Self efficacy as a mediator of the relationship between dietary knowledge and behavior

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Abstract: This study examines the causal relationship between dietary knowledge and behavior by including self-efficacy in the models. Regression analyses supported the hypothesized relationships that self-efficacy mediates effects of dietary knowledge and social influences on dietary behavior. Self-efficacy also accounted for variance in eating behavior not explained by knowledge or demographic variables. The coefficients for the relationship between dietary behavior and knowledge decreased for each of the four dietary models when the influence of self efficacy was added. Interventions and health promotion campaigns should seek to directly address factors influencing diet related self-efficacy instead of focusing on disseminating information only.

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Introduction and objectives:

Increased availability of nutritional information has been successful in enhancing public awareness of the importance of healthy diet and lifestyles. The important issue is whether enhanced nutrition and health awareness has any significant impact on consumers' actual dietary behavior. The date from the healthy eating index (HEI) show that although dietary quality has improved over the past years, the diets of most Americans need improvements in several aspects (Kennedy et al., 199; Guo et al., 2004). Studies evaluating the relationship between nutrition knowledge and dietary behavior have found no direct correlation between the two (Putler and Frazao, 1994; Sapp, 1991). Therefore, translating the dietary knowledge among individuals into healthy behavior remains a challenging task. This study examines the causal relationship between dietary knowledge and behavior by including self-efficacy in the models.

Self-efficacy is defined as a person's ability of exerting self-control in changing his/her behavior with regard to, for example, food choices (Parcel et al., 1995; Steptoe, et al., 1995), smoking (Schinke et al., 1985) and drug use (Hays and Ellickson, 1990). A person's health related self efficacy is influenced by his/her health knowledge and other socio-demographic background. Since self-efficacy itself is explained by the dietary knowledge of individuals (Slater, 1989), it is likely to play a mediating role in the relationship between healthy behaviors and dietary knowledge. Consumers with higher level of self-efficacy are more likely to sustain a healthy behavior with regard to food choices compared to those with lower level of self-efficacy.

Theoretical and Empirical Models

The preceding discussion points to a causal flow from dietary knowledge (hereafter, we call these predictor variables) and socio-demographic characteristics to self-efficacy and/or dietary behavior. At this point, an empirical question that remains to be determined is whether the predictor variables affect only self-efficacy, or dietary behavior, or both. We propose a mediation model here. More specifically, we hypothesize that (a) the predictor and socio-demographic variables influence both self-efficacy and dietary behavior, and (b) these variables influence dietary behavior primarily via their link to risk perceptions. For example, when consumers possess a high level of dietary knowledge, they are predisposed to exert a greater control over their diets and lifestyle, thereby adopting a healthy dietary behavior.

The hypotheses above underscore the notion of mediation. In other words, the mediation approach recognizes that consumers' self-control (efficacy) over diet and lifestyle can mediate the effects of the predictor variables (dietary knowledge) on the dietary behavior (Baron and Kenny 1986). Figure 1 (as adapted from Baron and Kenny 1986) illustrates this modeling approach using self-efficacy as mediators of the relationship between dietary behavior and predictor variables. The figure depicts three causal paths in a model of how overall dietary behavior is formed: (i) the direct impact of the predictors on dietary behavior (path a); (ii) the path from the predictors to the mediators (path b) and (ii) the impact of mediators on attitude (path c).

In this study, the mediating hypothesis is tested using the following four criteria adopted from Judd and Kenny (1981) and Baron and Kenny (1986): a) the self-efficacy of individuals (mediator) has statistically significant impact on dietary behavior; b) dietary knowledge and socio-demographic variables (predictors) have significant influence on dietary behaviors; c)

dietary knowledge exert a significant influence on diet related self-efficacy of individuals; and d) the effects of dietary knowledge is either diminished or no longer significant when self-efficacy is controlled for the dietary behavior equations.

