

**Self-Concept of Ability, Value, and Academic Achievement:  
A Test of Causal Relations**

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Paper presented at the Annual Meeting of the American Education Research Association at New York, April 1996. The writing of this article and data collection for this study was supported by Grant HD17229 from the National Institutes of Child Health and Human Development, Grant MH31724 from the National Institute for Mental Health, and Grant BNS85-10504 from the National Science Foundation. We would like to thank the school districts involved in this study and the following people for their assistance: Carol Midgley, Harriet Feldlaufer, David Reuman, Douglas Mac Iver, Connie Flanagan, Janis Jacobs, Bonnie Barber, Rena Harold and David Klingel.

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ABSTRACT

One of the most persistent puzzles confronting parents and teachers is uneven academic achievement among equally able students. What factors cause some students to go above and beyond their personal and environmental constraints is the focal interest of current social-cognitive theories of motivation and action (e.g., Bandura, 1986; Markus et al., 1990). Among many contributing factors, students' expectancy or self-concept of ability (SCA) and value at any specific task are proposed to mediate their achievement-related behaviors such as choice, persistence, and actual performance (Eccles et al., 1983). However, few studies systematically test reciprocal causal relations among expectancy, value, and academic achievement.

Based on the structural equation modeling of 4-semester, longitudinal data involving 826 sixth graders, this study tested the reciprocal causal relations among SCA, intrinsic value (i.e., interest and liking), and math performance of early adolescents. Generally, the results show significant, reciprocal causal relations between motivational factors and academic achievement. As predicted, intrinsic value had a consistent and positive influence on performance over time. Contrary to common beliefs, however, positive SCA alone did not always have a positive influence on academic performance over time when controlling for other factors. Unrealistically positive SCA was often detrimental to both performance and value. There were significant gender differences in these causal relations. For example, too high SCA had a slightly negative impact on performance for girls. In addition, the causal effect of performance feedback on students' SCA and value increased in the context of junior high school.

The results of the study are discussed in the light of cultural and contextual perspectives. Implications for education are also discussed.

## INTRODUCTION

One of the most persistent puzzles confronting parents and teachers is uneven academic achievement among equally able students. What factors cause some students to go above and beyond their personal and environmental constraints is the focal interest of current social-cognitive theories of motivation and action (e.g., Bandura, 1986; Eccles et al., 1983; Markus et al., 1990). These theorists propose that students' ability-related conceptions and value-related beliefs mediate their achievement-related behaviors such as choice, persistence, and actual performance.

With several exceptions (e.g., Eccles et al., 1983; Dweck & Leggett, 1988; Pintrich & De Groot, 1990), however, most researchers have failed to integrate *both* ability-related and value-related beliefs in their study of students' academic achievement. For example, some researchers have stressed the theoretical significance of ability-related beliefs like self-efficacy (Bandura, 1993; Schunk, 1991) or expectancy for success (Weiner, 1985), while others have focused on the theoretical importance of value-related beliefs like autonomy and intrinsic value (Deci & Ryan, 1985) or interest (Krapp, Hidi, & Renniger, 1992).

More recently, several researchers have attempted to integrate both components of motivational beliefs in their theoretical formulation to predict and explain children's academic behaviors. For example, Eccles & her colleagues (Eccles [Parsons], 1984; Eccles et al., 1983; Meece et al., 1990) tested their expectancy-value model of achievement motivation in explaining children's academic choices and performance. They showed that in general students' expectancy for success predicted subsequent performance in math more strongly than did their achievement values. On the other hand, students' intention or actual decision to take a math course was predicted by their valuing of math, not by expectancy for success. In a similar vein, Pintrich & De Groot (1990) tested the relative contributions of motivational constructs (i.e., self-efficacy, intrinsic value, test anxiety) along with self-regulated learning constructs (i.e., strategy use and self-regulation) in accounting for academic performance. When all variables were simultaneously entered in the equation,

children's self-regulation and self-efficacy turned out to be viable predictors of their science grade by teachers.

Although there is a handful of research evidence on the causal effects of motivational beliefs on performance attainments, we know less about the impact of academic achievement on subsequent ability-beliefs and values. One may wonder, for example, whether a child's high mark in math might subsequently lead to his or her greater self-confidence in the same subject matter. Similarly, are favorable grades in science likely to generate higher interest in science projects? Interestingly, the research on this area has been conducted in a different tradition. There has long been an ongoing debate in the causal priority between self-concept and academic achievement (Calsyn & Kenny, 1977; Marsh, 1990; Purkey, 1970). Some researchers (e.g., Marsh, 1990) endorse the causal priority of self-concept of ability (SCA) over achievement. In contrast, other researchers (e.g., Calsyn and Kenny, 1977) support the causal preponderance of achievement over SCA. Some researchers (e.g., Skaalvik & Hagtvet, 1990) suggest reciprocal relation between self-concept and achievement. Still others (e.g., Byrne, 1986) have found no evidence for any causal predominance. The divergence of age groups, specification of the domain of achievement, definition of self-concept, and measures of academic achievement seems to produce inconsistent results (Hansford & Hattie, 1982). Remarkably absent in this research tradition is the role of value in the causal dynamics of academic achievement. Therefore, exploring the possibility of reciprocal casual relations between academic achievement and self-concept of ability (SCA) on one hand and value on the other hand is very intriguing in light of their theoretical and practical implications for education.

