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. Models are useful because they allow us to communicate and test simplified pieces of our 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 Inquiry, 31*(4), 336-334.

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 in that theory.

Communicating Models with a Path Diagram

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

Path diagrams follow several graphical conventions:

1. Variables (or phenomena) are represented by a shape usually a square or circle.
2. Causal and predictive relationships among variables are represented with a unidirectional arrow.
3. Non-causal and non-predictive relationships (i.e. correlations) among variables are represented with curved, non-directional arrows.

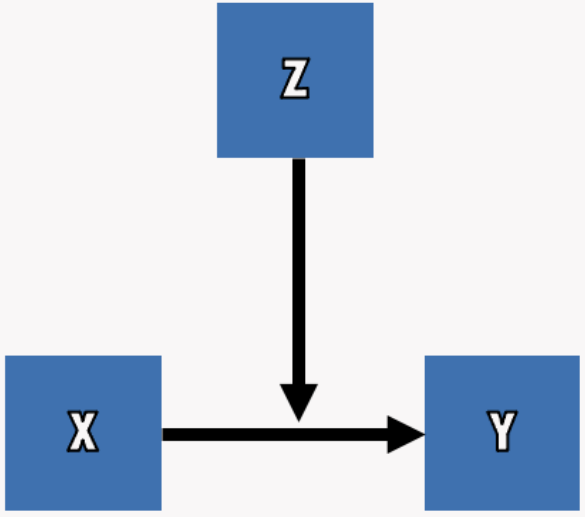
Types of Relationships Among Variables

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

Direct Relationship

Mediated (Indirect) Relationship

Moderated Relationship

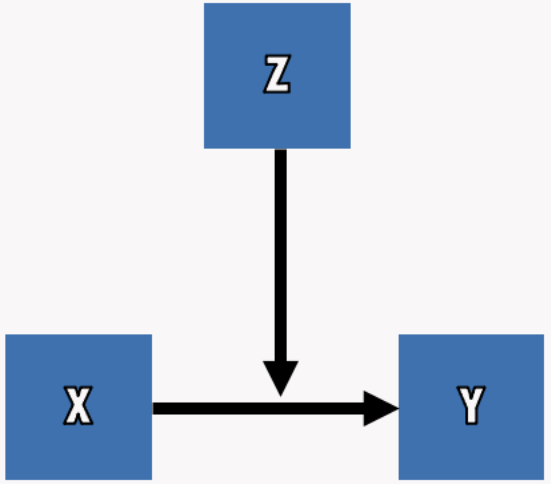


Direct Relationships

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

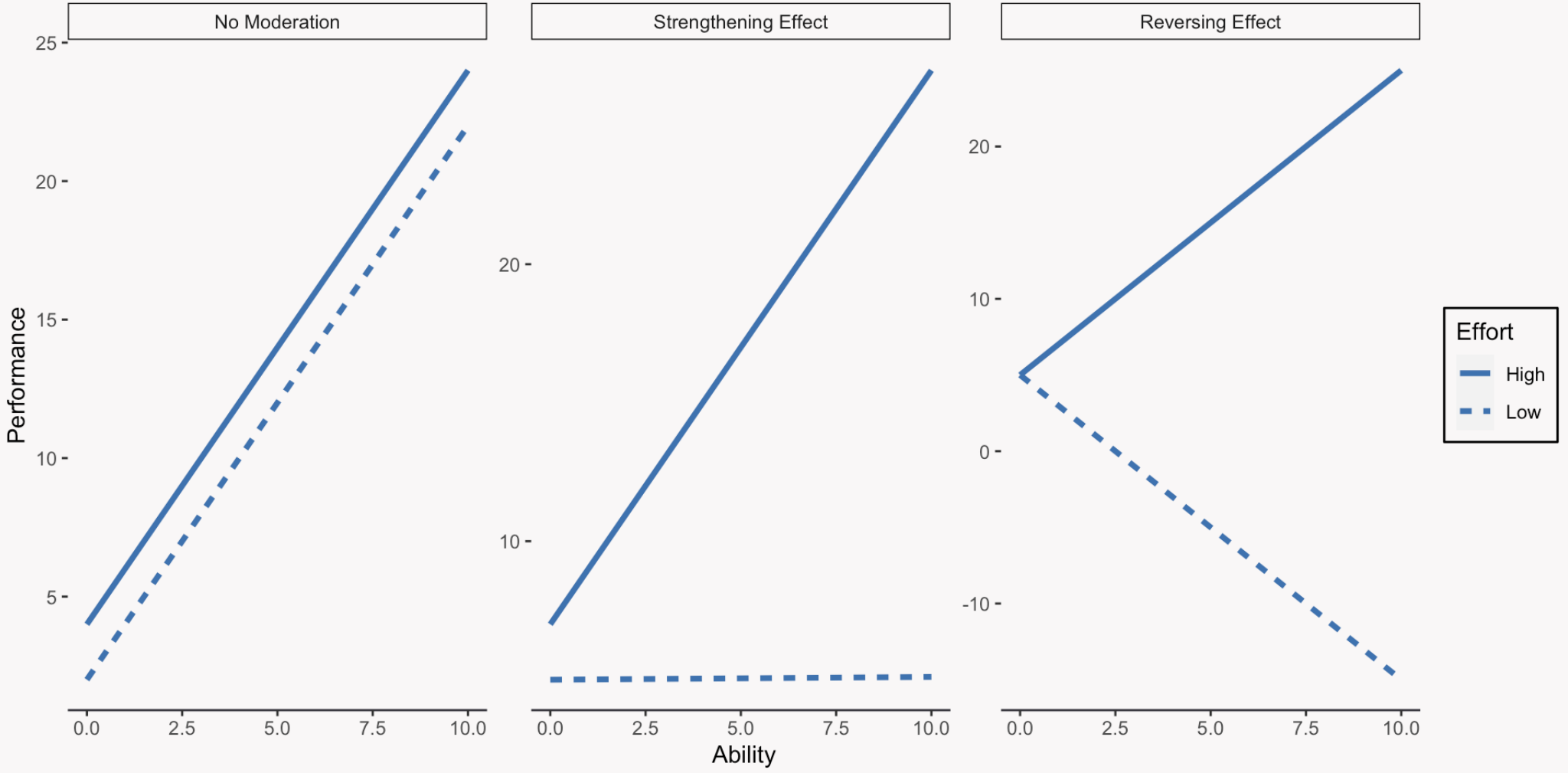
Moderated Relationships: The "How Strong" Heuristic