Following Baron and Kenny (1986) and Judd and Kenny (1981), a series of regression models were developed to assess whether risk and benefit perceptions mediated the link between the predictor variables and attitude toward agrobiotechnology:

Model 1: $BEHAVIOR = b_{10} + b_{11}$ DIETARY KNOWLEDGE + e

Model 2: $BEHAVIOR = b_{20} + b_{21}$ DIETARY KNOWLEDGE $+b_{22}$ FFICACY + e

Model 3: $BEHAVIOR = b_{30} + b_{31}$ DIETARY KNOWLEDGE + b_{32} FFICACY $+b_{33}$ AGE + b_{34} GENDER + b_{35} INCOME+ b_{36} EDUC+ b_{37} RACE+ b_{38} HOUSEHOLD SIZE + e

Model 4: $EFFICACY = b_{40} + b_{41}$ DIETARY KNOWLEDGE + b_{42} AGE + b_{43} GENDER + b_{44} INCOME+ b_{45} EDUC+ b_{46} RACE+ b_{47} HOUSEHOLD SIZE + e

Comparing estimated coefficients across Models 1 - 4 allows us to assess whether self-efficacy mediates the effects of the predictor variables on dietary behavior. To illustrate, assume that dietary knowledge exerts a statistically significant influence on behavior in Model 1. If dietary knowledge in the Model 2 has a negligible effect on behavior, it indicates that the effect of dietary knowledge is largely transmitted via the degree of self-control consumers can exercise on their diet and lifestyle. Second, if the effect of self-efficacy in Model 3 differs little from that in Model 2, it suggests that impacts of efficacy on diet behavior remain stable despite the presence of other predictors (socio-economic profile) in the model. The last case is a combination of the previous two: although the effects of efficacy in Model 3 are smaller to those in Model 2, they remain statistically significant. This indicates that the effects of dietary knowledge are partially mediated by risk perceptions.

The empirical model posits that a participant's dietary behavior is a function of dietary knowledge, self control (efficacy) in changing health behavior with regard to food choices and life-style and various socio-economic characteristics of individuals. The model, therefore, can be formally written as

(1) $U_j = \beta' Z_j + \epsilon_j$,

where U_j is the actual dietary behavior of the jth household and Z_j is a vector of explanatory variables including participant's socio-economic profile. While U_j is unobserved, what is observed is the reported dietary behavior represented by the rank-ordered dependent variables, R, where

(2) $R = 0$ if $U_j \leq 0$
$R = 1$ if $0 < U_j \leq \mu_1$
$R = 2$ if $\mu_1 < U_j \leq \mu_2$
.
.
$R = w$ if $\mu_{w-2} < U_j$

where the μ's are the threshold variables or cut-off points which provide the ratings of five different responses. The lowest ranked outcome, $R = 0$, represents the situation when the specific diet was considered almost never; highest ranked outcome, $R = w$, represents the situation when the consumer considers the specific diet nearly all the time.

The Data

In 2007, a national on-line survey among 3,458 US household was conducted. Households were randomly selected from the database of 400,000 households who make up Ipsos-NPD marketing research panel. The selection process was appropriately stratified to ensure that the demographic characteristics of the sample households corresponded with the

latest U.S. census. Sample households were sent e-mails soliciting information regarding their soy-consumption pattern and household characteristics. Each e-mail included a unique URL (keyed to the respondent's ID) to direct the respondent to the survey website. In addition to socio-economic characteristics of sample households, survey instruments included questions relating to three key components in the mediating model: dietary knowledge, dietary behavior and diet related self-efficacy.

Respondents were asked dietary behavior questions about fresh fruits, fresh vegetables, fat and cholesterol (Table 1). They were asked to respond as to how well the statements described their dietary behavior using a scale of one to five where one represented "not at all" and five represented "extremely well." Four statements to measure diet related self-efficacy were read to the participants in the survey. Respondents' reported self-efficacy were recorded on a 5-point scale. All responses were first coded such that the higher values represented high level of self-efficacy. Respondents were asked to respond as to how well the statements described the self-control (efficacy) in changing health behavior with regard to food choices and life-style (Table 2). The lowest degree of self-control was represented by the response "extremely unlikely" and the highest degree of self control was represented by 'the response "extremely likely." The total self-efficacy score was divided by total number of statements to construct an efficacy index. The higher the index value the higher the overall level of self control. A dietary knowledge construct (Moorman and Matulich, 1993) was calculated as the total number of nutrition related questions respondents answered correctly. Respondents were asked to link or match each of the eleven nutrients with appropriate health consequences from a list.

