

MEMORE V3 Beta Release

What's New? What's Changed?

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Playlist Outline

- ❖ Introduction to MEMORE and Version 3
- ❖ How to Install MEMORE
- ❖ Model Templates
- ❖ Moderated Mediation Models
- ❖ Understanding plots of conditional effects
- ❖ Wrapping Up

What is MEMORE?

- ❖ MEMORE (MEdiation and MOderation for REpeated measures designs)
- ❖ Macro for SPSS and SAS
 - ❖ SPSS has both syntax and dialog box functions
- ❖ Used for models with continuous mediators and outcome variables
- ❖ Uses difference scores to model the impact of a repeated measures factor on an outcome

What's New?

- ❖ Models 4 – 18 have been added which incorporate moderators into simple or parallel mediation
- ❖ Smarter mean centering
 - ❖ center = 0 (does not center moderators)
 - ❖ center = 1 (center all moderators)
 - ❖ center = 2 (center non-dichotomous moderators)

What's Changed?

- ❖ Bias-corrected bootstrap confidence intervals are no longer available (bc option)
- ❖ Fixed incorrect standard error estimation for serial mediation models

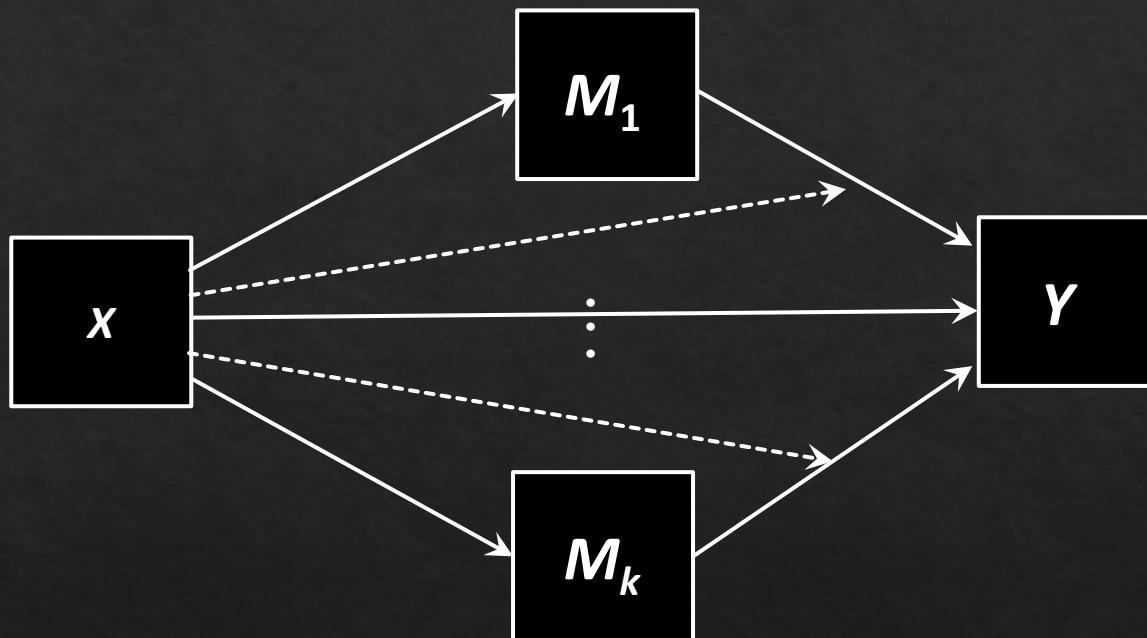
Installing MEMORE

- ❖ MEMORE can be installed 3 different ways:
 - ❖ Syntax in SPSS
 - ❖ Dialog Box in SPSS
 - ❖ Syntax in SAS

Template System

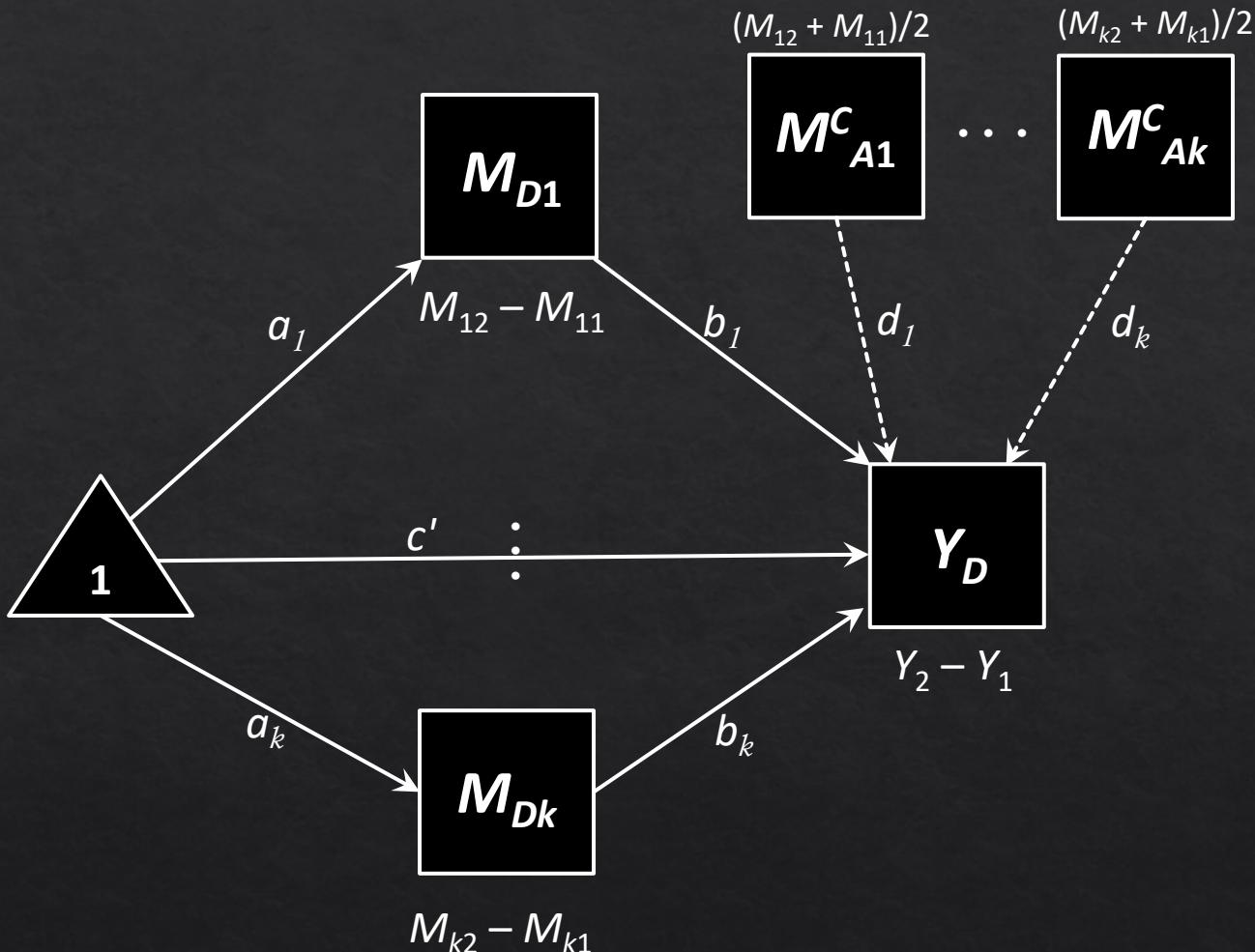
- ❖ Each model number in MEMORE is described with a model template:
 - ❖ Model 1: Mediation
 - ❖ Model 2 – 3: Moderation
 - ❖ Model 4 – 18: Moderated Mediation

Model 1 (Conceptual)



subscript k indicates pairs of mediators. Models can have up to 5 pairs of mediator
Dashed lines can be removed from model by using `xmint = 0`.

Model 1 (Statistical)