In sum, ample evidence exists showing empirical *associations* between positive SCA and enhanced academic achievement on one hand, and between intrinsic value and improved academic performance on the other. However, a literature review revealed that: (1) The *causal* direction between them is often ambiguous; (2) There are relatively few studies of the *net* or *independent* causal effect of SCA or value on achievement; and (3) Even fewer studies tested *reciprocal* causal relations among SCA, value, and academic achievement in a systematic fashion.

By merging divergent research traditions yet building upon the theoretical basis of expectancy-value model of achievement motivation (Eccles et al., 1983), the present study tested the causal relations among SCA, value, and academic achievement. Unlike others who took a domain-general approach to academic achievement (e.g., Byrne, 1986), we employed a domain-specific approach by focusing on mathematics as a domain of academic achievement.

This study is designed to assess the extent to which SCA and value contribute to early adolescents' academic achievement above and beyond the stable effect of past academic performance. In addition, this study assesses changes in SCA and value as developmental outcomes of academic achievement. In addition, we address the following specific questions in this study.

*Net or independent causal effect:*

1. Does SCA influence subsequent performance after controlling for value and prior performance? Can positive SCA alone enhance learning?
2. Does performance affect subsequent SCA after controlling for value and prior SCA? Do students reformulate their SCA in response to their own performance outcomes?
3. Does intrinsic value (i.e., liking and interest) influence on subsequent performance when SCA and prior performance being equal?
4. Do students' liking for and interest in a specific subject matter change in response to their performance outcomes?
5. Does SCA affect subsequent value?
6. Does value affect subsequent SCA?

*Reciprocal causal relation & causal order:*

7. Is there any significant, reciprocal causal relation between each pair of variables: (1) SCA and performance, (2) value and performance, and (3) SCA and value? If causal influences are bi-directional, which factor is predominant?

*Developmental and context effects:*

8. Is there any developmental pattern in the causal relations among SCA, value, and performance?

9. Does the transition to junior high school affect the causal relations?

*Gender difference:*

10. Is there any significant gender difference in the pattern of the causal relations?

## METHOD

### Data

The data presented in this study were collected as a part of a larger longitudinal investigation headed by Jacquelynne Eccles (The Michigan Study of Adolescent Life Transitions: MSALT).

### Participants

One hundred and seventeen teachers who taught math to the 6th grade students participated in Year 1 data collection. Of these classrooms, 75% were heterogeneously grouped, and 25% used between-classroom ability grouping. All of these teachers' students were asked to take part in the study, and 79% agreed to participate at Year 1. The students were then followed into 131 junior high school math classrooms for Year 2. Forty-three percent of the Year 2 classrooms were heterogeneously grouped, and 57% used between-classroom ability grouping; hence, between-classroom grouping was much more prevalent in Year 2. About 1,850 students completed questionnaires at all four waves. The total number of cases that were included in the final covariance analyses was 826 (463 females, 363 males).

### Design and Analysis

In the present study, we build on earlier empirical research on the relations between motivational factors and academic achievement in several important ways.

- Multiwave, longitudinal design

SCA and intrinsic value were measured over four waves, that is, twice in the sixth grade and twice in the seventh grade. Students' semester math grades were obtained from the school records.

- Developmental data involving junior high school transition

The study period encompassed (1) within the elementary school year, (2) between the elementary and junior high school years (i.e., during the junior high transition), and (3) within the junior high school year. This design allows to examine both developmental and context effects.

- Structural equation modeling (SEM) approach in conjunction with cross-lagged panel design

LISREL 8 program (Jöreskog & Sorböm, 1993) was used to perform the structural equation modeling. This causal modeling technique, particularly when used in conjunction with cross-lagged panel design (Alwin, 1988; Rogosa, 1980), has been proved to be an appropriate analytic tool for addressing the causality issues. Auto-regressive coefficients provide information about the stability of each of the measures. Cross-lagged partial structural coefficients provide information about the direction and magnitude of the causal effects.

- Measurement error model of latent variables with multiple indicators

Measurement model was designed to correct for (or disattenuate) the potential effect of non-random measurement errors (e.g., systematic response biases from students' self-reports).

- Multi-group analysis

This approach was used to test gender differences in the pattern of causal relations and to test the between-gender measurement equivalence.

## Measures

The actual measures for this study are presented in Table 1. Survey questionnaire method of data collection was used to measure students' achievement-related attitudes and beliefs. Many of the measures used a 7-point, Likert-type response scale.

## RESULTS

## Model Evaluation (see Table 2)

The base model (M1), based on the original model specifications, contained an improper estimation problem. The final model (M2) resolved this problem by adding 2nd-order auto-regressive effect parameters to the base model. The most serious contender to the final model was the isolated stability model (M4), which precludes any cross-lagged causal effect. However, this rival hypothesis was not tenable. The synchronous effect model (M5) was also tested. Even though the fit of this synchronous model was acceptable, it violated the basic assumption of the cross-lagged panel design that this study was based on.