A **moderated relationship**, causal or otherwise, involves three variables in which the relationship between two variables, a predictor and outcome variable, changes depending on the value of a third variable, the moderating variable or moderator.



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 influences 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:

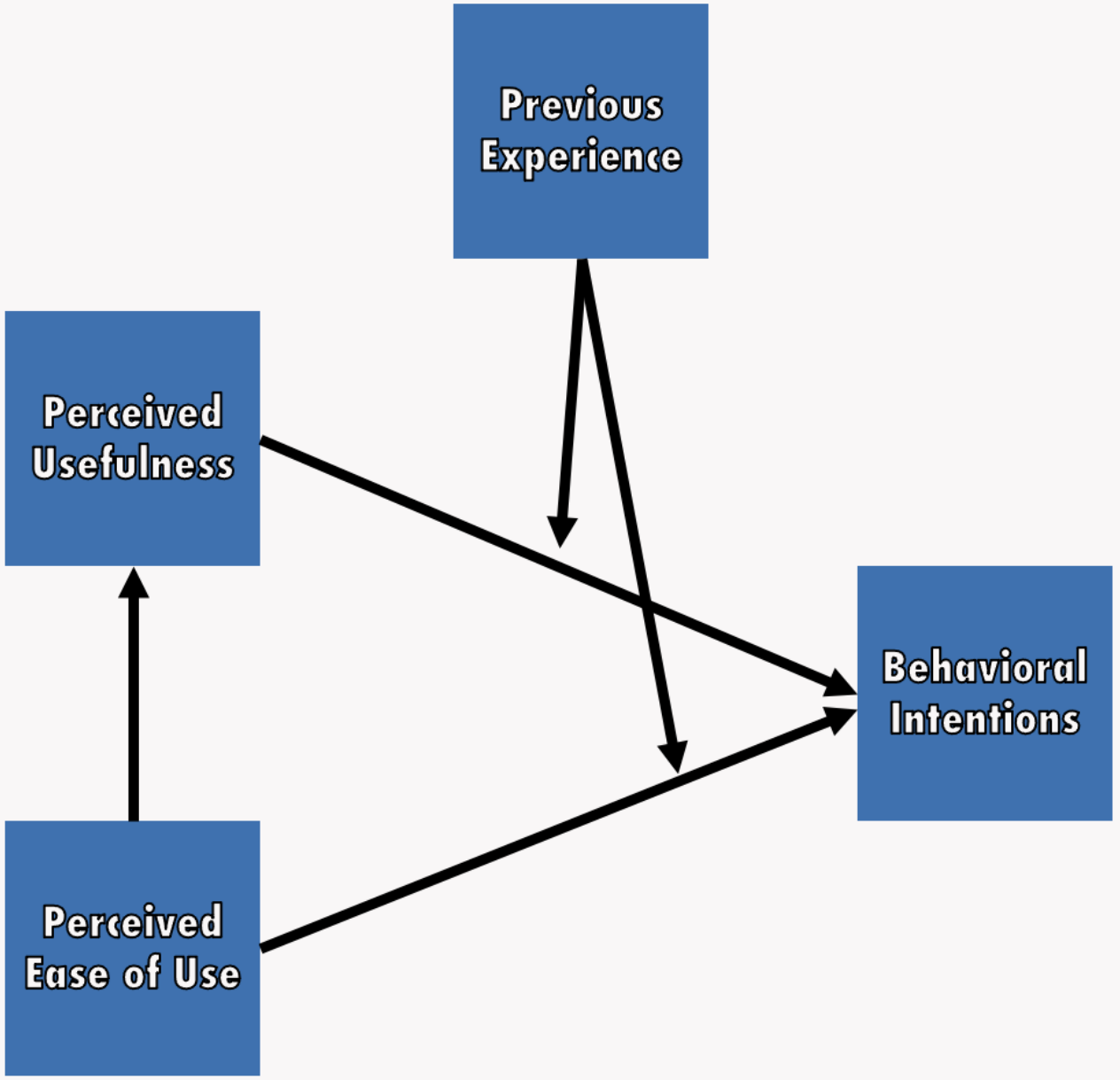
1. The indirect effect of X on Y
2. The direct effect of X on Y
3. The total effect of X on Y

