Model Building

Overview

- Difference between a theory and a model
- Explore the different relationship types conveyed by a model
- Build and communicate a path diagram
- Review a published article

What is a Theory

> A theory is a set of concepts whose proposed relationships offer explanation, understanding, or appreciation of a phenomenon of interest.
> — Hatch, 2013, p. 5

What is a Model

Models are derived from theories to test a particular aspect of that theory. Mod
are useful because they allow us to communicate and test simplified pieces of o
theory, thus providing a more local understanding of our phenomenon.

Fried (2020). Theories and models: What they are, what they are for, and what they are about. *Psychological Inqui*

Testing Theories with Models and Data

Theories inform the development of models, which go on to inform what data to collect and what hypotheses or propositions we should **empirically test with real data and statistical models**.

The more empirical tests a theory survives, the more confidence we tend to have that theory.

Communicating Models with a Path Diagram

Path diagrams are used to visually communicate models and the relationships tl
posit among variables.

Path diagrams follow several graphical conventions:

1. Variables (or phenomena) are represented by a shape usually a square or circ

2. Causal and predictive relationships among variables are represented with a
   unidirectional arrow.

3. Non-causal and non-predictive relationships (i.e. correlations) among variable
   are represented with curved, non-directional arrows.

Types of Relationships Among Variables

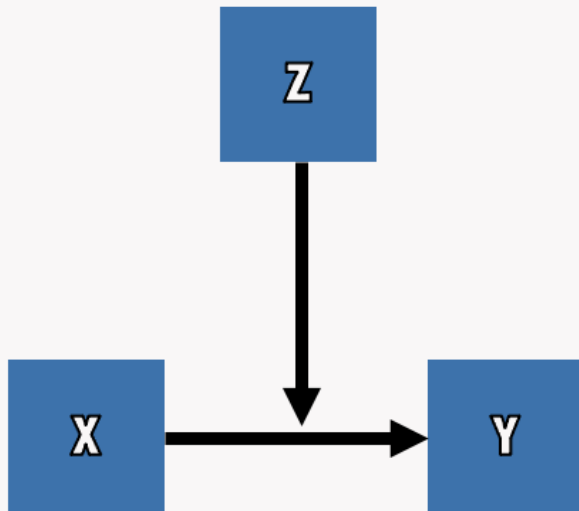Here are the three main relationships we will be working with in this course.

Direct Relationship

X → Y

Mediated (Indirect) Relationship

X → Z → Y
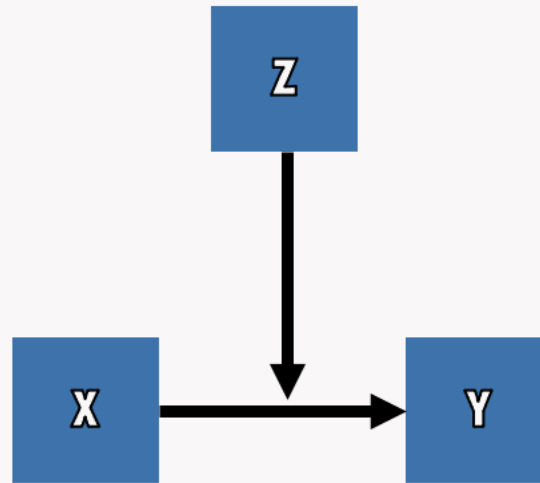
Moderated Relationship

Z → (X → Y)

Direct Relationships

A **direct relationship**, causal or otherwise, is a relationship in which a predict[or] variable (or independent variable) has a direct impact on an outcome variable.

Moderated Relationships: The "How Strong" Heuristic

A **moderated relationship**, causal or otherwise, involves three variables in wh[...]
the relationship between two variables, a predictor and outcome variable, chang[...]
depending on the value of a third variable, the moderating variable or moderato[...]