## Patterns of Stability (see Figures 1-a, 1-b, and Figure 2)

The timing of destabilization of SCA, value, and math performance varied. Especially among females, the major shuffling of relative class standing in performance and value was followed by the major change (or reformulation) in SCA, but not the way around.

## Tests of Causal Relations (see Figure 2 and Tables 3 &amp; 4)

*Net or independent causal effect:*

1. The net causal effect of SCA on subsequent performance depended on the gender of students (see below and No. 10) and the school context (see No. 9). Consistent with current theories of achievement motivation, for males, positive SCA in fact boosted math performance within the same school contexts, even after controlling for prior performance and value.

Contradictory to common beliefs, however, SCA had a consistently negative effect on subsequent math performance for females, though the effect size was statistically marginal at best. In other words, given comparable prior performance and liking/interest, those girls who had relatively higher SCA performed worse than girls who had lower SCA.



2. As predicted, students' performance attainment changed their SCA. Consistent with attributional theory, however, the reformulation of SCA occurred only when performance outcomes themselves were stable over time.

3. Generally, liking and interest had a positive, even if small, influence on performance.

4. Students' liking and interest changed in response to their performance outcomes.

5. SCA affected liking and interest slightly negatively, though marginally significant at best.

6. Generally, liking and interest positively influenced on subsequent SCA.

*Reciprocal causal relation & causal order:*

7. As predicted, there was some sign of significant, reciprocal causal relation between SCA and performance. However, the comparison of net causal effects between them supports the skill development hypothesis, which suggests the causal priority of performance over SCA .

There was a minor sign of reciprocal causal relation between value and performance. The causal order between these two was ambiguous.

Lastly, there was some indication of reciprocal causal relation between value and SCA. In terms of causal order, value seems to drive SCA rather than the other way around.

*Developmental and context effects:*

8 & 9. Developmental changes in expectancy, value, and achievement were confounded with the context effects resulting from the transition to junior high school (see Yoon et al., 1996 for full details). However, generally greater causal relations between performance and SCA in particular found within the junior high school year suggest that the salience of normative and public evaluation increased students' sensitivity to teachers' performance feedback. Another sign of context effect was the negative effect of SCA on academic achievement (i.e.,  $d_2$  effects) during the transitional period .

*Gender difference:*

10. Finally, there was a significant gender difference in the pattern of causal relations among expectancy, value, and academic achievement. For example, the SCA effect on performance was positive for males, but negative for females. Using the multi-sample analysis method, a series of incremental chi-square tests were conducted to see if factor structure was invariant between gender (see Table 2). First, an alternative model (M6), which assumes the equal factor loading between genders, was not tenable. Similarly, another alternative model (M7), which assumes the equal structural parameters (i.e., causal effects) between genders, was also not acceptable. Therefore, we concluded that there are significant gender differences in the pattern of causal relations among SCA, value, and academic achievement of early adolescents.

In brief, we found some evidence of reciprocal causal relations among SCA, value, and academic achievement of early adolescents. However, these causal dynamics were somewhat moderated by the gender of early adolescents and the context of schooling.

## DISCUSSION

We urge students to hold a realistic view of themselves on one hand, but we also encourage them to maintain a positive view of themselves (e.g., positive SCA) on the other hand. Apparently, the latter position is based on the assumption that positive SCA -- realistic or not -- has motivational and self-enhancing effects on subsequent performance attainments. However, the results of this study suggest that this assumption is not necessarily warranted. We found that, consistent with current theories of motivation, even unrealistically inflated SCA or over-confidence helped males' academic achievement. However, the opposite was true for females. When the effects of value and prior performance were partialled out, over-confidence was slightly harmful to subsequent performance for females. Furthermore, at the time of profound changes in learning environments, the unwarranted optimism in one's ability was clearly detrimental to subsequent performance for boys in

particular. It appears, then, that while males are likely to benefit from the promotion of positive, even unrealistic, self-concepts, females are likely to gain from encouragement of realistic self-concepts.

Compared to other societies (e.g., Stevenson & Stigler, 1992), American society seems to exalt the motivational effects of positive self-concepts. Several cross-cultural researchers found that some societies tend to stress a more realistic view of self. For example, Markus and Kitayama (1994) suggested that Japanese society promotes self-criticism for the sake of self-improvement and discourages unrealistically positive self-esteem. Oettingen et al. (1994) found that educational practices under the old East Berlin system also encouraged adequate self-appraisals. It is speculated that in the context of encouraging positive self-concept independent of actual achievement, the correspondence or causal relation between SCA and achievement is tenuous.

Finally, in contrast to the mixed effects of SCA, intrinsic value (i.e., liking and interest) produced consistently positive influence on subsequent performance, and vice versa. Unlike the preoccupation with one's relative ability, intrinsic interest seems to foster a task focus and a mastery goal orientation, which are conducive to learning. The implication of the results are clear. Educators are urged to highlight the role of value in enhancing academic achievement. The theorists of achievement motivation are called to reconsider the assumptions about the motivational quality of expectancies or positive self-concept of ability.