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 variables
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.

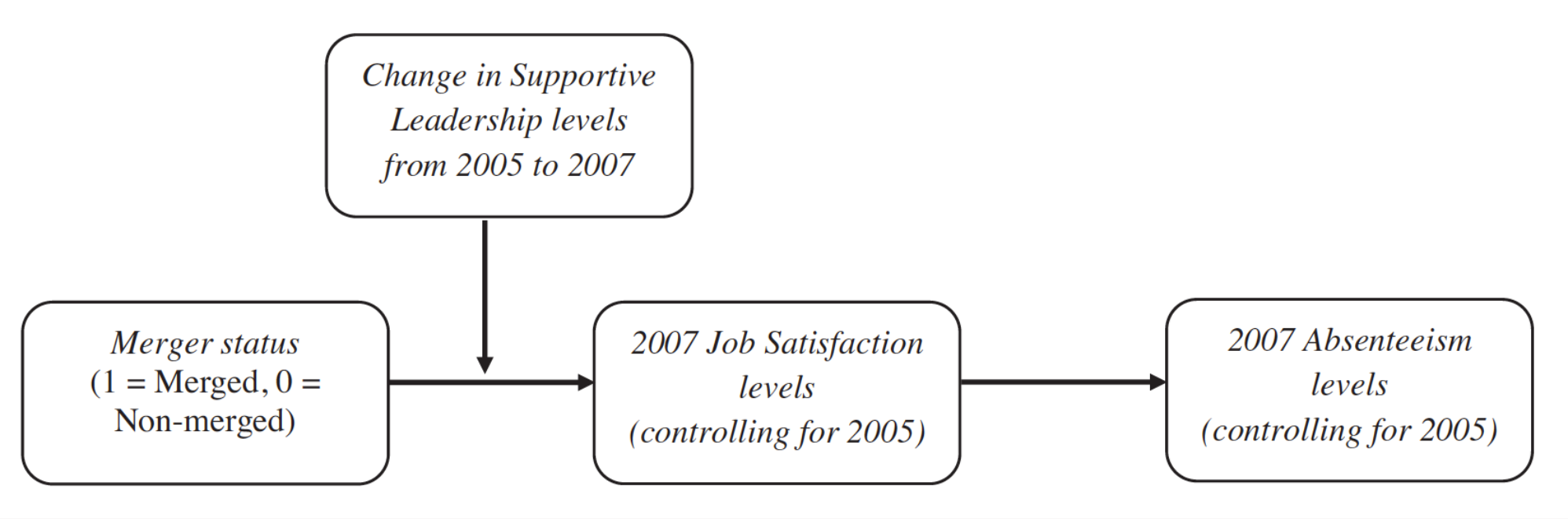
Path Diagrams and Regression Equations

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

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

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

The Human Costs of Mergers: A Published Example



Giessner et al. (2023). The impact of supportive leadership on employee outcomes during organizational mergers: An organizational-level field study. *Journal of Applied Psychology, 108*(4), 686-697.

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]**

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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 for organizations with increasing levels of supportive leadership**.

