ATTRIBUTIONAL STYLE, OUTCOME EXPECTANCIES, DEPRESSION, AND
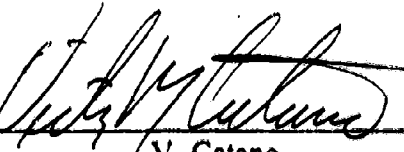
SELF-ESTEEM: TOWARD A COMPREHENSIVE THEORY

OF COGNITION-BASED DEPRESSION

Submitted in partial fulfilment of the requirements for the degree of

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Abstract

ATTRIBUTIONAL STYLE, OUTCOME EXPECTANCIES, DEPRESSION, AND SELF-ESTEEM: TOWARD A COMPREHENSIVE THEORY OF COGNITION-BASED DEPRESSION

Dean Andrew Tripp

September, 1993

This study used structural modelling equations to examine the relations among attributional style, outcome expectancies, depression, and self-esteem in an undergraduate student population at Saint Mary's University (n=195). Consistent with the theory of Carver and Scheier (1981) and Abramson, Seligman, and Teasdale (1978), the present results show that attributional style for positive and negative life events had a direct influence on a person's outcome expectancies, which in turn, directly influenced a person's level of depression and self-esteem. In contrast to these theories, ancillary data indicated that a negative attributional style had a direct influence on depression and that a positive attributional style directly influenced self-esteem. Depression also had a direct influence on self-esteem. These findings are discussed in light of their clinical implications and relevance to future research.

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Introduction

Depression, often called the "common cold of emotional disorders," is by itself and in combination with other disorders, the most commonly diagnosed psychological ailment (Freeman, 1990). Statistically, the chances are approximately 1 in 10 that you will have a depressive episode of clinical proportions at least once in your lifetime (Burke, Burke, Rae, & Regier, 1991). Many individuals who experience depressive episodes do recover but one out of every 100 depressed people die by suicide (Williams, Freedman, & Secunda, 1970).

Although depression has been recognized as an important form of psychopathology for hundreds of years, research over the past 20 years has radically altered the way in which the treatment and conceptualization of depression has been practised (e.g., Beck, 1967; Seligman, 1975). Such research strongly emphasizes that negative cognitions are a central component in the etiology, maintenance, and treatment of depression. Some authors argue that such a cardinal role for negative cognitions requires the need for a theory-based subtype of depression called "negative-cognition depression" (Abramson, Alloy, & Metalsky, 1988).

To date, there have been many comparable psychological theories emphasizing negative-cognition pathways thought to culminate in an increased incidence of depression. Two highly referenced examples are the reformulated theory of learned helplessness (Abramson, Seligman, & Teasdale, 1978) and self-regulation theory (Carver & Scheier, 1981; Scheier & Carver, 1988).

Resulting from the moderating role that an individual's cognitive perception of

their future has in promoting negative affective states, the reformulated theory of learned helplessness and self-regulation theory are generally called "expectancy" models of behaviour (Carver & Scheier, 1990). These expectancy models of behaviour state that in times of personal adversity, an individual's *outcome expectancies* for future situations are an important determinant of whether that person responds by continuing to exert an effort, or disengaging from the attainment of their intended goal of the moment. Furthermore, these outcome expectancies are causally influenced by an individual's personal attributions.

The reformulated model of learned helplessness (Abramson, Seligman, & Teasdale, 1978) and self-regulation theory (Carver & Scheier, 1981; Scheier & Carver, 1988) both assert that the way in which an individual attributes the causes of their behaviour in an interpersonal or social situation influences that person's outcome expectancies, which in turn effect the amount of dysphoria that person experiences. Although there are differences among these theories (Scheier & Carver, 1988), both have adopted this general position.

Resulting from the inherent theoretical complexity of the two expectancy models examined in this paper, a brief outline of self-regulation theory and the reformulated model of learned helplessness is necessary to provide the appropriate context for the following discussions on negative-cognition based depression.

Self-Regulation of Behaviour

Self-regulation theory (Carver & Scheier, 1981) has assumed a control-theory

framework in its conceptualization of human behaviour and affect, based on the work

of Wiener (1948). The theoretical focus of a control-theory approach is the manner in

which information is processed and monitored. These processes are described as

analogous to both electrical (e.g., computer) and biological systems (e.g., human

cognition).

The control-theory approach to human behaviour states that the perceptual

information gathered from our various interpersonal and social interactions are

processed in continuous cycles. With the massive amounts of incoming perceptual

information, controlling its flow becomes a salient issue. In this sense, the term

"control" refers to a sequencing of information that is directed by a set of

predetermined instructions. These instructions follow a temporal order in which one

set of instructions must be completed before the next may be performed. It is believed

that the self-regulation of behaviour is easily illustrated in terms of the principles of

feedback control. It is assumed that the functional elements underlying the self-

regulation of behaviour are the same functional elements that are found in different

kinds of electrical devices that people most often associate with the term "control

systems" (Scheier & Carver, 1988). Such a general information processing and control

system that is applicable to the self-regulation of behaviour is exemplified by the

TOTE unit of Miller, Galanter, and Pribram (1960).

TOTE is an acronym representing the basic actions of the unit; *test-operate-test-exit*. As illustrated in Figure 1, the TOTE unit consists of several operational phases. The *test* phase is a comparison process occurring between some existing state and some form of predetermined reference standard. Thus, this part of the TOTE unit is often called a comparator, as its function is to compare the state with the reference standard. What follows this test phase is a judgement process in which one of two outcomes may be produced; either the existing state is different from the reference standard or is similar. If this co-nparison process reveals a difference between the existing state and the reference standard, control is transferred to a second process, the *operate* phase. The nature of the operate phase is described to be unspecific, except that it functions to adjust the existing state in some manner (Miller, Galanter, & Pribram, 1960). Once the operate phase is complete, control is then transferred back to the *test* phase. The test phase begins to cycle back and forth with the operate phase, adjusting the existing state to the reference standard, until no discrepancy exists between the two. When such an outcome is reached, control is then transferred to exit, ending this regulatory cycle.

An often used illustration of how such a regulatory sequence functions is drawn from the operation of a room thermostat (Carver & Scheier, 1981). A thermostat senses the temperature in a room and compares it to some preset standard. If the temperature of the room is too far from the standard, control is transferred to a different part of the thermostat, turning on or off the furnace. Here, the furnace
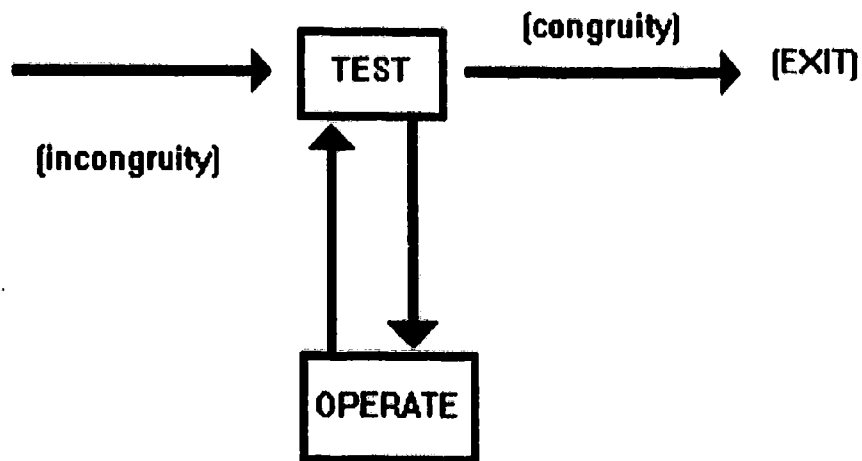
Figure 1. Carver and Scheier's (1981) schematic of the TOTE (test-operate-test-exit) unit

represents the operate phase. Once the temperature in the room has adjusted to a range where no discrepancy exists between the preset and existing standard, the furnace is shut off.

The TOTE cycle is regarded as a general construct making it applicable to the control and processing of information for electrical and biological systems (Carver & Scheier, 1981). However, what is most important about this regulatory unit is that it describes the process of a self-regulating system. Applying it to humans, the TOTE unit has been used as a basic structural model describing the manner in which an individual cognitively processes and responds to their environment. According to this approach, people attempt to keep their existing behaviour as close to some preset reference value as possible. This regulation is accomplished by executing a comparison process that examines any existing behavioral discrepancies and moves individuals toward their reference value (Carver & Scheier, 1981).

An individual's reference value is a cognitive framework, comprising the personal qualities that are taken as guides for that individual's behaviour. Therefore, people act to be who they think they ought to be by adopting any of the personal qualities that are implied by the currently employed reference value they are using for behavioral comparison (Carver & Scheier, 1981). The most prominent reference value is the idealized sense of self. The idealized self is a global internalized cognitive perception of what type of person an individual believes him or her self to be (e.g., a good-hearted, kind person or a nasty, grouchy person).

In control-theory terminology, self-regulating systems such as the TOTE unit, use *negative feedback loops* to control and respond to perceptual information. More specifically, this system is designed to loop back perceptual information reducing any sensed discrepancies between the existing state and the preset reference value. These loops are termed negative because they function to negate, or reduce, any sensed deviations from the comparison value.

As illustrated in Figure 2, such a discrepancy reduction process is initiated when individuals take notice of their behaviour. These incoming perceptions have been compared to and called "input functions", analogous to functions of a computer. After these perceptual inputs are acknowledged, they are compared against the currently employed reference value. Although the idealized self is described as the dominant internalized perception of how individuals perceive themselves to be, it comprises many sets of values that pertain to many different environments (Carver & Scheier, 1990). Depending on the particular situation, one of many reference values for behaviour may be compared to the specific existing behaviours.

Comparison processes of this nature may result in a sensed discrepancy between the existing behavioral state and its corresponding reference value. If so, adjustments will be made to shift the existing behaviour toward the reference value. This adjustment or "output function" then leads to behavioral changes. These changes in behaviour not only affect the present situation but are influenced by the present environment as well. The influence that these changes may have had on the
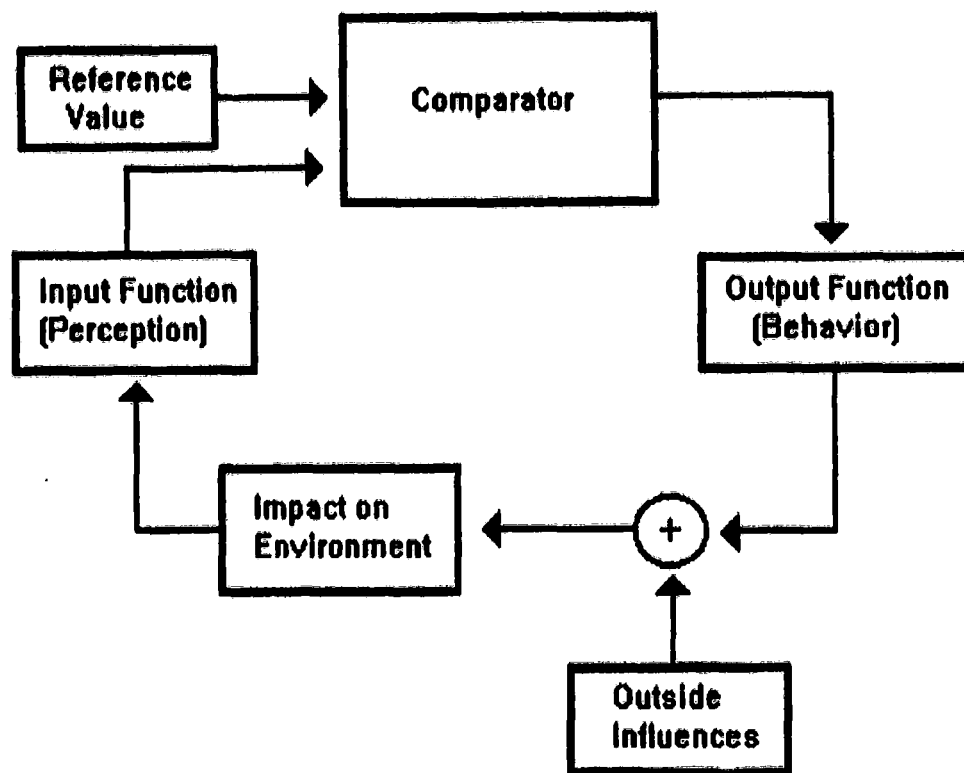
Figure 2. Carver and Scheier's (1981) negative feedback loop of discrepancy reduction for electrical and biological systems.

environment is then circled back in a loop-like fashion, where they are received as a new perceptual input function. When these new perceptions are gathered and processed and there is no discernible discrepancy between the new behaviour and the reference value, that type of behaviour will continue to endure. This type of discrepancy reducing feedback loop process forms the basic unit of behavioral self-regulation (Carver & Scheier, 1981).

Although the negative-feedback loop is the basic control structure for behavioral self-regulation, a single feedback loop by itself would be inadequate to explain the complex nature of human behaviour (Scheier & Carver, 1988). In applying the negative-feedback loop to the self-regulation of behaviour, there may be several discrepancy reduction processes working at once, organized in a hierarchical fashion (Carver & Scheier, 1981). Adopted from the work of Powers (1973), self-regulation theory specifies that there exists a hierarchy of feedback loops from the existing behaviour up to the idealised-self, with each level exhibiting its own level of feedback control.