## REFERENCES

- Alwin, D. F. (1988). Structural equation models in research on human development and aging. In K. W. Schaie, R. T. Campbell, W. Meredith, S. C. Rawlings (Eds.), Methodological issues in aging research (pp. 71-170). New York: Springer Publishing Company.
- Bandura, A. (1986). Social foundations of thought and action: A social cognitive approach. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. Educational Psychologist, 28, 117-148.
- Byrne, B. M. (1986). Self-concept/academic achievement relations: An investigation of dimensionality, stability, and causality. Canadian Journal of Behavioral Science, 18, 173-186.
- Calsyn, R. J. & Kenny, D. A. (1977). Self-concept of ability and perceived evaluation of others: Cause or effect of academic achievement? Journal of Educational Psychology, 69, 136-145.
- Deci, E. L. & Ryan, R. M. (1985). Intrinsic motivation and self-determination in human behavior. New York: Plenum.
- Dweck, C. S. & Leggett, E. L. (1988). A social-cognitive approach to motivation and personality. Psychological Review, 95, 256-273.
- Eccles (Parsons), J. (1984). Sex differences in mathematics participation. In M. Steinkemp & M. L. Maehr (eds.) Advances in motivation and achievement (Vol. 2), Greenwich, CT: JAI Press.
- Eccles [Parsons], J., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), Achievement and achievement behavior (pp. 75-146). San Francisco, CA: Freeman.
- Hansford, B. C. and Hattie, J. A. (1982). The relationship between self and achievement/performance measures. Review of Educational Research, 52, 123-142.
- Jöreskog, K. G. and Sörbom, D. (1993). LISREL 8 User's Guide. Chicago: Scientific Software, Inc.
- Krapp, A., Hidi, S., Renninger, K. A. (1992). Interest, learning, and development. In K. A. Renninger, S. Hidi, & A. Krapp (Eds.), The role of interest in learning and development, Hillsdale, NJ: Lawrence Erlbaum Associates.
- Markus, H. R., Cross, S., & Wurf, E. (1990). The role of the self-system in competence. In R. J. Sternberg & J. Kolligian, Jr. (Eds.), Competence considered (pp. 205-225), New Haven, CT: Yale University Press.
- Markus, H. R. & Kitayama, S. (1994). A collective fear of the collective: Implications for selves and theories of selves. Special issue: The self and the collective. Personality and Social Psychology Bulletin, 20, 568-579.
- Marsh, H. W. (1990). The causal ordering of academic self-concept and academic achievement: A multiwave, longitudinal path analysis. Journal of Educational Psychology, 82, 646-656.

- Meece, J. L., Wigfield, A., & Eccles, J. S. (1990). Predictors of math anxiety, and its consequences for young adolescents' course enrollment intentions and performances in mathematics. Journal of Educational Psychology, *82*, 60-70.
- Nicholls, J. G. (1990). What is ability and why are we mindful of it? A developmental perspective. In R. J. Sternberg & J. Kolligian (Eds.) Competence considered. New Haven, CT: Yale University Press.
- Oettingen, G., Little, T. D., Lindenberger, U., & Baltes, P. B. (1994). Causality, agency, and control beliefs in East vs. West Berlin children: A natural experiment on the role of context. Journal of Personality and Social Psychology, *66*, 579-595.
- Pintrich, P. R. & De Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. Journal of Educational Psychology, *82*, 33-40.
- Purkey, W. W. (1970). Self-concept and school achievement. Englewood Cliffs, N.J.: Prentice-Hall.
- Rogosa, D. R. (1980). A critique of cross-lagged correlation. Psychological Bulletin, *88*, 245-258.
- Schunk, D. H. (1991). Self-efficacy and academic motivation. Educational Psychologist, *26*, 233-262.
- Skaalvik, E. M. & Hagtvet, K. A. (1990). Academic achievement and self-concept: An analysis of causal predominance in a developmental perspective. Journal of Personality and Social Psychology, *58*, 292-307.
- Stevenson, H. W. & Stigler, J. W. (1992). The learning gap. New York: Simon & Schuster.
- Weiner, B. (1985). An attributional theory of achievement motivation and emotion. Psychological Review, *92*, 548-573.
- Wigfield, A., & Eccles, J. S. (1992). The development of achievement task values: A theoretical analysis. Developmental Review, *12*, 265-310.
- Yoon, K. S., Eccles, J. S., Wigfield, A., & Barber, B. L. (1996). Developmental trajectories of early to middle adolescents' academic achievement and motivation. Paper presented at the sixth biennial meeting of the Society for Research in Adolescence, Boston, MA.

Table 1

*The Measures of the Present Study: SCA, Value, and Academic Achievement*

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*Self-concept of Ability (SCA)*

- How good at math are you? (GOOD)  
(1) not at all good ... (7) very good
- If you were to rank all the students in your math class from the worst to the best in math, where would you put yourself? (RANK)  
(1) the worst ... (7) the best
- Compared to most of your other school subjects, how good are you at math? (SUBJ)  
(1) much worse ... (7) much better
- How well do you think you will do in math this year? (EXPE)  
(1) not at all well ... (7) very well

*Value*

- In general, I find working on math assignments: (INTRST)  
(1) very boring ... (7) very interesting.
- How much do you like doing math? (LIKE)  
(1) a little ... (7) a lot
- Would you take more math if you didn't have to? (Reversed) (TAKE)  
(1) I would definitely take more math  
(2) I probably would take more math  
(3) Maybe I would take more math  
(4) I'm not sure  
(5) Maybe, but not that likely  
(6) I probably would not take any more math  
(7) I very definitely would not take any more math

