Variance Component Analysis of Intergroup Responses

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Group Formation

Group formation: an adaptive evolutionary advantage

- safety
- task allocation and specialization
- close relationships
- mating opportunities
- a collective social identity
- a common fate

Subgroup Formation

- a subgroup may be more functional (committee within a department)

- subgroups separated in space (students in school A and B)

- subgroups with visible physical differences (Black and White)

- subgroups with invisible physical differences (HIV + or -)

- subgroups based on ability (Jesus or Mary reading group)

- subgroups with power differences (wealthy and poor nations)

Assumptions

In one of Donald Campbell's last papers (Heylighen & Campbell, 1995) he reiterated:

- powerful groups claim desirable resources at the expense of the less powerful

- "It is axiomatic that group formation provides an in-group advantage that also breeds intergroup conflict" (Malloy, 2008).

Research Designs for Studying Subgroups

Asymmetric Block

	Subgroup A		Subgroup B	
	a_1	a_2	b_1	b_2
a_1			x	x
a_2			x	x
b_1	x	x		
b_2	x	x		

Reciprocal Trait Judgments of Subgroups: Member i of Group I and j of Group J at occasion k

$$X_{ij} = \mu_k + \alpha_i + \beta_j + \gamma_{ij} + \varepsilon_{ij} \quad \text{(Equation 1)}$$

$$X_{ji} = \mu_k + \alpha_j + \beta_i + \gamma_{ji} + \varepsilon_{ji} \quad \text{(Equation 2)}$$

Interpretation of Effects

μ is the grand mean of judgments at occasion k

α consistency of trait judgments of multiple out-group members – reflects a lack of differentiation of traits (***Perceiver Effect)***

β agreement in trait judgments when in-group members judge out-group members (***Target Effect***)

γ Unique response by an in-group member to an out-group member (***Relationship Effect***)

ε random error

Individual Difference Variance Components in Intergroup Behavior

Variance Component	*Type of Individual Difference*
Actor (α)	Individual differences in behavior of in-group members that is consistent across multiple out-group partners
Partner (β)	Individual differences in behavior of in-group members elicited consistently from multiple out-group partners
Relationship (γ)	Individual differences in behavioral responses of in-group members to specific out-group partners

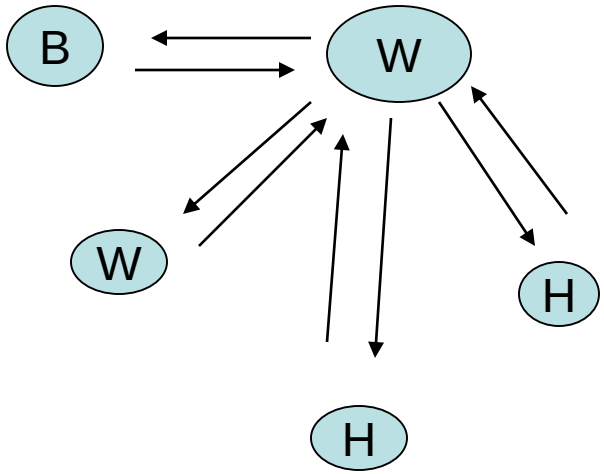
Cross-Situational Consistency of Individual Differences

Cross-Situational Consistency	***Psychological Meaning***
Actor Effect ----------	Extent to which behavior emitted consistently by in-group members with a set of out-group members within time is consistent over time
Partner Effect ----------	Extent to which behavior elicited consistently from a set of out-group partners within time is consistent over time
Relationship Effect----------	Extent to which unique responses by a specific in-group member to a specific out-group partner within time are consistent over time

One-With-Many Design with Reciprocal Measurements

Teachers' liking for students and students' liking of the teachers

White and Black physicians' responses to White, Black and Hispanic patients and patients' reciprocal responses to the physicians.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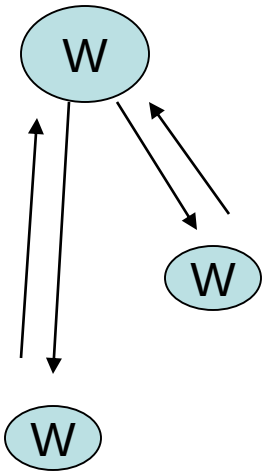
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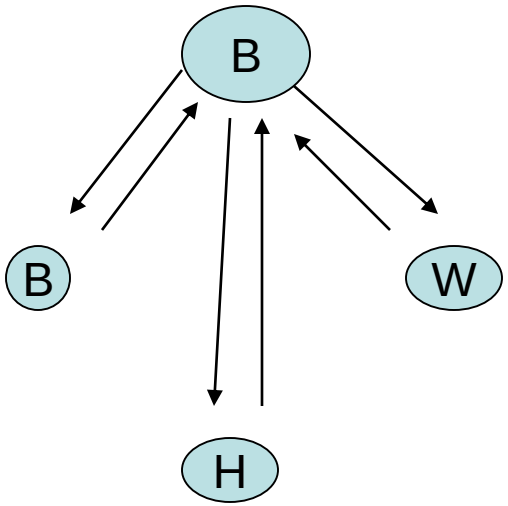
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Estimable Parameters