As illustrated in Figure 3, the hierarchy of operation shows three separate levels of control functioning in a subordinate manner. The predominate level of these feedback loops is called the *system concept*, which is often used to describe a person's reference values including their global sense of idealized self. Because reference values are often abstract and difficult to define in terms of what behavioral outputs are involved, the main function of the system concept level is to provide the appropriate

Idealized Self-Image
(System Concept)

Be Kind
(Principle)

Shovel Snow Off Walks
(Program)

Over-riding
Reference
Value

Comparator
3

Output Function 3
and
Reference Value 2

Comparator
2

Output Function 2
and
Reference Value 1

Comparator
1

Perceptual Input 3

Perceptual Input 2

Perceptual Input 1

Output Function 1

Execution of
Program

Effect on
Environment
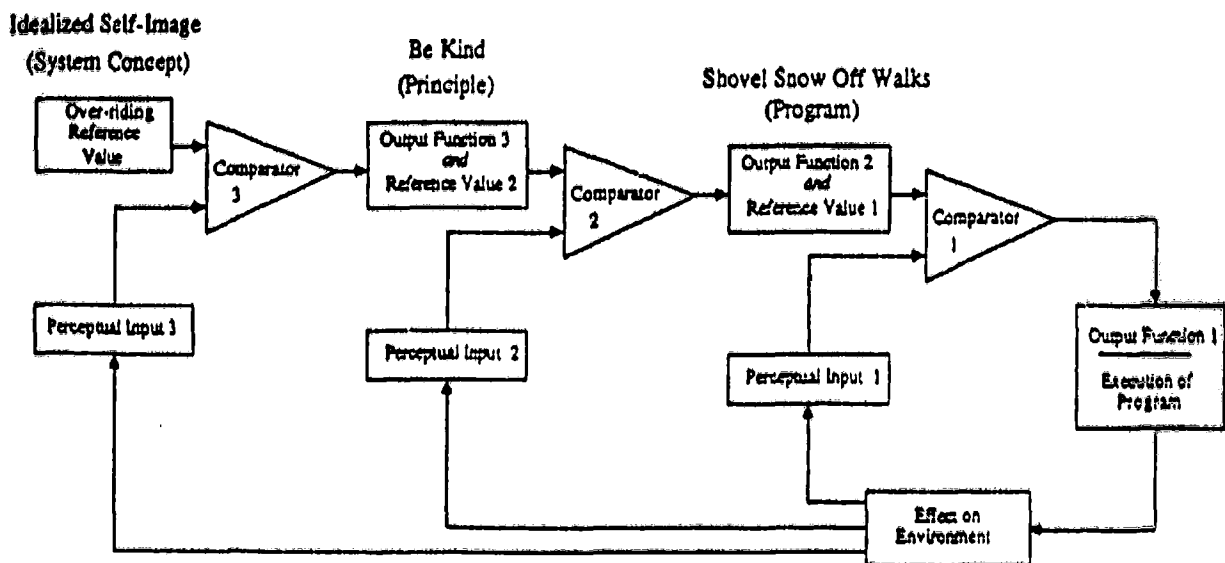
Figure 3. Carver and Scheier's (1990) three-tiered hierarchical organization of discrepancy reduction feedback loops in the regulation of behaviour.

reference value for the subordinate systems.

The *principles* level begin to form the observable behaviour of an individual.
For example, characteristics like thoughtfulness, anger, distrustfulness, or
responsibility, are all abstractions of principles (Carver & Scheier, 1981). Principles
are regarded as qualities and not behaviour or actions because people cannot perform
"thoughtfulness". The performance of concrete behavioral activities are termed
programs, and are the final subordinate control of the feedback loops. Programs are
actions that most people will recognize as behaviour. Examples of programs are,
writing an exam, walking the dog, or shovelling snow. Because of this hierarchical
organization, people behave the way they "think" they should, according to the
idealized-self that they aspire to (Carver & Scheier, 1990).

This hierarchical organization of behaviour has two important implications for
behavioral self-regulation: 1) the higher the control unit in the hierarchical
organization, the greater the idealizing sense of self becomes apparent; and, 2) the
importance assigned to a reference value at the subordinate levels, is partially
dependent upon the degree to which its attainment adds to the success in an attempt to
reduce discrepancies at the higher levels.

It would be unrealistic to claim that individuals perpetually attain their desired
goals, cycling smoothly through all discrepancy reduction processes. Variables present
in the physical setting or within the individual may often obstruct this process of goal
attainment. Accounting for these possible behavioral interferences, self-regulation

theory (Carver & Scheier, 1981) proposes that when individuals encounter a level of disruption in their overt behavioral efforts, they will disengage from discrepancy reduction and engage in assessing the possibility of success. This is done in comparison to previous similar situations that they have experienced and is called an outcome expectancy for the future.

The outcome expectancy held by a person will influence that individual's behaviour. Assessing an outcome expectancy is complicated and includes the internal manipulation of a vast amount of information about the external situation and the related internal qualities of the idealized-self. The main emphasis in the internal processing of any expectancy assessment relies heavily on the memories and prior experience of that individual (Carver & Scheier, 1981). Therefore, an a priori cognitive evaluation that may be either positive or negative can have a significant impact on the promotion of outcome expectancies regarding similar situations in the future.

As illustrated in Figure 4, if the outcome expectancy produced by this internal cognitive assessment procedure is positive, the individual will most likely renew their efforts in the current situation by attempting another discrepancy reduction. If the outcome expectancy is negative, that individual is more likely to disengage from the attempt, "giving up" on any further efforts regarding the task at hand. This process is termed behavioral disengagement.

Behavioral disengagement may take one of two forms, depending upon the
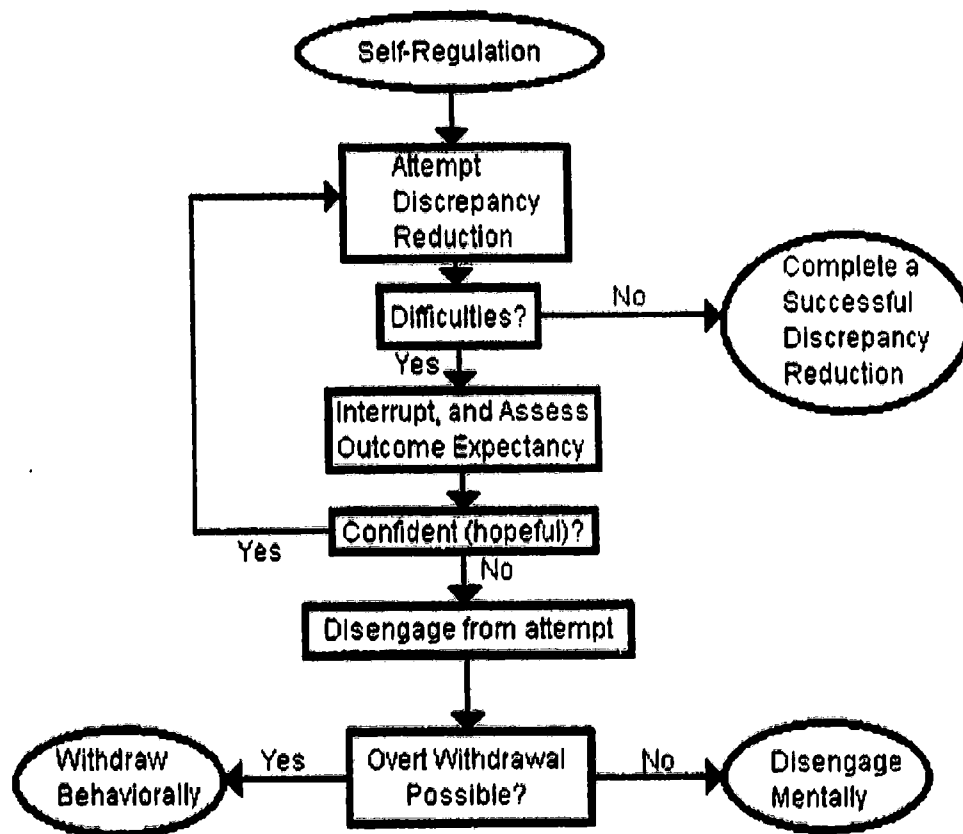
Figure 4. Carver and Scheier's (1981) schematic of an outcome expectancy assessment and its possible consequences

perceived physical or mental constraints of the situation. For example, a student

writing an examination who has developed a negative outcome expectancy regarding

their ability on examinations may not be permitted to leave the examination room

during the initial 30 minutes of the test (e.g., physical disengagement), but may refuse

to concentrate on the task at hand, seemingly giving up (e.g., mental disengagement).

There has been empirical support for the self-regulating process of discrepancy

reduction and disengagement in studies of self-directed attention (Carver & Scheier,

1981) and the self-management of anxiety in testing and social situations (Carver,

Peterson, Follansbee, & Scheier, 1983; Rich & Woolever, 1988). These types of

research designs typically place a subject in a situation where they are to complete a

difficult task. Subjects are then given the opportunity to stop or proceed with the task

under varying environmental influences (e.g., others have already completed the task).

Following the experiment subjects are usually asked about their experience and

whether or not they felt they could complete the task. Taken together, such results

have shown that an individual's outcome expectancies for future performances are

significantly related to goal attainment or goal disengagement.

As an important augmentation to the discussion on disengagement, Carver and

Scheier (1981) claim that an individual's outcome expectancies directly influence

affective states. For example, if a person's outcome expectancies are positive, that

person will tend to manifest positive affect, leading to increased self-esteem.

However, outcome expectancies that are negative may promote negative affect,

possibly leading to an increased occurrence of depression (Carver & Scheier, 1981).

The important capacity assigned to outcome expectancies regarding their direct influence on affective states by Carver and Scheier (1981; Scheier & Carver, 1988) is not a unique theoretical proposition. Self-regulation theory shares much in common with other expectancy models of behaviour, such as the reformulated model of learned helplessness proposed by Abramson, Seligman, and Teasdale (1978).

The Reformulated Model of Learned Helplessness

The original theory of learned helplessness was based on a series of experiments showing that organisms, when exposed to uncontrollable aversive events, will eventually behave as if they are helpless. In support of this model, an extensive body of research has reported that animals exhibiting learned helplessness show deficits in motivation and learning (e.g., Seligman, Maier, & Greer, 1968). When humans are exposed to unpleasant uncontrollable events, in experimental (e.g., Hiroto & Seligman, 1975; Maier & Seligman, 1976) or natural (e.g., Seligman, 1975; Seligman, Maier, & Soloman, 1971) settings, it is typically shown that deficits in self-esteem occur .

Although the original model of learned helplessness has provided an empirical basis for explaining the behavioral deficits associated with depression it nevertheless was not instrumental in providing theoretical explanations of why some animals or individuals may resist such states. In particular, the original model of learned

helplessness faced three general criticisms: 1) the model could not account for the generality of the motivational and cognitive deficits that had been produced by the experienced state of helplessness; 2) the observed helplessness deficits were often short lived while in other cases they were long lasting; and 3) although self-esteem deficits were mentioned in the learned helplessness model, it did not specify when or why someone might feel a sense of failure after an uncontrollable aversive event, and when and why they might not (Kamen & Seligman, 1987a). Resulting from these theoretical criticisms, Abramson, Seligman, & Teasdale (1978) reformulated the learned helplessness model using several facets of attribution theory.

Attribution theory, developed from the works of Heider (1958), Kelley (1965), and Weiner (1972, 1974), is a general theoretical perspective from the field of social psychology concerned primarily with social perception. The act of an attribution is one in which a person associates a characteristic, trait, or emotion, to oneself or to another individual. Therefore, the term attribution theory does not definitively represent a formal theory, but a general approach to understanding behaviour in terms of perception and interpretation. Manipulating such a rationale, attribution theory claims that the subjective causes of both personal successes and failures may be cognitively explicated to oneself along one of two dimensions: 1) a *locus dimension* (internal-external), which locates the cause for the event within or external to the individual, and 2) a *stability dimension* (stable-unstable), which identifies the cause of an event as chronic or situation specific. As described earlier, by Ickes and Layden

(1976), this proposed cognitive process of event perception and interpretation is referred to by the term "attributional style".

In an attempt to account for individual differences and the generalizability of the helplessness deficits experienced by some individuals, the reformulated model of learned helplessness (Abramson, Seligman, & Teasdale, 1978) partitioned their interpretation of an "attributional style" into three-dimensional elements. These three dimensions, which pertain equally to positive and negative life-events, are: 1) *Internal-External*: the perceived cause of the life event is promoted by the person versus the situation; 2) *Stable-Unstable*: the perceived cause of the life event will last a long time versus a short time; and, 3) *Global-Specific*: the perceived cause of the life event will influence many versus few situations. Therefore, an attributional style accounts for an individual's habitual method of cognitively explaining, or attributing, the causes of positive (e.g., becoming rich) and negative (e.g., not helping a friend in need) life-events to oneself. More recently (Seligman, 1991) attributional style has been described as a term for the manner, in which one may interpret their setbacks and successes.

Within the reformulated model of learned helplessness, there are two fundamental types of attributional styles. If an individual cognitively attributes the parameters of a negative life-event using internal, stable, and global attributions, and positive life-events with external, unstable, and specific causes, that individual presents with a depressogenic manner called a *pessimistic attributional style* (Abramson,

Seligman, & Teasdale, 1978). In contrast to a pessimistic attributional style, an individual may attribute their negative life-events employing temporary, specific, and external, perceptual parameters. Such an individual are referred to as presenting an *optimistic attributional style* (Abramson, Seligman, & Teasdale, 1978).