*Academic Achievement*

- Teacher's grades in math (GRADE)  
(1) F, (2) E-, (3) E, ... (15) A, (16) A+
  - Compared to other students in this class, how well is this student performing in math?  
(T.RATE)  
(1) near the bottom of the class  
(2) below the middle of the class  
(3) in the middle of the class  
(4) above the middle of the class  
(5) one of the best in the class
- 

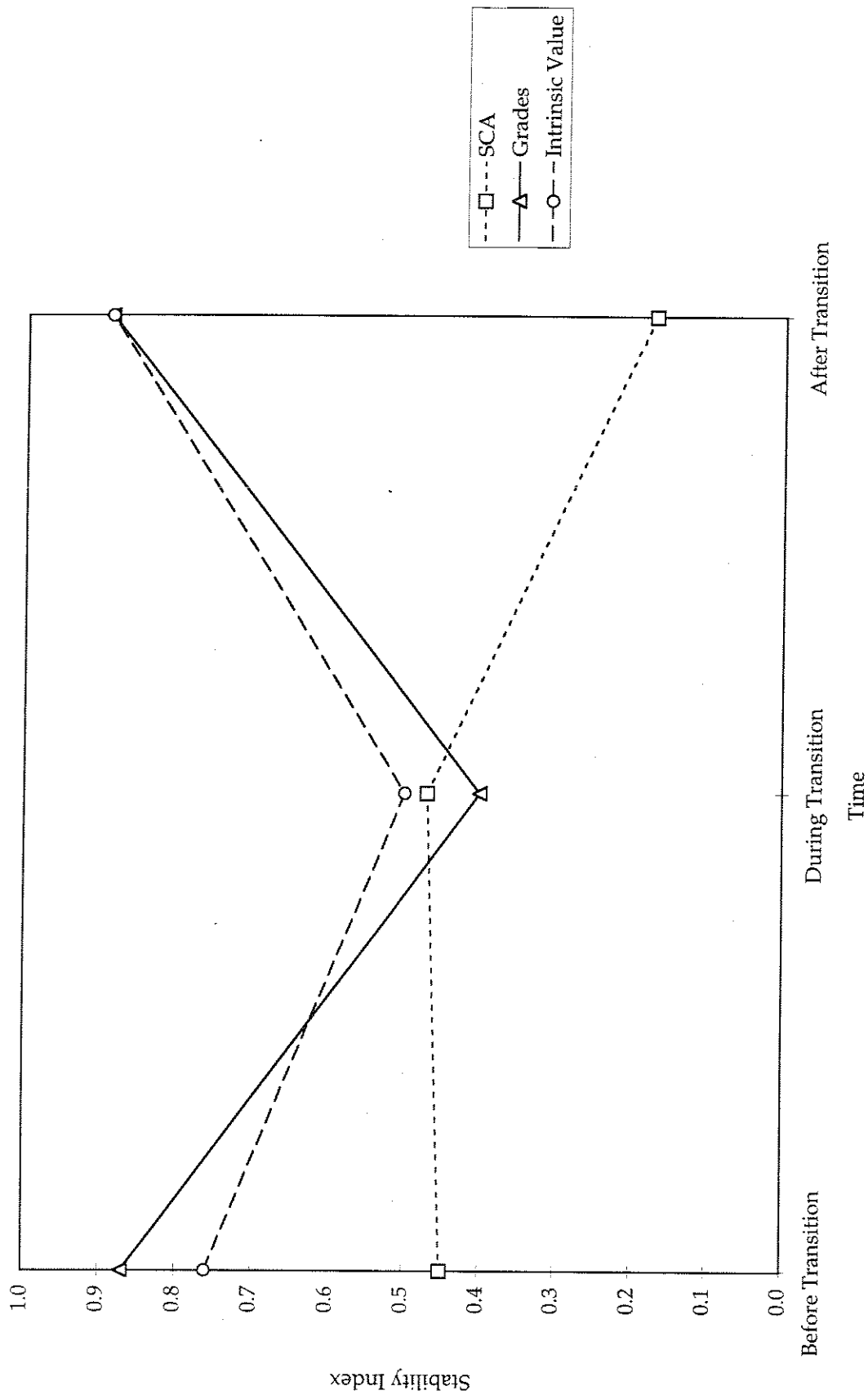
*Note.*

Variable names in parentheses.

Table 2  
*Goodness-of-Fit of Alternative Causal Models of Expectancy, Value, and Performance*

