



TESTING MEDIATING AND MODERATING EFFECTS USING THE PROCESS MACRO

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April, 6th



About me...



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How do consumers respond to fun wine labels?

Consumers response to fun wine labels

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Abstract Purpose – Because consumers nowadays face a wide diversity of wine labels – from very traditional to a myriad of contemporary labels with color and various images – the purpose of this paper is to better understand the effects of the presence of fun elements on wine labels. Specifically, it aims to identify the underlying mechanisms that explain why the elements on labels can lead to a decrease in consumers' willingness to pay (WTP) and purchase intentions. The authors also test whether consumers' risk propensity acts as a boundary condition for this effect. Design/methodology/approach – This research uses an online experiment conducted among a sample of 20 US residents. Multivariate analyses – including analyses of mediation, moderation and moderated mediation – are performed to test the theoretical model of the effects of fun elements on WTP and purchase intention through consumers' impressions and quality perceptions, and the moderating role of risk propensity. Findings – This research demonstrates that when consumers face a wine label that incorporates a high degree of fun elements, they perceive the label as less or not at all inherently credible. WTP and purchase intent are negatively affected by the fun elements. The moderating effect of risk propensity is significant only for consumers who are high on risk propensity. Practical implications – By showing that fun does not necessarily increase WTP and purchase intentions, this research suggests that labels' fun elements should be used with caution. Moreover, because consumers who are risk averse are more likely to purchase products with fun elements only for customers who are high on risk propensity, this research suggests that fun elements in labels can affect consumers' responses (moderated). The paper was supported, in part, by the USDA Strong Opinions, Endless Options, or Recommendations grant and is also grateful for the helpful comments and suggestions from the reviewers.

Keywords Risk perception, Wine, Quality, Label, Fun, Paper type Research paper

Article info

ABSTRACT

1. Introduction

Wine consumption is often seen as a highly rewarding experience. Wine-related sensory cues such as color, smell and taste contribute to make wine consumption a hedonic experience (Dion, 1988; Laroche, 2018; Torres, 2015), even an aesthetic one (Carraro & Pizzini, 2013). As a result, this positive sensory experience may sometimes lead consumers to overlook products such as wine (Grunert, 2013), especially because indulgent consumption is pleasurable and helps people feel better (Ponemon & Scott, 2014; Pridemore, Dechow, & Green, 2010; Laroche, 2018; Laroche, 2015). Beyond these sensory cues, indulgent consumption of wine might result from the social aspects that surround wine experience. People associate wine with feelings (Dion, 1988; Laroche, 2018; Laroche, 2015; Moore, La Mura, & Indiguito, & Park, 2013) and sometimes feel the need to drink wine to conform to others' expectations (Cherrier & Vermeiren, 1997), to satisfy their need to belong and to seek by any means to be accepted within a group (Festinger & Lyons, 1956).

Despite these positive aspects of wine experience – and although wine consumption can have health benefits (Cassidy, 2006; Lumarado, Lumarado, & Estruch, 2013; Green & Watson, 2003) – it can be harmful when consumed irresponsibly (Coffield & Pridemore, 2013). For instance, prior research reveals a sharp association between wine consumption and cardiovascular risks (Cassidy, 2006; Lumarado, Dion, Indiguito, & de Goozen, 2013), indicating that wine consumption can be detrimental for health. Because of such harms, several academic calls for more responsible wine consumption, the identification of individual variables that could explain the tendency for people to engage in such an excessive consumption, heretofore related to wine intoxication experience (Carraro, Chavira, & Indiguito, 2017) – an emergence of primary interest for producers and policymakers. Yet, the literature on this issue remains scarce, having as far identified wine knowledge and implications (Cassidy, & Lumarado, 1996), lack of wine labels (Dion, 2006; Moore, & Vignati, 2014) and gender (Dion, 1988; Moore, & Vignati, 2014) and sometimes felt the need to explain the frequent focus of research on particular age-based classes of individuals, like young (Cappi et al., 2010; Pridemore, Indiguito, Indiguito, & Schmitt, 2014) or older adults (Dion & Indiguito, 2013; Indiguito, & Carraro, 2010). While research has focused on those particular classes, little is known about what specific personality traits could prompt people to engage in wine consumption, particularly, in the

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Agenda

- The concepts of moderation and mediation
- The PROCESS macro (Hayes): definition and advantages
- An application in the field of marketing

The concepts of moderation and mediation

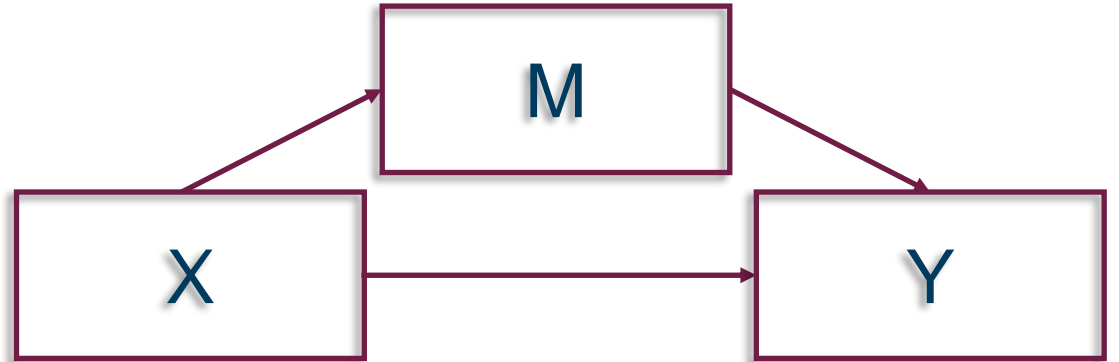
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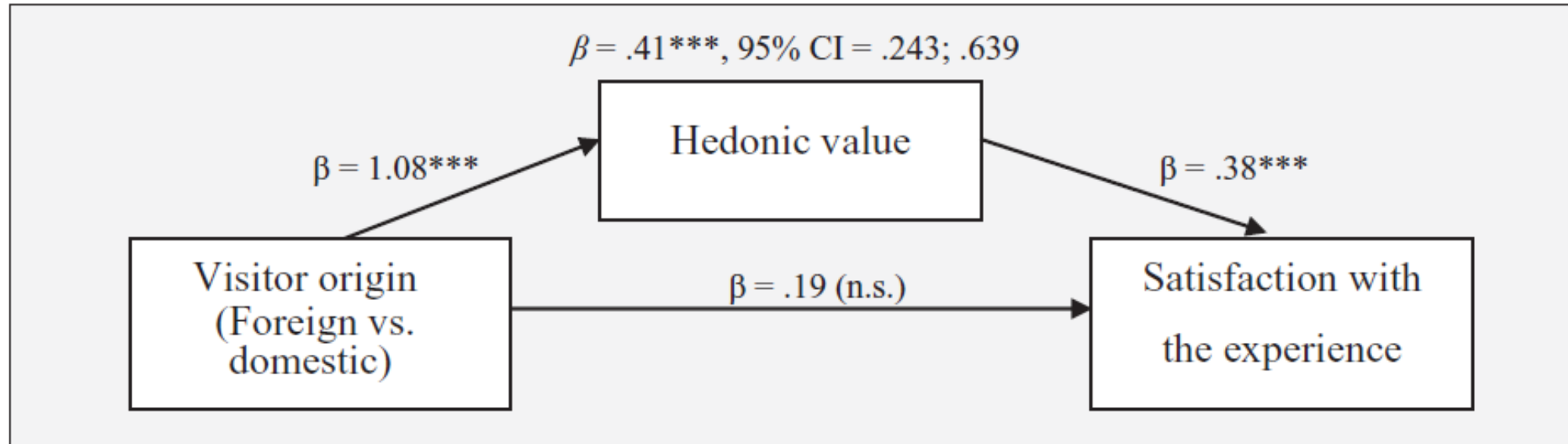
Mediating (i.e., indirect) effects