The most salient feature of an optimistic attributional style is that these individuals can say and believe, in relation to life events, "it was just circumstances; it's going to be over soon." (Seligman, 1991). Alternatively, individuals with a pessimistic attributional style tend to attribute their negative life events using internalized cognitive statements such as, "it's me; it's going to last forever" (Seligman, 1991). Because of such negative attributions, pessimistic individuals are more likely to experience increased chances of experiencing depressive episodes.

The reformulated model of learned helplessness suggests that what is most significant in creating states of negative affect, is the manner in which an individual may attribute the cause of both their positive and negative life-events. In fact, these attributions may directly influence an individual's outcome expectancies (Abramson, Seligman, & Teasdale, 1978). Attributions for negative life-events may lead to depression as they influence outcome expectancies concerning the probability of future events.

An example of how negative attributions may affect thought can be illustrated by examining the cognitions of an individual awaiting some type of surgery (see Table 1). Surgery is used in this example as it is generally viewed as a negative life-event.

An individual employing internal, stable, and global attributions (e.g., I've never been a good healer.), exhibit a pessimistic attributional style, which may lead to an elevation in the amount of despair they experience concerning their surgery. Therefore, an attributional style affects how an individual perceives their future, which in turn, influences the likelihood of a depressive episode under times of interpersonal turmoil (Abramson, Seligman, & Teasdale, 1978)(see Table 1).

Evidence for the reformulated model of learned helplessness has been accumulating in research that supports relations between negative attributions and depression (e.g., Brewin, 1985). Other research, has provided similar support, suggesting that attributions for both positive and negative events all relate to depression (Sweeney, Anderson, & Bailey, 1986).

Table 1. Possible causal attributions by a person worried about their upcoming surgery.

| | Internal | | External | |
	Stable	Unstable	Stable	Unstable
Global	I've never been a good healer	I don't heal well when I'm fatigued	All surgeons are extremely competent in their work	All surgeons are extremely competent only if they are giving 100% of their effort
Specific	I'm not going to heal well after this surgery	I don't heal well when I don't get my proper rest	Dr. X is a good surgeon, his work is sound	Dr. X is a good surgeon he is rested and prepared

Attributions, Outcome Expectancies, and Affect

Both the self-regulation theory (Carver & Scheier, 1981; Scheier & Carver, 1988) and the reformulated model of learned helplessness (Abramson, Seligman, & Teasdale, 1978) state that negative attributions and unfavorable outcome expectancies share a potential common endpoint: depression. However, each theory presents a different emphasis on the type of cognitive process involved in the etiology and maintenance of depression.

Self-regulation theory (Carver & Scheier, 1981) states that an individual's outcome expectancies about the future, mediate the influence that an attributional style has on behaviour. This theory endorses the view that:

> ...the prediction of behaviour does not depend directly upon the attributions themselves. Behaviour follows from the perception that responses will not produce desired outcomes, regardless of the reason for the perception... Outcome expectancy is the critical parameter, and how that expectancy is determined is unimportant. (Carver & Scheier, 1981, p. 254)

The reformulated model of learned helplessness, however, places a particular emphasis on the attributions employed by an individual. Abramson, Seligman, & Teasdale (1978) have suggested that attributions that are global and stable in reference but not internal, have particular affective repercussions by way of that person's expectancies for future events. Attributions are also emphasized because of their generalization of depressogenic cognitions. It is proposed that global attributions for negative events allow for greater generalization that negative outcomes are expected to

be present in all situations. The chronicity of depression is regarded as a function of stable attributions (i.e., that negative outcomes are expected to be present in the future). Such theoretical emphasis clearly make attributions a salient issue in the onset and maintenance of depression.

Although self-regulation theory and the reformulated model of learned helplessness have described the cognitive variables that are related to depression this research and theory provides only a restricted explanation of how attributional style, outcome expectancies, and affect may influence each other. As highlighted by Hull and Mendolia (1991), predictions about the role of outcome expectancies and the possible differential influences that attributions may manifest in depression are puzzling for various reasons. Their primary criticism was that most of the research supporting the reformulated model of learned helplessness has not examined the possible mediational role that expectancies may provide between depression and a negative attributional style. This critique is supported by the fact that most research in the area of depression has utilized a total score based approach in measuring attributional style to compensate for the low reliability estimates for each subscale of the Attributional Style Questionnaire (ASQ; Peterson & Seligman, 1984). This is a particularly relevant point when considering the causal influences that a negative attributional style is theorized to have on outcome expectancies (Abramson, Seligman, & Teasdale, 1978).

So how can we better analyze the data supplied by instruments such as that

used to quantify an attributional style (i.e., the ASQ)? How can one attempt to

account for the main and also possible subcomponent effects of these multifaceted

constructs? Pedhazur (1982) states that it is unrealistic to expect that a single

statistical indicator can validly or reliably capture such complexity of interaction,

suggesting that structural equation modelling be employed in such cases. Structural

equation modelling is a very versatile approach that may be used for the analysis of

causal models with multiple indicators of latent variables, reciprocal causation,

measurement errors, and correlated error terms, are present.

By employing the structural-modelling approach subsumed in LISREL

(Joreskog & Sorbom, 1984; 1989), Hull and Mendolia (1991) have not only

investigated the theorized relations among attributional style, outcome expectancies,

and depression, but also the possible effects arising from subcomponents of an

attributional style. As diagrammed in Figure 5, one interesting finding from the Hull

and Mendolia study was the robust nature of their measurement model for attributional

style. In two separate studies they manipulated the measurement of attributional style

into two separate latent variables with similar results. It was concluded that

attributional style is best measured using two separate latent constructs, one each for

positive and negative events. Their measurement model was derived for reasons of

statistical parsimony (i.e., it provides a good fit for the data but requires fewer

parameter estimates), and is suggested as the appropriate model for the multi-faceted

construct of attributional style.

Figure 5. Hull and Mendolia's (1991) structural equation model of attributional style, outcome expectancies, and depression. (Parameter estimates are standardized; significance levels are determined by critical ratios. LOT=Life Orientation Test; GESS=Generalized Expectancy for Success Scale; BDI=Beck Depression Inventory; ZUNG=Zung Self-Rating Depression Scale; *=p < 05; ***=p.<001.)
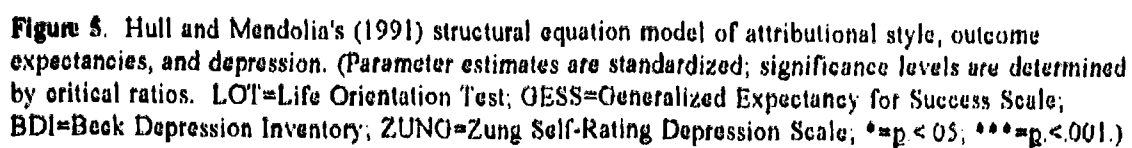
Hull and Mendolia (1991) provide a structural model in which attributional styles for positive and negative events were shown to directly influence outcome expectancies (.53 and -.43 respectively), which in turn, directly influenced depression (-.46). These findings support both the self-regulation theory and the reformulated model of learned helplessness position on the etiology and maintenance of depression. However, in contrast to these theories, a negative attributional style was shown to have a direct association with depression (.20), rather than simply affecting outcome expectancies. In considering this finding, Hull and Mendolia have said that the stringent claims that depression is only influenced by outcome expectancies (Carver & Scheier, 1981; Scheier & Carver, 1988), were inaccurate for a negative attributional style but accurate for a positive attributional style.

By providing conditional support for the type of cognition-based depression offered in self-regulation theory and the reformulated model of learned helplessness, Hull and Mendolia (1991) have delineated several vulnerability factors in the etiology and maintenance of depression. However, in doing so, the examination of possible invulnerability factors in the etiology and prevention of depression remains an unaddressed issue. The possible role that self-esteem may play in the etiology and maintenance of depression is an important theoretical point of inquiry as the association between these variables has been implied in self-regulation theory (Carver & Scheier, 1981) and the reformulated model of learned helplessness (Abramson, Seligman, & Teasdale, 1978).

As suggested in self-regulation theory (Carver & Scheier, 1981), self-esteem is promoted by attributions for positive events that are followed by favourable outcome expectancies for the future. More specifically,

> a person's outcome expectancy determines the general tone emotion that is experienced -i.e., positive or negative. But the specific nature of the affect is determined by other considerations. These additional considerations may be viewed most simply as comprising an attributional analysis of the basis for outcome expectancies... If the expectancy is viewed as a product of one's own efforts or abilities, the feeling is one of heightened self-esteem (Carver & Scheier, 1981, p. 199).

This theoretical statement is augmented by assertions concerning the influence that depression may have on self-esteem. In attempting to conceptually refine the reformulated theory of depression, Abramson, Alloy, and Metalsky (1988) suggested that when negative life events are attributed to internal as well as stable, global causes, the eventual depressive reaction has a negative influence on self-esteem.

In reference to the previous theoretical statements concerning cognition and affect, and building on the research of Hull and Mendolia (1991), this study will address several hypotheses (see Figure 6). The theorized model in this study will be assessed for its model fit with the observed data providing several specific hypotheses: 1) Replication of the structural model obtained by Hull and Mendolia (1991) which states that attributional style for positive and negative events are mediated by outcome expectancies. This model also specifies that a negative attributional style has both direct and indirect effects on depression via outcome expectancies; 2) based on the

theory of Carver and Scheier (1981; Scheier & Carver, 1988), outcome expectancies

will have a direct positive influence on self-esteem with an attributional style for

positive events having an indirect effect (via outcome expectancies); and 3) based on

the theorizing of Abramson, Alloy, and Metalsky (1988), depression will have a

negative influence upon self-esteem.
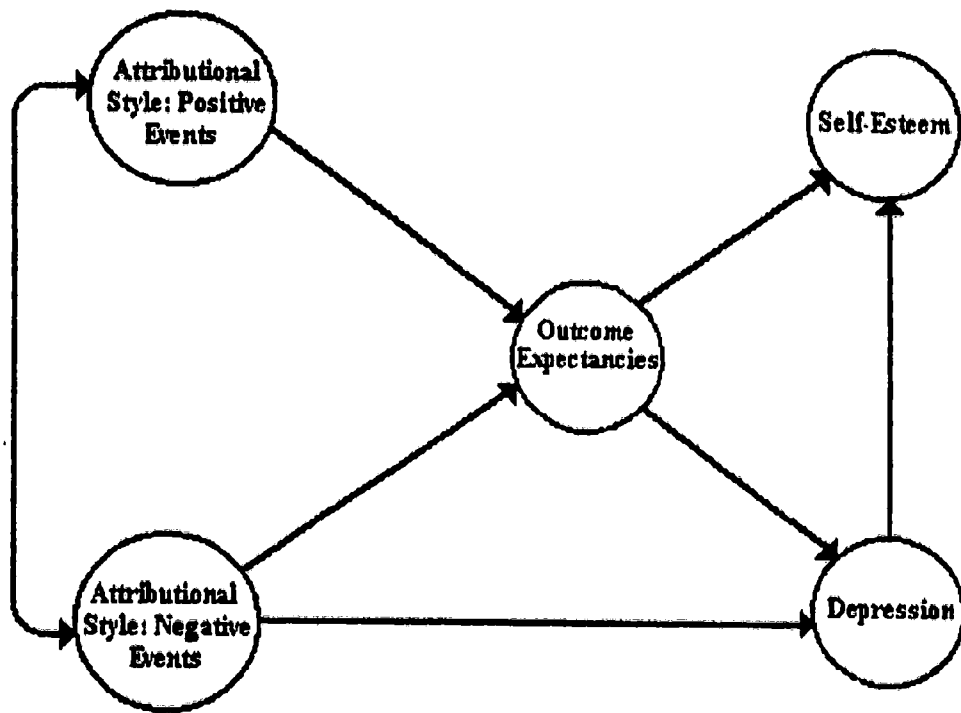
Figure 6. Proposed structural model of attributional style, outcome expectancies, depression, and self-esteem.

METHOD

Participants:

Participants were 199 undergraduates who received extra credits in an introductory psychology course at Saint Mary's University. Responses from participants who failed to complete all items on the scales used in this study were excluded from data analysis. The final sample consisted of 195 participants.

Measures:

Attributional Style:

The Attributional Style Questionnaire (ASQ; Peterson, Semmel, von Baeyer, Abramson, Metalsky, & Seligman, 1982) is a 48 item self-report instrument designed to measure an individual's attributional style across a variety of hypothetical situations rather than their explanation for any one particular outcome (Peterson & Seligman, 1984). The ASQ consists of a series of twelve situations or life events, six of which describe a positive outcome and six of which describe a negative outcome. The participant is instructed to read each of the twelve situations and vividly imagine it happening to themselves. He or she then decides what the major cause of the event is, and writes it down on the record form. The participant is then asked to rate the extent that their response is external, stable, and global on a 7-point scale. These three ratings for each of the twelve situations quantify the participants attributional style.

The ASQ has three dimensions or subscales for both positive and negative events; internality, stability, globality. These subscales can be totalled to form a composite score for positive situations (composite positive, or CP) as well as negative situations (composite negative, or CN). There is also an overall composite score that may be derived by subtracting the CN score from the CP score.