Thinking About Moderation with Plots

When you are hypothesizing a moderation—also referred to as an interaction—effect, it is helpful to draw a plot of your hypothesized effect.
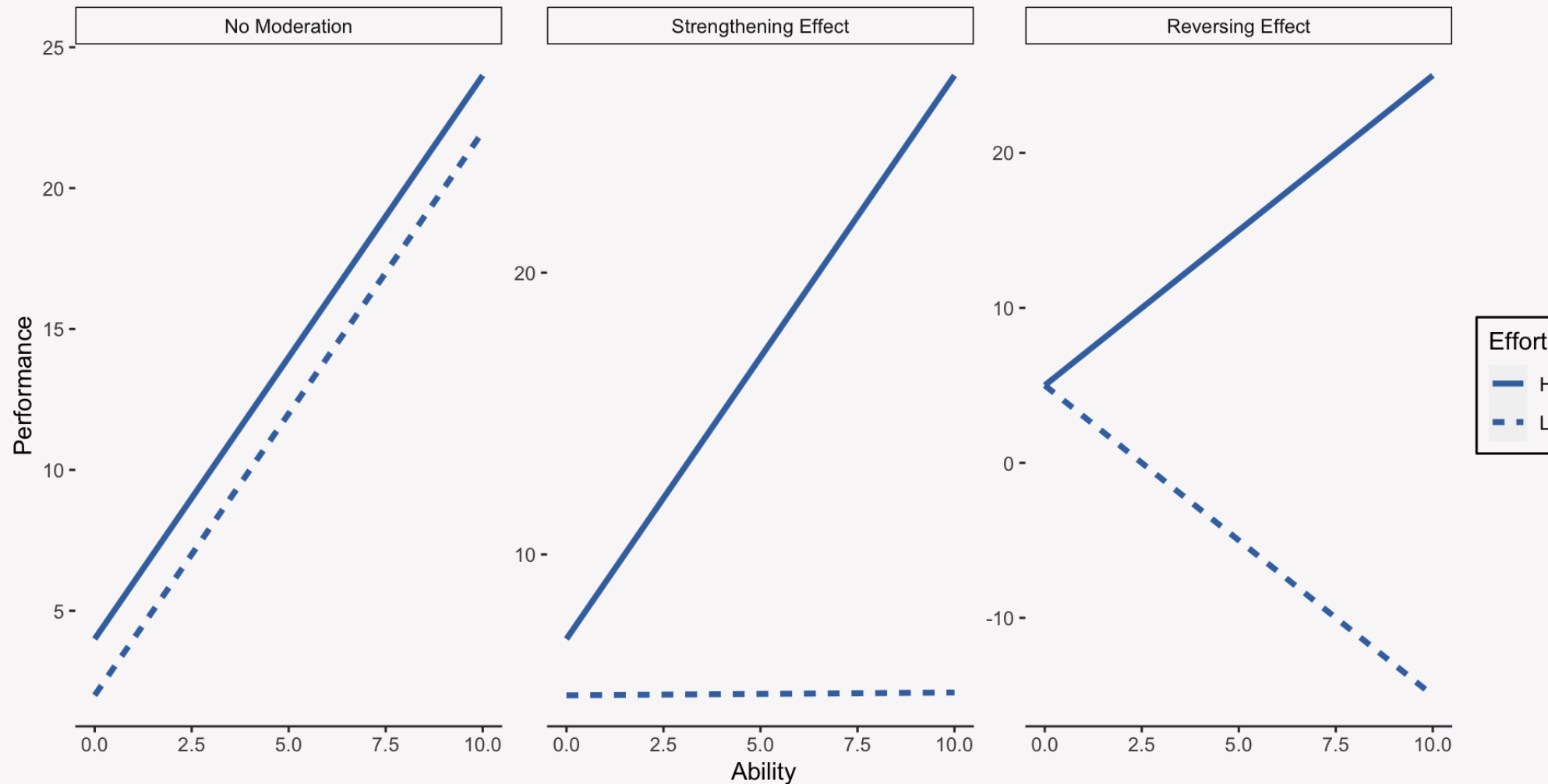
Mediated (Indirect) Relationships: The "Why" Heuristic

A **mediated (indirect) relationship** is one where a predictor variable influenc[es] an outcome variable **indirectly** through its influence on a mediating variable referred to as a **mediator**.

Thinking About Indirect, Direct, and Total Effects

When we hypothesize a mediated relationship, we can talk about three different effects:

1. The indirect effect of X on Y

2. The direct effect of X on Y

3. The total effect of X on Y

Why Use a Path Diagram?