Preliminary results and conclusion:

Regression models for each of the four dietary behaviors: fresh fruits, fresh vegetables, fat and cholesterol were run and reported in Tables 4 to 7. Initially, only knowledge was used as the explanatory variable. Self-efficacy and socio-demographic variables were added in subsequent runs.

Regression analyses supported the hypothesized relationships that self-efficacy mediates effects of dietary knowledge and social influences on dietary behavior for each of the four dietary items. Self-efficacy also accounted for variance in eating behavior not explained by knowledge or demographic variables. The pseudo R-squared for each of the four dietary items increased by a huge magnitude when self-efficacy was added to the models. The coefficients for the relationship between dietary behavior and knowledge decreased or became statistically insignificant for each of the four dietary models when the influence of self efficacy was added. Interventions and health promotion campaigns should seek to directly address factors influencing diet related self-efficacy instead of focusing on disseminating information only.

Figure 1. Conceptual model depicting the mediating role of self-efficacy between dietary behavior and predictor variables (adapted from Baron and Kenny, 1986).

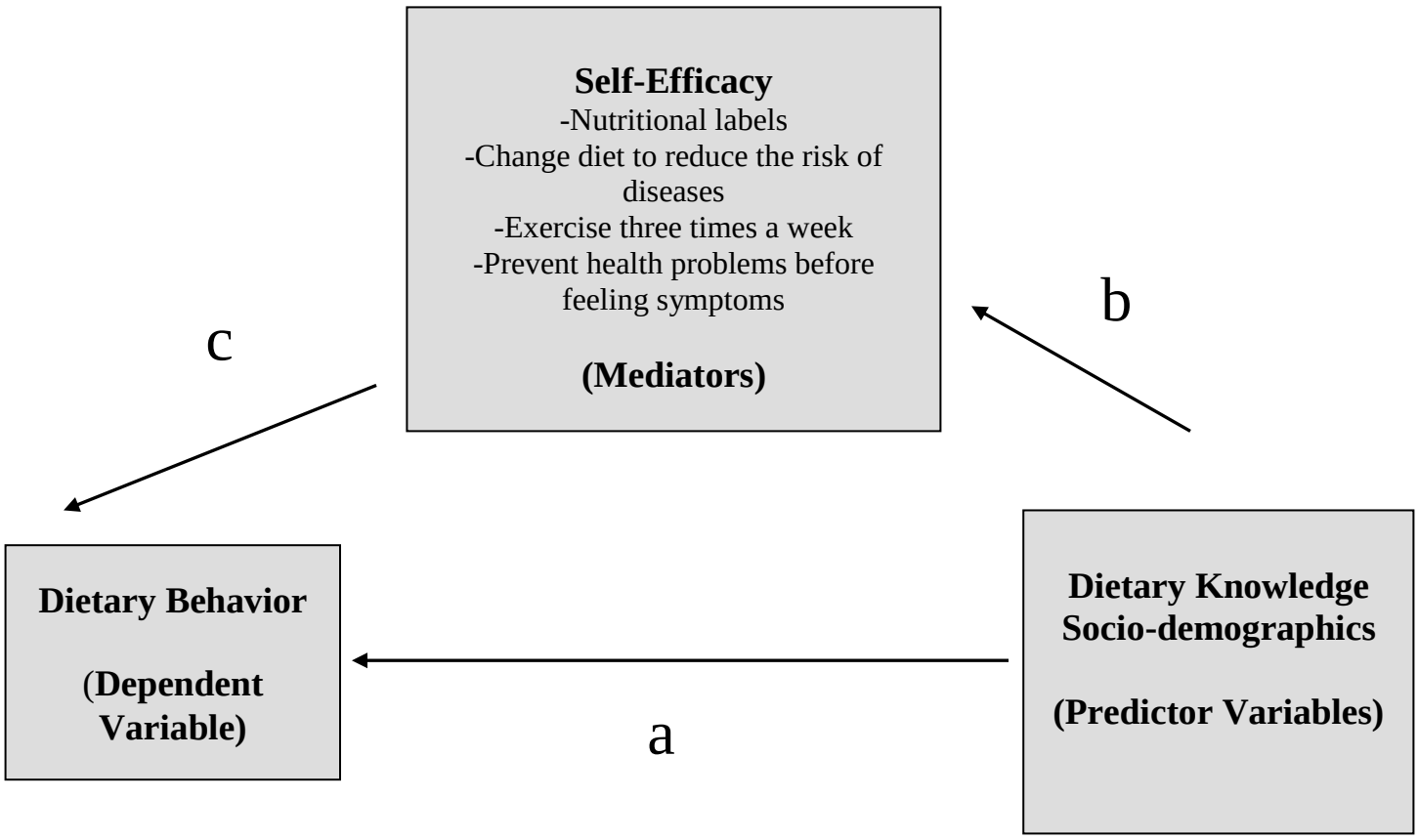

Table 1: Food Consumption Behavior of US households (n=3056).

How well each of the statements describes you?	I eat a lot of *fresh fruits*	I eat a lot of *fresh vegetables*	I am actively trying to consume *less fat* in my diet	I am actively trying to consume *less cholesterol* in my diet
1 = Not at all	5.9%	5.5%	8.1%	12.2%
2 = Slightly	19.8	17.0	13.4	16.1
3 = Somewhat	33.8	33.0	31.8	31.0
4 = Very well	25.9	29.2	31.8	26.7