The internal reliability of the ASQ has been investigated with reports of modest reliabilities for each of the subscales. Chronbach's (1951) coefficient alpha for the ASQ range from $\propto=.44$ to $\propto=.69$, with a mean of $\propto=.54$ (Peterson et al., 1982). These figures are based on the subscales that contain six of the twelve items in the questionnaire. In the present study, internality, stability, and globality attributions for negative life events produced $\propto=.35$, $\propto=.54$, and $\propto=.60$, respectively. Also, internality, stability, and globality attributions for positive life events produced $\propto=.44$, $\propto=.45$, and $\propto=.47$, respectively. When the these subscales are combined to form the CN and the CP, higher reliabilities have been reported; $\propto=.75$ and $\propto=.72$ (Peterson et al., 1982). The internal consistency for the CN and the CP scales in this study are $\propto=.67$ and $\propto=.73$.

There is a large body of literature supporting the criterion and construct validity of the ASQ. Some investigators have used criterion groups to validate the ASQ. For example, Eaves and Rush (1984) found that a group of depressed female psychiatric patients provided more internal, stable, and global attributions for negative events than did the non-depressed control group. Alloy, Peterson, Abramson, and Seligman (1984)

examined the construct validity of the ASQ. They tested, as predicted by the reformulated model of learned helplessness, that individuals who habitually attribute negative outcomes to global causes will manifest behavioral deficits across a wide range of situations after exposure to uncontrollable aversive events and that those who attribute negative outcomes to specific events should manifest fewer severe effects. Subjects who had been exposed to uncontrollable bursts of noise had recorded negative events on the ASQ as global, showed more general deficits on various experimental tasks. Other studies have also provided support for the construct validity of the ASQ. Zullow and Seligman (1985) showed that people who were classified with a pessimistic attributional style were inclined to ruminate about depressogenic cognitions and were at risk of developing a later depression. Examining the convergent validity of the ASQ, Blaney, Behar, and Head (1980) showed a moderate relationship between a measure of depressive cognition, the Cognitive Bias Questionnaire (Krantz & Hammen, 1979), and the ASQ. In terms of discriminant validity the ASQ reliably discriminates between psychiatric patients who are depressed and those who are not (Raps, Peterson, Reinhard, Abramson, & Seligman, 1982). Other studies have also linked the ASQ to measures of depression in a variety of populations and settings (Kamen & Seligman, 1987a, 1987b; Peterson & Seligman, 1984; Sweeney, Anderson, & Bailey, 1986).

Outcome Expectancies:

The Life Orientation Test (LOT; Scheier & Carver, 1985) (see Appendix A) is a measure of dispositional, generalized, outcome expectancies about future life events. This scale consists of eight scored items and four filler items included to disguise the underlying purpose of the test. Of the scored items, four have been phrased in a positive manner (e.g., I'm always optimistic about my future), and four have been phrased in a negative manner (e.g., Things never work out the way I want them to). In scoring, the positive and negative items are combined, after reversing the value of the negatively phrased items, to form a single optimism score. This score may range from 0 (representing low outcome expectancy score) to 32 (representing high outcome expectancy scores).

The internal consistency of the LOT, with coefficients based on a combined sample of 357 men and 267 women (n=624), was reported at $\alpha=.76$ (Scheier & Carver, 1985); present results report an $\alpha=.83$. The scale stability, examined in a four-week test-retest analysis, was reported to be .79 (Scheier & Carver, 1985).

Research using the LOT supports the hypothesis that generalized outcome expectancies are related to depression, suggesting convergent and discriminant validity. For example, dispositional optimism was negatively related to depressive mood for women in their 3rd trimester and three-weeks postpartum (Carver & Gaines, 1987). Additional research using this scale has found that compared to pessimists, optimists can cope with stressful life events more effectively (Scheier, Weintraub, & Carver,

1986), are more likely to complete an aftercare treatment program for alcoholism

(Strack, Carver, & Blaney, 1987), and report fewer physical symptoms (Scheier &

Carver, 1985).

Depression:

The Beck Depression Inventory (BDI; Beck, Ward, Mendelson, Mock, &

Erbaugh, 1961) is a 21-item test presented in a multiple-choice format that purports to

measure depressive symptomatology in adolescents and adults. Each item on the BDI

attempts to assess a specific symptom or attitude that is related to a state of

depression.

Internal consistency for the BDI has been reported at $\alpha=.86$ while the

Spearman-Brown correlation for the BDI was .93 (Beck et al., 1961); the present

results report $\alpha=.87$. Test-retest reliability has been studied using psychiatric patients

who were administered the BDI on two separate occasions (Beck, 1970). It has also

been shown that scores on the BDI changed according to the observed clinical rating

of depression, indicating a consistent relationship between BDI scores and patient

state, with reliability figures above .90.

The BDI has been examined for its concurrent validity in several studies. One

study showed a correlation of .77 between the BDI and psychiatric rating using

university students as subjects (Bumberry, Oliver, & McClure, 1978). Beck (1970)

reported similar studies in which coefficients of .65 and .67 were obtained with

psychiatric patients.

Self-Esteem:

The Rosenberg Self-Esteem Scale (RSE; Rosenberg, 1965)(See Appendix B) is

a ten-item scale presented in a multiple choice format assessing "global self-esteem" in

adolescents and adults. Each of the 10 items on the RSE examines a specific attitude

which is related to the "general feeling" of self-esteem. Describing this form of

general self-esteem, Rosenberg (1979) has stated:

> When we characterize a person having high self-esteem ... We mean that he
> has self-respect, considers himself a person of worth. Appreciating his own
> merits, he nonetheless recognizes his faults ... that he hopes and expects to
> overcome ... The term "low self-esteem" ... means that the individual lacks
> respect for himself, considers himself unworthy, inadequate, or otherwise
> seriously deficient as a person. (p. 54)

In scoring the RSE, the positive and negative items are combined after

reversing the value of the negatively phrased items to form a single score. This score

may range from 10 (representing low global self-esteem) to 40 (representing high

levels of global self-esteem).

Internal consistency of the RSE has been reported in several studies using

different samples: Schmitt and Bedeian (1982), 873 civil servants, $\alpha = .83$; Byrne and

Shavelson (1986), urban Canadian 11th and 12th graders, $\alpha = .87$; and, Orme, Reis, and

Herz (1986), 116 parents, $\alpha = .80$. In this study, $\alpha = .89$. Test-retest reliability

coefficients of .85 and .60 for a two-week interval (Silber & Tippett, 1965), and a

seven-month interval (Byrne, 1983), respectively have been reported.

The construct validity of the RSE has been examined primarily by factor analysis because of the proposed unidemensionality of global self-esteem (Rosenberg, 1965). O'Brien (1985) reported strong support for the unidemensionality of the RSE, sighting a single factor with an eigenvalue of 5.28 accounting for 58% of the variance. Hensley (1977) also obtained a single factor solution in both a female and male sa ple.

Convergent and discriminant validity for the RSE have been examined using the multitrait-multimethod matrix. Byrne and Shavelson (1986) presented a matrix in which the RSE had convergent validity coefficients of .79, with the General Self-Esteem scale (Marsh & O'Neill, 1984), and .64, with the Self-Concept scale (Soares & Soares, 1979). These figures were greater in value than the other series of correlations presented, providing support for discriminant validity. The RSE correlates with the Coopersmith Self-Esteem inventory (Coopersmith, 1981) (r=.65), showing evidence of construct validity.

Procedure:

All participants were notified of this study by in-class announcements made by the experimenter which states: 1) that each participant would receive extra credit towards their final grade for participating in this study; 2) the general topics of interest in this study (e.g., that this study examines issues of self-evaluation along with various

other cognitive measures); 3) the time and location of the study; 4) an explanation of the procedure used to ensure participant anonymity (i.e., no names would be recorded, each participant would be referred to by an assigned number); and, 5) the approximate time period required to complete the questionnaires (15-25 minutes).

When participants had gathered in the testing room at the appropriate date and time, they were provided with a numbered questionnaire package and pencils. They were given general instructions, details on how to fill out the questionnaires, instructed on the rights of research participants, and the method used for obtaining informed consent in this study (see Appendix C). All participants were allotted as much time as they required to complete their questionnaire packages. Before leaving the testing room all participants were given a letter from the experimenter describing the particular aspects of this study and a description of how to obtain further information on the results and conclusions produced by this research (see Appendix D).

RESULTS

Correlational Analyses:

Pearson product moment correlations were computed among the latent constructs of outcome expectancies (LOT), self-esteem (RSE), and depression (BDI). The resulting correlations are presented in Table 2. Depression, is negatively

correlated with self-esteem (-.70, p. <.01, two-tailed) and outcome expectancies (-.53,

p. <.01, two tailed), while self-esteem and outcome expectancies share a positive

correlation (.61, p. <.01, two tailed).

Causal Modelling Analysis:

Theoretical Replication-models:

For the reader not familiar with a LISREL analysis refer to Appendix E. In

order to examine the relations among the constructs of outcome expectancies, self-

Table 2. Pearson product moment correlations among outcome expectancies, self-esteem, and depression.

	LOT	RSE	BDI
LOT	----		
RSE	.61*	----	
BDI	-.53*	-.70*	----

Note. LOT = Life Orientation Test; RSE = Rosenberg Self-esteem Scale; BDI = Beck Depression Inventory. Two tailed tests of significance were used; * = p.<.01.

esteem, depression, and attributional style a LISREL (Joreskog & Sorbom, 1984; 1989)

causal modelling procedure was used. The correlation matrix and standard deviations

which served as input for the LISREL analysis is presented in Table 3.

Table 3. Correlation matrix, means, and standard deviations used for LISREL input.

Measure	1	2	3	4	5	6	7	8	9
1. LOT	--								
2. RSE	.61	--							
3. BDI	-.53	-.70	--						
4. PGLO	.13	.14	-.05	--					
5. PSTA	.27	.26	-.09	.54	--				
6. PINT	.22	.25	-.16	.43	.57	--			
7. NGLO	-.19	-.26	.28	.21	.01	-.08	--		
8. NSTA	-.19	-.20	.24	-.06	-.06	-.09	.41	--	
9. NINT	-.18	-.22	.26	-.04	.01	.05	.32	.10	--

M	19.05	30.43	9.07	30.44	31.03	31.88	23.18	24.65	24.73
SD	5.85	5.28	7.28	4.83	4.08	4.64	5.76	4.05	5.23

Note. LOT = Life Orientation Test; RSE=Rosenberg Self-Esteem Scale; BDI=Beck Depression Inventory; PGLO=positive globality; PSTA=positive stability; PINT=positive internality; NGLO=negative globality; NSTA=negative stability; NINT=negative internality (n=195).

The final structural model produced by Hull and Mendolia (1991), was tested

against the observed data to explain the relations among four latent variables. This

model[1] stipulated that attributional style for positive events, attributional style for negative events, outcome expectancies, and depression were related (Figure 5). All hypothesized paths in the model were based on Carver and Scheier (1981). They stated that an individual's outcome expectancies should mediate the effects of their attributions on behaviour. Therefore, Theoretical Replication (TR)-Model 1 specified that a positive and negative attributional style should affect outcome expectancies and that outcome expectancies should effect depression but neither a positive nor negative attributional style will effect depression.

As presented in Table 4, TR-Model 1 did not fit the observed data but did represent an improved model in comparison to the Null model, which specified no pathways between the latent variables (p.<.001), X^2 (17,N=195)=34.25, p.<.01. As suggested by examining the Bentler Bonett Index =.76 (BBI; Bentler & Bonett, 1980), Tucker Lewis Index =.81 (TLI; Tucker & Lewis, 1973), Incremental Fit Index =.86 (IFI; Bollen, 1986), and the X^2/df index =2.01 (Joreskog & Sorbom, 1989), this model may be substantially improved upon. BBI, TLI, and IFI values above .90 indicate a satisfactory model fit. The X^2/df index should be below a value of 2.00.

Examining the modification indices for TR-Model 1, a direct pathway is suggested from a negative attributional style to depression. The decision criteria used to justify the addition of new pathways is based on the largest modification index

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[1]Resulting from the use of one observed variable to estimate each of the Y-side latent constructs, each lambda Y is set to corresponding known reliability of the observed measure, and each theta epsilon is set to 1-known reliability (its measurement error) (K.Kalloway, personal communication, April 4, 1993).

value presented with the LISREL output. This value represents the expected drop in

X^2 if a particular parameter were freely estimated. Therefore, in respecifying the

model, the decrease in X^2 should at least be equal to or larger than the modification

index value. However, it must be emphasized that the decision whether or not to free

any particular parameter must have substantive theoretical relevance to the model; if

not, the next highest modification index value should be examined (Byrne, 1989). The

addition of the pathway between a negative attributional style and depression would

have an approximate change in the X^2 value of 11.50 ($p. < .05$). Therefore, TR-Model

2 was reestimated including this pathway. TR-Model 2 adequately fit the data on six

of the eight fit indices, X^2 (16,$\underline{N}$=195)=21.53, $p. > 1$, and does represent an improved

model fit in comparison to the TR-Model 1 ($p. < .01$).