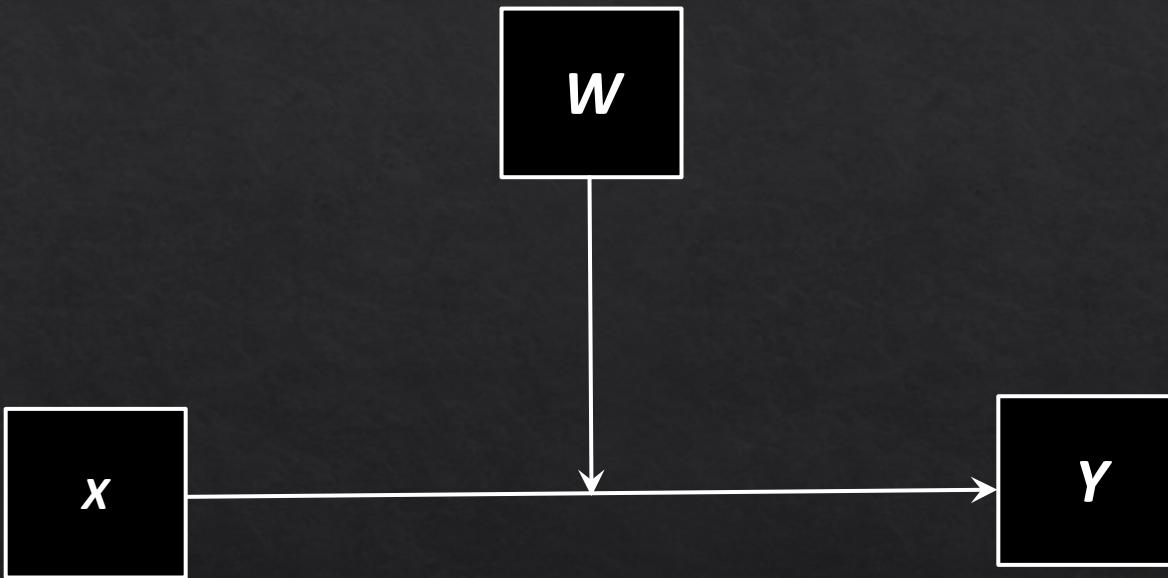


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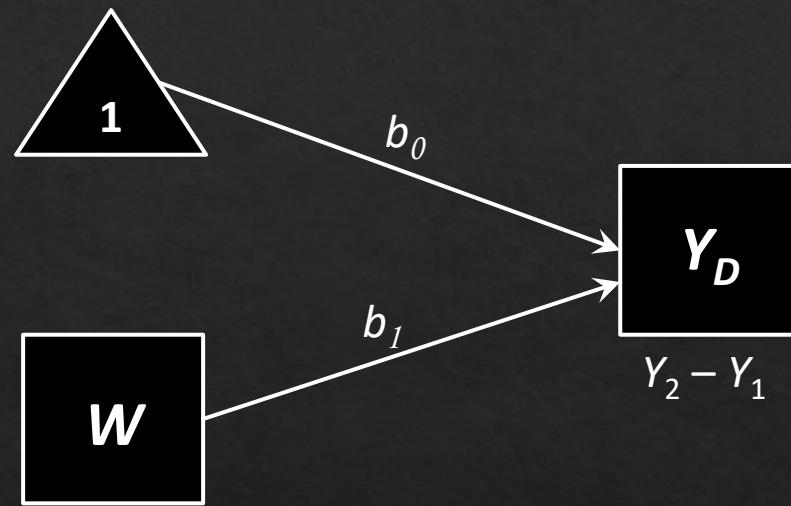
^c Indicates grand mean centered

Dashed lines can be removed from model by using `xmint = 0`.

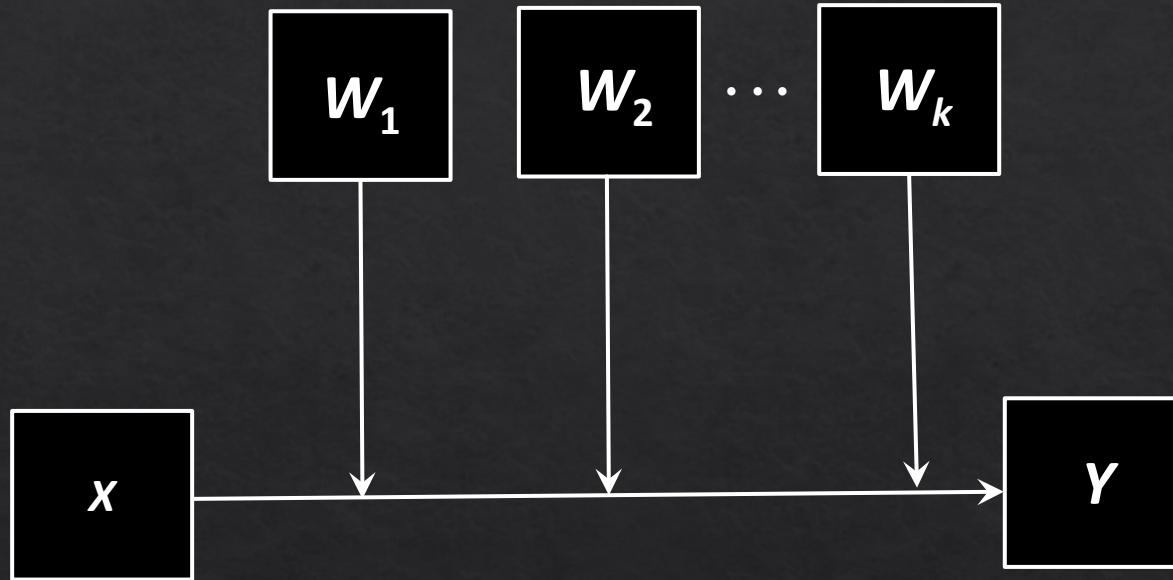
Model 2 or 3 with One Moderator (Conceptual)



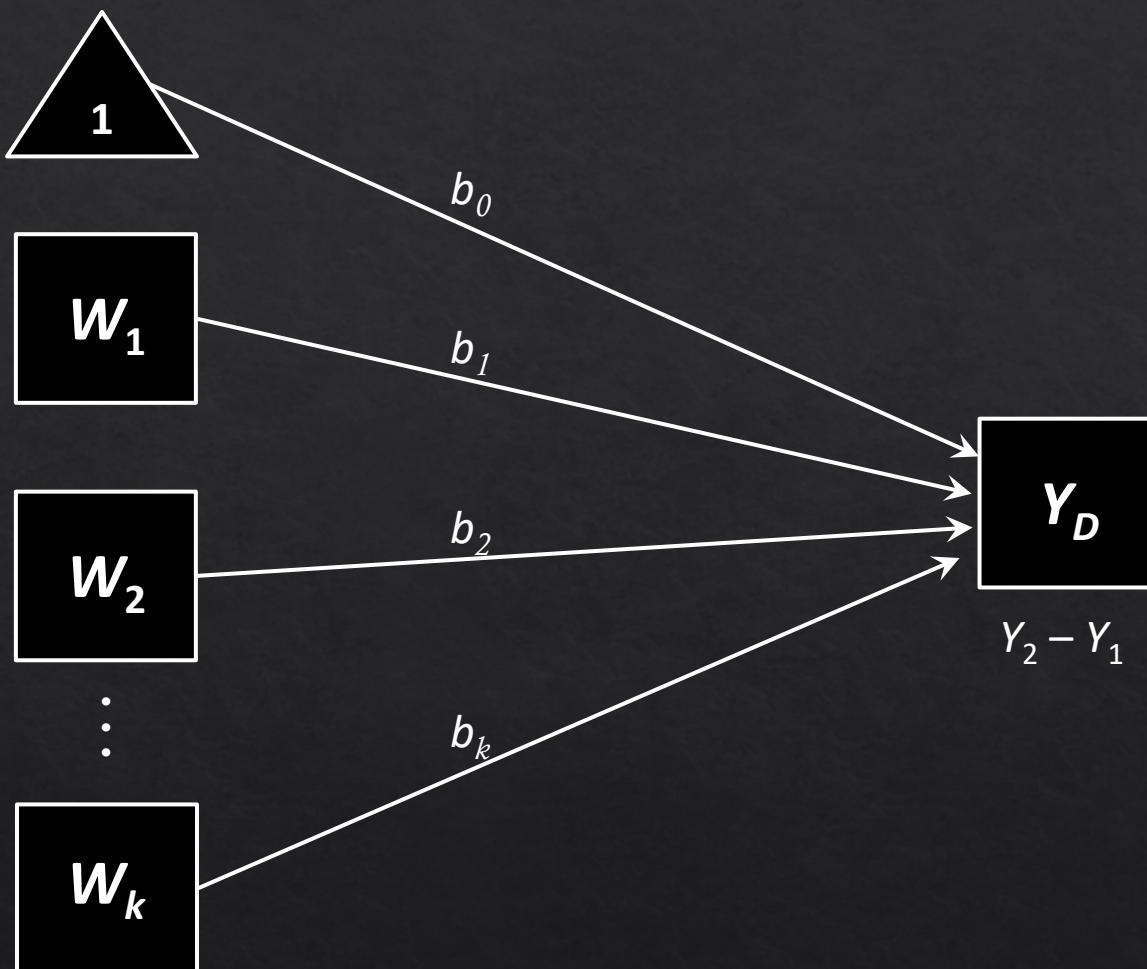
Model 2 or 3 with One Moderator (Statistical)



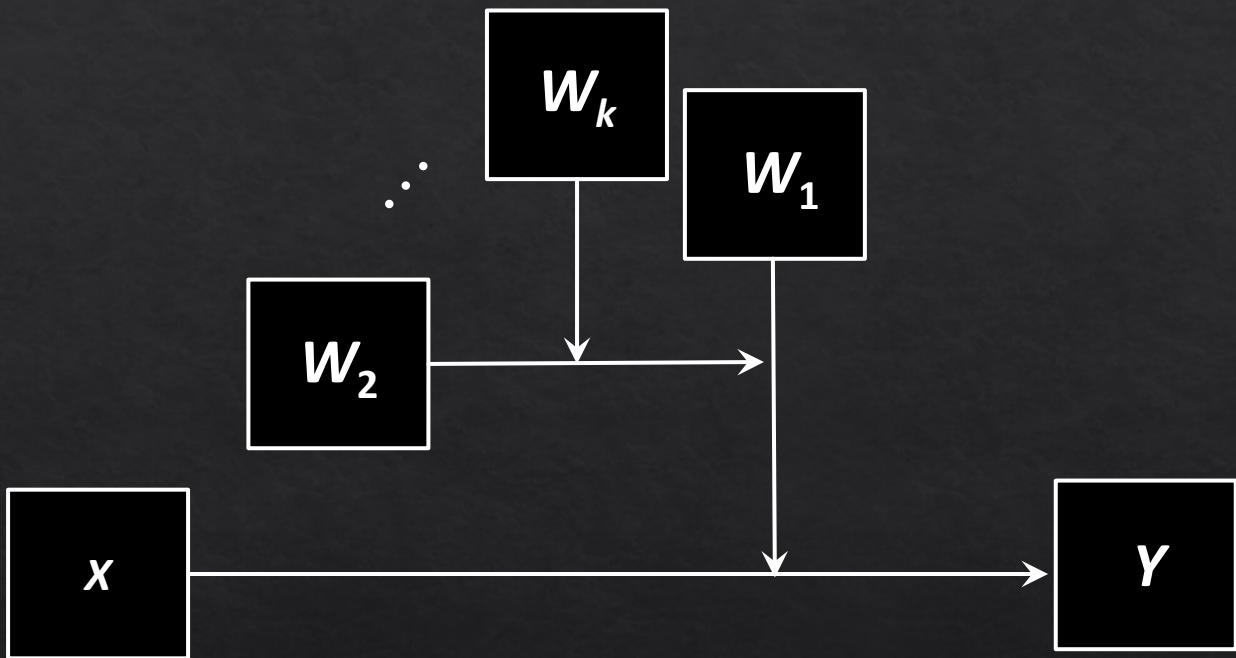
Model 2 (Conceptual)



