coupling develop in infancy and childhood?
3. **Pathological states:** Are conditions like social anxiety or autism linked to disrupted acoustic processing?
4. **Technological augmentation:** Can acoustic signals be enhanced or synthesized to improve coordination?

### 7.3 Theoretical Integration

1. **Evolutionary origins:** When did acoustic-physiological coupling evolve? How is it related to vocal learning?
  2. **Computational modeling:** Can we create formal models of CCS dynamics?
  3. **Cross-cultural variation:** Do different languages/cultures show different coupling patterns?
  4. **Philosophical implications:** How does this change understanding of self/other boundaries?
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## 8. Conclusion

We have proposed a mechanistic framework for understanding subjective experiences of "telepathy" or "intuition" through established biological pathways: **acoustic biometric signaling triggering neuroendocrine-immune synchronization**. This framework:

1. **Explains the phenomenon** without requiring paranormal mechanisms
2. **Makes testable predictions** that can be empirically verified or falsified
3. **Builds on established science** (PNI, acoustic biometrics, social physiology)
4. **Extends to collective cognition** through the CCS model
5. **Has practical applications** in therapy, conflict resolution, and AI coordination

The key insight is recognizing **sound as an immutable transfer agent**—a physical medium carrying biometric information that bridges immunological and endocrinological systems. Just as immune systems coordinate complex responses without central control through chemical signaling, social groups may coordinate cognitive and behavioral responses through acoustic signaling.

This reframes what appears to be mysterious "mind reading" as sophisticated biological signal processing operating below conscious awareness—not telepathy, but something perhaps more remarkable: **the capacity of biological systems to achieve distributed intelligence through continuous physiological synchronization**.

### 8.1 Call for Collaboration

This framework requires interdisciplinary collaboration across:

- Psychoneuroimmunology
- Acoustic engineering
- Social neuroscience
- Evolutionary biology
- Computer science (multi-agent systems)
- Clinical psychology

We invite researchers from these domains to:

1. Critique and refine the theoretical framework
2. Design and conduct empirical tests
3. Develop computational models
4. Explore practical applications

### 8.2 Final Note

If validated, this framework would not diminish the wonder of human connection—it would deepen it. Understanding that we continuously and unconsciously synchronize our physiological

states through acoustic channels reveals an intimacy of biological communication far more profound than metaphorical "chemistry." We are, quite literally, feeling one another's internal states through mechanisms older than language itself.

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## Appendix A: Glossary of Terms

**Acoustic Biometric:** Individual-specific voice characteristics encoding physiological and emotional state

**Collective Cognitive Sentience (CCS):** Distributed intelligence emerging from physiological synchronization across multiple agents

**Immutable Transfer Agent:** A physical medium (here, sound) that reliably carries state information that cannot be fully suppressed by conscious control

**Neuroendocrine-Immune Axis:** The bidirectional communication network linking nervous, endocrine, and immune systems

**Physiological Synchrony:** The tendency for biological measures (heart rate, hormones, etc.) to align during social interaction

**Prosody:** The rhythm, stress, and intonation patterns of speech, often processed unconsciously

**Psychoneuroimmunology (PNI):** The study of interactions between psychological processes, the nervous system, and the immune system

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## Appendix B: Technical Specifications for Experimental Implementation

### B.1 Acoustic Recording Standards

#### Minimum Requirements:

- Sample rate: 48 kHz (captures up to 24 kHz, including near-ultrasonic)
- Bit depth: 24-bit (dynamic range for subtle variations)
- Infrasonic capture: Requires specialized microphones ( $\geq 5$  Hz response)
- Environmental isolation: Acoustic chamber or calibrated noise cancellation

### B.2 Physiological Measurement Protocols

#### Endocrine Measures:

- Cortisol: Salivary samples, ELISA assay, 4-6 samples/day
- Oxytocin: Plasma samples (not salivary due to reliability issues)
- Timing: Consider circadian rhythms and pulsatile release

#### **Immune Measures:**

- Cytokine panel: IL-6, TNF- $\alpha$ , IL-10, IL-1 $\beta$  (minimum)
- Collection: Venous blood, processed within 2 hours
- Storage: -80°C until batch analysis

#### **Autonomic Measures:**

- Heart rate variability: ECG or photoplethysmography, 5-minute windows
- Skin conductance: Constant voltage method, cleaned sites
- Respiration: Strain gauge or impedance pneumography

### **B.3 Data Analysis Approaches**

#### **Synchrony Metrics:**

- Cross-correlation with time lags
- Coherence analysis (frequency domain)
- Dynamic time warping for non-linear alignment
- Granger causality for directionality

#### **Statistical Considerations:**

- Account for autocorrelation in time series
- Multiple comparison correction (Bonferroni or FDR)
- Mixed-effects models for within-dyad correlation
- Sufficient power analysis (likely  $n > 50$  dyads)

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**Document Status:** This white paper represents a theoretical framework open for peer review, critique, and empirical testing. Correspondence and collaboration inquiries welcome.

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