TR-Model 2 failed to meet the satisfactory level of $> .90$ on the BBI, indicating

that the model may be substantially improved upon. The Root Mean Square Residual

(RMSR) value is large but is considered to be suspect as an assessment index for the

present model[2]. The modification indices produced for TR-Model 2 suggest that a

new path from the error term for the Internality and Stability measures of negative

attributional style be added to improve the model fit. This new path would produce an

estimated change in X^2 of 8.33 ($p. < .05$). Resulting from the previously acknowledged

problematic features concerning the ASQ subscales (e.g., low reliability) (Peterson et

al., 1982) and the substantial estimated change in X^2, TR-Model 3 was reestimated

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[2]See discussion of the RMSR index in Appendix E.

Table 4. Chi-square fit values, fit indices, and model comparisons for TR-Models.

Model	X^2(N=195)	df	p.	GFI	AGFI	RMSR	X^2/df	BBI	TLI	IFI
Null Model	142.68	22	<.001	----	----	----	----	----	----	----
TR-Model 1	34.25	17	<.01	.960	.916	2.342	2.01	.76	.81	.86
TR-Model 2	21.53	16	>.15	.975	.944	1.198	1.35	.85	.94	.96
TR-Model 3	12.06	15	>.67	.985	.963	.833	.80	.92	1.04	1.02
Model Comparisons										
Null Model vs TR-Model 1	108.39	5	<.001							
TR-Model 1 vs TR-Model 2	12.77	1	<.01							
TR-Model 2 vs TR-Model 3	9.47	1	<.01							

Note. GFI=Goodness of Fit Index; AGFI=Adjusted Goodness of Fit Index; RMSR=Root Mean Square Residual; BBI=Bentler Bonett Normed Index; TLI=Tucker Lewis Index; IFI=Incremental Fit Index. Entries in the Chi-Square column under Model Comparisons are the differences involved in the ΔX^2 test for nested groups.

adding the pathway correlating the Internality and Stability measures.

TR-Model 3 (see Figure 7) fits the data adequately improving upon all goodness of fit indices indicating a good model fit, X^2 (15,$\underline{N}$=195)=12.06, $\underline{p}$.>.6. TR-Model 3 represents an improved model fit in comparison to the TR-Model 1 ($\underline{p}$.<.01). The modification indices and standardized residuals values produced with TR-Model 3 indicate that no further model respecifications may be conducted. Therefore, TR-Model 3 replicates the findings of Hull and Mendolia (1991) using the current data, with the exception of the addition of the negative Internality and Stability pathway.

The present results of the theoretical replication of Hull and Mendolia's (1991) model show that an attributional style for positive events is directly associated with outcome expectancies and is indirectly associated with depression via outcome

expectancies. As well, a negative attributional style was shown to be directly

influenced by outcome expectancies, which in turn, directly influenced depression.

Also, a negative attributional style is modeled to have direct influence on depression.
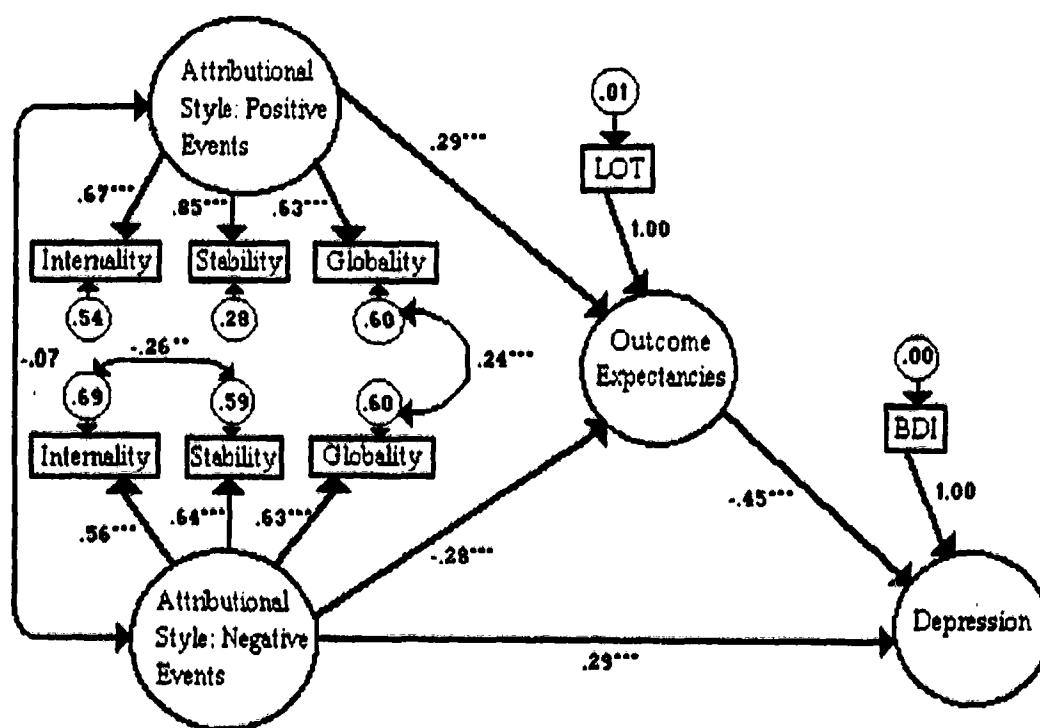
Figure 7. TR-Model 3: Obtained structural equation model of attributional style, outcome expectancies, and depression. (Parameter estimates are standardized; significance levels are determined by critical ratios. LOT=Life Orientation Test; BDI=Beck Depression Inventory; *=p.<.05; ***=p.<.001.)

Full-models:

Using the structural model obtained in the first part of this analysis, the next

stage of data analysis stipulates a Full-Model that additionally specifies the latent

variable of self-esteem. Full-Model 1, based on the theory of (Carver & Scheier,

1981), specifies that self-esteem will be directly influenced by outcome expectancies

and indirectly influenced by a positive attributional style. As well, depression will

have a direct influence on self-esteem (Abramson, Alloy, Metalsky, 1988).

Full-Model 1 results in an adequate fit, X^2 (21,$\underline{N}$=195)=23.22, p.>.3, satisfying

seven out of the eight fit indices criteria (see Table 5). Also, Full-Model 1 represents

an improved model in comparison to the Null model ($\underline{p}$.<.001). The modification

indices produced with Full-Model 1 suggest that the model may be improved upon

substantially by the addition of a new pathway leading from a positive attributional

style to self-esteem. The addition of this new pathway is expected to produce an

estimated X^2 of 8.87 (p.<.05).

As diagrammed in Figure 8, Full-Model 2 specifies the suggested direct

pathway leading from positive attributional style to self-esteem. Full-Model 2, X^2

(20,$\underline{N}$=195)=13.99, $\underline{p}$.>.8, improves upon all of the goodness of fit measures that were

presented for Full-Model 1 and represents a substantially improved model when the

two are compared ($\underline{p}$.<.01). The modification indices along with the standardized

residuals[3] produced for Full-Model 2 relay that it cannot be substantially improved

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[3]See Appendix E for discussion on standardized residuals.

upon. Thc.efore, Full-Model 2 represents the final structural model in which: 1) a

negative attributional style is indirectly, via outcome expectancies, and directly

associated to depression; 2) a positive attributional style is indirectly, via outcome

expectancies, and directly associated to self-esteem; and 3) depression was directly

associated with self-esteem.

Table 5. Chi-square fit values, fit indices, and model comparisons for Full-Models.

Model	X^2(N=195)	df	p.	GFI	AGFI	RMSR	X^2/df	BBI	TLI	IFI
Null Model	316.36	30	<.001	.....	.....	.....	......	.....	.....	.....
Full-Model 1	23.22	21	>.30	.975	.946	1.020	1.11	.93	.99	.99
Full-Model 2	13.99	20	>.80	.984	.965	.860	.70	.96	1.03	1.02
Model Comparisons										
Null Model vs Full-Model 1	293.14	9	<.001							
Full-Model 1 vs Full-Model 2	9.23	1	<.01							

Note. GFI=Goodness of Fit Index; AGFI=Adjusted Goodness of Fit Index; RMSR=Root Mean Square Residual; BBI=Bentler Bonett Normed Index; TLI=Tucker Lewis Index; IFI=Incremental Fit Index. Entries in the Chi-Square column under Model Comparisons are the differences involved in the ΔX^2 test for nested groups.
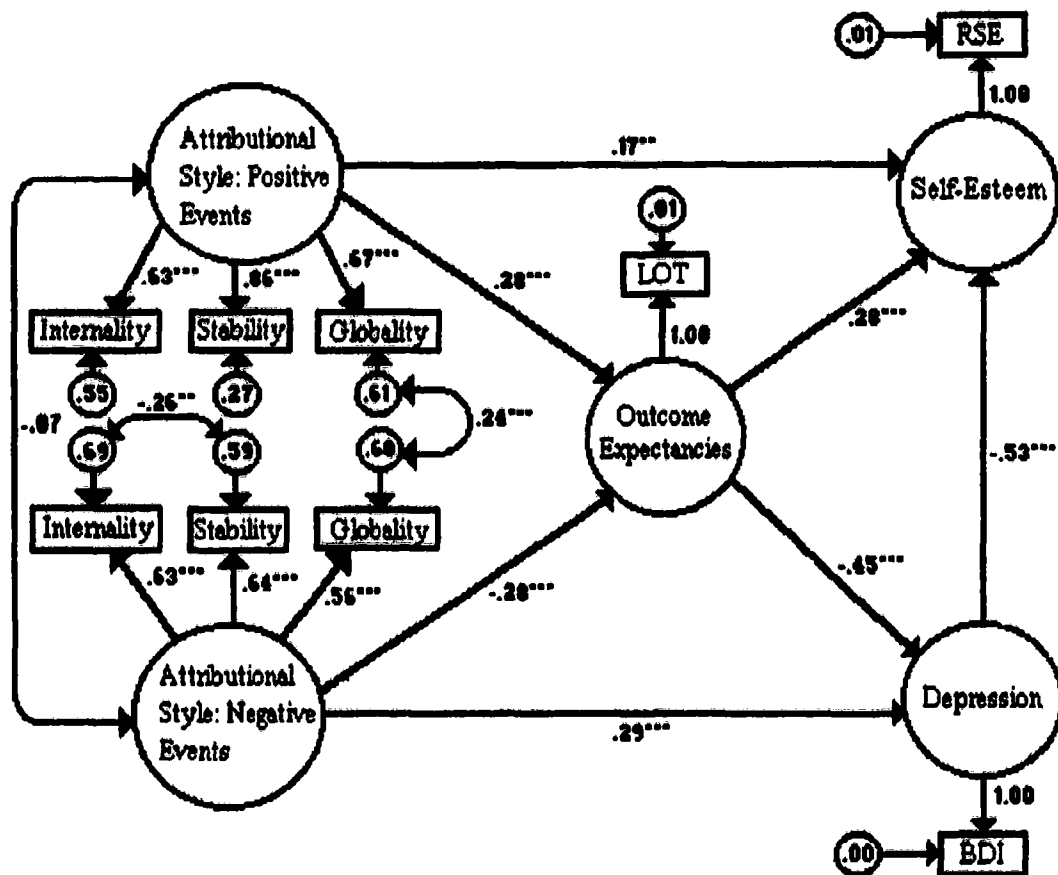
Figure 8: Full-Model 2: Obtained structural equation model of attributional style, outcome expectancies, depression, and self-esteem. (Parameter estimates are standardized; significance levels are determined by critical ratios. LOT=Life Orientation Test; BDI=Beck Depression Inventory; RSE=Rosenberg Self-Esteem Scale; *=p.<.05; ***=p.<.001.)

Discussion

The present results support a model in which attributional style has both a direct and indirect effect upon depression and self-esteem, and in which depression directly influences self-esteem. Contrary to Carver and Scheier (1981; Scheier & Carver, 1988) attributional style for positive events directly affect self-esteem; the effects of attributions on behaviour are *not* completely mediated by outcome expectancies. The final structural model in this study, represented in Full-Model 2, conditionally supports all of the presented hypotheses, each of which are considered in turn.

Hypothesis 1:

The structural model developed by Hull and Mendolia (1991), that attributional style influenced depression in an indirect (via outcome expectancies) and direct manner, was replicated in this study. However, to obtain a satisfactory model fit, two error terms for a negative attributional style were allowed to correlate (i.e., Internality and Stability).

Although the negative internality and stability measures were significantly associated with their associated latent variable, they shared more variance with each other than could be explained by this variable. The simplest interpretation of these correlated measurement errors suggests method variance. In the present case, method variance states that the scores of negative internality and stability share more in

common with each other than they do with the negative globality measure. The correlation of these error terms is an unexpected finding, but is deemed justified because it allows for a better model fit and accomplishes this by allowing the interrelations of these variables to exist outside the structural model of interest.

In replicating the structural model of Hull and Mendolia (1991), several statements may be proposed concerning cognitions and their effects on depression. The present results show that an attributional style for negative life-events, or pessimistic thinking (Seligman, 1991), has an inverse association with outcome expectancies and that outcome expectancies have an inverse association with depression. These types of associations suggest that individuals presenting with pessimistic cognitions for life-events are not likely to contemplate positive thoughts concerning their future. In turn, such unfavorable outcome expectancies suggest an increased incidence of depression. Additionally, an attributional style for positive events, or optimistic thinking (Seligman, 1991), greatly affects depression via its positive association with outcome expectancies. These relations suggest that individuals who present with optimistic cognitions concerning life-events are more likely to have positive outcome expectancies for their future. These positive outcome expectancies are then associated with a decreased incidence of depression. Taken together the present findings provide support for the theory of Carver and Scheier (1981) that attributions only influence affect via outcome expectancies.