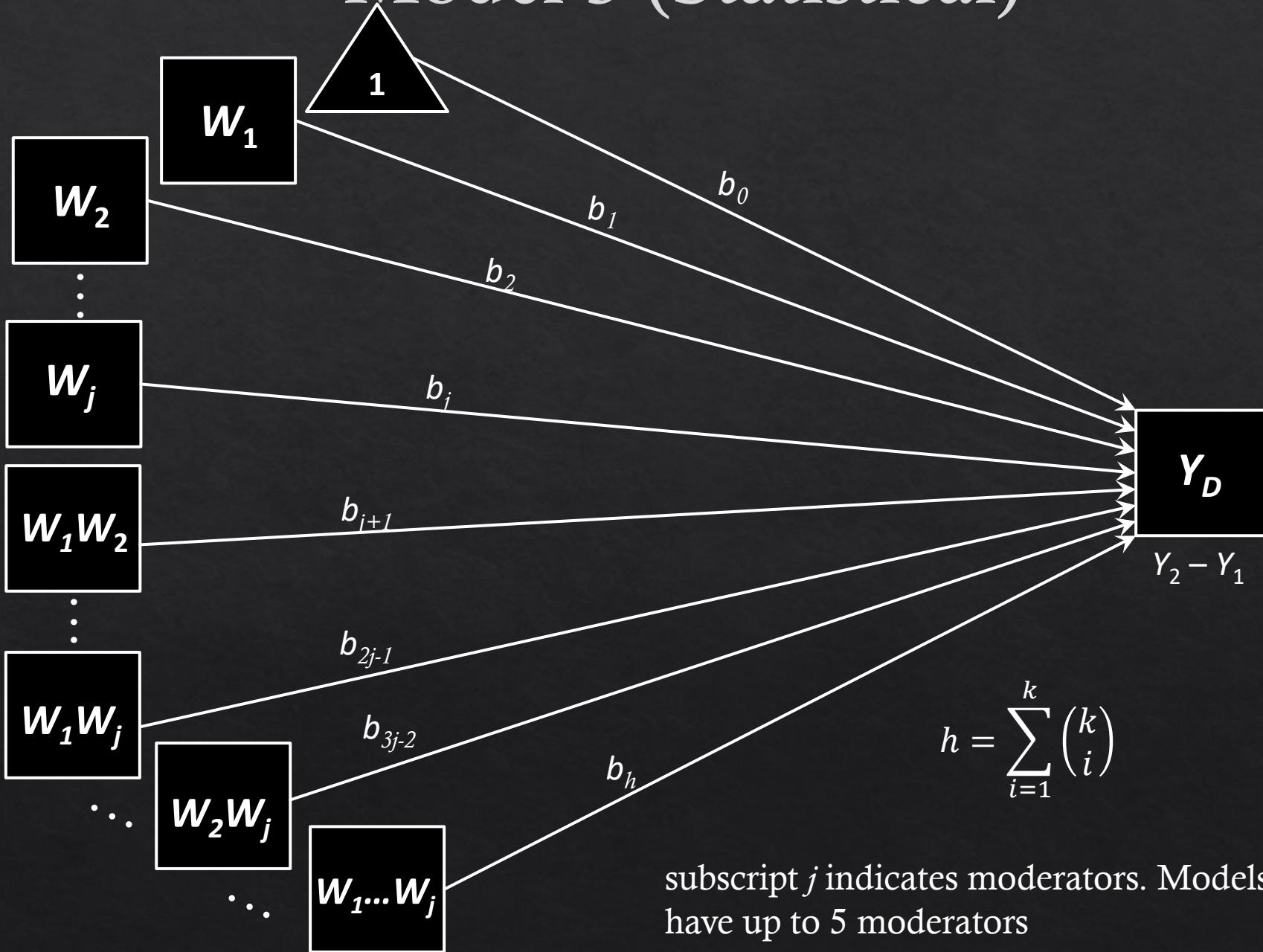
Model 2 (Statistical)



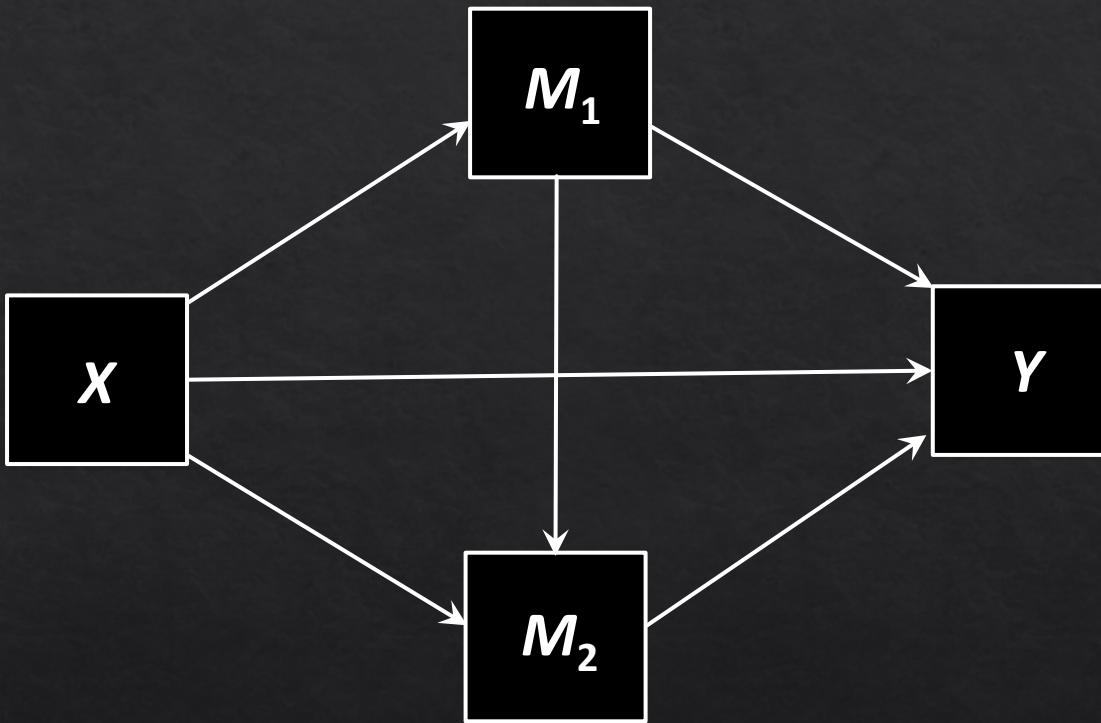
Model 3 (Conceptual)



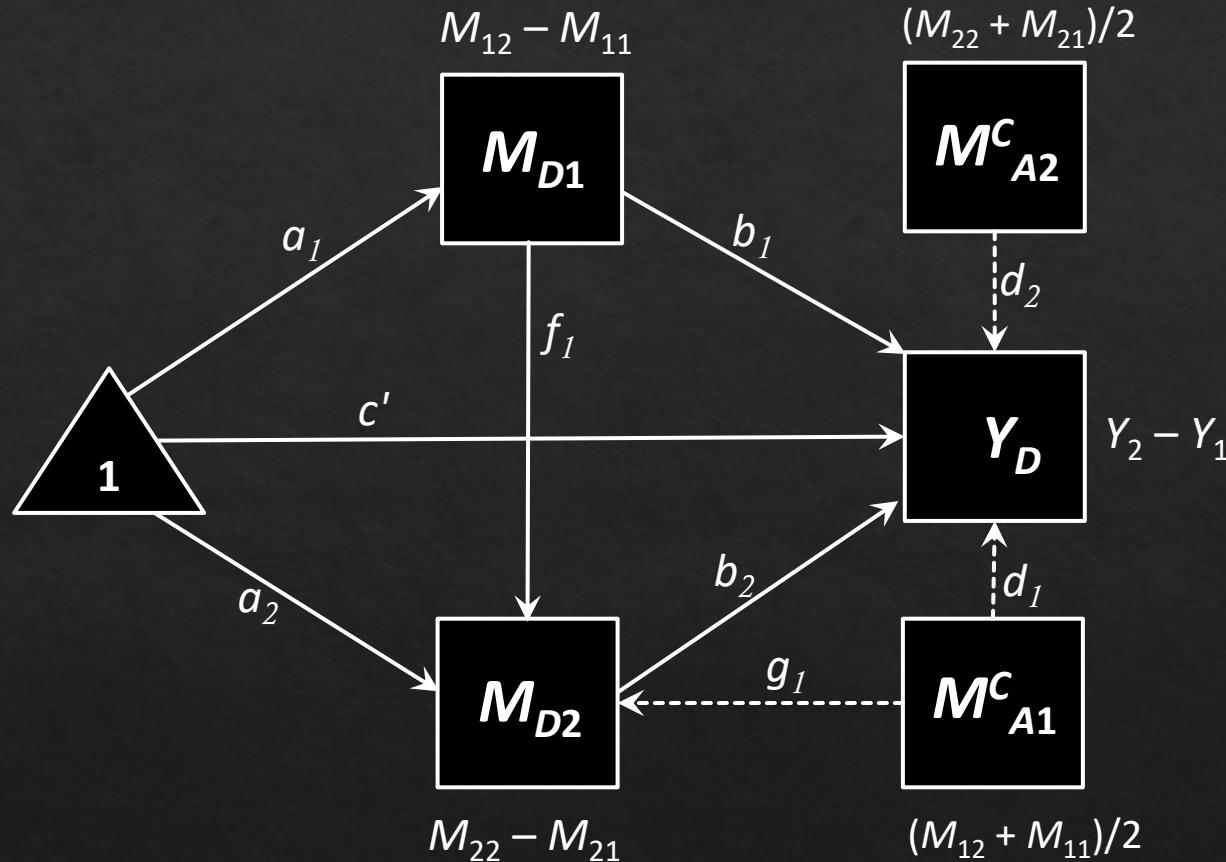
Model 3 (Statistical)