A path diagram is useful as it is a simple way to graphically communicate our:

1. The phenomena (variables) we are interested in

2. Hypotheses or theoretical propositions about the relationships among variabl

3. The regression equations needed to test the hypothesized model

The Model Behind Your Homework as an Example
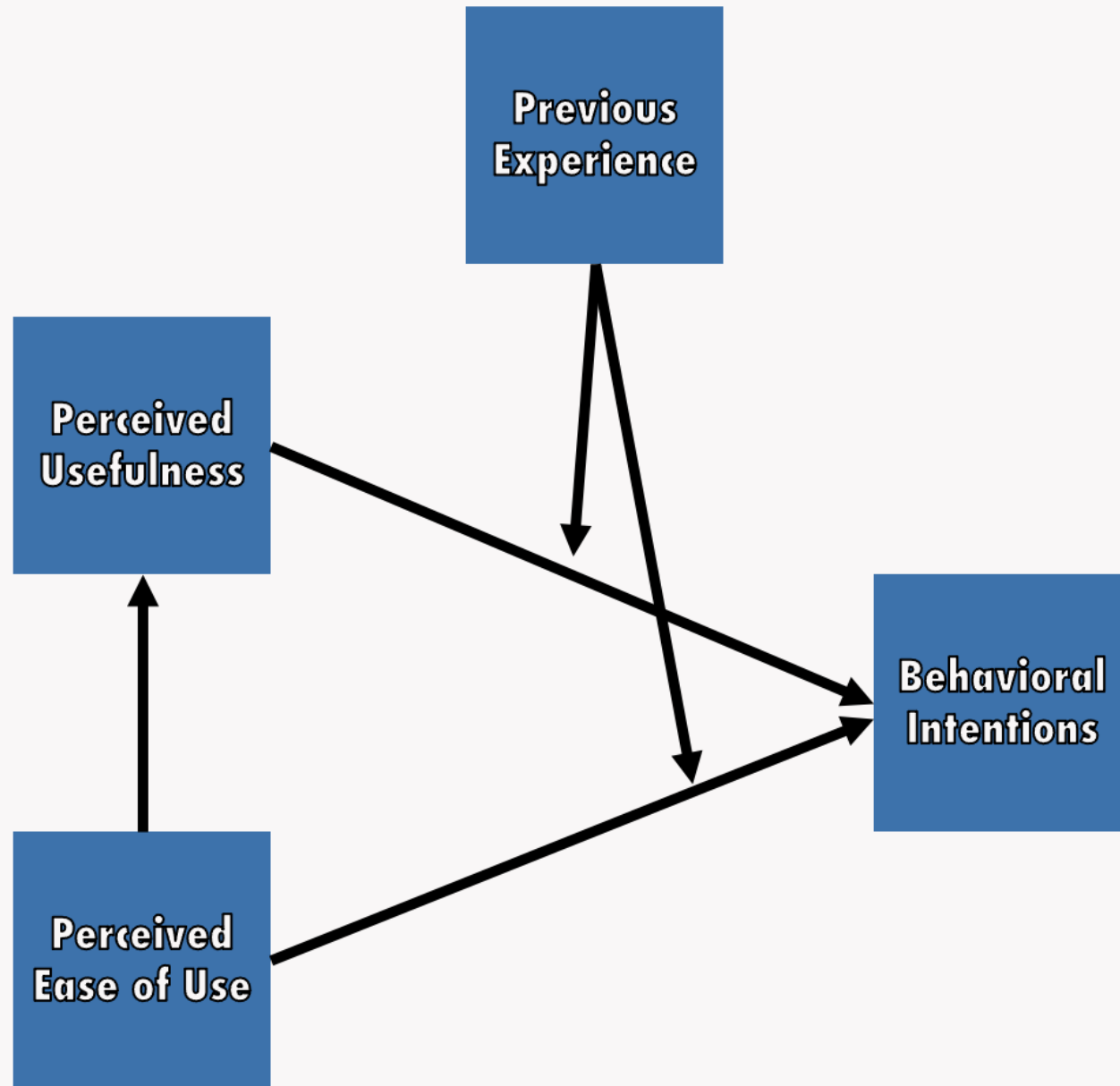
Path Diagrams and Hypotheses

From the path diagram for our homework, we can infer several different hypotheses/propositions:

1. The effect of perceived ease of use is partially **mediated** through a tool's perceived usefulness.

2. The effect of perceived ease of use on one's intention to use the tool is **moderated** by one's previous experience with a similar tool.