Although these results support the theory of Carver and Scheier (1981),

contradictory findings also occurred. Specifically, pessimistic thinking was associated directly with an increased incidence of depression. Explicating this contradictory finding, several attribution theorists argue that attributions may be best described as internal self-directed "explanations" (Hull & Mendolia, 1991), giving negative life-events meaning beyond the possibility that these types of events will or will not recur in an individual's future. More specifically, Wollert and Rowley (1987) state that pessimistic and optimistic thinking are associated with inner-sanctioned feelings of "blame" or "credit". Furthermore these sanctions of blame, which are assigned to objects in an individual's perceptual field after bad life-events, are hypothesized to play a causal role in the development of dysphoric mood. This line of theorizing indicate that blame may be associated with depression independent of one's self-evaluated judgements about the future (Wollert & Rowley, 1987).

Hypothesis 2:

Carver and Scheier (1981) theorized that negative attributional style for life-events would have a positive association with outcome expectancies, which in turn, are associated with increased self-esteem. The present results support this statement, suggesting that individuals employing optimistic thinking foster favourable outcome expectancies that are associated with increases in one's self-esteem. However, contradictory to Carver & Scheier (1981) self-esteem was also directly associated with a positive attributional style.

As noted previously, Wollert and Rowley (1987) argued that individuals who employ attributions that are positive internal, stable, and global in nature are likely to promote inner-sanctioned feelings of credit. Therefore, optimistic thinking may have a possible causal role in increasing an individual's self-esteem as moderated by "credit". These internalized cognitions of credit may therefore be associated with increased self-esteem independent of one's outcome expectancies concerning their future.

When examining the sanctioned-object hypothesis of Wollert, et al. (1983), sanctions and attributions are presented as seemingly similar constructs. Both theories recognize that life events are related to affect and that individuals tend to perceive objects as internal or external in nature, that is, in relation to themselves. There are however, notable differences between the two theories. Attributional theory strongly emphasizes that affect varies with the associations people entertain between causal conditions and life-events (Heider, 1958). Therefore, attributional theory relays that what people understand to be the causes of life-events are essential for understanding the diversity of affect. In contrast to this position, the sanctioned-object hypothesis of Wollert, et al. (1983) emphasizes that affect is determined by the calibre of the relationships that have developed within one's perceptual field (i.e., between individuals and the *meanings* attached to particular life-events). Therefore, apart from the perceived cause of the current event, it is more meaningful to understand the different ways in which individuals engage themselves and others in response to life-events.

Hypothesis 3:

The theoretical statement by Abramson, Alloy, & Metalsky (1988) that

depression will have a negative influence on self-esteem was supported. This

association suggests that when negative life events are attributed to internal, stable,

and global factors the resulting depression will be associated with lower self-esteem.

In part, such an inverse relationship is said to exist from the antagonistic nature of

these variables (Abramson, Alloy, & Metalsky, 1988). The implication of this finding

is that the altering of a pessimistic attributional style not only decreases the amount of

depression experienced, but increases the amount of self-esteem as well.

Clinical Implications:

One important function of the theorized expectancy models cited in this study,

is to illustrate the feasibility of predictions concerning possible therapeutic

interventions for depression (Abramson, Alloy, & Metalsky, 1988). By specifying the

causal chain of events leading to the development of depression, each identified point

along these causal pathways becomes a relevant area for possible clinical intervention.

For example, many currently practised cognitive-therapy approaches to depression

(e.g., Beck, et al., 1979) target a specific aspect of an individual's thought processes

for change. Such specific interventions may be produced when research and theory

augment each other.

Abramson, Alloy, and Metalsky (1988) have argued that most of the literature

pertaining to depression, examines only its vulnerability factors, and that future research in this area should include variables of positive affect, termed invulnerability factors. Then researchers will be able to discuss the association between the invulnerability and vulnerability factors of depression. Heeding their advice, a self-esteem measure was included in this study to explicitly specify one possible invulnerability factor for depression. The major advantage in illustrating the cognitive antecedents of both depression and self-esteem in a causal-modelling approach, is that possible intervention points for diminishing an individual's vulnerability to depression are provided within a more comprehensive examination of the topic. As indicted by the present results, the hypothesized positive benefit of optimistic thinking is a noteworthy finding. People who employ optimistic cognitive strategies for life-events tend to have more favourable outcome expectancies concerning their future than do individuals who employ a pessimistic cognitive strategy. Furthermore, these favourable outcome expectancies may lead to increased self-esteem.

The direct association between optimistic thinking and self-esteem as well as pessimistic thinking and depression, were unexpected findings but indicative of the complex interplay between self-esteem, depression, and cognition. These findings highlight the position that Abramson, Alloy, & Metalsky (1988) promote on depression research; that it is to restricted in examining possible variables of relevance. By revealing unanticipated relationships exhibited between several variables in this study the LISREL based modelling approach has exemplified its utility when modelling the

relations among multi-faceted psychological constructs.

Supporting the position of Wollert and Rowley (1987), the present results show that attributions are not identical to expectations about the future, and that optimistic and pessimistic thinking has implications beyond their implied probability that similar events will occur in the future. This research did not anticipate the direct relations optimistic and pessimistic thinking with self-esteem and depression respectively; apparently, antecedent cognitions provide a greater role in the production of positive and negative affect than their joint association with outcome expectancies. The present findings clearly illustrate the utility of conceiving the relations between attributional style, outcome expectancies, and affect in a different manner than what has been suggested by previous theory (Carver & Scheier, 1981).

Research Limitations:

The most pertinent limitation in this study concerns the generalizability of the results. It must be emphasized that the data in this study was collected from an undergraduate student subject pool. Employing such sampling strategies seriously effects the generalizability of the obtained results because any comparisons drawn between clinically depressed p   .nts and the current results must be considered implausible. Therefore, the implications of this study may not be readily applied to other populations, outside university students.

Despite the many advantages to structural-modelling technique employed by

LISREL, this approach has its limitations. LISREL analysis does not produce evidence of experimental causality. However, in research dealing particularly with depression, there is no ethical or moral justification for employing a research design that would adequately test the effects of a negative attributional style on depression. Such designs would have to covertly devise negative circumstances for the subjects to experience and such practises are inconceivable in research with human subjects.

Although a LISREL analysis does not allow causal conclusions, its results should be conceived as tests of the associations among your modeled set of variables. Associations do not make causal influences but one should remember that causal influences are not possible without associations.

Future Research:

Guided by the present results and the current literature in several related areas, there are several directions for future studies:

"Credit or Blame?"

Future research should examine the possible association that self-sanctioned credit or blame may have with self-esteem and depression. As suggested by the sanctioned-object hypothesis of Wollert, et al. (1983), credit and blame may moderate the direct associations between optimistic and pessimistic thinking with self-esteem and depression respectively, further delineating the vulnerability and invulnerability

factors of depression. Such findings may also provide new clinical and theoretical

insights in the maintenance of depression. Issues such as self-sanctioned blame may

prove to be a worthwhile point of discussion between client and therapist. As a result,

the therapist would have a theoretical rationale for entertaining a wider therapeutic

focus. Such an emphasis would provide the theoretical impetus to address the

ruminatory nature of a pessimistic attributional style as well as its effect upon their

client's view of the future.

"Longitudinal Analysis?"

Since its introduction into the reformulated learned helplessness model of

depression (Abramson, Seligman, & Teasdale, 1978) there has been little refinement to

the construct of attributional style. Current researchers have suggested that the impact

from the passage of time may greatly affect an individual's attributional style, this

needs to be examined (Hill & Larson, 1992). Currently it is not known whether the

attributional style of the clinically depressed, compared to non-depressed individuals,

becomes more internal for a negative life-event as time passes.

If attributions for life-events do change over time, the basic measurement of an

attributional style may be inaccurate because the current conceptualization does not

allow for this change variable (e.g., the stable-unstable dimension). Therefore, future

research should attempt to replicate the final structural model in this study along

several time points. By employing the LISREL based simplex-model-analysis

(Joreskog & Sorbom, 1989) the same set of variables will be repeatedly measured on the same people over several occasions. This methodology would allow any notable differences between the various covariance structures along these model points to be highlighted and described.

"Gender Effects?"

As information on gender or other demographic was not collected in this study, the possible influence that these variables may have had on cognitions and affect were not examined. Current research suggests that there may be quantifiable differences in the relationship of dysfunctional cognitions and depression in males and females (Barnett & Gotlib, 1990). Other research notes that different types of events may induce differential affective responses in males and females, due in part to how life-events are differentially interpreted (Johnson, 1992). Research suggests that women appear to be twice as likely as men to suffer from a major depressive disorder (McGrath, Keita, Strickland, & Russo, 1992). Although the reasons for these differences are not completely clear, Rosenhan and Seligman (1989) have suggested that traditional sex role expectations for females in our is to be passive and dependent in the face of stress or loss. Accordingly, women may be more willing to express depressive symptoms than men because helplessness is consistent with the sociologically dictated female sex role.

By employing the LISREL based multi-sample analysis (Joreskog & Sorbom,

1989) two groups of subjects, one male and one female, should be examined and their modeled responses compared. If the obtained models are not similar, each group may be modeled independently illustrating how the two groups vary in terms of the cognitions pertinent to the etiology and maintenance of depression (i.e., attributional style and outcome expectancies)..

"Anxiety?"

The relation among cognitions, life events, depression, and anxiety has been assigned an increasing level of empirical attention over the years. Much of this research was focused on affective responses to stressful life events, with a specific emphasis strongly promoting the negative attributional style and its influential relationship with depression and anxiety (e.g., Abramson, Seligman, & Teasdale, 1978; Sweeney, Anderson, & Bailey, 1986). In response, Gotlib (1984) concludes that these claims must be cautiously interpreted because the measures of psychopathology used in these studies were highly intercorrelated, leaving the constructs of anxiety and depression with precarious discriminant validity.

Whether an attributional style for negative life events is associated specifically to the onset of depression, or whether it can also predict the onset of anxiety symptoms, has not been conclusively addressed. Although several authors have found that attributions are not consistently associated with measures of anxiety current research has shown that a negative attributional style can predict the onset of anxiety

but not depression in university students (Johnson & Miller, 1990). Because negative

life-events contribute to the onset of anxiety and that this relationship is sometimes

stronger when preexisting dysphoric cognitions are accounted for, Johnson & Miller

(1990) suggest that anxiety may be independently associated with a negative

attributional style. These contradictory findings may be artifacts because of a possible

overlap between measures of anxiety and depression in non-clinical undergraduate

samples. Further research must address this issue.

A negative attributional style directly influences depression. This suggests that

a negative attributional style may have an intrapersonal quality beyond the prediction

of expected future performances. If so, then what role does anxiety play in the

affective responses to these self-condemning cognitions? By specifying anxiety as a

latent variable that is directly associated with a negative attributional style, based on

the theoretical speculation of Johnson & Miller (1990), such questions may be more

fully illustrated.

"Measurement Issues?"

As currently argued (Larson & Hill, 1992), there has been little refinement of

the construct of attributional style since it was first proposed for the reformulated

model of learned helplessness (Abramson, Seligman, & Teasdale, 1978) as the ASQ

(Peterson, Semmel, von Baeyer, Abramson, Metalsky, & Seligman, 1982). Since the

refinement of psychological constructs is dependent on the progression of both theory

and relevant measurement issues, this lack of empirical work is a hinderance to development.

Although several problematic measurement issues exist for the ASQ in depression research (e.g., memory and automatic vs. effortful cognitive processing)(Hill & Larsen, 1992), the issue of item similarity with depression inventories has not been addressed. In this study the BDI was used to assess depression. Although the wording and format is different between the two measures, the items of the BDI and the ASQ appear to be addressing a similar construct of negative affect. If this were proven to be the case, via a factor analysis procedure, the association between what has been labelled depression and attributional style may be spurious. Such findings would present a serious argument for refining attributional style along the lines of theory and measurement. Therefore, it is suggested that future research examine the factor structures of both attributional style and depression measures (e.g., the ASQ and BDI) to scrutinize the amount of construct overlap they may share.

Conclusions

The present investigation confirms and augments the results obtained in previous research examining the relations among attributional style, outcome expectancies, and affect. Although the present results must be interpreted as tentative until replicated, their implications nevertheless provide an expanded conceptualization

of the etiology, maintenance, and the possible treatment of cognition-based depression.

Placed in the broader context of the cognitive processes that may lead to depression, the present investigation strongly emphasizes the need for further research. It is hoped that this study will provide a starting point from which future researchers will more clearly define the complex interrelations among the cognitive antecedents that may promote depressive states. In doing so, we can provide clinicians and theorists alike with an expansive and clearer rationale for new psychotherapeutic intervention points and research focuses.

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Appendices

Appendix A

Life Orientation Test

Directions:

After reading the following sentences, please indicate the extent to which you agree or disagree with it by circling the most appropriate number: 0 = Strongly Disagree, 1 = Disagree, 2 = Neutral, 3 = Agree, 4 = Strongly Agree. Try to be as accurate and honest as you can with your responses, trying not to let your response for one sentence influence your responses to any other. There are no correct or incorrect responses to these items.