Model 1 where serial = 1 (Conceptual)



Model 1 where serial = 1 (Statistical)

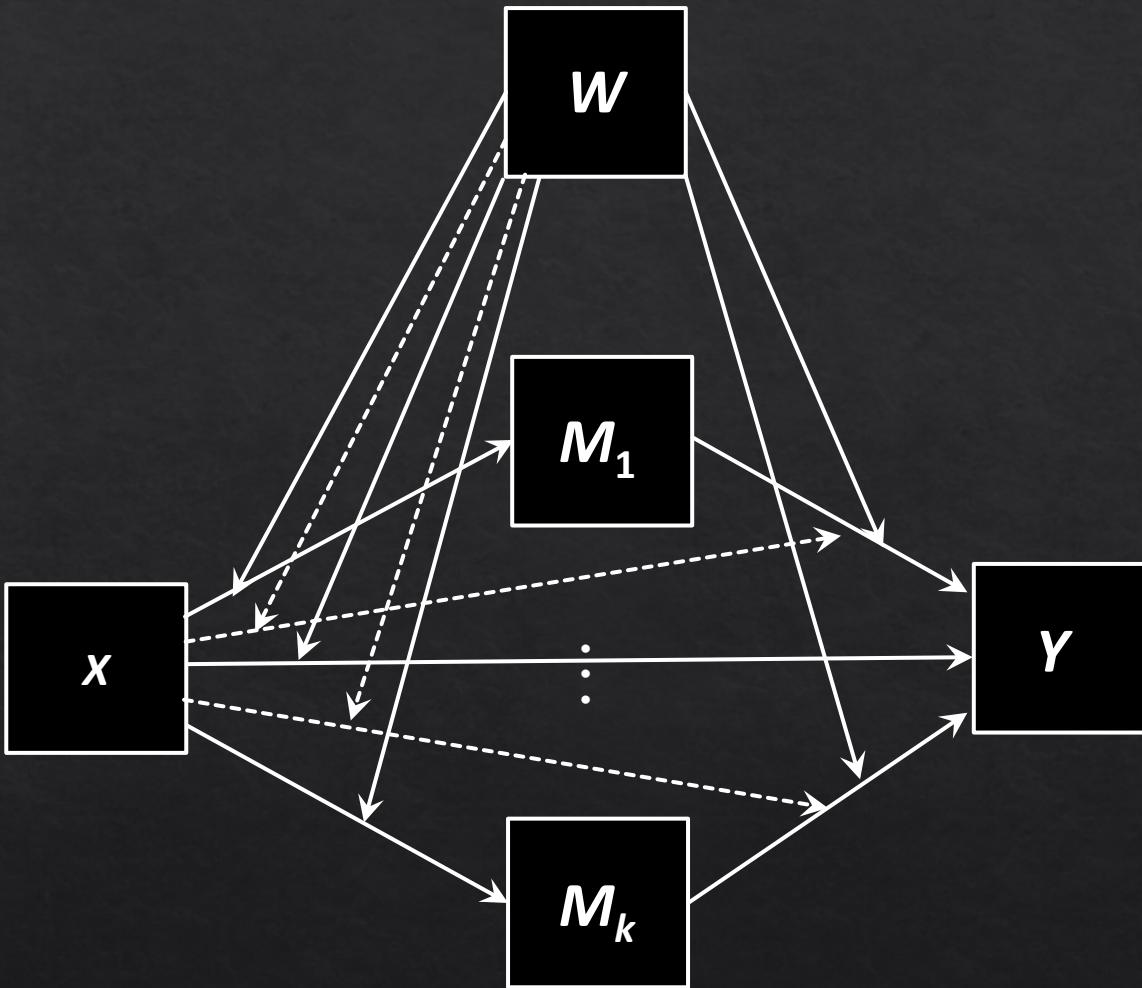


Please note that notation differs from Montoya & Hayes (2017)

Models can have up to 5 pairs of mediator

Dashed lines can be removed from model by using `xmint = 0.`

Model 4 (Conceptual)

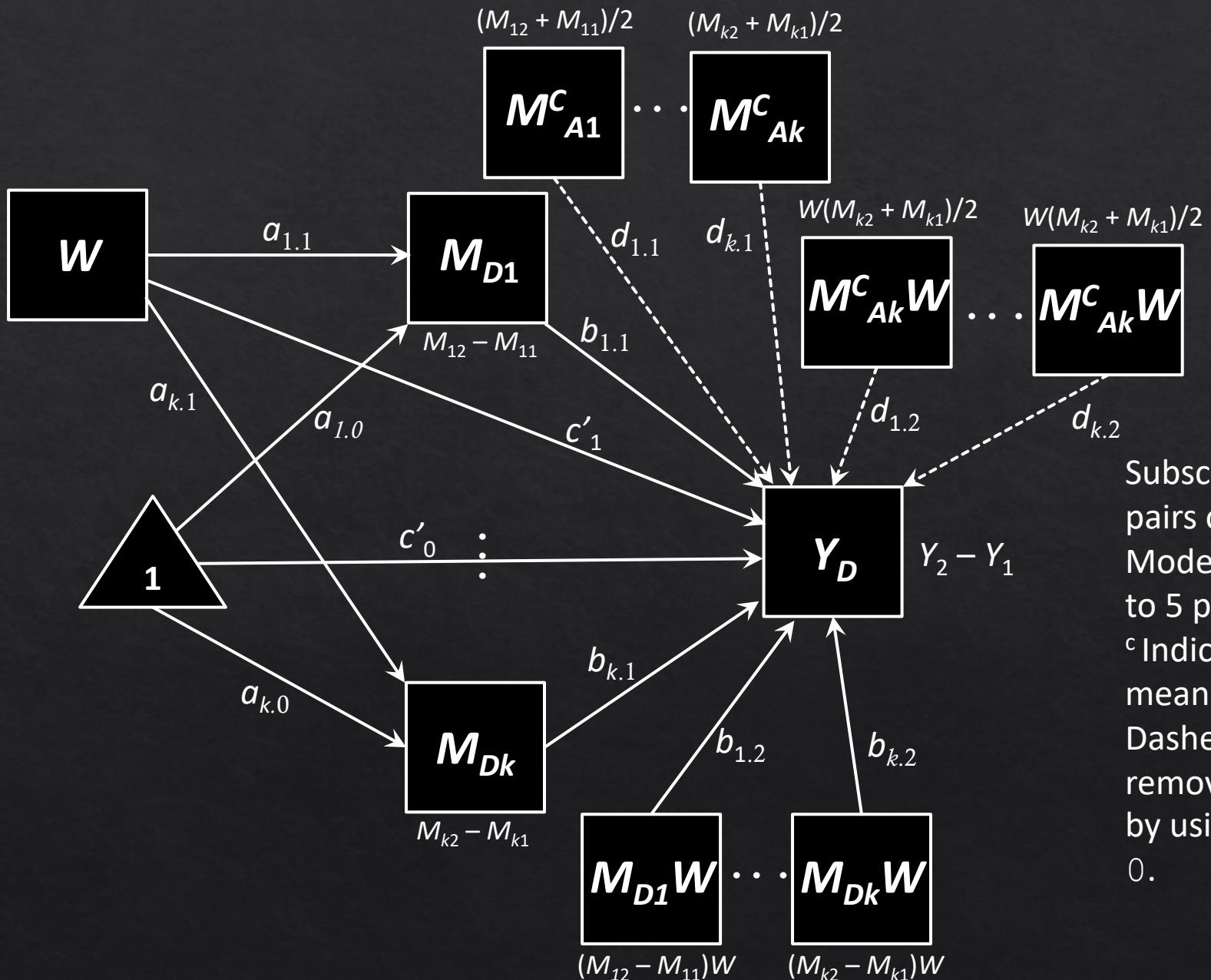


subscript k indicates pairs of mediators. Models can have up to 5 pairs of mediator

