

# Applying the Axioms of Additive Conjoint Measurement to a Hierarchy of Latent Variable Models

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# Score scales and latent structure

different models, score scales, inferences, individual differences

# A tale of two methods

Torres Irribarra and Diakow – framework / hierarchy of latent variable models according to latent structure / implied/supportable scale (qualitative, ordinal, interval), check using standard model fit indices

Domingue – whether data consistent with the Rasch model possessed sufficient structure, according to the axioms of Additive Conjoint Measurement (ACM; Luce & Tukey, 1964), to support a score scale with interval properties

# A hierarchy of latent variable models

[equations]

[figures]

# Additive conjoint measurement (ACM)

ACM is [unclear to me]

axioms: cancellation, solvability, archimedes

# Cancellation axioms

[set of matrices used to explain]

# Applying the axioms of ACM

Domingue method to check cancellation axioms – estimate credible intervals with relevant cancellation constraints and check if observed data within interval

Previously applied to Rasch model

[new figure showing relationship of hierarchy to axioms]





# Hypotheses

1. UN model – most violations
2. symmetry between MON and IIO models
3. order: MON / IIO, DM, LCR / RM

If hold, straightforward criteria to distinguish latent structure

# Simulation design

generate data under each of six models

1000 people in 6 latent classes and 50 items in 6 latent groups

50 replications for each model

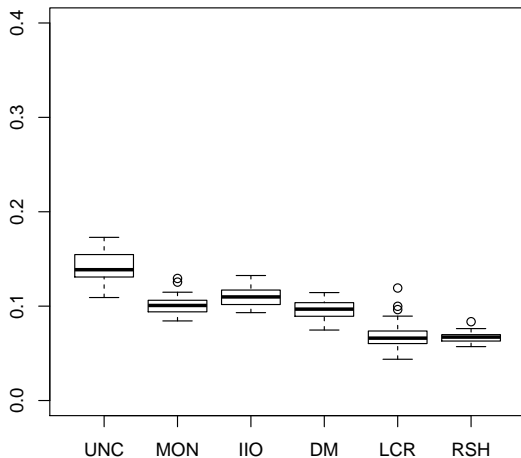
# Analysis

ConjointChecks, each single cancellation and double cancellation  
% weighted violations

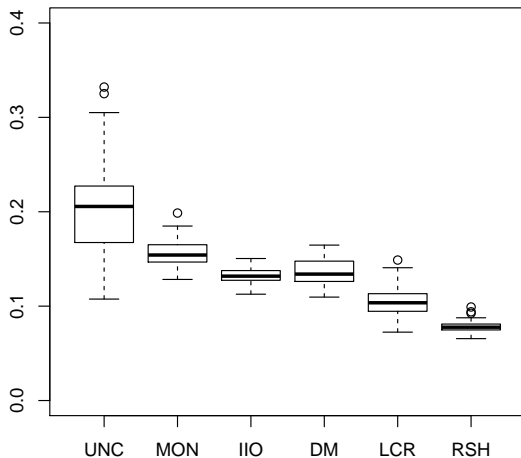
# Double cancellation

[include figure]

# Single cancellation – Person ordering



# Single cancellation – Item ordering



# Person monotonicity versus item ordering

precision / aggregation

how this simulation is different from how we usually treat persons and items



# Reconsidering double cancellation

# Further thoughts

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## Appendix Slides