5 = Extremely well	14.5	15.2	14.9	13.9

Table 2: Reported level of self-control (Efficacy) in changing health behavior with regard to food choices and life-style (n=3056).

How likely are you to:	**1 = "Extremely Unlikely"**	**2 = Slightly**	**3 = Somewhat**	**4 = Very much**	**5 = Extremely Likely**
Read nutritional Labels on food packages very carefully	12.5	19.5	27.8	24.6	15.5
Change Diet to reduce the risk of certain diseases	23.3	18.9	28.9	20.1	8.7
Exercise at least three times per week	25.9	20.2	19.6	17.3	16.9
Prevent health problems before feeling any symptoms	9.0	17.9	35.2	27.5	10.4

Table 3: Description of other explanatory variables used in the analysis.

VARIABLES	DESCRIPTION	Mean	Std. Deviation
Dietary Knowledge	Total number of dietary questions answered correctly (0 to 11).	6.085	3.142
Sociodemographics			
Gender	1 = female; 0 = male	0.501	0.500
Age	Respondents' age in years	49.722	14.754
Income	1 = less than $5,000; 25 = $250,000 or more	67,377	38,292
Education	1 = college or more than college education; 0= otherwise	0.649	0.477
Household Size	Number of household member	2.612	1.399
Ethnic background	1 if white; 0 otherwise	0.734	0.442

Table 4: Mediation by *efficacy* in the relationship between dietary knowledge and fruit consumption behavior: An Ordered Probit Model

Variables	Model1		Model2		Model3	
	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
ONE	1.399	0.000	0.265	0.000	-0.154	0.142
KNOW	0.028	0.000	0.002	0.706	-0.006	0.317
EFFICACY			0.563	0.000	0.551	0.000
AGE					0.005	0.000
GENDER					0.215	0.000
INCOME					0.001	0.005
EDUCA					0.090	0.036
RACE					-0.125	0.003
HHSIZE					0.043	0.001
Mu(1)	0.914	0.000	1.012	0.000	1.025	0.000
Mu(2)	1.812	0.000	2.006	0.000	2.031	0.000
Mu(3)	2.628	0.000	2.910	0.000	2.945	0.000
Pseudo-R-Squared*	0.01		0.32		0.35	

