PREDICTING BEHAVIORAL INTENTIONS:

AN ASSESSMENT OF FISHBEIN'S MODEL

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ABSTRACT

An empirical assessment is reported of Fishbein's model (Fishbein, 1967c; Fishbein & Ajzen, 1975) for predicting behavioral intentions (I) from attitudes toward the behavior (A_B) and the subjective (social) norms (SN) perceived to govern that behavior:

$$I = A_B\ (W_1) + SN\ (W_2)$$

where W_1 and W_2 are empirically determined weights (usually standardised multiple regression coefficients).

The model was tested by measuring behavioral intentions, the components of the model, and other related variables, for two different issues. The first issue was the (future) learning of statistics by introductory psychology students, some of whom were already learning statistics and some of whom were not. Measures were taken on three different occasions, that is, under three different conditions for the learning group: i) immediately prior to the commencement of their statistics course; ii) at the end of the final statistics lecture but prior to examination; and iii) after the examination results were known. For the second issue, a representative sample of the general population who lived close to a proposed nuclear power station site indicated their support or opposition to the introduction of nuclear power into New Zealand and their intentions to engage in behavior in support of their views.

It was hypothesised that: i) the various components of attitude discussed by Fishbein -- attitudes toward the object, attitudes toward the behavior, subjective (social) norms, the motivation to comply with these norms, and personal normative beliefs -- should be conceptually and factorially independent from one another; ii) the weight assigned to the components of the model should be different for different groups of people and for different conditions of measurement; iii) other two-component (one attitudinal and one normative) models would sometimes give better prediction of behavioral intentions than Fishbein's model; and iv) the model would not always be sufficient to explain behavioral intentions, that is, variables external to the model would sometimes have a significant influence on behavioral intentions over and above that made by the components of the model. Generally, these hypotheses were supported, with the results for hypotheses iii) and iv) indicating that Fishbein's model was not adequate and needs to be further reconsidered and developed.

It was also found that: a) personal normative beliefs, which had been dropped from the model by Fishbein and his associates, was often a critical variable for predicting behavioral intentions and was not "simply an alternative measure of behavioral intentions"; b) the motivation to comply was an alternative measure of subjective norms and did not improve the prediction of behavioral intentions; c) other variables which improved prediction of behavioral

intentions beyond that achieved by Fishbein's model were mostly ego-involvement, arousal, or self-relevance type variables, which suggests that the role of this type of variable in influencing behavioral intentions needs to be studied further; and d) the causal links within a model can be different for different groups of people or different conditions, and adding variables to a model may change the relationships between variables and so change the whole model. It was concluded that much more work needs to be done in the attitude-behavior domain in the search for a parsimonious, but nevertheless more complex, model for predicting behavioral intentions and ultimately overt behavior.

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CHAPTER ONE

INTRODUCTION

This thesis is concerned with testing a model developed by Fishbein (Fishbein, 1967 a,b,c; Ajzen & Fishbein, 1973; Fishbein & Ajzen, 1975) to relate attitudes to behavior. Fishbein's model postulates that behavioral intentions, and through them behavior, are influenced by attitudes toward the behavior and the subjective social norms that are perceived to govern that behavior. Before a detailed discussion of the model and the empirical work that has been done on it, the concept of attitude will be introduced. The relationship between attitudes and other phenomena such as beliefs, intentions, and behaviors, will then be reviewed and discussed. During the course of this review and discussion the definition of some of the terms used by Fishbein will be given. The derivation of Fishbein's model for predicting behavioral intentions from attitudinal and normative components is then presented followed by a review of empirical tests of the model. Discussion of the empirical evidence leads to many questions concerning the model and so to the derived hypotheses for the tests of the model to be presented here.

The Concept of Attitude

Allport (1935), after reviewing more than 100 different definitions of attitude, concluded that there was basic agreement that an attitude is a learned predisposition to

respond to an object or class of objects in a consistently favourable or unfavourable way. This is a simple unidimensional conceptualisation of attitude, with the bipolarity from unfavourable to favourable being regarded as the most distinctive feature of the concept. To the present day Allport's definition is often regarded as being acceptable (McGuire, 1968), and social psychologists have even used attitude as an explanatory device to account for observed consistency in overt behavior toward a stimulus object (cf. Campbell, 1963).

However, as early as 1935, Allport noted that research based on this conception of attitude had not resulted in behavioral prediction, and he felt that this view of attitude might be oversimplistic. From Allport's view, two people could feel equally favourable towards an object, yet feel differently about components or characteristics of it. For example, two people could be equally in favour of conserving energy, but disagree on what forms of energy should be saved, how to save energy, who should save it, or what to do to ensure that the issue of energy conservation is taken up by government. Thus Allport argued that one reason that behavior could not be predicted from attitudes was that the measures of attitude were unidimensional and did not take other qualities into consideration, and he argued for the consideration of the qualitative nature of attitude. He did not, however, suggest how this should be done, so that two of the major developments in attitude measurement after Allport's review were designed specifically to obtain unidimensional scores (i.e., the Guttman scale and the Semantic Differential).