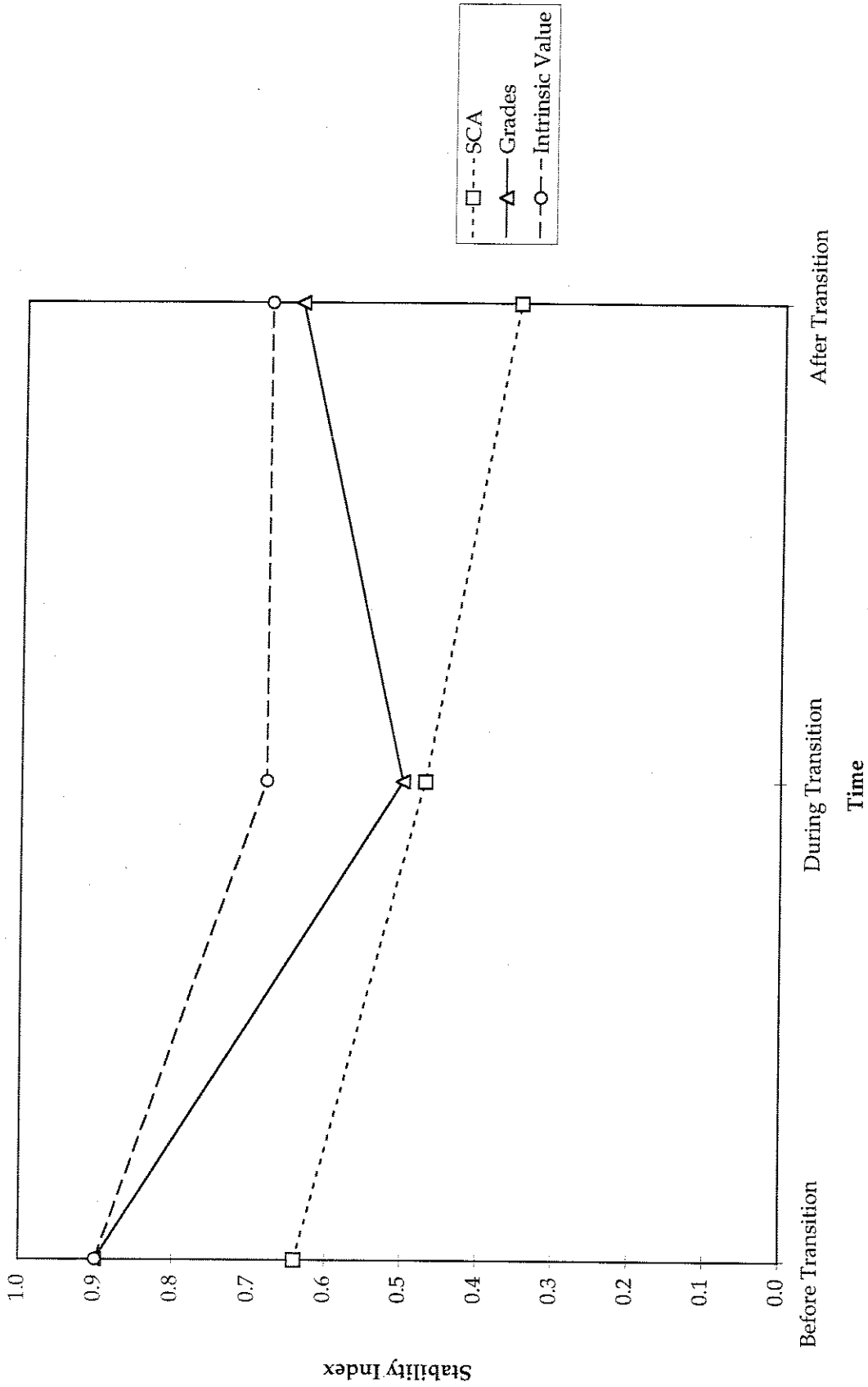
Model	Description	df	$\chi^2$	p	GFI	NFI	NNFI	Model Comparison	$\Delta df$	$\Delta\chi^2$	$\Delta p$
M1	Base model: 1st-order autoregressive & cross-lagged effect	1042	2148.67	.00	.87	.90	.94				
M2	Final model: M1 w/ 2nd-order autoregressive effects	1002	1869.42	.00	.89	.92	.95	M1-M2	40	279.25	***
M3	M2 w/ 2nd-order correlated errors of math grades	998	1859.02	.00	.89	.92	.95	M2-M3	4	10.40	*
M4	Isolated stability model: M2 w/o cross-lagged effects	1038	2078.37	.00	.87	.91	.94	M4-M2	36	208.95	***
M5	Synchronous model: M2 w/ synchronous <i>d</i> & <i>e</i> effects	1002	1864.56	.00	.89	.92	.95	M5-M2	0	4.86	*
M6	M2 w/ between-gender $\lambda$ 's invariance constraints	1026	1907.67	.00	.88	.91	.95	M6-M2	24	38.25	*
M7	M2 w/ between-gender $\beta$ 's invariance constraints	1035	1917.71	.00	.88	.91	.95	M7-M2	33	48.29	*

Note. GFI: Goodness of Fit Index, NFI: Normed Fit Index, NNFI: Non-Normed Fit Index