3. The effect of perceived usefulness on one's intention to use the tool is **moderated** by one's previous experience with a similar tool.
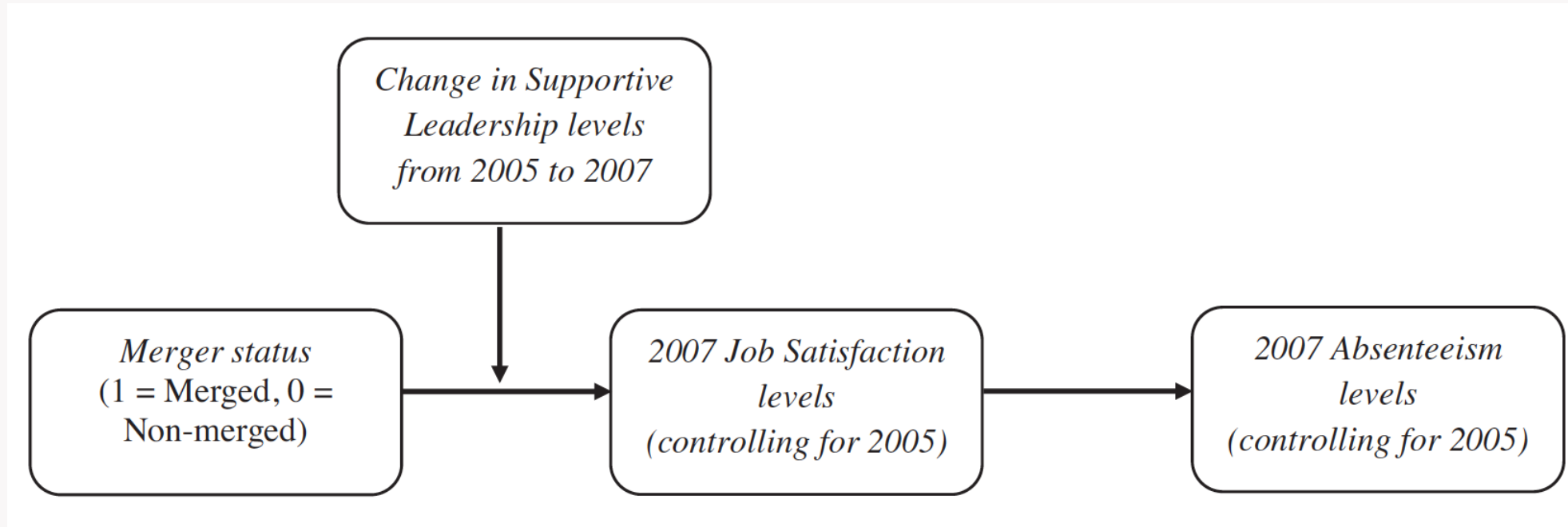
Path Diagrams and Regression Equations

We can also infer the regression equations needed to test our hypotheses from path diagram:

$$X_{\text{Useful.}} = \beta_0 + \beta_1 X_{\text{Ease Use}} + \epsilon$$

$$Y_{\text{Beh. Int.}} = \beta_0 + \beta_1 X_{\text{Ease Use}} + \beta_2 X_{\text{Useful.}} + \beta_3 Z_{\text{Mod}}$$

The Human Costs of Mergers: A Published Example

Giessner et al. (2023). The impact of supportive leadership on employee outcomes during organizational mergers:

Using Theories to Build Models

Giessner et al. (2023) use two broad theories to build their more narrow model:

- Organizational support theory
- Conservation of resources theory

Mediation Hypotheses: H1 to H3

- *H1*: Merging organizations will experience greater decreases in job satisfaction relative to nonmerging organizations within the same context and time period. **[Total Effect]**

- *H2*: Merging organizations will experience greater increases in absenteeism relative to nonmerging organizations within the same context and time period. **[Direct Effect]**

- *H3*: The increases in absenteeism for merging organizations will be **(partially) mediated** by decreases in job satisfaction. **[Indirect Effect]**

Giessner et al. (2023). The impact of supportive leadership on employee outcomes during organizational mergers:

Moderation Hypothesis: H4

- *H4*: The decreases in job satisfaction for merged versus nonmerged organizations will be **moderated** by changes in supportive leadership at the midlevel management level, such that **this relationship will be weaker fo organizations with increasing levels of supportive leadership**.

