

Force, Field, and Inertial Mass in Source Credibility

A Field-Theoretic Reanalysis of the Nurses vs. Congress Experiment

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ABSTRACT

Traditional persuasion theory holds that messages delivered by less credible sources produce weaker attitude change. A multidimensional Galileo measurement study comparing nurses (high credibility) and members of Congress (low credibility) found instead that both conditions produced nearly identical magnitudes of semantic motion, but in different directions.

We extend this finding using a field-theoretic model of semantic motion incorporating message force, semantic field gradients, and inertial mass estimated from frequency of occurrence. Results suggest that source credibility effects arise primarily from directional differences in multidimensional semantic space rather than differences in persuasive force magnitude.

These findings, together with recent analyses of synonym inertia, perpendicular semantic motion, and convergence dynamics, support a general dynamical model of semantic motion.

1. INTRODUCTION

Source credibility has long been considered a central determinant of persuasion. Classical theory predicts that high-credibility sources should produce stronger persuasion than low-credibility sources.

However, multidimensional Galileo measurement suggests a different interpretation. In the Nurses vs. Congress experiment, both sources produced nearly identical total semantic motion, but in different directions.

This observation is inconsistent with scalar persuasion models but is predicted by vector-field models of semantic motion.

2. ORIGINAL FINDINGS

Participants evaluated concepts including:

- Nurses
- Members of Congress
- Beneficial
- Attractive
- HCRA
- Trustworthy
- Reliable
- Yourself

Messages:

High credibility:

"Health Care Reform Act is beneficial and attractive according to nurses"

Low credibility:

"Health Care Reform Act is beneficial and attractive according to members of congress"

Observed motion:

Condition HCRA Motion

Nurses 41.28

Congress 36.37

Total message-component motion:

Condition Total Motion

Nurses 102.05

Congress 100.42

Nearly identical magnitudes.

Thus:

Low credibility does not reduce motion magnitude.

Instead, motion direction differs.

3. VECTOR INTERPRETATION

Message vectors:

High credibility:

$$F_{\text{nurses}} = x_{\text{beneficial}} + x_{\text{attractive}} + x_{\text{nurses}}$$

Low credibility:

$$F_{\text{congress}} = x_{\text{beneficial}} + x_{\text{attractive}} + x_{\text{congress}}$$

Thus:

Magnitude similar

Direction different

Observed correlations:

- Nurses: $r = .703$
- Congress: $r = .648$

Both significant.

4. FIELD EFFECTS

Control space structure:

Nurses located near:

- trustworthy
- health
- self

Members of Congress located near:

- unreliable
- untrustworthy

Thus:

$Bx_{\text{nurses}} \rightarrow$ positive semantic region

$Bx_{\text{congress}} \rightarrow$ negative semantic region

This produces directional divergence.

5. INERTIAL MASS

Google Ngram estimates:

Concept Frequency

Nurses .00197

Congress .000356

Relative mass:

$m_{\text{nurses}} = 1$

$m_{\text{congress}} = 0.18$

However:

"Members of Congress" likely increases effective mass.

Observed motion:

Concept Motion

Nurses 17.69

Congress 2.67

Thus:

Members of Congress shows greater effective inertia.

6. FIELD–FORCE MODEL

Combined model:

$$\Delta x_i = (1/m_i)(F_{msg} + Bx_i)$$

Where:

- Message provides force
- Field provides constraint
- Mass provides inertia

Predictions:

- Similar total motion
- Different directions
- Differential concept movement

All observed.

7. CONSERVATION OF SEMANTIC MOTION

Total motion:

Nurses = 102.05

Congress = 100.42

Near equality suggests:

$\Sigma |\Delta x| \approx \text{constant}$

This resembles conservation-like behavior in semantic systems.

8. RELATION TO OTHER STUDIES

Pigs in Space:

- Frequency predicts inertia
- Magnitude varies

Perpendicular Motion:

- Field topology constrains motion
- Dense regions deflect movement

Convergence:

- Long-term field dynamics

Nurses vs Congress:

- Direction varies
- Magnitude constant

Together:

Mass \rightarrow magnitude

Field \rightarrow direction

Dynamics \rightarrow trajectory

Unified semantic mechanics emerges.

9. GENERAL MODEL

Semantic motion:

$$\Delta x = (1/m)(F_{\text{msg}} + F_{\text{field}})$$

Where:

- Message generates force
 - Field generates topology
 - Frequency generates inertia
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10. CONCLUSION

The Nurses vs. Congress study shows:

- Low credibility does not reduce persuasion magnitude
- Credibility alters direction of semantic motion
- Frequency influences inertial resistance
- Field effects determine trajectory

These findings support a general dynamical theory of semantic motion.

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