*$R^2_{ML} = 1 - \exp(-G^2/N)$, where $G^2 = -2 \ln [L(M_\alpha)/L(M_\beta)]$; M_α = restricted likelihood, M_β = Unrestricted Likelihood, and N=Number of observation (Maddala, 1983)

Table 5: Mediation by *efficacy* in the relationship between dietary knowledge and vegetable consumption behavior: An Ordered Probit Model

Variables	Model1		Model2		Model3	
	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
ONE	1.361	0.000	0.171	0.008	-0.415	0.000
KNOW	0.041	0.000	0.016	0.005	0.007	0.286
EFFICACY			0.592	0.000	0.579	0.000
AGE					0.008	0.000
GENDER					0.246	0.000
INCOME					0.002	0.000
EDUCA					0.050	0.243
RACE					-0.115	0.007
HHSIZE					0.041	0.002
Mu(1)	0.853	0.000	0.955	0.000	0.976	0.000
Mu(2)	1.756	0.000	1.962	0.000	2.002	0.000
Mu(3)	2.649	0.000	2.960	0.000	3.016	0.000
Pseudo-R-Squared*	0.03		0.36		0.39	

*$R^2_{ML} = 1 - \exp(-G^2/N)$, where $G^2 = -2 \ln [L(M_\alpha)/L(M_\beta)]$; M_α = restricted likelihood, M_β = Unrestricted Likelihood, and N=Number of observation (Maddala, 1983)

Table 6: Mediation by *efficacy* in the relationship between dietary knowledge and fat consumption behavior: An Ordered Probit Model

Variables	Model1		Model2		Model3	
	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
ONE	1.087	0.000	-0.617	0.000	0.524	0.000
KNOW	0.055	0.000	0.019	0.002	0.025	0.000
EFFICACY			0.889	0.000	0.128	0.000
AGE					0.006	0.000
GENDER					0.034	0.368
INCOME					0.001	0.125
EDUCA					0.012	0.773
RACE					-0.003	0.942
HHSIZE					0.006	0.656
Mu(1)	0.621	0.000	0.782	0.000	0.607	0.000
Mu(2)	1.507	0.000	1.902	0.000	1.481	0.000
Mu(3)	2.475	0.000	3.120	0.000	2.439	0.000
Pseudo-R-Squared*	0.05		0.60		0.26	

*$R^2_{ML} = 1 - \exp(-G^2/N)$, where $G^2 = -2 \ln [L(M_\alpha)/L(M_\beta)]$; M_α = restricted likelihood, M_β = Unrestricted Likelihood, and N=Number of observation (Maddala, 1983)

Table 7: Mediation by *efficacy* in the relationship between dietary knowledge and cholesterol consumption behavior: An Ordered Probit Model

Variables	Model1		Model2		Model3	
	Coeff.	P-value	Coeff.	P-value	Coeff.	P-value
ONE	0.932	0.000	-0.662	0.000	0.384	0.000
KNOW	0.040	0.000	-0.009	0.147	0.004	0.542
EFFICACY			0.846	0.000	0.333	0.000
AGE					0.002	0.077
GENDER					-0.023	0.556
INCOME					0.000	0.382
EDUCA					-0.012	0.773
RACE					-0.054	0.201
HHSIZE					-0.038	0.004
Mu(1)	0.598	0.000	0.748	0.000	0.590	0.000
Mu(2)	1.413	0.000	1.768	0.000	1.416	0.000
Mu(3)	2.265	0.000	2.839	0.000	2.279	0.000
Pseudo-R-Squared*	0.03		0.60		0.29	

*$R^2_{ML} = 1 - \exp(-G^2/N)$, where $G^2 = -2 \ln [L(M_\alpha)/L(M_\beta)]$; M_α = restricted likelihood, M_β = Unrestricted Likelihood, and N=Number of observation (Maddala, 1983)

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