Giessner et al. (2023). The impact of supportive leadership on employee outcomes during organizational mergers:

Moderated Mediation Hypothesis: H5

- *H5*: The increases in absenteeism for merging organizations relative to nonmerging organizations as **mediated by the decreases in job satisfact** will be **moderated by changes in supportive leadership** at the midlevel management level, such that **the indirect effect of mergers on absenteeism via job satisfaction will be weaker when there is an increase in supportive leadership**.

Giessner et al. (2023). The impact of supportive leadership on employee outcomes during organizational mergers:

Regression Models: Mediation Hypotheses

H1–H3 Testing Results

Dependent variable	H1	H2	H3
	Job satisfaction 2007	Absenteeism 2007	Absenteeism 2007
Intercept	1.28 (0.70, 1.86)***	3.53 (2.92, 4.14)***	7.63 (1.49, 13.76)*
PCT size[a]	0.02 (0.00, 0.04)*	0.00 (−0.01, 0.00)	0.00 (0.00, 0.00)
Job satisfaction 2005	0.62 (0.46, 0.78)***		1.03 (−0.81, 2.87)
Merger status[b]	−0.06 (−0.09, −0.03)***	0.08 (−0.36, 0.20)	−0.21 (−0.51, 0.09)
Absenteeism 2005		0.24 (0.10, 0.37)***	0.23** (0.09, 0.36)
Job satisfaction 2007			−2.22** (−3.79, 0.6
Supportive leadership 2005			
Change in supportive leadership			
Merger Status × Change in Supportive Leadership			
R^2	.308	.084	.133

Note. PCT = primary care trust; H = hypothesis. Figures in central section of table are unstandardized regression coefficients (with 95% confiden
interval).
[a] Measured as number of employees in 2007 (i.e., postmerger).   [b] 1 = *merged*; 0 = *nonmerged*.
* $p < .05$.   ** $p < .01$.   *** $p < .001$.

Giessner et al. (2023). The impact of supportive leadership on employee outcomes during organizational mergers:

Regression Models: Moderation Hypotheses

H4 Testing Results

|	H4	H5	H5	
Dependent variable	Job satisfaction 2007	Job satisfaction 2007	Absenteeism 2007	Absenteeism 2007
Intercept	0.33 (−0.01, 0.67)[**]	0.38 (0.02, 0.74)[*]	8.17 (2.11, 14.24)[**]	10.24 (4.61, 15.87)[*]
PCT size[a]	0.00 (0.00, 0.01)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)
Job satisfaction 2005	0.35 (0.17, 0.54)[***]	0.35 (0.16, 0.53)[**]	3.94 (0. 97, 7.09)[*]	
Merger status[b]	−0.02 (−0.04, 0.00)[*]	−0.02 (−0.04, 0.00)[*]	−0.27 (−0.57, 0.03)	−0.20 (−0.50, 0.11)
Absenteeism 2005		−0.00 (−0.01, 0.00)	0.22 (0.08, 0.35)[**]	0.22 (0.08, 0.35)[**]
Job satisfaction 2007			−2.08 (−3.64, −0.52)[**]	
Supportive leadership 2005	0.52 (0.35, 0.69)[***]	0.51 (0.34, 0.68)[***]	−3.14 (−5.91, −0.37)[*]	−1.80 (−3.31, −0.29)
Change in supportive leadership	0.63 (0.53, 0.72)[***]	0.63 (0.53, 0.72)[***]		−1.98 (−3.57, −0.39)
Merger Status × Change in Supportive Leadership	0.23 (0.07, 0.38)[*]	0.23 (0.07, 0.38)[*]		0.527 (−2.09, 3.14)
R^2	.787	.788	.163	.163

Note. PCT = primary care trust; H = hypothesis. Figures in central section of table are unstandardized regression coefficients (with 95% confidence interval).
[a] Measured as number of employees in 2007 (i.e., postmerger). [b] 1 = *merged*; 0 = *nonmerged*.
[*] $p < .05$. [**] $p < .01$. [***] $p < .001$.