GOAL:

- Identify the mechanism that explains why X has an effect on Y
- Even better: rule out some other potential alternative mechanisms



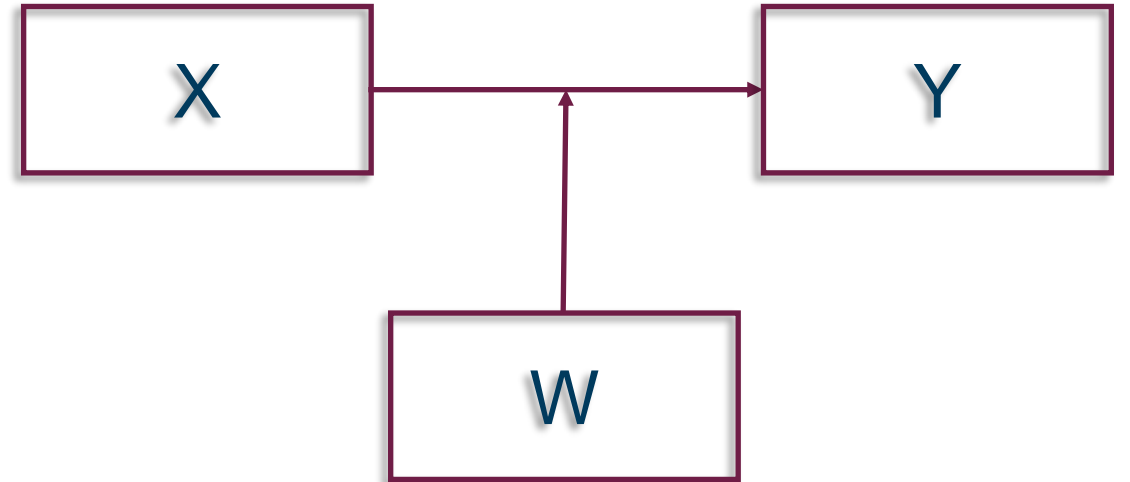
An example of mediating effect



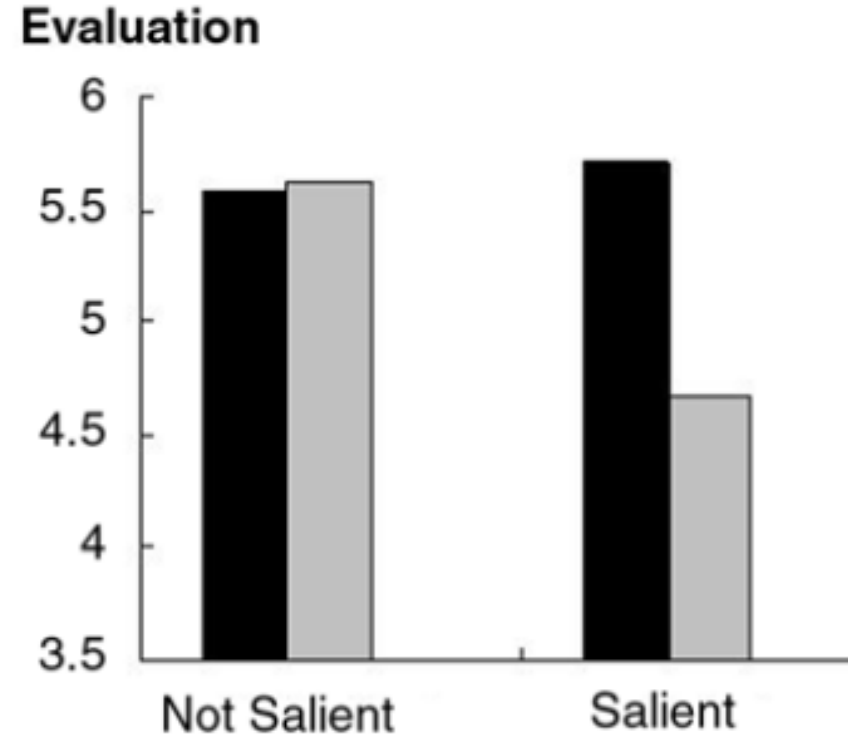
Moderating effects

GOAL: identify the conditions under which:

- X has an effect on Y...
- ... the effect of X on Y changes (or, the boundary condition for the effect of X on Y)



Reporting moderating effects... depending on X and Z



The Macro PROCESS (Hayes)

Definition and advantages


02

A decorative graphic of overlapping leaf shapes in a lighter shade of purple, located in the bottom right corner of the slide.

At the origin of the Process macro...

Andrew F. Hayes - Google Scholar

scholar.google.com/citations?user=qRrkCbkAAAAJ&hl=en&oi=ao



Andrew F. Hayes [FOLLOW](#)

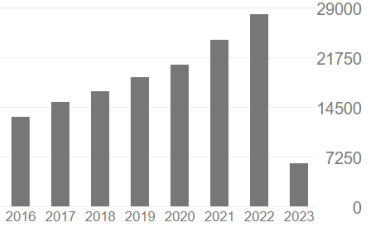
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TITLE	CITED BY	YEAR
Introduction to mediation, moderation, and conditional process analysis: A regression-based approach AF Hayes New York, NY: Guilford Press	62473	
Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models KJ Preacher, AF Hayes Behavior research methods 40 (3), 879-891	33040	2008
SPSS and SAS procedures for estimating indirect effects in simple mediation models KJ Preacher, AF Hayes Behavior research methods, instruments, & computers 36, 717-731	20345	2004
Beyond Baron and Kenny: Statistical mediation analysis in the new millennium AF Hayes Communication monographs 76 (4), 408-420	10757	2009
Addressing moderated mediation hypotheses: Theory, methods, and prescriptions KJ Preacher, DD Rucker, AF Hayes Multivariate Behavioral Research 42 (1), 185-227	10593	2007