0	1	2	3	4
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

1. In uncertain times, I usually expect the best   0 1 2 3 4

2. It's easy for me to relax   0 1 2 3 4

3. If something can go wrong for me, it will   0 1 2 3 4

4. I always look on the bright side of things   0 1 2 3 4

5. I'm always optimistic about my future   0 1 2 3 4

6. I enjoy my friends alot   0 1 2 3 4

7. It's important for me to keep busy   0 1 2 3 4

8. I hardly ever expect things to go my way   0 1 2 3 4

9. Things never work out the way I want them to   0 1 2 3 4

10. I don't get upset too easily   0 1 2 3 4

11. I'm a believer in the idea that "every cloud
    has a silver lining"   0 1 2 3 4

12. I rarely count on good things happening to me   0 1 2 3 4

Appendix B

Rosenberg Self-Esteem Scale

Directions:

In this section we are interested in the kind of person you are like. Below you will find a list of statements about feelings. For each question, **CIRCLE** whether you *Strongly Disagree* (1), *Disagree* (2), *Agree* (3), or *Strongly Agree* (4) with how you feel the statement represents your feelings.

For example, if a statement describes how you feel, circle "3" (Agree) or "4" (Strongly Agree). If the statement describes how you never feel, circle "1" (Strongly Disagree) or "2" (Disagree).

There are no right or wrong answers.

1	2	3	4
Strongly Disagree	Disagree	Agree	Strongly Agree

1. On the whole, I am satisfied with myself   1 2 3 4

2. At times I think I am no good at all   1 2 3 4

3. I feel that I have a number of good qualities   1 2 3 4

4. I am able to do things as well as most other people   1 2 3 4

5. I feel I do not have much to be proud of   1 2 3 4

6. I certainly feel useless at times   1 2 3 4

7. I feel that I am a person of worth, at least on an equal plane with others   1 2 3 4

8. I wish I could have more respect for myself   1 2 3 4

9. All in all, I am inclined to feel that I am a failure   1 2 3 4

10. I take a positive attitude toward myself   1 2 3 4

Appendix C

General Instructions to be read to Participants

.

- Thank you for agreeing to participate in this study about self-evaluation. I am administering these questionnaires to approximately 200 undergraduate students and will analyze the results to complete my Masters Thesis in Clinical Psychology. Dr. Victor Catano is my thesis advisor.

- Completing the questionnaire package will take approximately 15-25 minutes of your time. Although each of the questionnaires are self-explanatory, I must emphasis the need for absolute honesty in responding. I assure you that all of your responses will be anonymous and confidential. There is no way of matching any of your responses with your name because all materials use a numbering I.D. system. Therefore, if you would like to know more about your individual scores at a latter time, you should record your I.D. # and contact me in a few weeks.

- You have the right to withdraw from this study at any time. Also, you have the right to freely access the results of my research, which will be available at the Psychology Department or the Saint Mary's library in the fall of 1993. By choosing to participate in this study, completing the questionnaires, and handing the completed questionnaire package to me you will have provided informed consent. Informed consent is collected in this manner for reasons of participant anonymity. This method does not require signatures or other personal information, ensuring anonymity.

- Each of you have been given a folder containing a questionnaire package and writing utensils.

- All of the questionnaires are to be filled out in the order in which they appear in the folder in front of you.

- Open your folder now and examine the first questionnaire. You will notice that there are directions on the first page every questionnaire in the package. Please read these carefully before you attempt to complete the questionnaire. If you are not clear of their meaning then raise your hand and I will go to you and answer your question in order to keep the noise level in this room as low as possible. Please try to be as accurate and honest with your responses as you can.

- When you have finished all the questionnaires, please check them for any unmarked responses you may have omitted, then pass it in to me.

- Are there any questions before you start? O.K. then, please open your folders and begin.

Appendix D

Letter to Participant

Dear Participant,
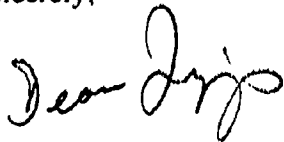
Thank you for participating in this study. Let me reassure you that all information in this study is strictly confidential. I have no way of tracing any of the testing material to any participant because of the coded ID number system used to identify the questionnaire packages. If you wish to discuss your particular questionnaire profile you should remember the coded ID number on the package you have completed, otherwise I have no way of identifying your information. If at any time during this study you have felt that you were dealt with unprofessionally you may contact Dr. V. Catano (Psychology Department) for further discussion.

The study that you have participated in was designed to examine the observed relations between several psychological constructs: Attributional Style, Dispositional Expectancies, Depression, and Self-Esteem. The data produced from this study will be analyzed using a structural equation modelling approach that will examine the relations among these constructs in order to delineate the influences that they share with each other.

If you would like further information concerning the results of this study, you may contact the Psychology Department, the Saint Mary's University library, or write to Mr. Dean Tripp, C.O. Psychology Department, Saint Mary's University, Halifax, Nova Scotia, B3H-3C3 (please include your name and return address).

Once again, Thank You for your assistance in this research.

Sincerely,

Dean Tripp

Appendix E

The Basic Pre-Analytic Steps in a LISREL Analysis

The LISREL model:

Resulting from the complexity and unfamiliarity of the LISREL programming approach used in this study, its basic pre-analysis procedures will be briefly reviewed. LISREL models are mathematical representations of theory-based relations among a set of latent variables. The data used in LISREL applications is usually supplied in either a covariance or correlation matrix with the appropriate standard deviations. The five basic preanalytic steps in conducting a LISREL analysis involve: 1) Modeling the relations of the latent variables that you are investigating, based upon theory; 2) Labeling your model with the appropriate paths indicating the statistical relations in your model; 3) translating these theory-based relations into measurement and structural model equations and their corresponding matrices; 4) testing the theoretical model for *identification*; and 5) translating your matrix information into program language and running your analysis. Using this study as an example, these basic steps will be illustrated.

Step 1 & 2: After the appropriate diagrammatic of the theoretical relations among attributional style, outcome expectancies, depression, and self-esteem have been completed (refer to Figure 6 for an example), the appropriate lettering may be assigned to each parameter in this model (see Figure E-1). These steps define the statistical relations among the latent and observed variables.

To understand what the Greek lettering represents it should be noted that LISREL models may be defined as a series of matrices, each represented by a capitalized Greek letter. Each of these matrices consists of a series of numbers written in rows and columns. Each number in the matrix is termed an element represented by
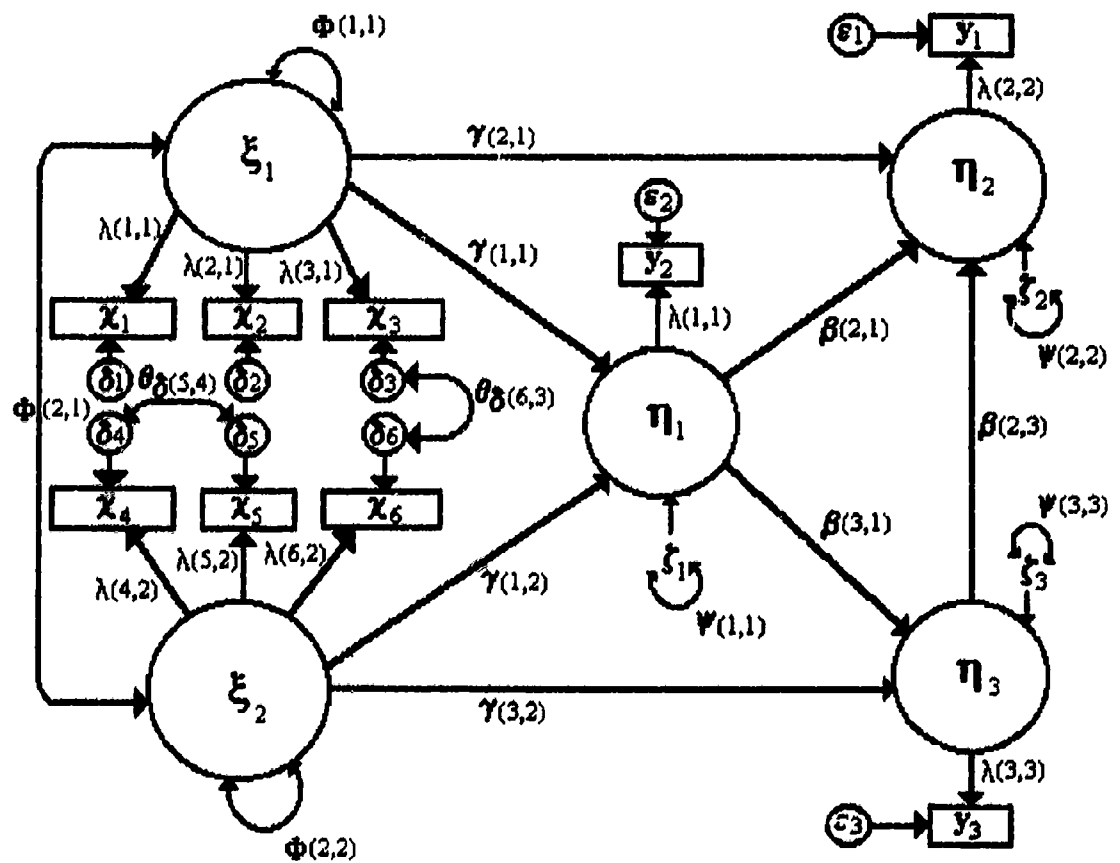
Figure E-1 Proposed model with appropriate Greek lettering

the lower-case Greek letter equivalent. LISREL uses this matrix notation system to delineate the type of statistical interaction specified within your model.

Observed variables, which are the measures that quantify your latent variables, are represented by the Roman letters X and/or Y and are termed *exogenous* and *endogenous* variables, respectively. Exogenous latent variables are synonymous with independent variables; they cause value fluctuation in other latent variables. However, endogenous latent variables are synonymous with dependent variables; they are influenced by the exogenous variables within the model in either a direct or indirect manner.

Step 3: After the diagrammatic of the theorized relations in your model have been completed and the appropriate Greek lettering is assigned to all the pathways, the definition of your model's components may commence. The general LISREL model is divided into two submodels: a *measurement model* and a *structural model*, with each model corresponding to a defined set of matrices. The measurement model may consist of either an X side, a Y side, or both, depending on the type of model analysis you are employing (Joreskog & Sorbom, 1989). To define your measurement and structural models you must first identify the X and Y measurement models. These models are defined as equations that are used to delineate the relations among your unobserved and observed variables. Therefore, these equations illustrate the nature of the statistical relations between all the variables in the model. Once the equations are specified, they are transformed into a matrix format. These various matrices graphically illustrate the statistical relation that each parameter holds within the theorized model (e.g., regression, covariance, correlation).

As presented in Table E-1, the measurement models comprise two regression matrices, two variance-covariance matrices among the errors of measurement, and one vector representing the endogenous factor. The structural model consists of two regression matrices, two variance-covariance matrices (one for the endogenous variables and one for the residual error terms for the endogenous variables), and three vectors that represent the exogenous, endogenous, and errors associated with the endogenous variables, respectively (Byrne, 1989)(see Figure E-2 for example of measurement and structural models)..

Step 4: After completing the matrix translation procedure model *identification* must be established. All models must be identified before statistical estimation can

Table E-1. Summary of matrix and Greek notation, and type for measurement and structural models.

Greek Letter	Full Matrix	Matrix Elements	Type
Measurement Model			
Lambda X	Λ_x	λ_x	Regression
Lambda Y	Λ_y	λ_y	Regression
Theta delta	Θ_δ	θ_δ	Var / Cov
Theta epsilon	Θ_ε	θ_ε	Var / Cov
Nu	...	ν	Vector
Structural Model			
Gamma	Γ	γ	Regression
Beta	B	β	Regression
Phi	Φ	ϕ	Var / Cov
Psi	Ψ	ψ	Var / Cov
Ksi	...	ξ	Vector
Eta	...	η	Vector
Zeta	...	ζ	Vector

begin (Long, 1983b). Model identification examines whether the parameters of your

model are uniquely determined. Model identification compares the number of

unestimated model parameters to the number of estimated parameters. To obtain

model identification the number of unestimated parameters must be less than or equal

to the number of estimated parameters or your model cannot be estimated (Long,

1983b) (these comparison figures are calculated and presented in Figure E-2). If your

model is not identified, it is impossible to uniquely determine its parameters.

Attempts to estimate models that are not identified will result in arbitrary estimates of

the parameters and meaningless interpretations.

Step 5: The final step of the pre-analytic LISREL procedures translate the

matrix information into programming language. A discussion of this topic is

considered beyond the scope that these brief explanations were intended. Interested

readers are referred to Joreskog and Sorbom (1989).