^c Indicates grand mean centered

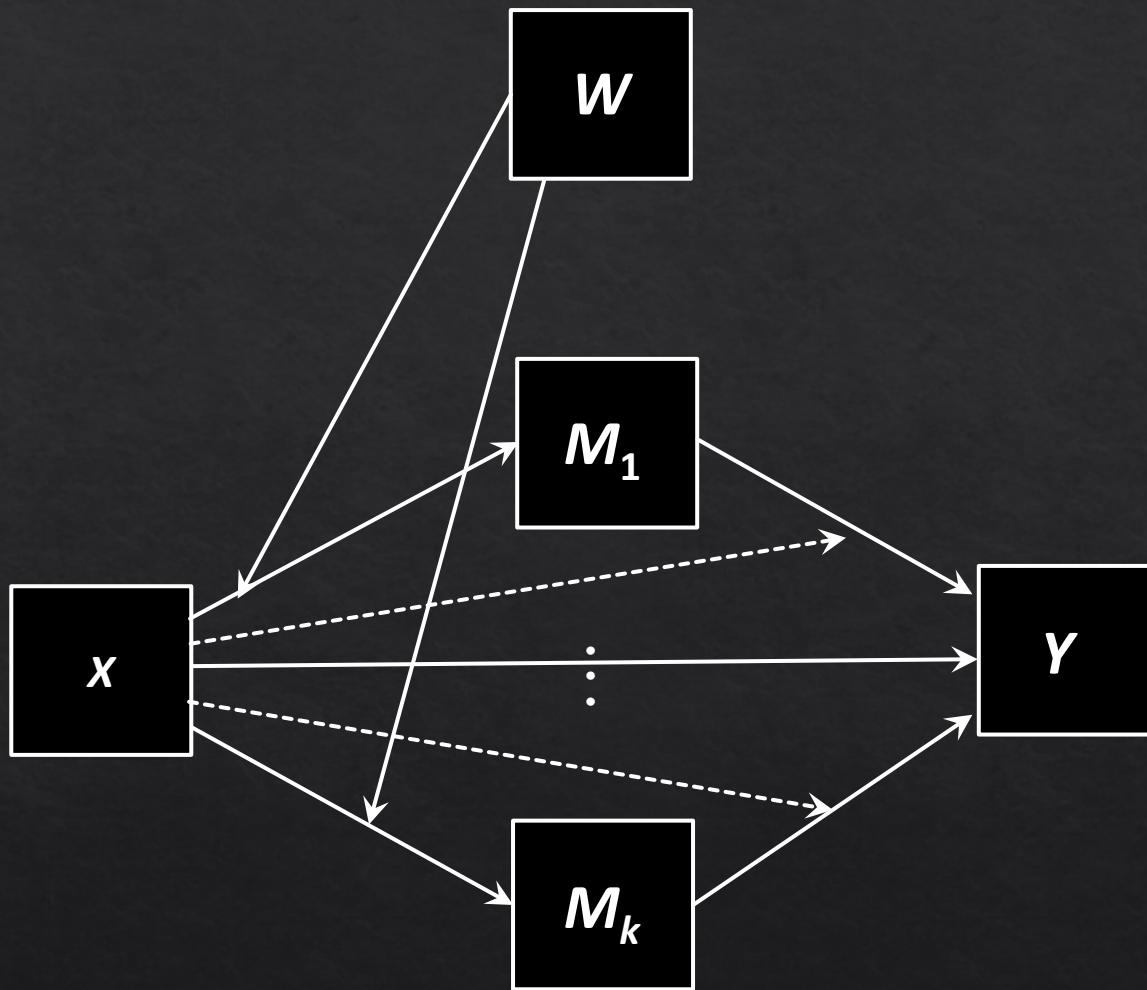
Dashed lines can be removed from model by using `xmint = 0`.

Model 4(Statistical)



Subscript k indicates pairs of mediators.
 Models can have up to 5 pairs of mediator
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Model 15 (Conceptual)

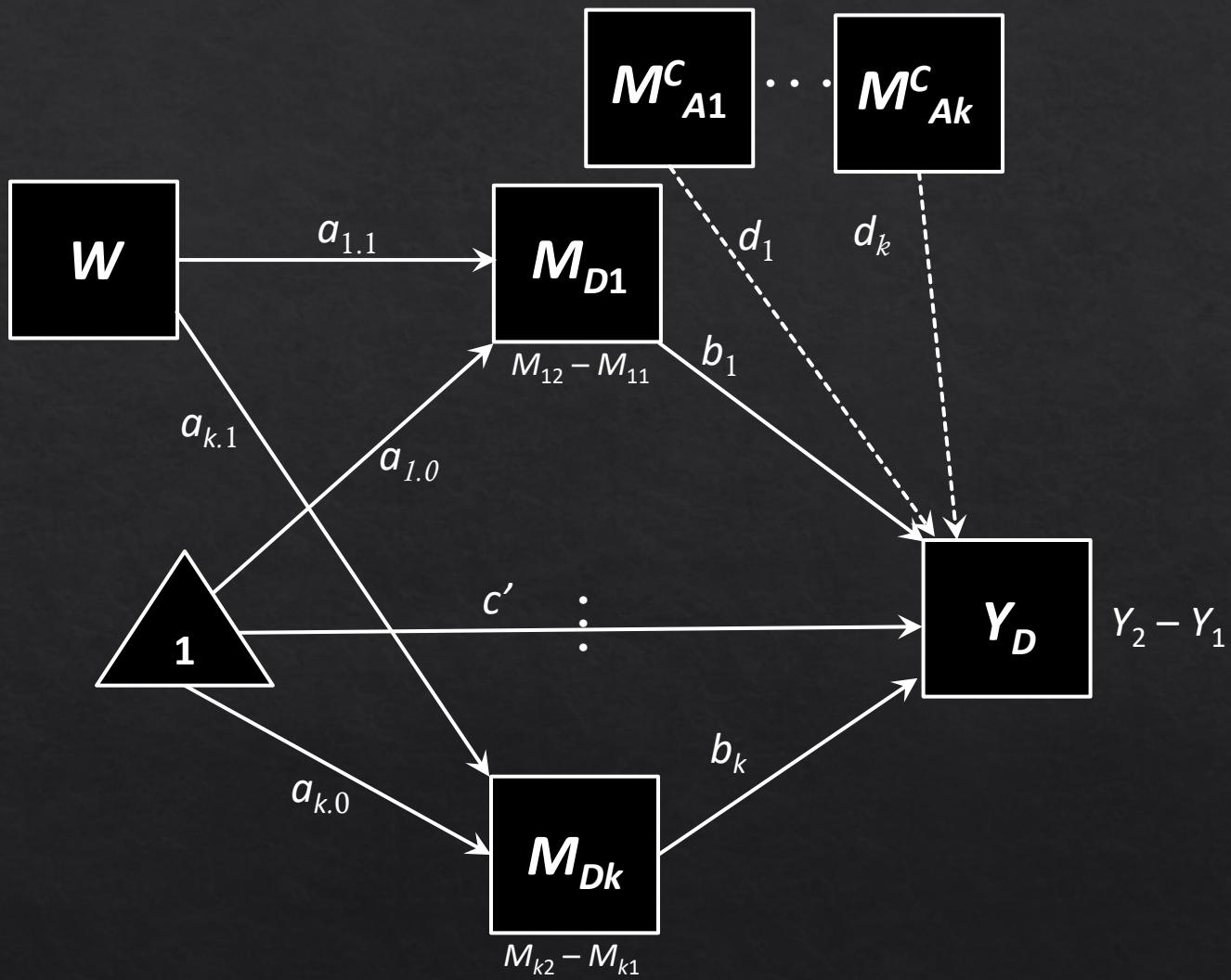


subscript k indicates pairs of mediators. Models can have up to 5 pairs of mediator