In 1947 Doob suggested that there may not be any one-to-one relationship between attitude and behavior. He suggested that attitude is a learned predisposition to respond -- and also that once one has learned the attitude one must then learn what response to make to it. That is, there is not necessarily any innate relationship between the attitude and the behavior; thus, two people may learn the same attitude towards a given object, but they may learn to make different behavioral responses to that same learned attitude.

Chien (1948) in a critique of Doob's paper took Doob's point and used it to suggest that a multi-component definition of attitude was more suitable. He suggested that attitudes consist of knowing, feeling, and acting components or, as they are more commonly known, cognitive, affective, and conative components (cf. Brown, 1965; Campbell, 1947; Krech & Crutchfield, 1948; Krech, Crutchfield, & Ballachey, 1962; Lambert & Lambert, 1964; Newcomb, Turner, & Converse, 1964; Rosenberg & Hovland, 1960; Secord & Bachman, 1964; Sherif & Cantril, 1945, 1946; Smith, 1947). The cognitive component of attitudes (also called the perceptual, informational, stereotype, or belief component) refers to how the attitude object is perceived, its conceptual connotation. The affective component of attitude (also called the feeling or emotional component) deals with the person's feelings of liking or disliking about the object of the attitude. "As the purely evaluative component, some theorists would consider it the core of attitude, while viewing the cognitive and conative components as accretions that form around it or as the matrix out of which it grows" (McGuire, 1968, pp. 155-6). Unidimensional

scales tend to measure the affective component. The conative (action, behavioral) component of attitude refers to the person's gross behavioral tendencies regarding the object. It would appear that this component is the most useful as the criterion component of attitude. However, it tends to be measured, as frequently as do the other components, by a paper-and-pencil questionnaire which indicates how the person says he would behave, rather than by observation of how he actually behaves. Attitude research has long indicated (Festinger, 1964; LaPiere, 1934; Mann, 1959; Saenger & Gilbert, 1950) that verbal reports of attitude correlate rather low with actual behavior toward the object of the attitude. Other results, however, (e.g., Campbell, 1947; Kahn, 1951) indicate that these three components of attitude are quite highly intercorrelated -- but this is when all components are measured on similar-appearing self-rating scales, and so may be a result of a methods artifact (cf. Campbell & Fiske, 1959).

Fishbein (1967c) prefers to follow Thurstone (1931) and view attitude as a relatively simple unidimensional concept, refering to "the amount of affect for or against a psychological object" (Thurstone, 1931, p. 261). Rather than viewing beliefs (the cognitive component) and behavior (the conative component) or behavioral intentions as part of attitude, Fishbein prefers to define them <u>independently</u> and to view them as phenomena that are nevertheless <u>related</u> to attitudes. More specifically, he sees beliefs and behavioral intentions as determinants or consequents of an individual's attitude.

Following Fishbein, for this dissertation the term "attitude" will refer only to the affective or evaluative component unless otherwise stated.

Relationship between attitude and other phenomena

There is already considerable evidence (e.g., Rosenberg, 1956, 1960; Zajonc, 1954; Peak, 1955; Jaccard & Davidson, 1972; Fishbein, 1963, 1965a, 1966, 1967a,b; Fishbein & Coombes, 1974) that a person's attitudes toward any object can be expressed in an expectancy-value formulation. That is, a person's attitude toward any object can be seen as a function of his beliefs about the object (i.e., the probability or improbability that the object is related to some other object, value, concept, goal) and the evaluative aspects of those beliefs (i.e., the evaluation of-- or attitude toward -- the "related concept"). Algebraically, this may be expressed as follows (e.g., Fishbein & Ajzen, 1975, p. 223):

$$A = \sum_{i=1}^{n} b_i \; e_i \qquad (1)$$

where A = the attitude toward some object, action or event

b_i = belief i about the object's attitudes or about the acts' consequences

e_i = the evaluative aspect of b_i, that is, the respondents evaluations of the attributes or consequences

n = the number of beliefs.

Thus, according to the model, a person's attitude toward an object can be estimated by multiplying his evaluation of each attribute associated with the object by his subjective probability that the object has that attribute and then summing the products for the total set of beliefs. Similarly, a person's attitude toward a behavior can be estimated by multiplying his evaluation of each of the behavior's consequences by his subjective probability that performing the behavior will lead to that consequence and then summing the products for the total set of beliefs. This formulation is very similar to those suggested by Edwards (1954), Peak (1955), Rosenberg (1956, 1960), and Zajonc (1954). Although there are several methodological and theoretical differences between the various theories that have dealt with the belief-attitude relationship (see Fishbein, 1967b)the important point is that all of them essentially lead to the hypothesis that an individual's attitude toward any object is a function of his beliefs about the object and the evaluation aspects of those beliefs. This does not imply, however, that any given belief will be correlated with the attitude. Indeed, it is possible that persons holding the same beliefs may have very different attitudes, and that persons holding different beliefs may have the same attitudes.