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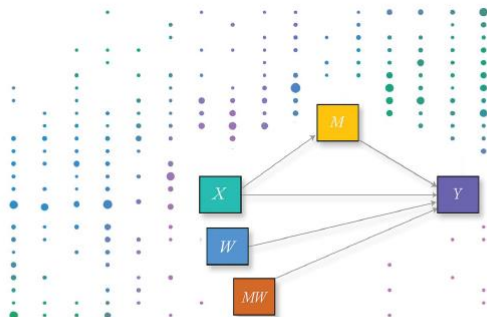
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SECOND EDITION

Introduction to Mediation, Moderation, and Conditional Process Analysis | A Regression-Based Approach



Andrew F. Hayes

MEDIATIONS



Some historical perspective on mediations

Journal of Personality and Social Psychology
1986, Vol. 51, No. 6, 1173-1182

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The Moderator-Mediator Variable Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations

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University of Connecticut

In this article, we attempt to distinguish between the properties of moderator and mediator variables at a number of levels. First, we seek to make theorists and researchers aware of the importance of not using the terms *moderator* and *mediator* interchangeably by carefully elaborating, both conceptually and strategically, the many ways in which moderators and mediators differ. We then go beyond this largely pedagogical function and delineate the conceptual and strategic implications of making use of such distinctions with regard to a wide range of phenomena, including control and stress, attitudes, and personality traits. We also provide a specific compendium of analytic procedures appropriate for making the most effective use of the moderator and mediator distinction, both separately and in terms of a broader causal system that includes both moderators and mediators.

The purpose of this analysis is to distinguish between the properties of moderator and mediator variables in such a way as to clarify the different ways in which conceptual variables may account for differences in peoples' behavior. Specifically, we differentiate between two often-confused functions of third variables: (a) the moderator function of third variables, which partitions a focal independent variable into subgroups that establish its domains of maximal effectiveness in regard to a given dependent variable, and (b) the mediator function of a third variable, which represents the generative mechanism through which the focal independent variable is able to influence the dependent variable of interest.

Although these two functions of third variables have a relatively long tradition in the social sciences, it is not at all uncommon for social psychological researchers to use the terms *moderator* and *mediator* interchangeably. For example, Harkins, Latané, and Williams (1980) first summarized the impact of identifiability on social loafing by observing that it "moderates social loafing" (p. 303) and then within the same paragraph proposed "that identifiability is an important mediator of social loafing." Similarly, Findley and Cooper (1983), intending a moderator interpretation, labeled gender, age, race, and socioeconomic level as mediators of the relation between locus of control and academic achievement. Thus, one largely pedagogical function of this article is to clarify for experimental researchers the importance of respecting these distinctions.

This is not, however, the central thrust of our analysis. Rather, our major emphasis is on contrasting the moderator-mediator functions in ways that delineate the implications of this distinction for theory and research. We focus particularly on the differential implications for choice of experimental design, research operations, and plan of statistical analysis.

We also claim that there are conceptual implications of the failure to appreciate the moderator-mediator distinction. Among the issues we will discuss in this regard are missed opportunities to probe more deeply into the nature of causal mechanisms and integrate seemingly irreconcilable theoretical positions. For example, it is possible that in some problem areas disagreements about mediators can be resolved by treating certain variables as moderators.

The moderator and mediator functions will be discussed at three levels: conceptual, strategic, and statistical. To avoid any misunderstanding of the moderator-mediator distinction by erroneously equating it with the difference between experimental manipulations and measured variables, between situational and person variables, or between manipulations and verbal self-reports, we will describe both actual and hypothetical examples involving a wide range of variables and operations. That is, moderators may involve either manipulations or assessments and either situational or person variables. Moreover, mediators are in no way restricted to verbal reports or, for that matter, to individual-level variables.

Finally, for expository reasons, our analysis will initially stress the need to make clear whether one is testing a moderator or a mediator type of model. In the second half of the article, we provide a design that allows one to test within the structure of the same study whether a mediator or moderator interpretation is more appropriate.

Although these issues are obviously important for a large number of areas within psychology, we have targeted this article for a social psychological audience because the relevance of this distinction is highest in social psychology, which uses experi-

This research was supported in part by National Science Foundation Grant BNS-8210137 and National Institute of Mental Health Grant R01MH-40295-01 to the second author. Support was also given to him during his sabbatical year (1982-83) by the MacArthur Foundation at the Center for Advanced Studies in the Behavioral Sciences, Stanford, California.

Thanks are due to Judith Harackiewicz, Charles Judd, Stephen West, and Harris Cooper, who provided comments on an earlier version of this work.

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Reconsidering Baron and Kenny: Myths and Truths about Mediation Analysis

XINSHU ZHAO
JOHN G. LYNCH JR.
QIMEI CHEN

Baron and Kenny's procedure for determining if an independent variable affects a dependent variable through some mediator is so well known that it is used by authors and requested by reviewers almost reflexively. Many research projects have been terminated early in a research program or later in the review process because the data did not conform to Baron and Kenny's criteria, impeding theoretical development. While the technical literature has disputed some of Baron and Kenny's tests, this literature has not diffused to practicing researchers. We present a nontechnical summary of the flaws in the Baron and Kenny logic, some of which have not been previously noted. We provide a decision tree and a step-by-step procedure for testing mediation, classifying its type, and interpreting the implications of findings for theory building and future research.

Many a research project has stalled in the starting gate or staggered at the finish line because the data did not conform to Baron and Kenny's (1986) criteria for establishing mediation. Advisors tell their graduate students to start by establishing a basic effect. "Once you have the effect, then you can look for mediation." But after the first couple of tries, if the effect is not found, the project is abandoned. Other researchers find the effects they hypothesized, and they propound a mediational account, but they struggle in the review process when it becomes clear that the data do not comport with one or more of the Baron-Kenny criteria.

This article shows that misapplication of the Baron-Kenny procedure is causing authors to drop projects that may be promising and causing journals to reject papers that may deserve publication. We also show how misunderstanding of mediation causes many authors to ignore important hints for theory building.

Baron and Kenny's (1986) article had been cited by 12,688 journal articles as of September 2009, according to *Social Sciences Citation Index*, with citations per year growing each year, including 1,762 by then in 2009. The procedure is so well known that it is used by authors and requested by reviewers almost reflexively—even when experimental approaches other than statistical ones might be more appropriate (Iacobucci, Saldanha, and Deng 2007; Mitra and Lynch 1995; Spencer, Zanna, and Feng 2005). Ironically's Note.—This article was invited, and it is intended to serve as a guide to authors either to follow or to take into account if an alternative approach is used. Because a number of articles submitted to *JCR* follow Baron and Kenny (1986) on mediation analysis, I invited this article to serve as a tutorial on the state of the art in mediation analysis, similar to Fitzsimons's (2008) article on analysis of moderated regression. The article was reviewed with two issues in mind: are the points technically correct, and are the points already known by practicing consumer researchers? Two sets of reviewers were used, methodologists to answer the first question and mainstream users of Baron and Kenny's procedure who are not methodologists to answer the second.