Assessment of Model Fit:

The most important issue associated with the analysis of LISREL models is the

assessment of fit between your hypothesized model and the sample data with which

comparisons are conducted (Byrne, 1989). There are a variety of statistics available to

assess the appropriateness of structural models with latent variables (Bentler & Bonett,

1980; Bollen, 1989; Joreskog & Sorbom, 1989). This study will report eight model-fit

statistics for each model presented: the X^2 goodness-of-fit test (X^2 GFT), the goodness-

of-fit index (GFI), the adjusted goodness-of-fit index (AGFI), the root-mean-square-

residual (RMSR), the X^2/df ratio, and the Bentler and Bonett (1980) normed index
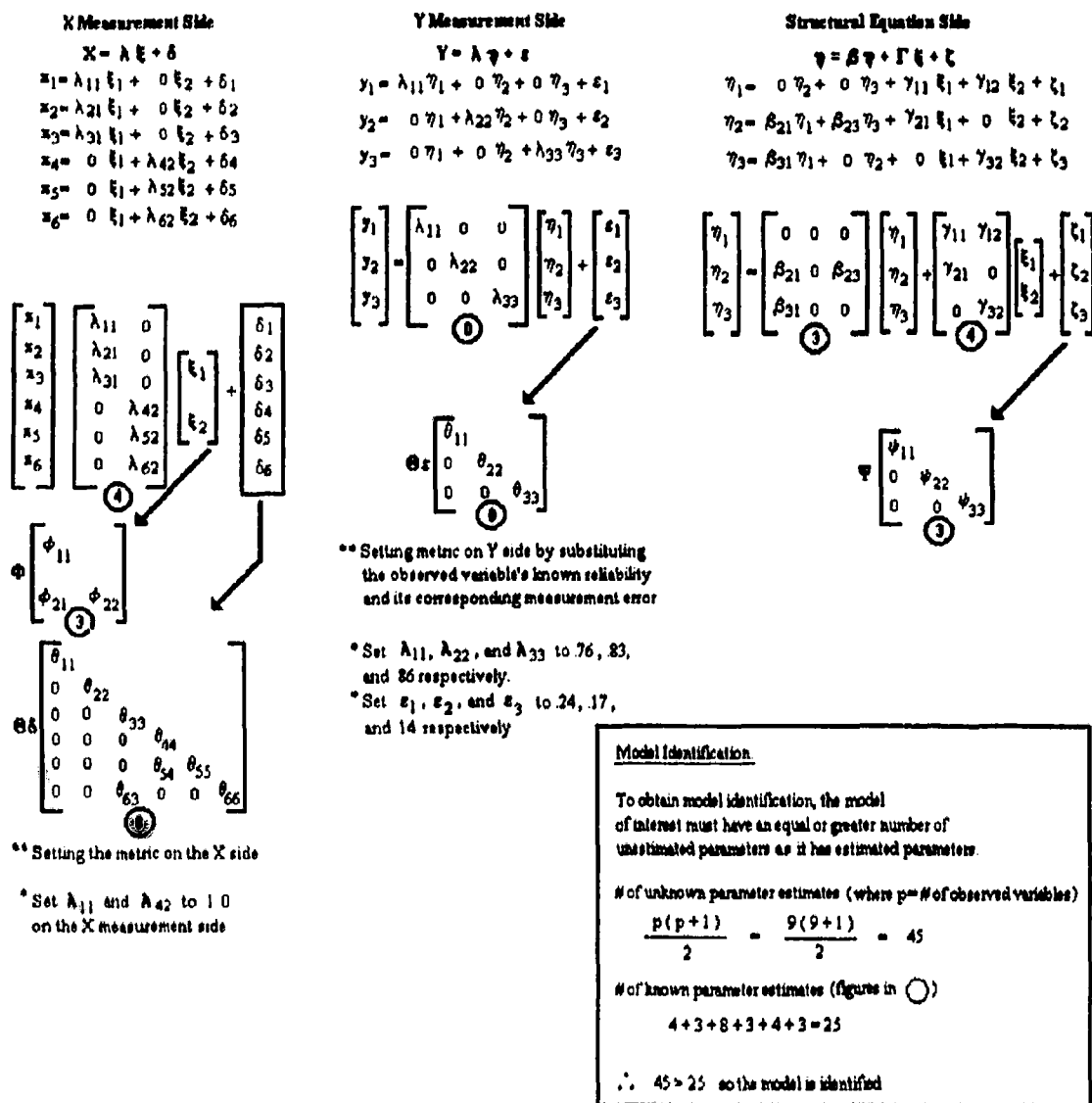
X Measurement Side

$$X = \lambda \xi + \delta$$

$x_1 = \lambda_{11}\xi_1 + 0\,\xi_2 + \delta_1$

$x_2 = \lambda_{21}\xi_1 + 0\,\xi_2 + \delta_2$

$x_3 = \lambda_{31}\xi_1 + 0\,\xi_2 + \delta_3$

$x_4 = 0\,\xi_1 + \lambda_{42}\xi_2 + \delta_4$

$x_5 = 0\,\xi_1 + \lambda_{52}\xi_2 + \delta_5$

$x_6 = 0\,\xi_1 + \lambda_{62}\xi_2 + \delta_6$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5 \\ x_6 \end{bmatrix} = \begin{bmatrix} \lambda_{11} & 0 \\ \lambda_{21} & 0 \\ \lambda_{31} & 0 \\ 0 & \lambda_{42} \\ 0 & \lambda_{52} \\ 0 & \lambda_{62} \end{bmatrix}_{\textcircled{4}} \begin{bmatrix} \xi_1 \\ \xi_2 \end{bmatrix} + \begin{bmatrix} \delta_1 \\ \delta_2 \\ \delta_3 \\ \delta_4 \\ \delta_5 \\ \delta_6 \end{bmatrix}$$

$$\Phi \quad \begin{bmatrix} \phi_{11} & \\ \phi_{21} & \phi_{22} \end{bmatrix}_{\textcircled{3}}$$

$$\Theta\delta \begin{bmatrix} \theta_{11} & & & & & \\ 0 & \theta_{22} & & & & \\ 0 & 0 & \theta_{33} & & & \\ 0 & 0 & 0 & \theta_{44} & & \\ 0 & 0 & 0 & \theta_{54} & \theta_{55} & \\ 0 & 0 & \theta_{63} & 0 & 0 & \theta_{66} \end{bmatrix}_{\textcircled{10}}$$

** Setting the metric on the X side

* Set λ_{11} and λ_{42} to 1.0 on the X measurement side

Y Measurement Side

$$Y = \lambda \eta + \varepsilon$$

$y_1 = \lambda_{11}\eta_1 + 0\,\eta_2 + 0\,\eta_3 + \varepsilon_1$

$y_2 = 0\,\eta_1 + \lambda_{22}\eta_2 + 0\,\eta_3 + \varepsilon_2$

$y_3 = 0\,\eta_1 + 0\,\eta_2 + \lambda_{33}\eta_3 + \varepsilon_3$

$$\begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} \lambda_{11} & 0 & 0 \\ 0 & \lambda_{22} & 0 \\ 0 & 0 & \lambda_{33} \end{bmatrix}_{\textcircled{0}} \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \end{bmatrix} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \varepsilon_3 \end{bmatrix}$$

$$\Theta\varepsilon \begin{bmatrix} \theta_{11} & & \\ 0 & \theta_{22} & \\ 0 & 0 & \theta_{33} \end{bmatrix}_{\textcircled{0}}$$

** Setting metric on Y side by substituting the observed variable's known reliability and its corresponding measurement error

* Set λ_{11}, λ_{22}, and λ_{33} to .76, .83, and .86 respectively.

* Set ε_1, ε_2, and ε_3 to .24, .17, and .14 respectively

Structural Equation Side

$$\eta = \beta\eta + \Gamma\xi + \zeta$$

$\eta_1 = 0\,\eta_2 + 0\,\eta_3 + \gamma_{11}\xi_1 + \gamma_{12}\xi_2 + \zeta_1$

$\eta_2 = \beta_{21}\eta_1 + \beta_{23}\eta_3 + \gamma_{21}\xi_1 + 0\,\xi_2 + \zeta_2$

$\eta_3 = \beta_{31}\eta_1 + 0\,\eta_2 + 0\,\xi_1 + \gamma_{32}\xi_2 + \zeta_3$

$$\begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \end{bmatrix} = \begin{bmatrix} 0 & 0 & 0 \\ \beta_{21} & 0 & \beta_{23} \\ \beta_{31} & 0 & 0 \end{bmatrix}_{\textcircled{3}} \begin{bmatrix} \eta_1 \\ \eta_2 \\ \eta_3 \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & 0 \\ 0 & \gamma_{32} \end{bmatrix}_{\textcircled{4}} \begin{bmatrix} \xi_1 \\ \xi_2 \end{bmatrix} + \begin{bmatrix} \zeta_1 \\ \zeta_2 \\ \zeta_3 \end{bmatrix}$$

$$\Psi \begin{bmatrix} \psi_{11} & & \\ 0 & \psi_{22} & \\ 0 & 0 & \psi_{33} \end{bmatrix}_{\textcircled{3}}$$

Model Identification

To obtain model identification, the model of interest must have an equal or greater number of unestimated parameters as it has estimated parameters.

# of unknown parameter estimates (where p = # of observed variables)

$$\frac{p(p+1)}{2} = \frac{9(9+1)}{2} = 45$$

# of known parameter estimates (figures in ◯)

$$4 + 3 + 8 + 3 + 4 + 3 = 25$$

∴ 45 > 25 so the model is identified

Figure E-2 X and Y measurement models, structural model, and model estimation and identification.

(BBI), the Tucker-Lewis index (TLI)(1973), and the incremental fit index (IFI)(Bollen, 1986).

The X^2 GFT assesses the fit between your theoretical model and your sample data in reference to its ability to replicate the observed covariance matrix. Models that result in a predicted covariance matrix that is significantly different from the one obtained from your sample data are referred to as insufficient in estimation. Therefore, significant values for the X^2 GFT indicate a poor fitting model. Unfortunately, the X^2 GFT is reported to be influenced by fluctuations in sample size (Joreskog & Sorbom, 1989), providing the impetus for employing other model fitting statistics.

The GFI is a model-fit statistic that indicates the comparable amount of variance and covariance jointly explained by the theoretical model (Byrne, 1989). The AGFI is basically the same statistic as the GFI except that it accounts for the number of degrees of freedom present in the theoretical model. Both model-fit indices have a value range from 0-1.00, with values approaching 1.00 indicative of a qualified model fit (e.g., >.90)(Byrne, 1989). As well, both the GFI and AGFI are argued to be independent of sample size fluctuations (Joreskog & Sorbom, 1985).

A RMSR assesses the mean discrepancy between the sample and theoretical model covariances. Values for this statistic may range from 0-1.00, with values able to exceed 1.00. Values indicative of a good model-fit should be relatively small; <.05 (Joreskog & Sorbom, 1989). However, it has been noted that RMSR values will only be small when the model fits appropriately and all the observed variables are measured along the same metric; this is true in factor analysis when the measures are "items" all

rated along a 5-point scale. Therefore, the RMSR is generally not a useful goodness of fit index when testing a structural model with variables measured on different scales (K. Kalloway, personal communication, May 8, 1993).

The X^2/df ratio has had several acceptable levels proposed, ranging from <3.00 to <5.00 for sample sizes of one thousand (Byrne, 1989). Presently, an acceptable model-fit is obtained when this X^2/df ratio is <2.00.

The BBI, TLI, and the IFI are statistics that compare theoretically nested models with a *Null model*. Null models are obtained when your theoretical model is altered resulting in complete independence among all of the observed measures. Values for the BBI may range from 0-1.00, with values <.90 indicative of a model that can be substantially improved upon. Values for the TLI may fall outside the 0-1 range, but cannot take on negative values. TLI values <.90 indicate that the model may be improved upon substantially (Balla & McDonald, 1988). Values for the IFI may fall outside the 0-1 range, with possible negative values. IFI values that are <.90 indicate that the model may be improved upon substantially (Bentler, 1990).

Although the X^2 GFT, GFI, AGFI, RMSR, X^2/df ratio, BBI, TLI, and IFI all provide an assessment for the general fit of a theoretical model, they do not allow the researcher to identify the specific ill fitting parameter estimates that may result in an inadequate fit. To aid in determining such information, LISREL produces several goodness-of-fit statistics for individual model parameters: T-values, standardized residuals, and modification indices (MI).

T-values allow the researcher to examine the statistical significance of the parameter estimates within their model. T-values are obtained by dividing the

obtained parameter estimate by its standard error. As such, T-values provide statistical evidence of whether a specific parameter is significantly different from zero; values exceeding approximately 2.00 are statistically significant at the .05 alpha level (Byrne, 1989).

Nonsignificant T-values have been suggested as a necessary and sufficient condition for the elimination of parameters from a LISREL analysis because such parameters can be considered unimportant to the model (Byrne, 1989). When LISREL is used in an exploratory manner there is little argument with the Byrne (1989) statement. However, when such a "theory trimming" approach (Pedhazur, 1982) is applied post-hoc it suffers from serious shortcomings. McPherson (1976) provides strong arguments against post-hoc theory trimming stating that, "The data cannot tell the researcher which hypothesis to test, at best the data may tell when a particular hypothesis is supported or unsupported, when a priori grounds exist for testing it" (p. 99). Therefore, to be statistically conservative and avoid overestimating the theorized model in this study, no post-hoc alterations will be justified by a non-significant T-values.

Standardized residuals examine the discrepancy of fit between the sample data and the theoretical covariance matrices. These values are easily interpreted because they are analogous to Z-scores; values greater than 2.58 showing possible model misspecification (Joreskog & Sorbom, 1989).

LISREL provides modification indices for each estimated parameter in any specified model. MI's are measures associated with the fixed and constrained parameters of your model. For each parameter, the MI's provide a measure of

predicted decrease in X^2 if a single constraint is relaxed and your model reestimated (Joreskog & Sorbom, 1989). These values are examined as a X^2 value with one degree of freedom (Byrne, 1989). Therefore, MI values that are >3.841 and 6.635 represent $p.<.05$ and $p.<.01$, respectively. Model modification as guided by the MI values is recommended only when relaxing a particular model parameter makes sense from a substantive theoretical point of view.