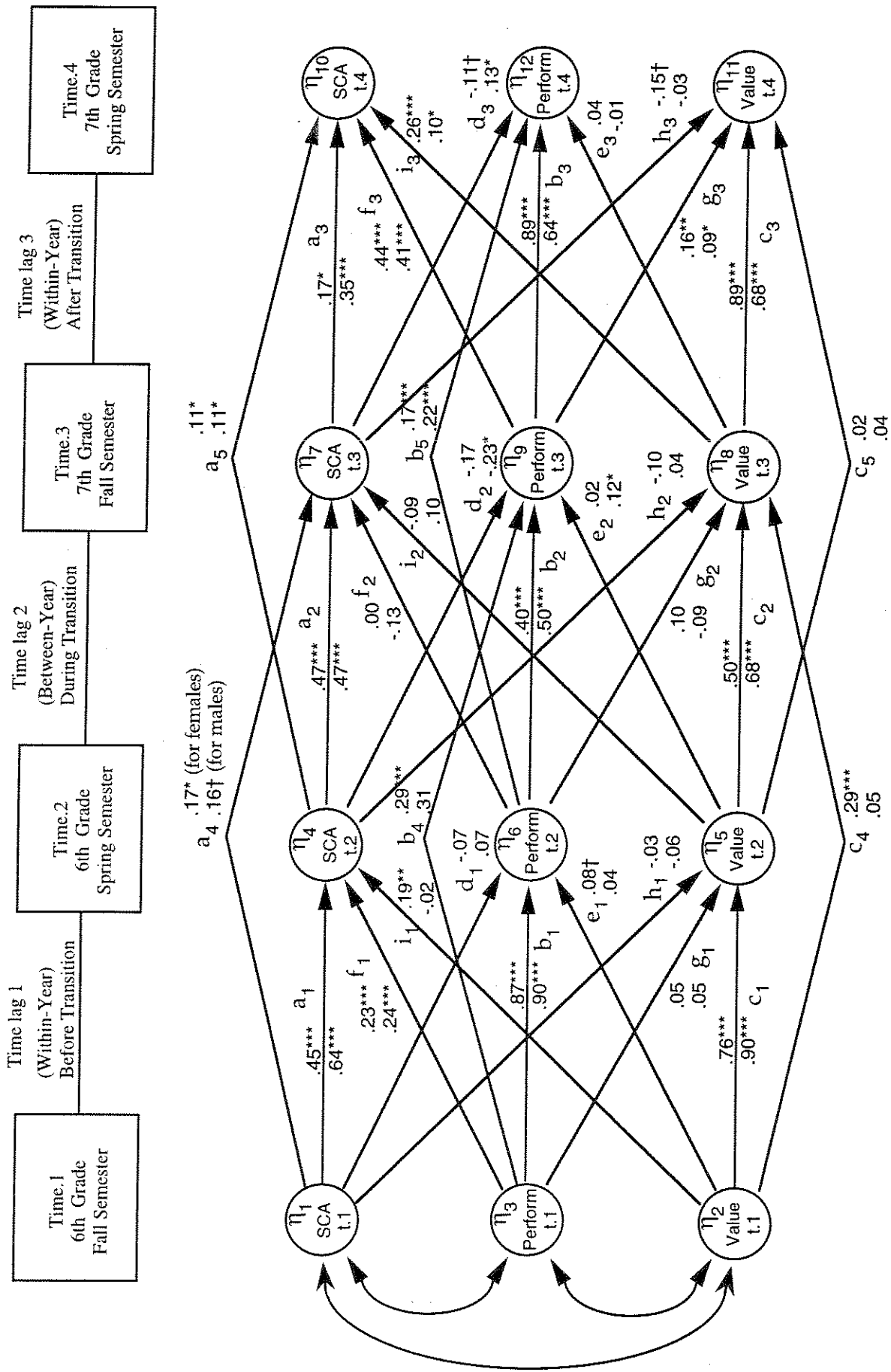


**Figure 1-a.**  
**Patterns of Stability in SCA, Value, and Math Performance**  
**for Females**





**Figure 1-b.**  
*Patterns of Stability in SCA, Value, and Math Performance  
 for Males*



**Figure 2.** The Final Structural Model (M2) of Causal Relations among Expectancy (SCA), Value, and Academic Achievement (Perform)

*Note.* LISREL's common metric standardized solution is reported. The structural coefficients on the top are for females and those at the bottom are for males. †  $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

Table 3

*First- and Second-Order Autoregressive Correlations and Partial Structural Coefficients of SCA, Value, and Performance for Females and Males: Stabilities*

Causal path or effect <sup>§</sup>	LISREL notation	Females				Males			
		<i>r</i>	<i>b</i> ( <i>SE</i> )	$\beta$	<i>p</i>	<i>r</i>	<i>b</i> ( <i>SE</i> )	$\beta$	<i>p</i>
a <sub>1</sub>	( $\beta$ 4.1 )	.72	.40 ( .07 )	.45	***	.78	.56 ( .09 )	.64	***
a <sub>2</sub>	( $\beta$ 7.4 )	.55	.48 ( .12 )	.47	***	.53	.49 ( .13 )	.47	***
a <sub>3</sub>	( $\beta$ 10.7 )	.60	.17 ( .08 )	.17	*	.70	.37 ( .07 )	.35	***
a <sub>4</sub>	( $\beta$ 7.1 )	.48	.15 ( .06 )	.18	*	.46	.15 ( .09 )	.16	†
a <sub>5</sub>	( $\beta$ 10.4 )	.43	.12 ( .05 )	.11	*	.51	.12 ( .05 )	.11	*
b <sub>1</sub>	( $\beta$ 4.1 )	.87	.90 ( .06 )	.87	***	.93	.93 ( .07 )	.90	***
b <sub>2</sub>	( $\beta$ 7.4 )	.59	.52 ( .16 )	.40	***	.63	.65 ( .29 )	.50	*
b <sub>3</sub>	( $\beta$ 10.7 )	.90	.92 ( .07 )	.89	***	.86	.65 ( .07 )	.64	***
b <sub>4</sub>	( $\beta$ 9.3 )	.58	.39 ( .14 )	.29	***	.63	.41 ( .27 )	.31	
b <sub>5</sub>	( $\beta$ 12.6 )	.64	.23 ( .06 )	.17	***	.68	.29 ( .06 )	.22	***
c <sub>1</sub>	( $\beta$ 5.2 )	.83	.84 ( .09 )	.76	***	.78	.99 ( .15 )	.90	***
c <sub>2</sub>	( $\beta$ 8.5 )	.74	.47 ( .13 )	.50	***	.69	.64 ( .14 )	.68	***
c <sub>3</sub>	( $\beta$ 11.8 )	.77	.95 ( .16 )	.89	***	.79	.72 ( .11 )	.68	***
c <sub>4</sub>	( $\beta$ 8.2 )	.72	.29 ( .10 )	.29	***	.55	.06 ( .13 )	.05	
c <sub>5</sub>	( $\beta$ 11.5 )	.58	.02 ( .09 )	.02		.57	.04 ( .07 )	.04	