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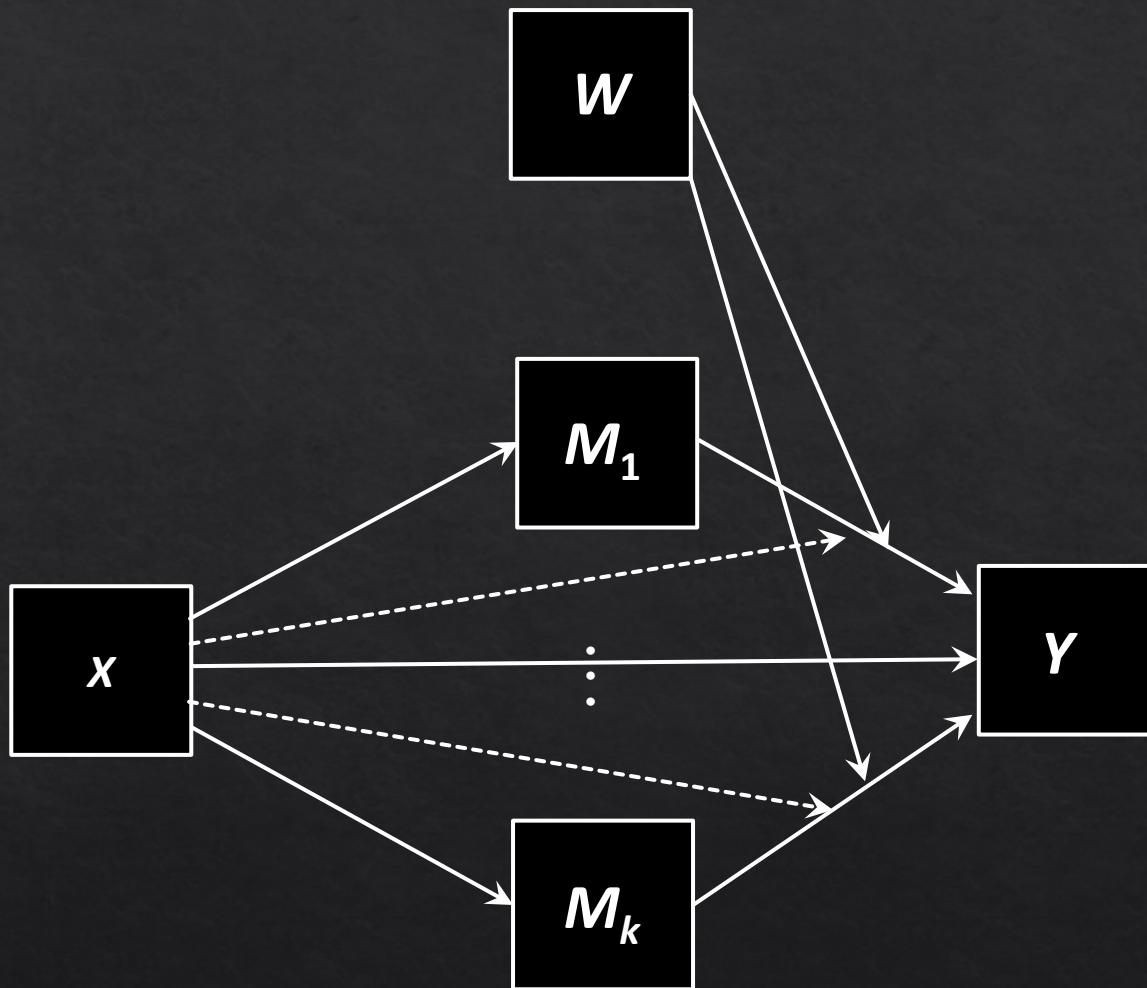
Dashed lines can be removed from model by using `xmint = 0`.

Model 15 (Conceptual)



Subscript k indicates pairs of mediators.
 Models can have up to 5 pairs of mediator
^c Indicates grand mean centered
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Model 16 (Conceptual)

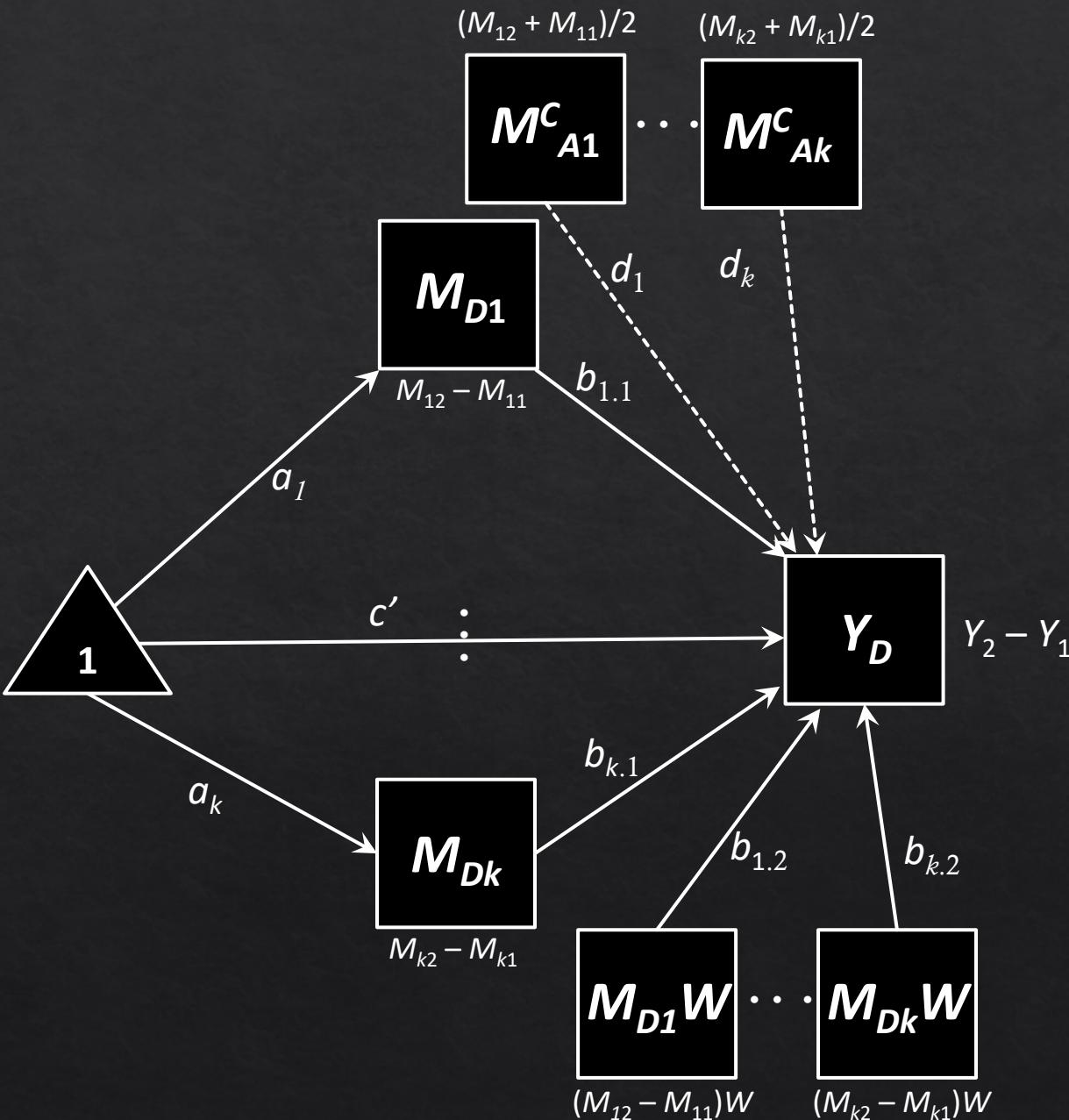


subscript k indicates pairs of mediators. Models can have up to 5 pairs of mediator

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Dashed lines can be removed from model by using `xmint = 0.`

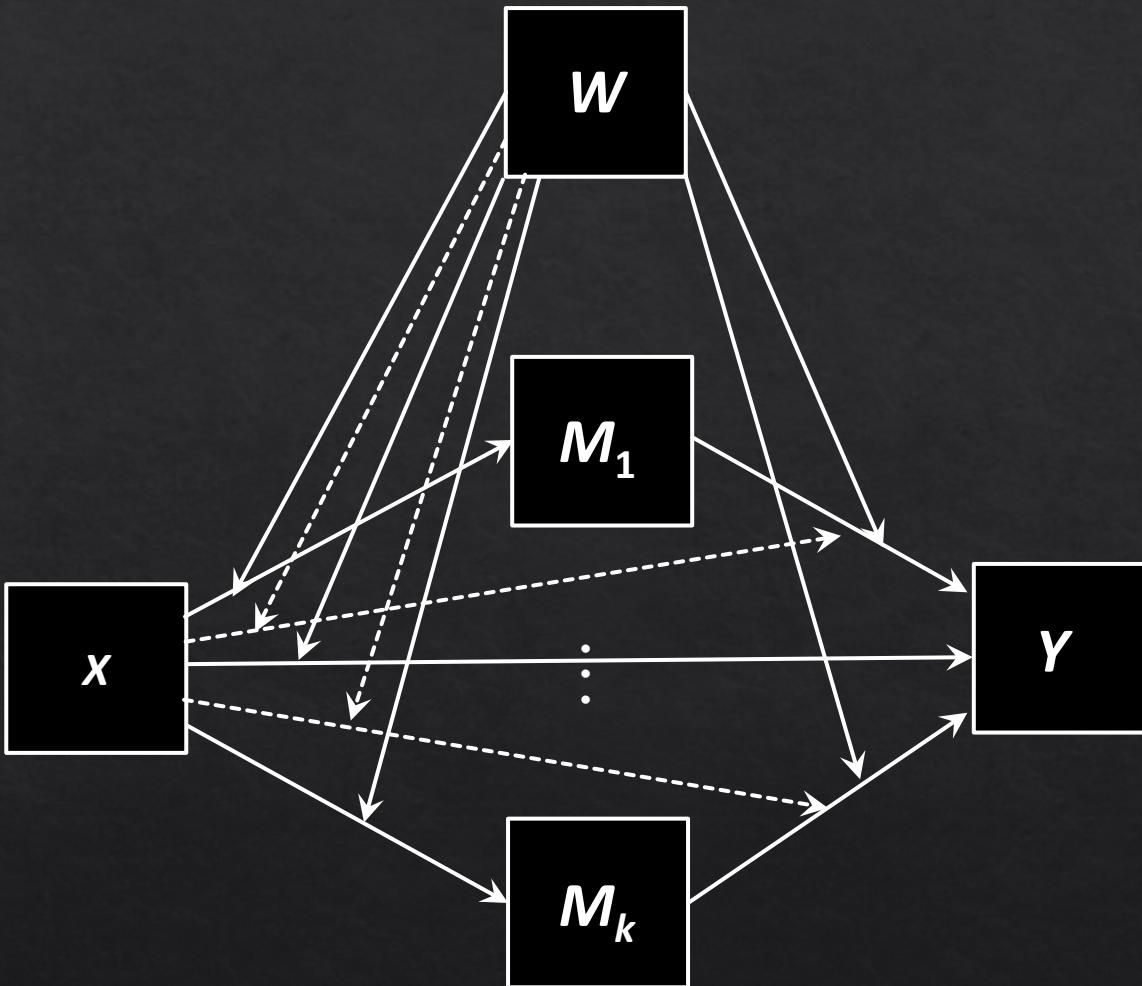
Model 16 (Statistical)