White physician i's liking for Black patient j yielding X_{ij} and that patient's liking rating of this physician yielding X_{ji}

$$X_{ij} = \mu + \alpha_i + \varepsilon_{ij} \quad \text{(Physician Equation)}$$

$$X_{ji} = \mu + \beta_i + \varepsilon_{ji} \quad \text{(Patient Equation)}$$

Interpretation of Physician Effects

$X_{ij} = \mu + \alpha_i + \varepsilon_{ij}$ (Physician Equation)

μ is the average liking of patients by physicians

α_i is physician i's general liking for patients (i's perceiver effect)

ε_{ij} is error of measurement and physician i's unique liking of patient j

Interpretation of Patient Effects

$X_{ji} = \mu + \beta_i + \varepsilon_{ji}$ (Patient Equation)

μ is the average liking of physicians by patients

β_i is patients' general liking for physician i (i's target effect)

ε_{ji} is error of measurement and patient j's unique liking of physician i

Dyadic Reciprocity

covariance of ε_{ij} and ε_{ji} estimates dyadic reciprocity (attenuated by error) of liking – if i uniquely likes j does j uniquely like i

Generalized Reciprocity

covariance of α_i and β_i – is a physician who generally likes patients liked by them

Round Robin Design

Initiation of Face to Face Meetings by World Leaders at the 1960 Meeting of the United Nations General Assembly

	C	*Na*	*T*	*Ne*	*K*	*Nk*	*M*	*E*
Castro (Cuba)	—	1	0	1	1	1	0	0
Nasser (Egypt)	1	—	3	1	2	1	0	1
Tito (Yugoslavia)	0	0	—	1	2	0	0	1
Nehru (India)	1	1	2	—	2	1	1	1
Khrushchev (Soviet Union)	1	0	0	1	—	0	0	0
Nkrumah (Ghana)	0	0	1	1	3	—	0	1
Macmillan (England)	0	1	1	0	1	1	—	1
Eisenhower (United States)	0	0	0	0	0	0	0	—

Initiation of Face to Face Visits by Leaders A and B

$$X_{ab} = \mu + \alpha_a + \beta_b + \gamma_{ab} + \varepsilon \quad (1)$$

$$X_{ba} = \mu + \alpha_b + \beta_a + \gamma_{ba} + \varepsilon \quad (2)$$

α estimates consistency of approach

β estimates consistency of being approached

γ estimates approach to a specific other leader

ε estimates random error

	Variance Components		
	Actor	Partner	Uniqueness/Error
Face to Face Meetings	.24	.22	.54

Reciprocity Correlations

Generalized	-.14
Dyadic	-.28

Power, Approach, and Avoidance

Power can be defined as the difference between approach and avoidance

$$P_i = \beta_i - \alpha_i$$

P_i is leader i's power and defined as the difference between being approached (β_i) and the initiation of approach (α_i).

+P is more power

-P is less power

P = 0 is equal power

Leader Power

Most Powerful Leaders

Krushchev 1.13

Eisenhower .63

Least Powerful Leaders

Nassar -.75

Nehru -.50

Macmillan -.50

Idiographic variance component analysis

Estimate idiographic (within person) variances

1) aggregate across persons

2) use effect estimates or variance components as individual difference measures in subsequent analyses

Example

Teachers are asked to generate types of students they encounter in their classes (e.g., serious, unsure, athletic, popular, boy-crazy)

Each type is rated on a set of traits or affect is measured

Idiographic Data Structure

		Personality Factors				
		1	2	3	4	5
Types	A	x	x	x	x	x
	B	x	x	x	x	x
	C	x	x	x	x	x
	D	x	x	x	x	x
	E	x	x	x	x	x

Idiographic Model Within Teacher

Teacher rating of a category type t (i.e., student) on a personality factor p yielding X_{tp}

$$X_{tp} = \mu + \alpha_t + \beta_p + \gamma_{tp} + \varepsilon$$

μ is the teachers average rating of types across all traits

α_t is the effect of the category type

β_p is the effect of a trait

γ_{tp} is the type by trait factor interaction effect

ε is error of measurement

Analysis

Each teacher generates a matrix with dimensions of types by trait factors

Estimate type variance, factor variance, and interaction variance components

Idiographic Variance Components

Variance Component	*Psychological Interpretation*
Category Type	the differentiation of the types on a set of traits
Personality Trait	the differentiation among traits when rating the set of types
Type x Trait	unique rating of a specific type on a specific trait

Example Experiment: Blacks and Whites generate Black and White Types that are Rated on Traits

	Race of Judge					
	Blacks			Whites		
	Target Category			Target Category		
	Black		White	Black		White
Type Variance	19.37	=	17.39	9.31	<	19.08
Factor Variance	2.79	=	2.86	2.28	=	1.79

Entries are average variance components in a 10 point metric.

< (t (26) = 2.06, p = .025, d = .81)

Summary

- Intergroup Responses are ubiquitous and consequential in daily social life
- Standard and novel designs can be integrated (e.g. factorial design and variance component analysis) to address a broad range of theoretical questions at multiple levels of analysis
- Variance component analysis is a general statistical method that provides precise estimates of phenomena that remain confounded if the focus is only on means