Note.

<sup>§</sup> Causal path or effect letters refer to Figure 2.

*r* represents correlation between latent ( $\eta$  or eta) variables.

*b* represents unstandardized partial structural coefficients estimated by LISREL's maximum-likelihood method.

*SE* stands for the standard error of *b* coefficients.

$\beta$  represents standardized partial structural coefficients.

†  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .

Table 4

*Cross-lagged Correlations and Partial Structural Coefficients of SCA, Value, and Performance for Females and Males: Independent Causal Effects*

Causal path or effect <sup>§</sup>	LISREL notation	Females				Males			
		<i>r</i>	<i>b</i> ( <i>SE</i> )	$\beta$	<i>p</i>	<i>r</i>	<i>b</i> ( <i>SE</i> )	$\beta$	<i>p</i>
d <sub>1</sub>	( $\beta$ 6.1 )	.52	-.14 ( .12 )	-.07		.66	.15 ( .14 )	.07	
d <sub>2</sub>	( $\beta$ 9.4 )	.26	-.48 ( .27 )	-.17		.39	-.66 ( .29 )	-.23	*
d <sub>3</sub>	( $\beta$ 12.7 )	.43	-.31 ( .16 )	-.11	†	.51	.36 ( .16 )	.13	*
e <sub>1</sub>	( $\beta$ 5.1 )	.27	.13 ( .08 )	.08	†	.33	.06 ( .09 )	.04	
e <sub>2</sub>	( $\beta$ 8.4 )	.09	.03 ( .16 )	.02		.22	.25 ( .12 )	.12	*
e <sub>3</sub>	( $\beta$ 11.7 )	.23	.08 ( .11 )	.04		.28	-.03 ( .10 )	-.01	
f <sub>1</sub>	( $\beta$ 4.3 )	.56	.11 ( .03 )	.23	***	.65	.11 ( .03 )	.24	***
f <sub>2</sub>	( $\beta$ 7.6 )	.37	.00 ( .03 )	.00		.33	-.06 ( .04 )	-.13	
f <sub>3</sub>	( $\beta$ 10.9 )	.59	.17 ( .02 )	.44	***	.69	.15 ( .02 )	.41	***
g <sub>1</sub>	( $\beta$ 5.3 )	.24	.03 ( .04 )	.05		.25	.03 ( .05 )	.05	
g <sub>2</sub>	( $\beta$ 8.6 )	.27	.06 ( .04 )	.10		.16	-.05 ( .05 )	-.09	
g <sub>3</sub>	( $\beta$ 11.9 )	.28	.08 ( .03 )	.16	**	.30	.05 ( .02 )	.09	*
h <sub>1</sub>	( $\beta$ 5.1 )	.52	-.03 ( .10 )	-.03		.46	-.08 ( .16 )	-.06	
h <sub>2</sub>	( $\beta$ 8.4 )	.49	-.14 ( .13 )	-.10		.37	.05 ( .16 )	.04	
h <sub>3</sub>	( $\beta$ 11.7 )	.47	-.21 ( .12 )	-.15	†	.52	-.03 ( .09 )	-.03	
i <sub>1</sub>	( $\beta$ 4.2 )	.54	.15 ( .05 )	.19	**	.43	-.01 ( .05 )	-.02	
i <sub>2</sub>	( $\beta$ 7.5 )	.35	-.07 ( .06 )	-.09		.39	.07 ( .05 )	.10	
i <sub>3</sub>	( $\beta$ 10.8 )	.51	.21 ( .06 )	.26	***	.50	.09 ( .04 )	.10	*

Note.

<sup>§</sup> Causal path or effect letters refer to Figure 2.

*r* represents correlation between latent ( $\eta$  or eta) variables.

*b* represents unstandardized partial structural coefficients estimated by LISREL's maximum-likelihood method.

*SE* stands for the standard error of *b* coefficients.

$\beta$  represents standardized partial structural coefficients.

† *p* < .10; \* *p* < .05; \*\* *p* < .01; \*\*\* *p* < .001.