Subscript k indicates pairs of mediators.
 Models can have up to 5 pairs of mediator
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Moderated Mediation with MEMORE

Model 4 (Conceptual)

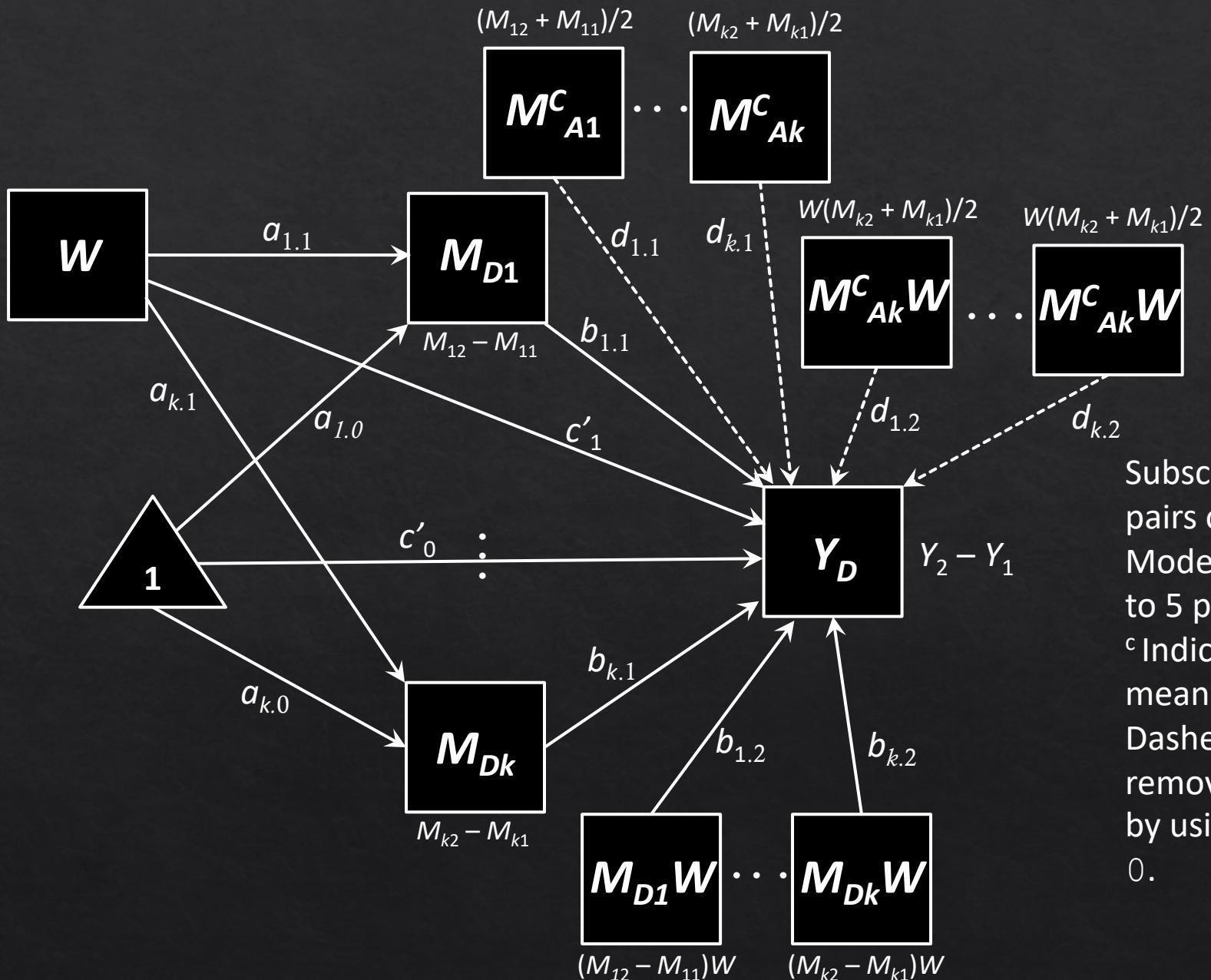


subscript k indicates pairs of mediators. Models can have up to 5 pairs of mediator

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Model 4(Statistical)



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Functionality for Moderated Mediation

- ❖ Many of the previous options available for moderation or mediation can be used in the moderated mediation section.
 - ❖ JN: Johnson-Neyman procedure for probing interactions
 - ❖ quantile: For probing at quantiles of the distribution of the moderator (instead of $M \pm 1 SD$)
 - ❖ wmodval: For probing at specific values of the moderator
 - ❖ plot: For generating data for plotting interactions
 - ❖ MC: Monte Carlo confidence intervals for indirect effects and indices of moderated mediation
 - ❖ normal: Sobel tests for indirect effects and indices of moderated mediation
 - ❖ conf: Set the level of your confidence intervals
 - ❖ samples: Number of samples for bootstraps or Monte Carlo
 - ❖ save: Save the bootstraps or Monte Carlo estimates in a separate dataset
 - ❖ xmint: Include or Exclude the Mavg term in the model for Y
 - ❖ center: mean center moderators (see previous slide for changes)

Functionality for Moderated Mediation

- ❖ Some options not available with moderated mediation:
 - ❖ Serial: Moderated mediation models with serial mediators
 - ❖ Contrast: Contrasts of conditional indirect effects
 - ❖ Cannot have more than 1 moderator

Plots of Conditional Effects

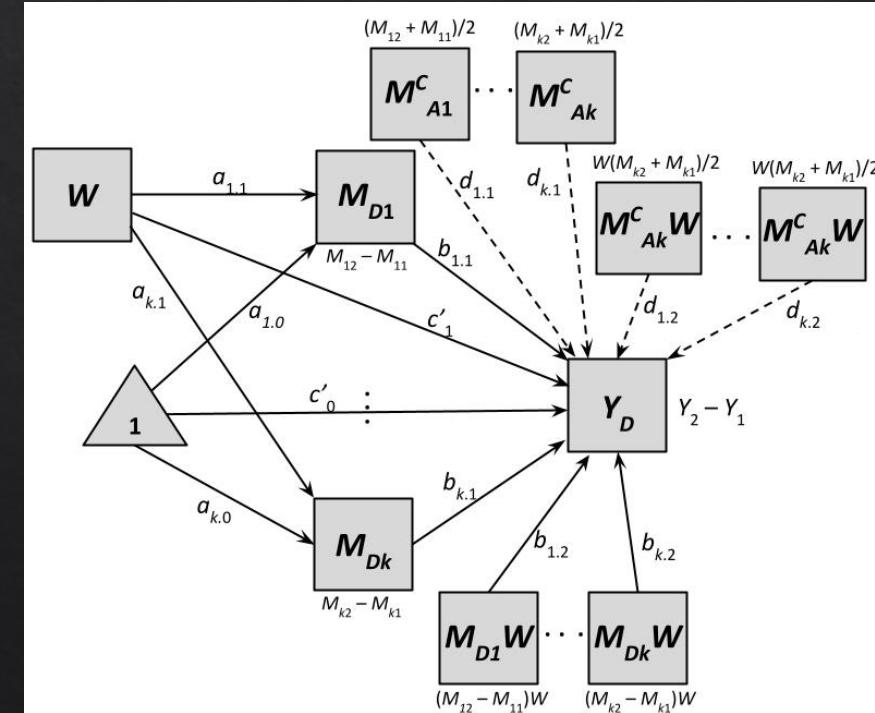
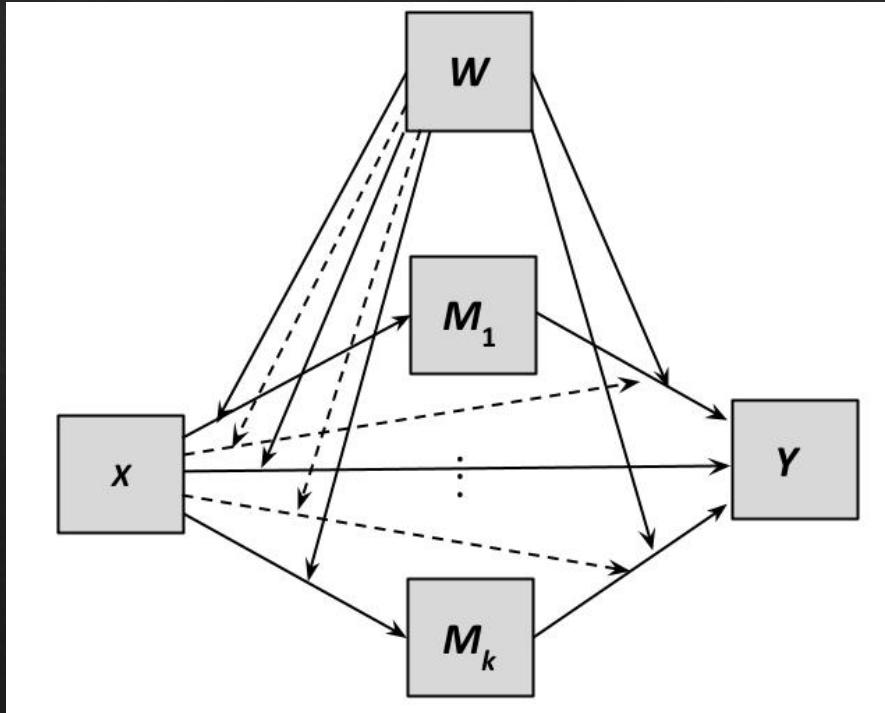
- ❖ Explain how plot code is generated
- ❖ Example using Model 4 (all paths in mediation moderated)
 - ❖ Diagrams
 - ❖ Equations
 - ❖ MEMORE output
 - ❖ Conditional Effects
 - ❖ Graphs

Plots of Conditional Effects

- ❖ Using the plot = 1 option creates datasets which you can then use to create plots of conditional effects.
- ❖ Often there are more variables in the model than just the predictor, moderator, and outcome
 - ❖ These variables are conditioned on their...
 - ❖ mean (if it is another moderator)
 - ❖ predicted score (if it is the average of the mediators, Mavg)

Conditional Effect in Moderated Mediation

Let's say you wanted to use Model 4 where all paths are moderated.