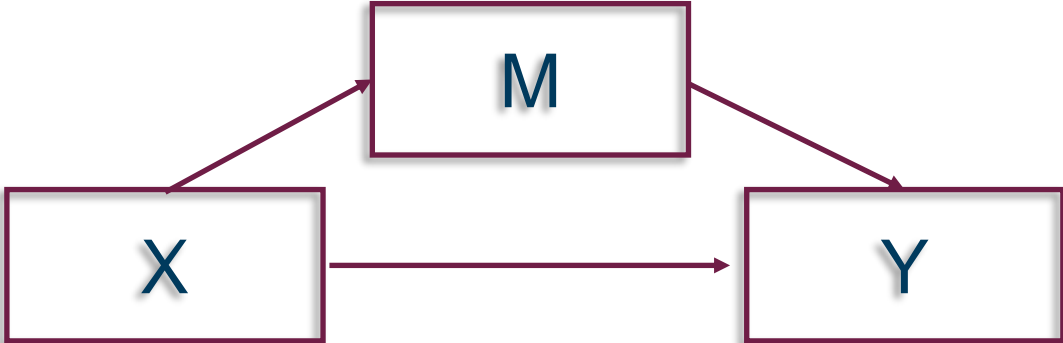
John Deighton served as editor and Gavriel Salvendy served as associate editor for this article.

Electronically published February 15, 2010

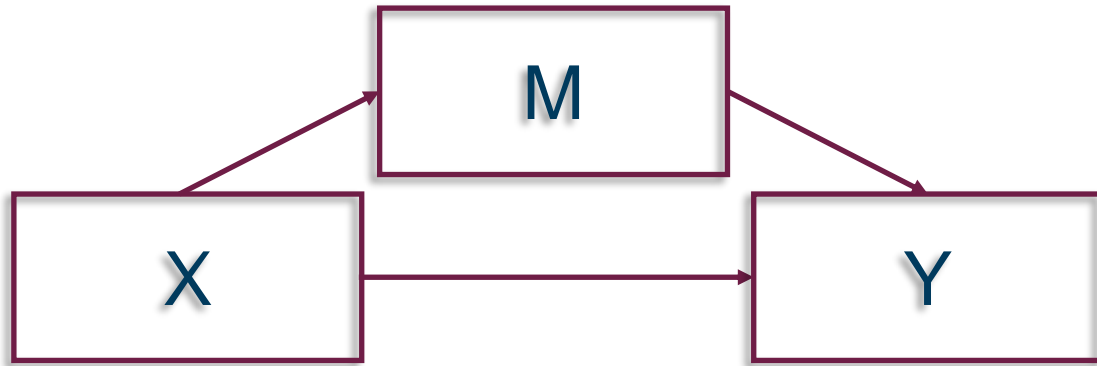
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Mediation effects



The 4-step old (1986...) fashion way of testing mediation



$$Y = i_1 + cX + e_1, \quad 1.$$
$$Y = i_2 + c'X + bM + e_2, \quad 2.$$
$$M = i_3 + aX + e_3, \quad 3.$$

1. Significant relation of X to the Y in eq. 1
2. Significant relation of X to M in eq. 3
3. M significantly related to Y when both X and M are predictors of Y in eq. 2
4. Non-significant coefficient relating X to Y in eq. 2

Baron, R. M. , & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, 51, 1173–1182.

Testing mediation using the Process macro

PROCESS_v3.5

Variables:

- What is your age? [Age]
- What is your gender? [Sex]
- Conditions_DO_No_switch
- Conditions_DO_Switch_Perfect
- Conditions_DO_Switch_accent
- CHECK
- ACCULLG
- RETURN
- WOM

Model number: 4

Confidence intervals: 95

Number of bootstrap samples: 5000

Save bootstrap estimates

Bootstrap inference for model coefficients

Y variable: SATISF

X variable: SWITCH01

Mediator(s) M: IDTHREAT

Covariate(s):

Moderator variable W:

Moderator variable Z:

Do not use PASTE button

Buttons: About, Options, Multicategorical, Long variable names, OK, Paste, Reset, Cancel, Help



Model : 4 Y : SATISF X : SWITCH01 M : IDTHREAT

OUTCOME VARIABLE: IDTHREAT

	coeff	se	t	p	LLCI	ULCI
constant	2,3143	,1918	12,0678	,0000	1,9361	2,6925
SWITCH01	1,3485	,2331	5,7842	,0000	,8888	1,8083

OUTCOME VARIABLE: SATISF

	coeff	se	t	p	LLCI	ULCI
constant	6,1991	,1656	37,4358	,0000	5,8725	6,5256
SWITCH01	-,0267	,1653	-,1616	,8718	-,3528	,2993
IDTHREAT	-,3120	,0465	-6,7087	,0000	-,4038	-,2203

***** DIRECT AND INDIRECT EFFECTS OF X ON Y *****

Direct effect of X on Y

Effect	se	t	p	LLCI	ULCI
-,0267	,1653	-,1616	,8718	-,3528	,2993

Indirect effect(s) of X on Y:

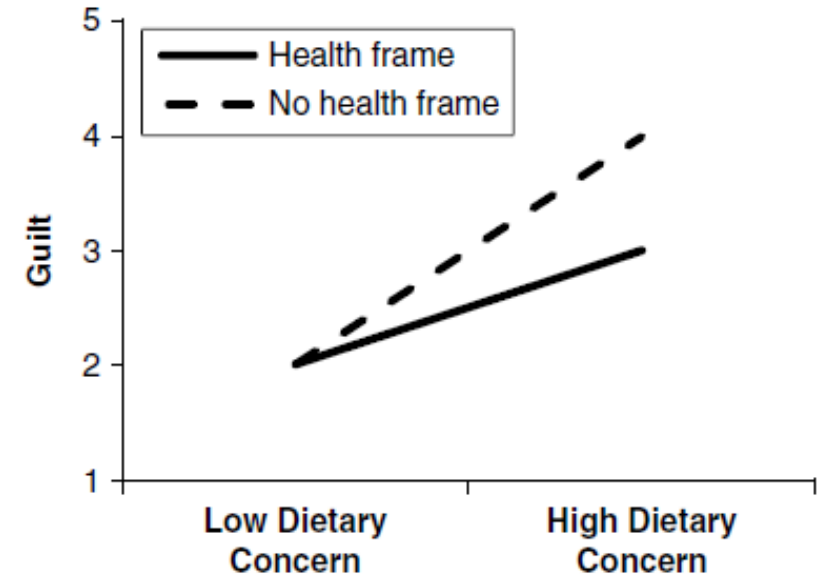
Effect	BootSE	BootLLCI	BootULCI	
IDTHREAT	-,4208	,0997	-,6315	-,2418

Testing moderations: what **NOT** to do...