Giessner et al. (2023). The impact of supportive leadership on employee outcomes during organizational mergers:

Moderation Plot
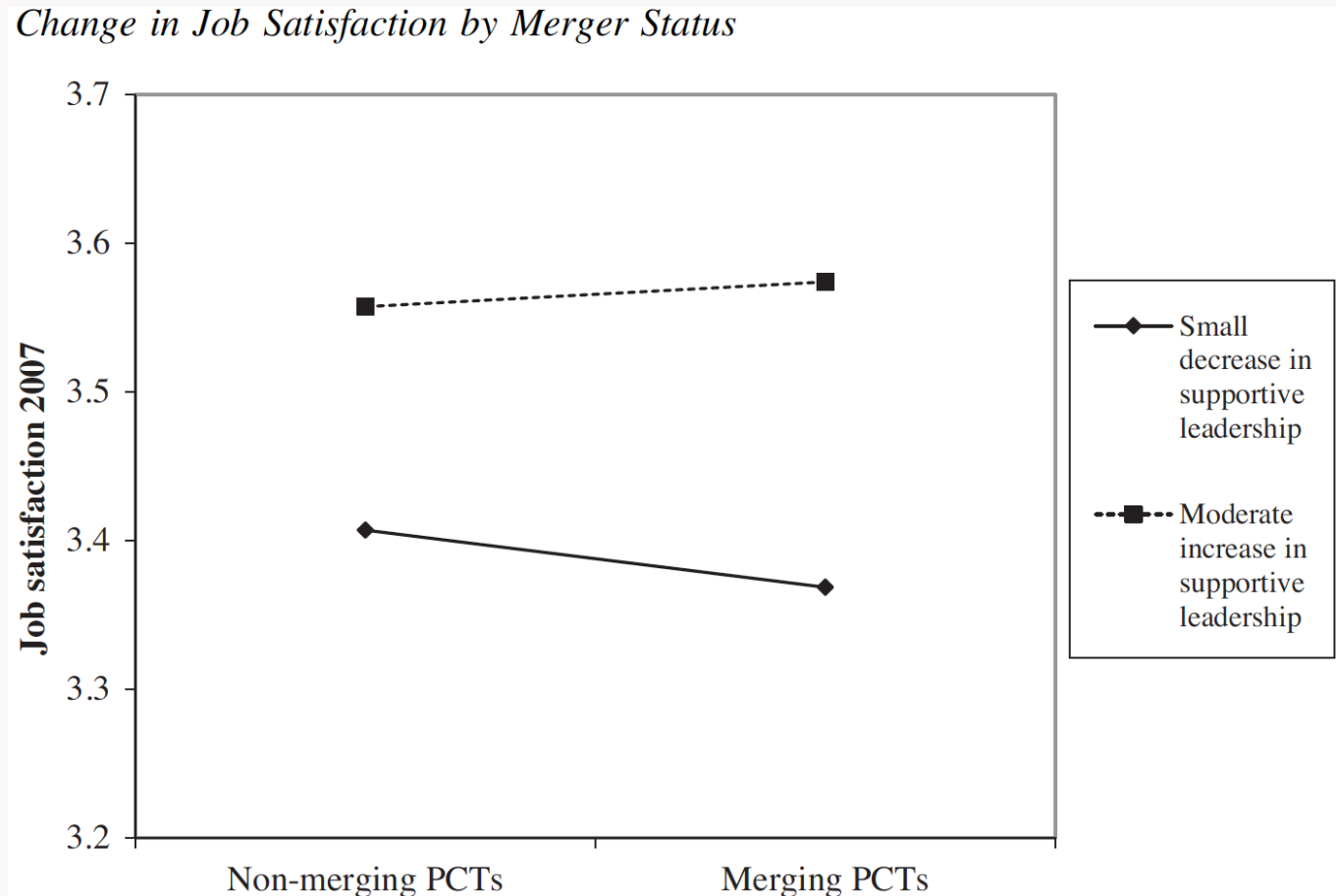
Change in Job Satisfaction by Merger Status