Conditional Effects in Moderated Mediation Example

Let's say you wanted to use Model 4 where all paths are moderated.

Let's assume we have 1 mediator

Statistical Equations

$$Y_{Di} = c_0 + c_1 W_i + e_{Yi}$$

$$M_{Di} = a_0 + a_1 W_i + e_{Mi}$$

$$Y_{Di} = c'_0 + c'_1 W_i + b_1 M_{Di} + b_2 M_{Di} W_i + d_1 M_{Ai}^C + d_2 M_{Ai}^C W_i + e_{Y'i}$$

MEMORE Command

```
MEMORE y = Yvar2 Yvar1 /m = Mvar2 Mvar1 /w = Wvar /model = 4 /plot = 1
```

Go to Output

Moderated Mediation Conditional Effects

In the model there are a variety of conditional effects:

- ❖ Conditional Total Effect of X on Y at values of W

$$\theta_{X \rightarrow Y|W} = c_0 + c_1 W$$

- ❖ Conditional effect of $M(M_D)$ on Y at values of W

$$\theta_{M_D \rightarrow Y|W} = b_1 + b_2 W$$

- ❖ Conditional Effect of $M(M_A)$ of Y at values of W

$$\theta_{M_A \rightarrow Y|W} = d_1 + d_2 W$$

- ❖ Conditional Direct Effect of X on Y at values of W

$$\theta_{X \rightarrow Y.M|W} = c'_0 + c'_1 W + d_1 M_A^C + d_2 M_A^C W$$

- ❖ Unclear what value of M_{Ai}^C to use

- ❖ MEMORE fits the following model: $\widehat{M}_A^C = f_0 + f_1 W$

- ❖ Conditional effects are $\theta_{X \rightarrow Y.M|W} = c'_0 + c'_1 W + d_1 \widehat{M}_A^C + d_2 \widehat{M}_A^C W$

Conditioning in Plots

The plots include a predicted Y_D or M_D and so these must be conditioned on specific values of the other predictors in the model.

Unless otherwise noted, variables are conditioned on their mean.

Data for visualizing conditional direct effect of X on Y at values of W.

Paste text below into a SPSS syntax window and execute to produce plot.

Note: All mediator averages are conditioned on their predicted value based on W.

```
DATA LIST FREE/Wvar YdiffHAT.
```

```
BEGIN DATA.
```

```
.1789  -.0383  
.4630  -.0508  
.7471  -.0583
```

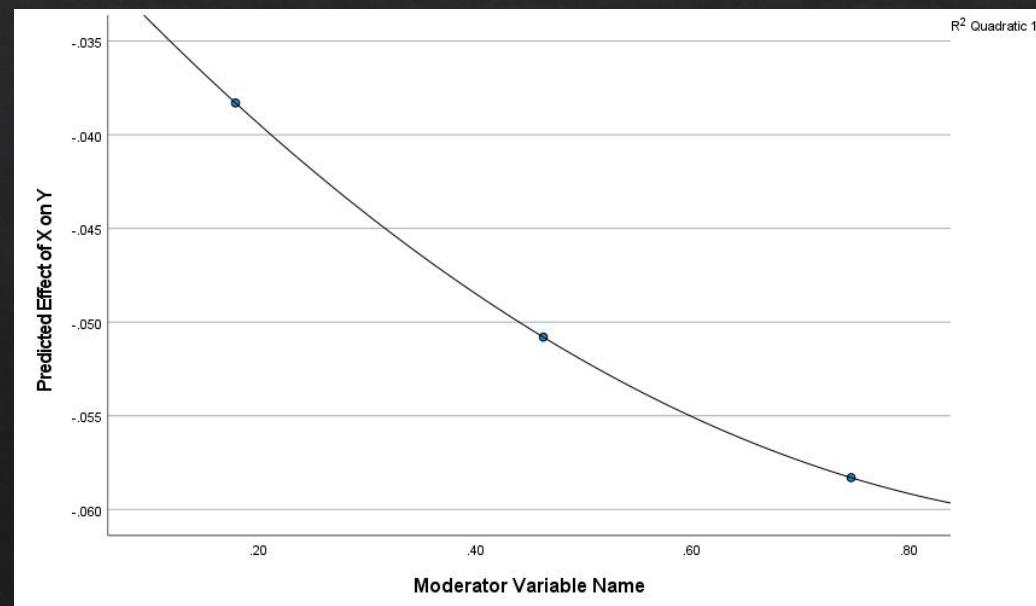
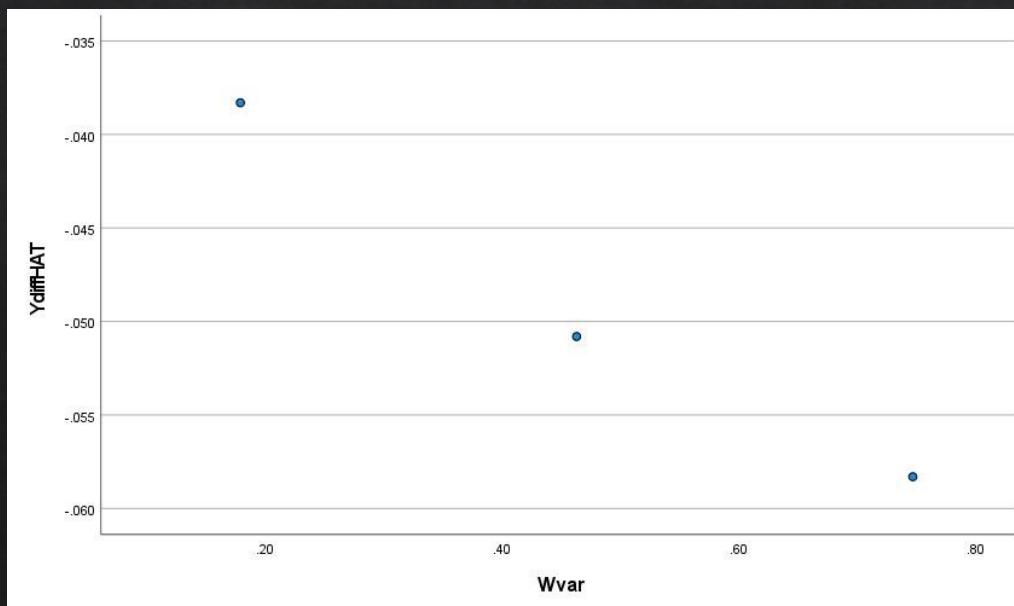
```
END DATA.
```

```
GRAPH/SCATTERPLOT = Wvar WITH YdiffHAT.
```

Conditioning in Plots

Example of the output based on running the code on the previous slide.

Note that the plotted effect is non-linear and this is due to the differential conditioning at each point.



Additional Tools

- ❖ Power Analysis for Within-subject Mediation Analysis (only in R):
<https://psyarxiv.com/gqryz/>
- ❖ Database of Moderated Mediation Papers (Between-Subjects Only):
<https://www.jlfossum.com/home/moderated-mediation-article-database>
- ❖ PROCESS Macro by Andrew Hayes (Between-Subjects Only): <https://processmacro.org>
- ❖ MLMED Macro by Nick Rockwood (Multilevel Data): <https://njrockwood.com/mlmed>

For More on MEMORE

- ❖ Read the Documentation
- ❖ My Website: akmontoya.com/spss-and-sas-macros
- ❖ Follow me on Twitter: @AmandaKMontoya
- ❖ Email Me: akmontoya@ucla.edu

For More on MEMORE

- ❖ Montoya, A. K., & Hayes, A. F. (2017). Two-condition within-participant statistical mediation analysis: A path-analytic framework. *Psychological Methods*, 22(1), 6-27.
- ❖ Montoya, A. K.(2019). Moderation analysis in two-instance repeated-measures designs: Probing methodsand multiple moderator models. *Behavior Research Methods*,51,(1), 61 - 82.
- ❖ Montoya, A. K. (under review). The Power of Design: Impact of Experimental Design on Statistical Power to Detect Indirect Effects Outweigh Impact of Inferential Methods.
- ❖ Montoya, A. K., Hayes, A. F., & Gomez, N. (in prep). Mediation Analysis in the Two Condition Pretest-Posttest Design: A Treatment-as-Moderator Conditional Process Approach.
- ❖ Montoya, A. K. (2018).Conditional process analysis in two-instance repeated-measures designs (Dissertation). The Ohio State University.