Performing a split (median- or mean-based) when Z is numerical/continuous

→ Huge controversy around this method due to, among others, **arbitrary value of the split** and **insensitive analysis to the pattern of local covariation between X and Y within groups defined by the median split**

→ « *We know of no statistical argument in favor of median splits to counterbalance the chorus of statistical critiques against them*» (Mc Lelland et al., 2015, p.680).

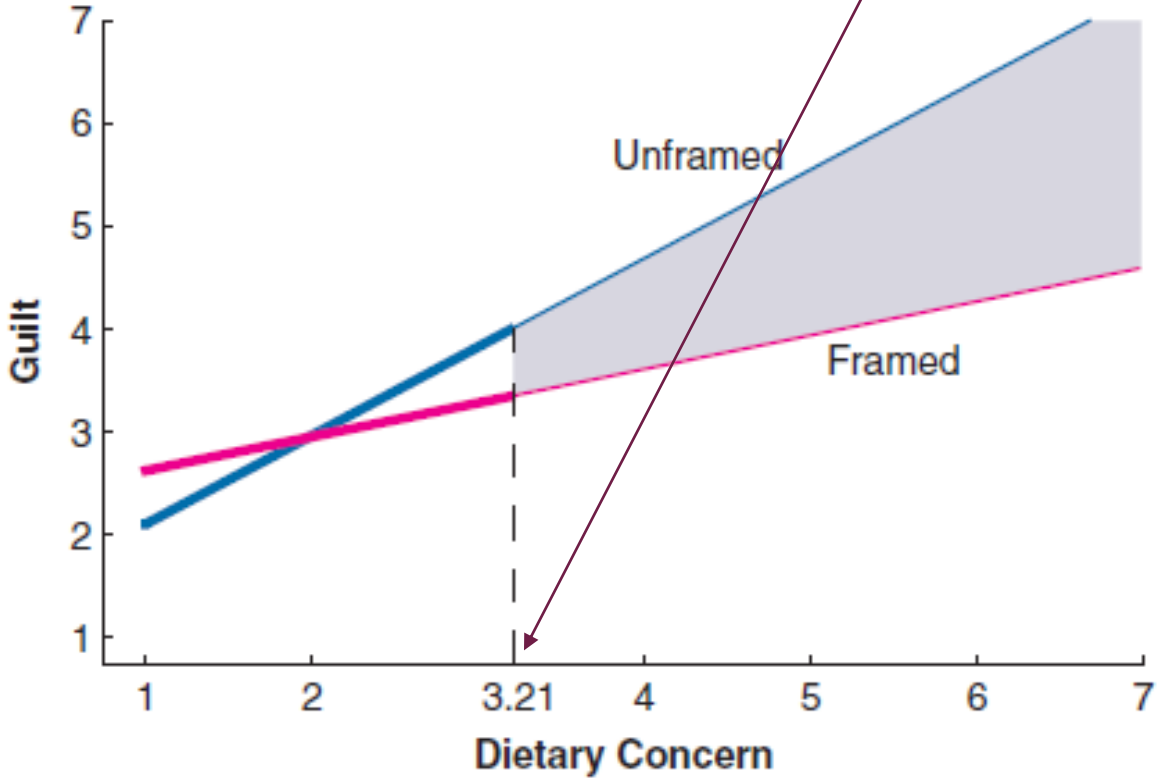
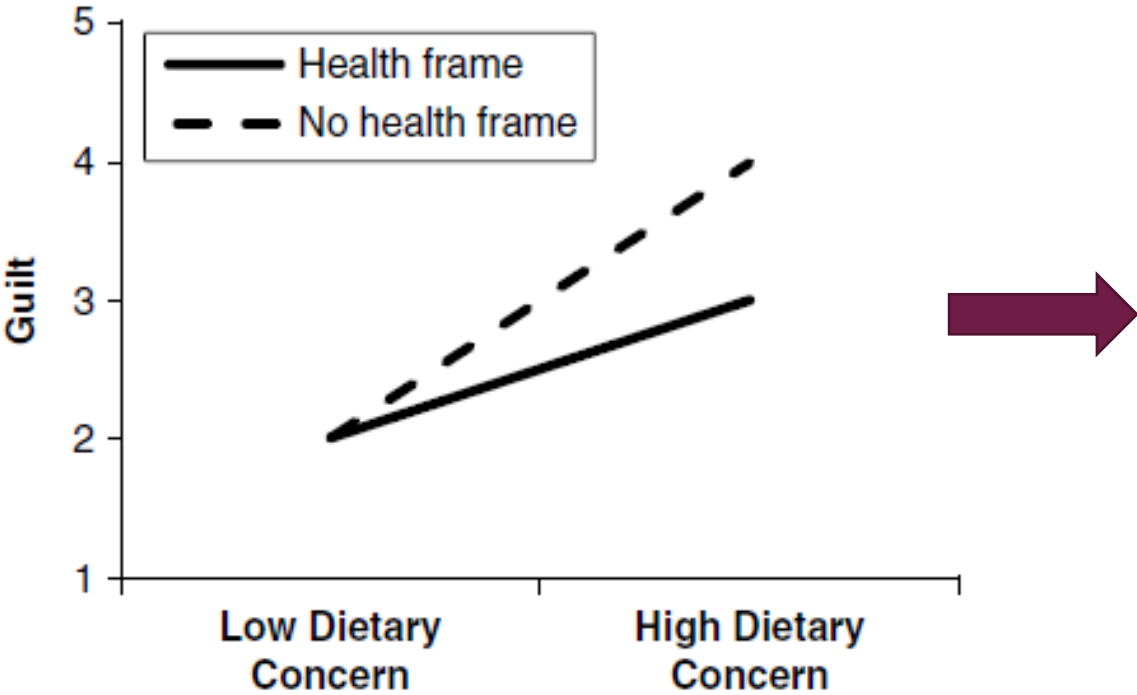


Fitzsimons, G. J. (2008), Death to dichotomizing, *Journal of Consumer Research* 35(1), 5–8.

McClelland, G.H., Lynch, Jr., J.G., Irwin, J.R., Spiller, S.A., & Fitzsimons, G. J. (2015), Median splits, Type II errors, and false–positive consumer psychology: Don't fight the power, *Journal of Consumer Psychology* 25 (4), 679–689.

What TO DO

- Keep the continuous measure (i.e., do NOT split)
- Identify the Johnson-Neyman point



Spiller, S. A., Fitzsimons, G. J., Lynch, Jr. J. G., & McClelland, G.H (2013). Spotlights, floodlights, and the magic number zero: Simple effects tests in moderated regression. *Journal of Marketing Research*, 50, 277-88.