Giessner et al. (2023). The impact of supportive leadership on employee outcomes during organizational mergers: An organizational-level field study. *Journal of Applied Psychology, 108*(4), 686-697.

Moderated Mediation Hypothesis: H5

- *H5*: The increases in absenteeism for merging organizations relative to nonmerging organizations as **mediated by the decreases in job satisfaction** 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: An organizational-level field study. *Journal of Applied Psychology, 108*(4), 686-697.

Regression Models: Mediation Hypotheses

H1–H3 Testing Results

Dependent variable	H1 Job satisfaction 2007	H2 Absenteeism 2007	H3 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, 0.64)
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% confidence interval).

[a] Measured as number of employees in 2007 (i.e., postmerger). [b] 1 = *merged*; 0 = *nonmerged*.

* $p < .05$. ** $p < .01$. *** $p < .001$.

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Regression Models: Moderation Hypotheses

H4 Testing Results

Dependent variable	H4	H5	H5	
	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*.
* $p < .05$. ** $p < .01$. *** $p < .001$.

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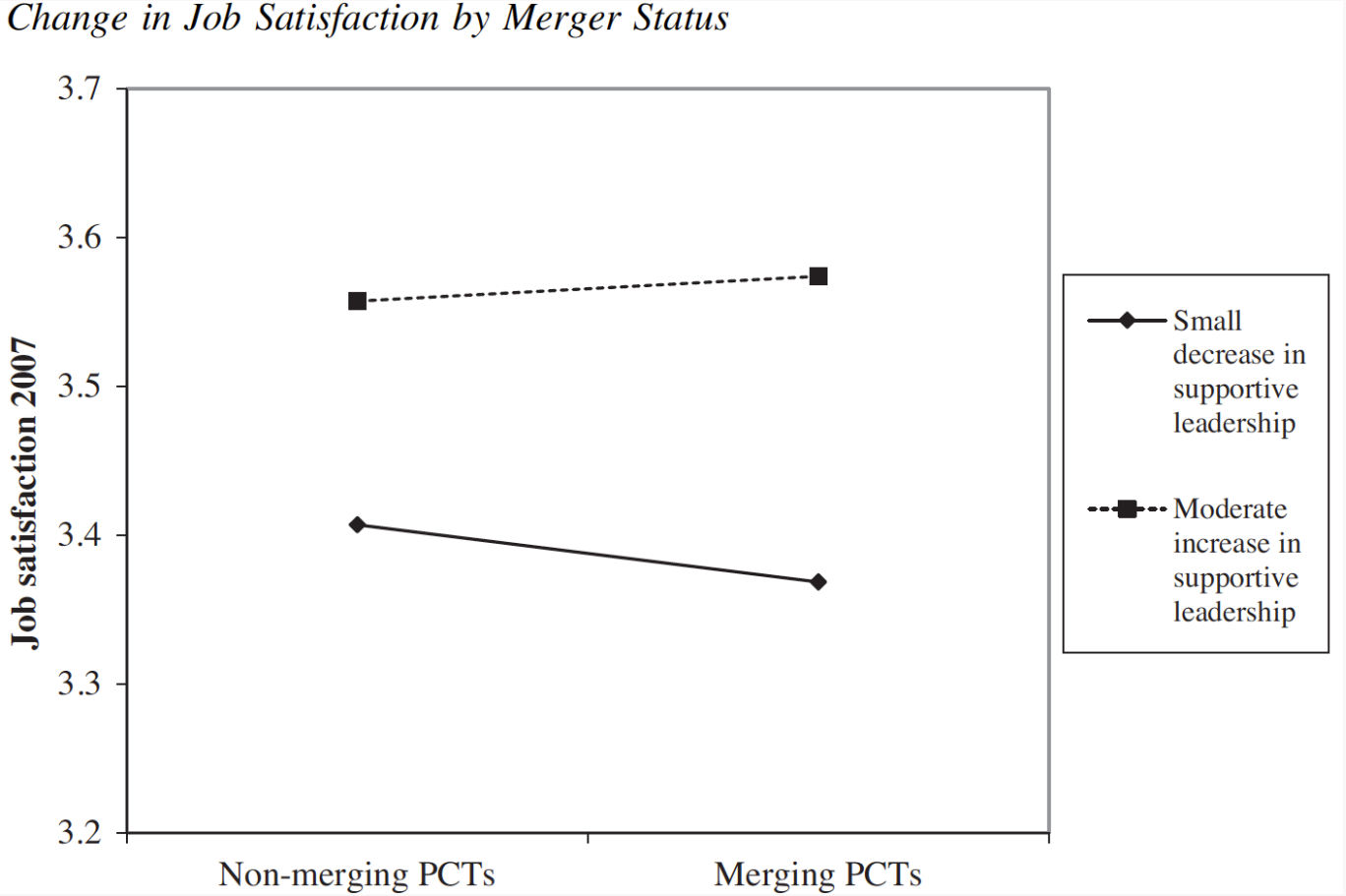
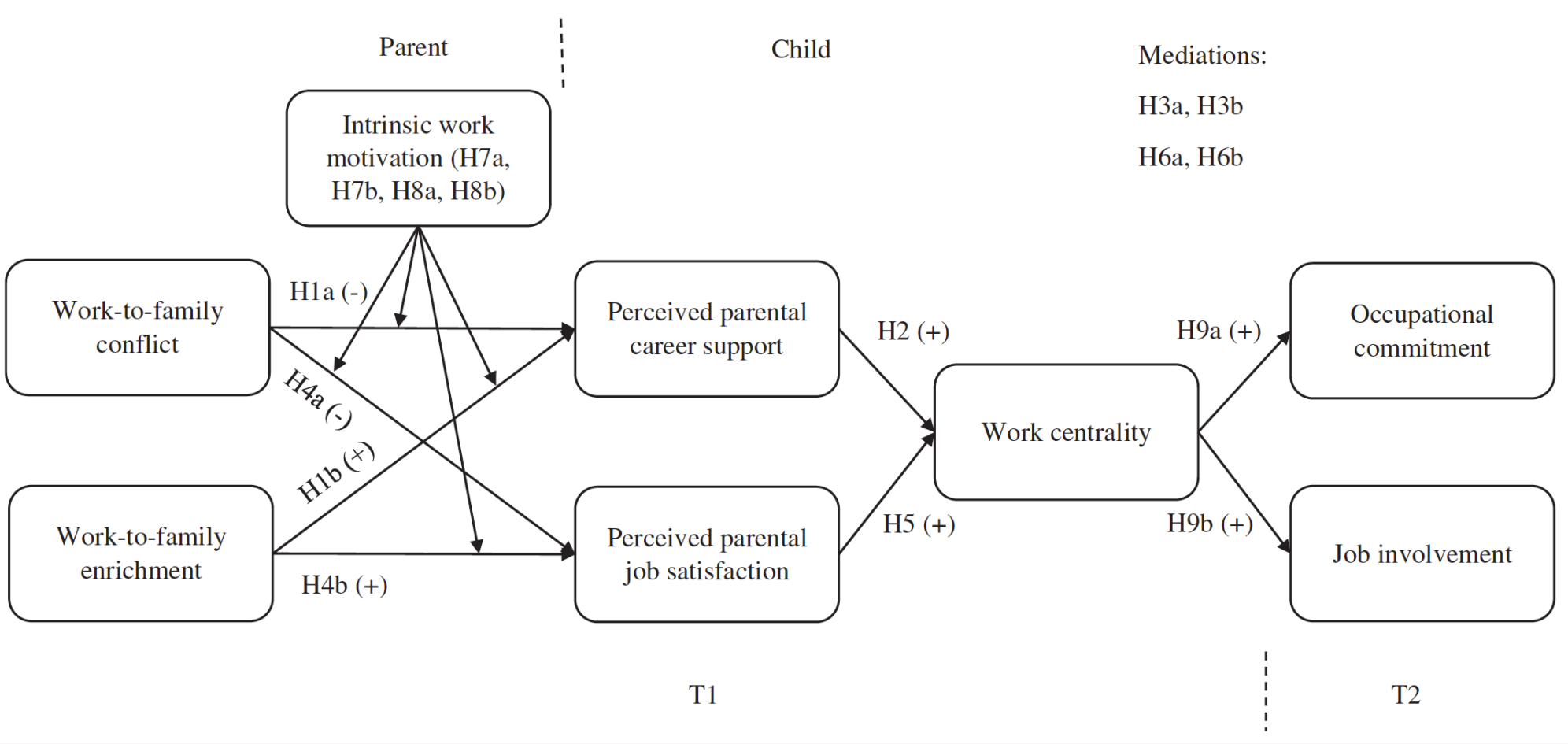
Moderation Plot



Giessner et al. (2023). The impact of supportive leadership on employee outcomes during organizational mergers: An organizational-level field study. *Journal of Applied Psychology, 108*(4), 686-697.

A More Complex Published Example



Steiner et al. (2023). Crossover effects of parent work-to-family experiences on child work centrality: A moderated mediation model. *Journal of Applied Psychology, 108*(6), 934-953.