Moderated Mediation for Integrating Between X Within-Subject Designs

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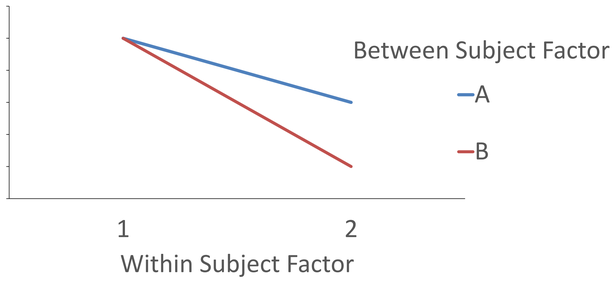
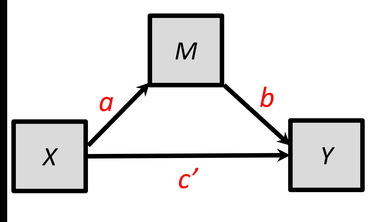
Introduction

Researchers commonly use a combination of **within- and between-subject factors** for experimental studies. Using ANOVA to test the impact of these factors on an outcome.

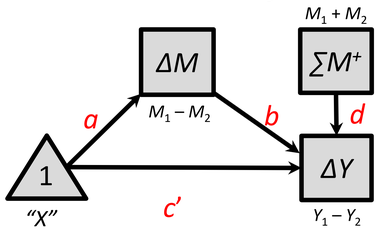


Mediation analysis is commonly used to investigate **mechanisms** of causal effects and is available for both between and within-subject designs.

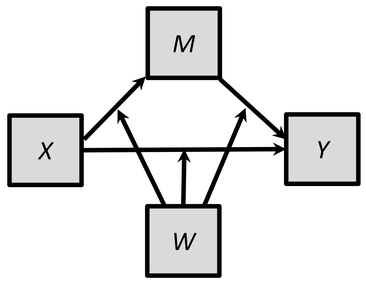
Between-Subject



Within-Subject



With two between-subject factors researchers can use **moderated mediation**, to investigate if the proposed mechanism of one factor is moderated by the second factor.



This model and others like it can be fit using the PROCESS macro for SPSS and SAS, as well as packages in R

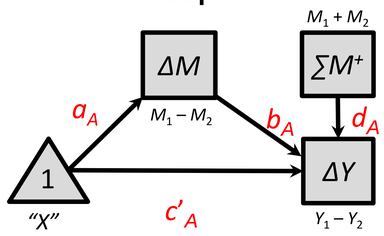
When researchers have a mix of within-subjects and between-subject factors, existing tools are not able to fit moderated mediation models.

Moderated Mediation Models (Within X Between)

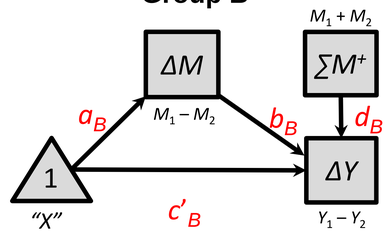
One could split the data, estimating the mediation model for each group.

Research Question: Are the estimated parameters the same across groups?

Group A



Group B

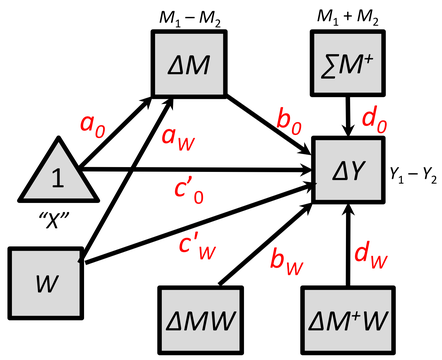


A single model can be estimated where the coefficients are the differences between the coefficients from the two group specific models.

$$\Delta M_i = a_0 + a_W W_i + e_{Mi}$$

$$\Delta Y_i = c'_0 + c'_W W_i + b_0 \Delta M_i + b_W \Delta M_i W_i + d_0 \Sigma M_i^+ + d_W \Sigma M_i^+ W_i + e_{Yi}$$

Combined Model



+ indicates group-mean centered

Group A/B		Combined Model
a_A		a_0
a_B	=	a_0+a_W
b_A	=	b_0
b_B	=	b_0+b_W
c'_A	=	c'_0
c'_B	=	$c'_0+c'_W$
$a_A b_A$	=	$a_0 b_0$
$a_B b_B$	=	$(a_0+a_W)(b_0+b_W)$
a_B-a_A	=	a_W
b_B-b_A	=	b_W
c'_B-c'_A	=	c'_W
$a_B b_B$-$a_A b_A$	=	$a_0 b_W + a_W(b_0+b_W)$

Hypothesis tests on a_W, b_W, and c'_W indicate whether these coefficients differ across groups.

A hypothesis test for $a_0 b_W + a_W(b_0+b_W)$ indicates whether the indirect effects differ across groups. Because this coefficient involves a product of coefficients, bootstrapping or other non-parametric methods should be used for conducting this test.

MEMORE: Mediation and Moderation for Repeated-Measures

MEMORE is a macro for SPSS and SAS available at *akmontoya.com* that will estimate mediation models, moderation models, and (coming soon!) moderated mediation models, where the focal predictor of interest is a within-subjects or repeated-measures factor.

Model Specification: After running the syntax file, a simple command can be used to run a within X between moderated mediation analysis.

```
MEMORE Y=Y1 Y2/M=M1 M2/W=Group/model=4.
```

This command would estimate the combined model as displayed, including all coefficient estimates, total, indirect, and direct effects for each group, and tests comparing total, direct, and indirect effects across groups using percentile bootstrap confidence interval based on 5,000 bootstrap samples.

EXAMPLE OUTPUT

Some options:

- Inferential methods for the indirect effect
  - Percentile bootstrap confidence interval
  - Bias-corrected bootstrap confidence interval
  - Monte Carlo confidence interval
  - Normal theory tests (i.e. Sobel test)
- Confidence level
- Number of resamples
- Save bootstrap or Monte Carlo coefficients

Conclusion

Recent years have seen expansion of methods for mediation and moderation for within-subject designs. Now moderated mediation can integrate within- and between-subject designs.

MEMORE is an easy to use tool for SPSS and SAS which can fit these models as well as mediation and moderation separately.

Future work should expand to

- More than two levels of each variable
- More complex outcomes (e.g., ordinal or dichotomous)
- Within- by within-designs

This poster

Quantitative Research Collaboratory

Email to be a Beta Tester for MEMORE
Contact: akmontoya@ucla.edu