Testing moderation using the Process macro

The screenshot shows the IBM SPSS Statistics Data Editor interface. The main window displays a data table with 19 rows and 12 columns. The columns are labeled: IDTHREAT, SATISF, SWITCH01, ACCULLG, RETURN, WOM, and two empty columns labeled 'var'. The data values are as follows:

	IDTHREAT	SATISF	SWITCH01	ACCULLG	RETURN	WOM	var	var
1	00	2,86	6,00	1	5,00	4,67		
2	00	5,86	5,00	1	5,40	4,67	2,00	
3	33	2,00	4,33	1	2,00	5,67	4,67	
4	00	1,00	4,00	1	2,20	4,00	4,00	
5	33	1,00	7,00	0	3,40	5,67	5,00	
6	00			0	3,20	5,00	6,67	
7	1			1	3,00	5,67	5,67	
8	1			1	5,40	4,00	3,67	
9	1			1	3,00	4,33	3,67	
10	1			1	3,40	6,33	5,00	
11	0			0	3,40	6,33	6,33	
12	1			1	2,00	6,00	5,00	
13	1			1	4,00	5,33	5,67	
14	0			0	5,00	5,00	3,33	
15	1			1	6,00	4,67	5,00	
16	1			1	4,80	1,33	1,33	
17	1			1	5,00	2,00	2,00	
18	1			1	3,80	4,33	4,33	
19	1			1	3,40	2,00	1,00	

The 'Regression' menu is open, and the 'PROCESS v3.5 by Andrew F. Hayes' option is highlighted with a pink box. The status bar at the bottom indicates 'IBM SPSS Statistics Processor is ready' and 'Unicode:ON'.

How to use it

PROCESS_v3.5

Variables:

- What is your age? [Age]
- What is your gender? [Sex]
- Conditions_DO_No_switch
- Conditions_DO_Switch_Perfect
- Conditions_DO_Switch_accent
- CHECK
- SATISF
- RETURN
- WOM

Y variable: IDTHREAT

X variable: SWITCH01

Mediator(s) M:

Covariate(s):

Model number: 1

Confidence intervals: 95

Number of bootstrap samples: 5000

Save bootstrap estimates

Bootstrap inference for model coefficients

Moderator variable W: ACCULLG

Moderator variable Z:

Do not use PASTE button

Buttons: About, Options, Multicategorical, Long variable names, OK, Paste, Reset, Cancel, Help

OUTCOME VARIABLE:
IDTHREAT

Model Summary

	R	R-sq	MSE	F	df1	df2	P
	,5222	,2727	2,0616	24,4921	3,0000	196,0000	,0000

Model

	coeff	se	t	p	LLCI	ULCI
constant	2,0054	,6619	3,0298	,0028	,7001	3,3108
SWITCH01	-1,1995	,8325	-1,4409	,1512	-2,8414	,4423
ACCULLG	,0801	,1654	,4844	,6286	-,2460	,4062
Int_1	,5963	,2018	2,9549	,0035	,1983	,9942

Tells you if the effect of X on Y depends on Z (or if the simple slopes representing the effect of X on Y significantly differ at different values of Z)

Identifying the Johnson-Neyman point

Moderator value(s) defining Johnson-Neyman significance region(s):

Value	% below	% above
2,9924	10,5000	89,5000

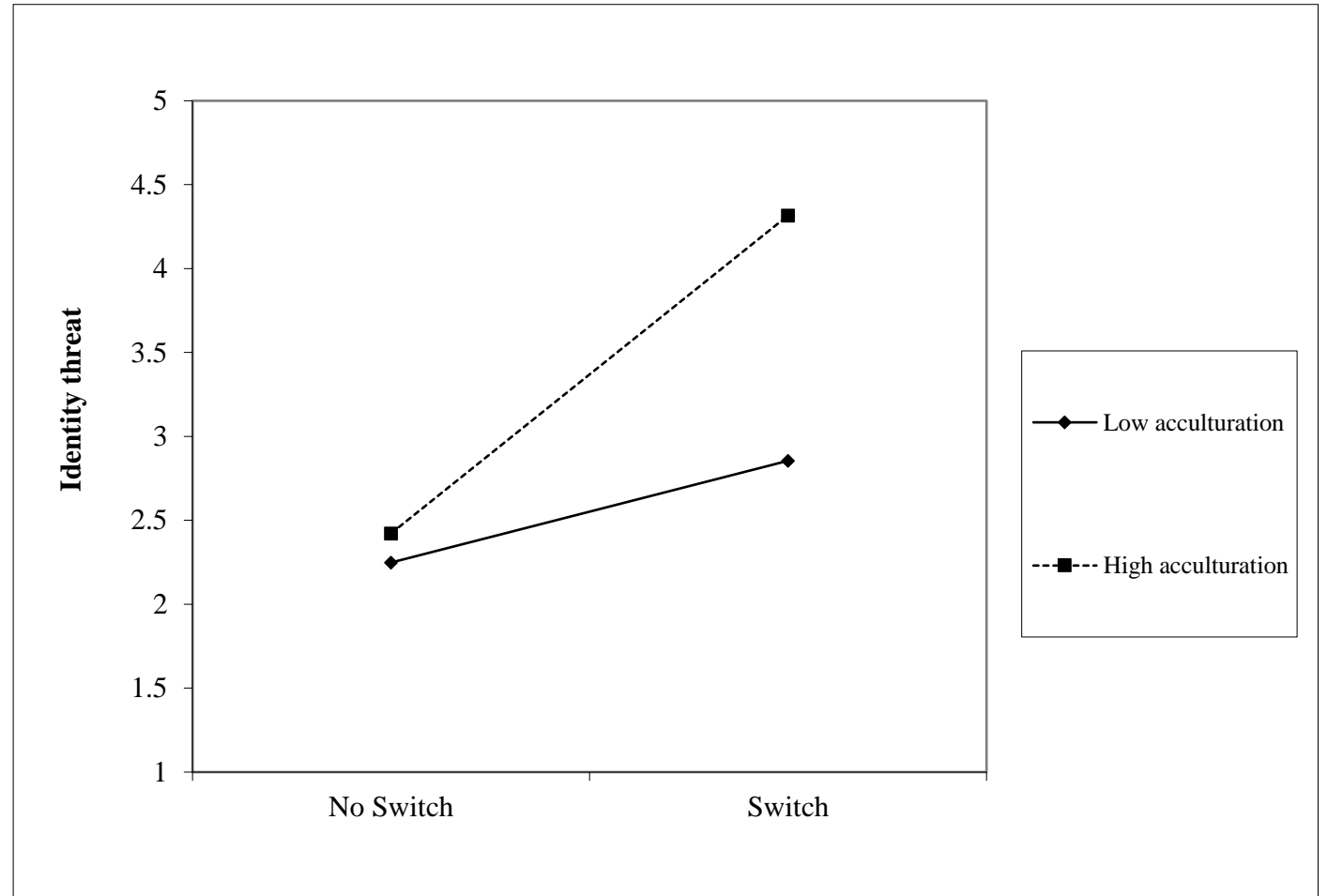
Conditional effect of focal predictor at values of the moderator:

ACCULLG	Effect	se	t	p	LLCI	ULCI
1,2000	-,4840	,6023	-,8035	,4226	-1,6719	,7039
1,4900	-,3111	,5483	-,5674	,5711	-1,3923	,7702
1,7800	-,1382	,4952	-,2790	,7806	-1,1148	,8385
2,0700	,0348	,4435	,0784	,9376	-,8399	,9095
2,3600	,2077	,3938	,5275	,5985	-,5688	,9842
2,6500	,3806	,3467	1,0977	,2737	-,3032	1,0644
2,9400	,5535	,3037	1,8225	,0699	-,0455	1,1525
2,9924	,5848	,2965	1,9721	,0500	,0000	1,1696
3,2300	,7265	,2667	2,7239	,0070	,2005	1,2524
3,5200	,8994	,2384	3,7718	,0002	,4291	1,3696
3,8100	1,0723	,2223	4,8229	,0000	,6338	1,5108
4,1000	1,2452	,2210	5,6334	,0000	,8093	1,6811
4,3900	1,4181	,2348	6,0396	,0000	,9551	1,8812
4,6800	1,5911	,2613	6,0899	,0000	1,0758	2,1063
4,9700	1,7640	,2970	5,9386	,0000	1,1782	2,3498
5,2600	1,9369	,3392	5,7103	,0000	1,2680	2,6058
5,5500	2,1098	,3856	5,4708	,0000	1,3493	2,8704
5,8400	2,2827	,4350	5,2474	,0000	1,4248	3,1407
6,1300	2,4557	,4864	5,0483	,0000	1,4964	3,4150
6,4200	2,6286	,5393	4,8742	,0000	1,5650	3,6921
6,7100	2,8015	,5932	4,7226	,0000	1,6316	3,9714

You see that below a value of acculturation of 2.94, the effect of the switch is non significant (or, in other words, not different from 0, being 95% sure). Hence, the conclusion is that the switch has a positive (check the coef. > 0) effect on identity threat only for values of acculturation greater than 2.99.

Probing the interaction (<http://www.jeremydawson.co.uk/slopes.htm>)

Variable names:	
Name of independent variable:	Switch
Name of moderator:	Acculturation
Name of dependent variable:	Identity threat
Unstandardised Regression Coefficients:	
Independent variable:	-1,1995
Moderator:	0,0801
Interaction:	0,5963
Intercept / Constant:	2,0054
Means / SDs of variables:	
Mean of independent variable:	0,68
SD of independent variable:	0,469
Mean of moderator:	4,11
SD of moderator:	1,08
Values of variables at which to plot slopes*:	
Low value of IV:	0
High value of IV:	1
Low value of moderator:	3,03
High value of moderator:	5,19
(* If left blank, this will automatically be done at one standard deviation above and below mean)	
Optional alternative legend**:	
Low value of independent variable:	No Switch
High value of independent variable:	Switch
Low value of moderator:	Low acculturation
High value of moderator:	High acculturation
(** Leave these cells blank to get the normal "low/high" legend)	



Probing the interaction using SPSS syntax

PROCESS options

Show covariance matrix of regression coefficients

Generate code for visualizing interactions

Show total effect model (only models 4, 6, 80, 81, 82)

Pairwise contrasts of indirect effects

Effect size (mediation-only models)

Standardized coefficients (mediation-only models)

Test for X by M interaction(s)

Residual correlations

Many options available in PROCESS through command syntax are not available through this dialog box. See Appendices A and B of <http://www.guilford.com/p/hayes3>

Heteroscedasticity-consistent inference
None

Decimal places in output
4

Mean center for construction of products

No centering

All variables that define products

Only continuous variables that define products

Moderation and conditioning

Probe interactions...
if $p < .05$

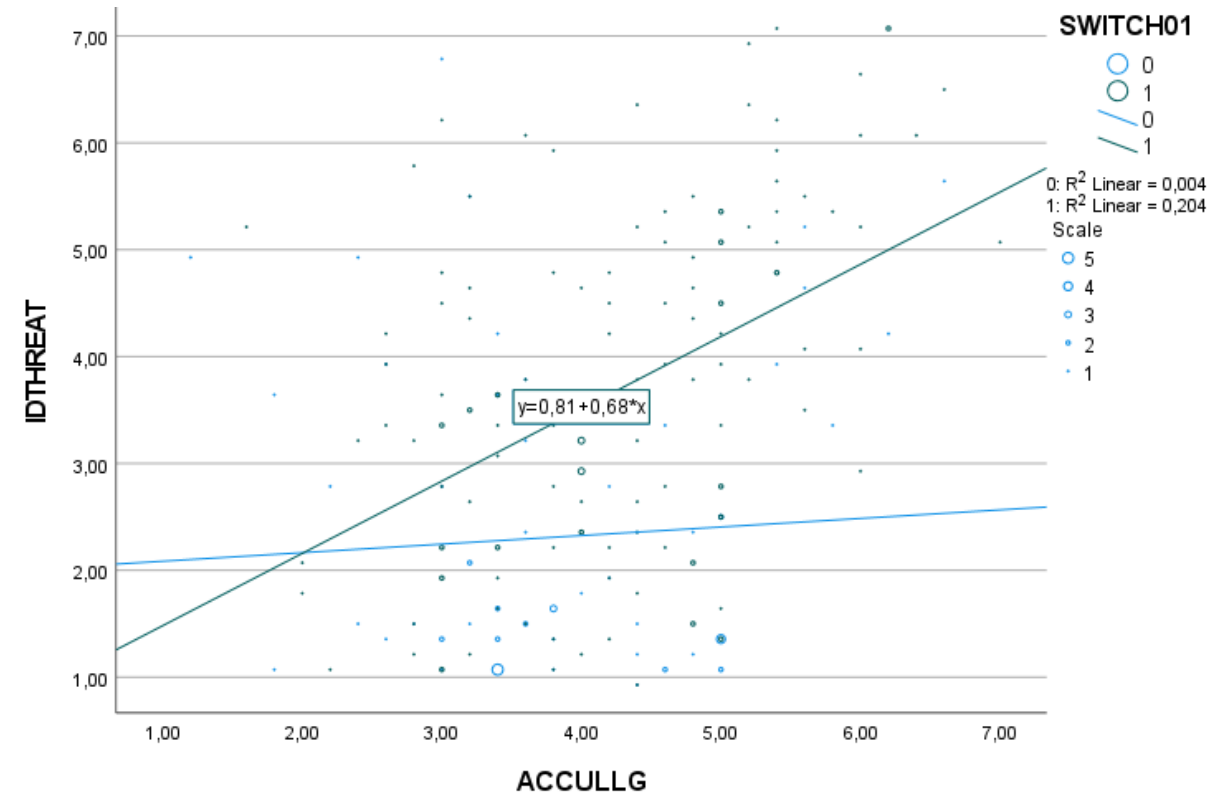
Conditioning values

16th, 50th, 84th percentiles

-1SD, Mean, +1SD

Johnson-Neyman output

Continue Cancel



Probing the interaction using the CAHOST procedure

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METHODS
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CAHOST: An Excel Workbook for Facilitating the Johnson-Neyman Technique for Two-Way Interactions in Multiple Regression