Giessner et al. (2023). The impact of supportive leadership on employee outcomes during organizational mergers:

A More Complex Published Example
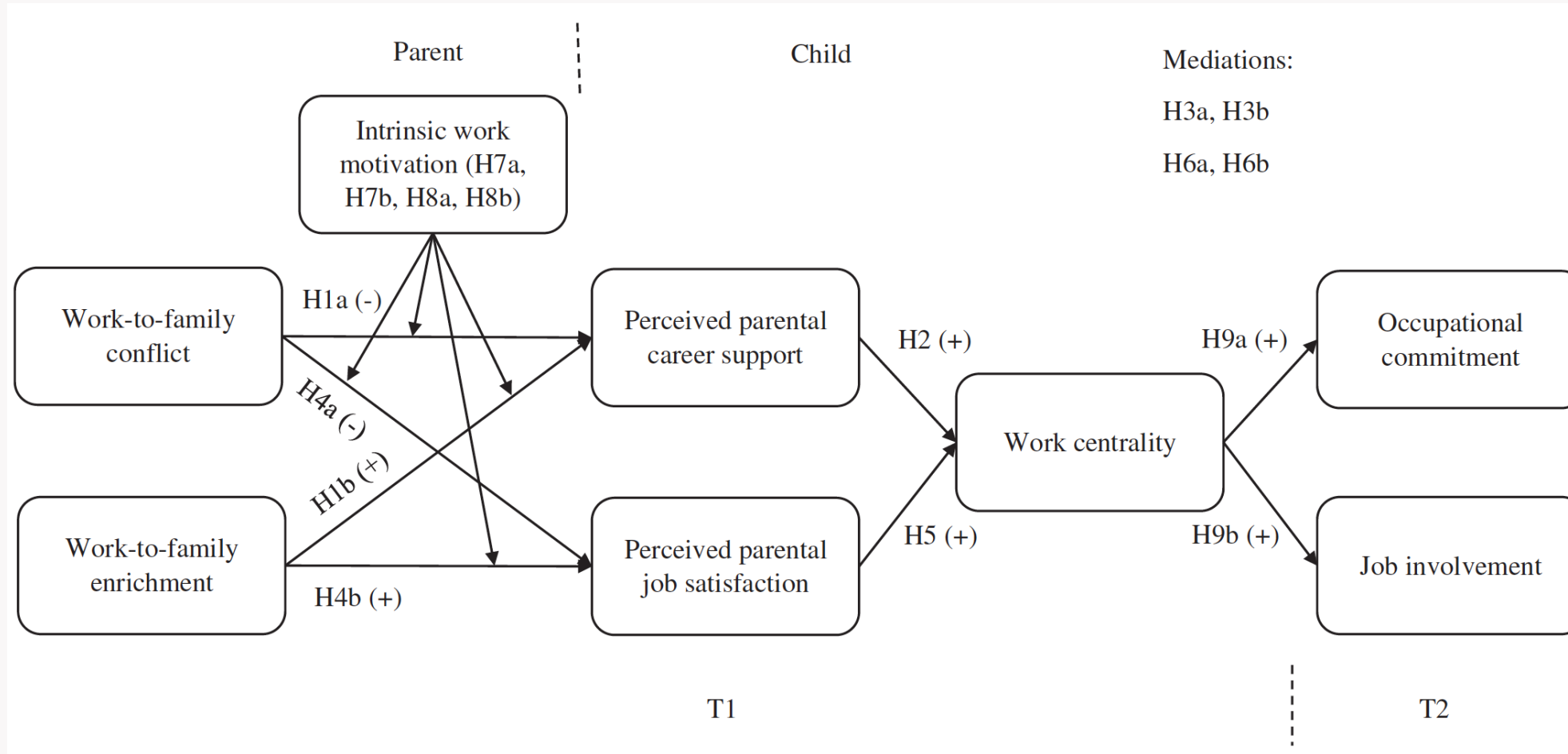
Steiner et al. (2023). Crossover effects of parent work-to-family experiences on child work centrality: A moderate