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When using multiple regression, researchers frequently wish to explore how the relationship between two variables is moderated by another variable; this is termed an interaction. Historically, two approaches have been used to probe interactions: the pick-a-point approach and the Johnson-Neyman (JN) technique. The pick-a-point approach has limitations that can be avoided using the JN technique. Currently, the software available for implementing the JN technique and creating corresponding figures lacks several desirable features—most notably, ease of use and figure quality. To fill this gap in the literature, we offer a free Microsoft Excel 2013 workbook, CAHOST (a concatenation of the first two letters of the authors' last names), that allows the user to seamlessly create publication-ready figures of the results of the JN technique.

Keywords: moderation, johnson-neyman, interactions, probing interactions, multiple regression

1. INTRODUCTION

When a researcher seeks to quantify the linear effect an explanatory variable, X , has on a response variable, Y , the size of that effect may depend on a second explanatory variable, M . For example, a person's blood alcohol content is influenced by the amount of alcohol that person has ingested, but the size of this influence depends on, among other things, the body mass of that person. In such a situation, the two explanatory variables are said to "interact" in their influence on the response variable. Taking the view that X is the primary variable of interest or the "focal predictor," the other explanatory variable M is the "moderator." Thus, the study of how the explanatory variables interact is often called moderation analysis (Cohen et al., 2003; Hayes, 2013b). One of the tools used in moderation analysis is the Johnson-Neyman (JN) technique.

This article describes CAHOST (a concatenation of the first two letters of the authors' last names), an implementation of the JN technique in a Microsoft Excel 2013 macro-enabled workbook (.xlsm) which produces high-quality publication-ready graphics, requires no programming capabilities, and limits error in data entry (e.g., entering coefficients). The target audience is researchers without programming experience who wish to probe interactions. Version 1.0 of the workbook may be found in the Supplementary Material accompanying this article, and future releases may be found at <https://sites.google.com/a/georgiasouthern.edu/stephen-carden/research>. The following sections will describe the JN technique, the underlying mathematics, detail how the workbook operates on a sheet-per-sheet basis, present a brief example, and conclude.

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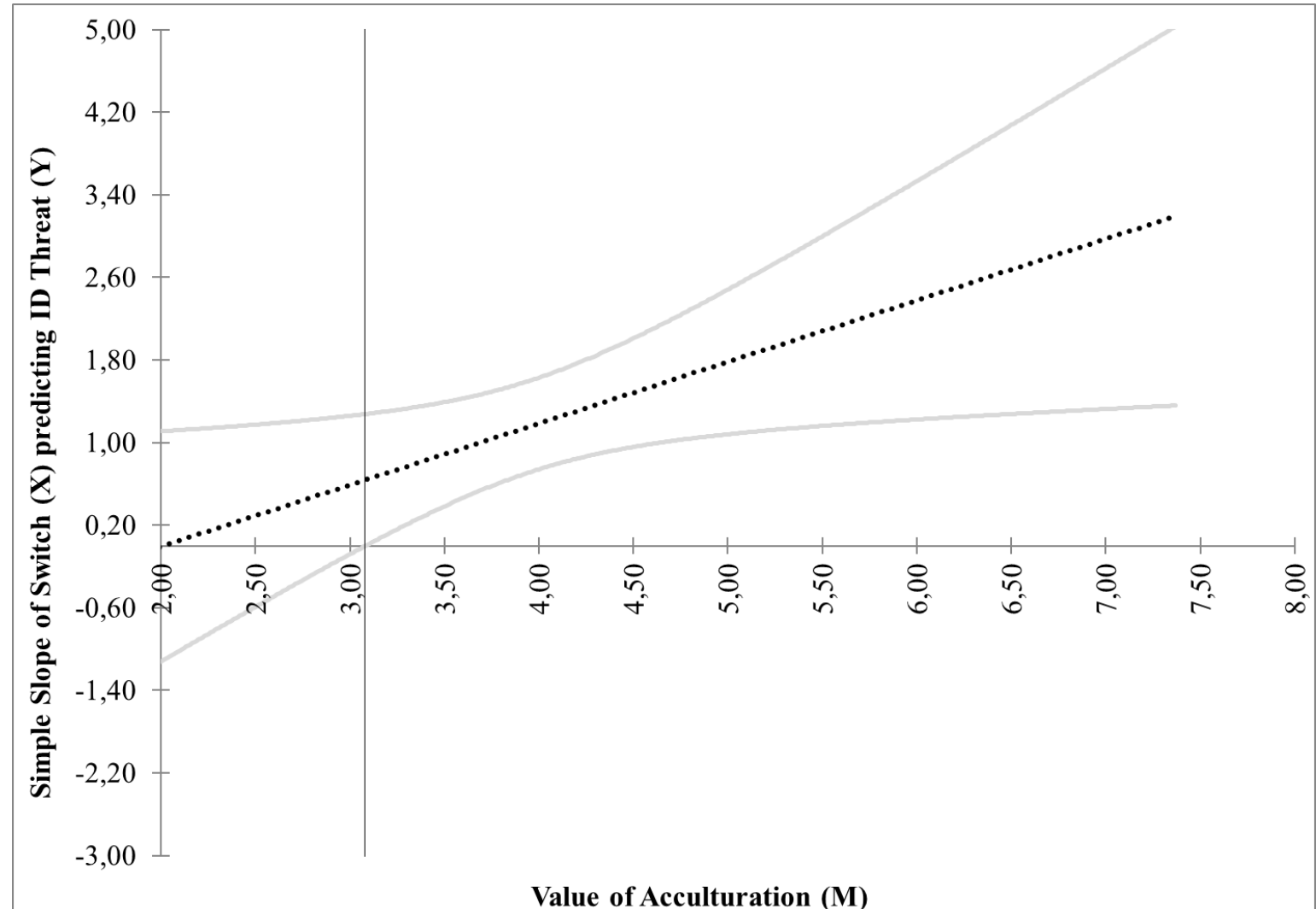
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