Similar equations may be set up to relate behavioral intentions (I) and behaviors (B) to attitudes:

$$A = \Sigma\ b_i\ e_i = \Sigma\ I_i\ e_i \text{ or } \Sigma\ B_i\ e_i \qquad (2)$$

Affective component — Cognitive component — Conative component

Such formulations make it clear that the three components of the multicomponent view of attitude can, in fact, be all equal to the affective component. Ostrom (1969) provides strong evidence for this view. On the other hand the beliefs (b), intentions (I), and behaviors (B) can be regarded as separate independent variables. The distinction is made clear when specific beliefs, intentions, or behaviors are considered, rather than sets of beliefs, intentions, or behaviors as is necessary for the above formulations. Thus, two persons may have the same attitude towards religion, but they may hold different specific intentions concerning religious behaviors. One person might intend to attend church regularly and to pray before meals, but not to donate money to the church or to sing in the church choir, whereas the other person might have the opposite intentions. The overall favourability expressed by their respective sets of intentions is approximately the same and corresponds to their attitudes. Fishbein and Ajzen (1974) have found that correlations between attitudes and an index of intention based on 100 behaviors ranged from .60 to .75 (depending on which method -- self-report scale, semantic differential, Likert scale, Guttman scale, or Thurstone scale -- was used to measure attitudes), while the average correlation between attitudes and single intentions ranged from .16 to .20.

It must be noted, however, that while the above finding makes good psychological sense, it is nevertheless also a statistical artifact -- it is generally true that a larger number of specific items will give a better measure of

a generalized concept than a smaller number of specific items (cf. Stanley, 1974). This is true for all manner of psychological measures, whether the interest be in intelligence, performance, personality, or attitudinal variables.

In general, as the measure of intention becomes more specific (in terms of the behavior, the target object at which the behavior is directed, the situation in which the behavior is to be performed, and the time at which the behavior is to be performed), its relation to attitude towards the object will tend to decrease. The model to be tested in this study is concerned with predicting specific behavioral intentions.

"Despite the commitment of the social sciences to the study of human behavior, relatively little research in the attitude area has investigated overt behavior as such" Fishbein & Ajzen, 1975, p. 335). It has usually been assumed that a person's behavior with respect to an object is in large part determined by his attitudes toward that object. In regard to this, in a recent review of the literature on the persistence of attitude change, Cook and Flay (to appear, 1977) found that some change attempts which were aimed at cognitive and affective change did generalise to cause persisting changes in behavior. Such findings suggest that attitudes sometimes do mediate behavior. However, most of the accumulated evidence to date is to the contrary (e.g., Berg, 1966; Bray, 1950; Kutner, Wilkins & Yarrow, 1952; LaPiere, 1934), so that in recent years the assumption of a strong relationship between attitude and behavior has been questioned by an increasing

number of investigators (e.g., DeFleur & Westie, 1958; Festinger, 1964; Linn, 1965; McGuire, 1969, Warner & DeFleur, 1969; Wicker, 1969). Most of the empirical research, however, (e.g., Bray, 1950; DeFleur & Westie, 1958; Linn, 1965; Rokeach & Mezei, 1966; Smith & Dixon, 1968) obtained a general measure of attitudes toward a stimulus object and then observed the relation between a person's score on the attitude scale and some specific behavior towards some specific target object.

In a review of the research on the relationship between attitudes and behavior, Wicker (1969) was able to identify a relatively small number of studies in which "at least one attitudinal measure and one overt behavioral measure toward the same object (were) obtained for each subject" (p. 48). Discrepencies between the attitudes people profess and this overt behavior were revealed so consistently that Wicker was forced to conclude that "only rarely can as much as 10% of the variance in overt behavioral measures be accounted for by attitudinal data" (p. 65), and that "it is considerably more likely that attitudes will be unrelated or only slightly related to overt behaviors than that attitudes will be closely related to actions" (p. 65).

There have been many attempts to explain the low attitude-behavior relationship. It has been suggested (e.g., Rosenberg & Hovland, 1960) that attitudes are multi-dimensional, including cognitive, affective, and conative components; it follows that single attitude scores cannot adequately represent all of these attitudinal components and thus cannot

predict behavior accurately. It has also been suggested (e.g., Ehrlich, 1969; Triandis, 1967; Wicker, 1969) that other variables such as social norms, habits, personality characteristics, etc., also influence behavior and must therefore be taken into consideration. A popular current view is that

> ... attitudes always produce pressure to behave consistently with them, but external pressures and extraneous considerations can cause people to behave inconsistently with their attitudes. Any attitude or change in attitude tends to produce behavior that corresponds with it. However, this correspondence often does not appear because of other factors that are involved in the situation. (Freedman, Carlsmith, & Sears, 1970, pp. 385-386).

These other variables can be seen to be moderator variables that interact with attitudes to predict behavior, or as independent variables that have direct effects on behavior.

Of the few studies that have explicitly attempted to test the "other-variables" explanation, most have employed a measure of intention rather than behavior as their criterion. Studies by Warner and DeFleur (1972) and Green (1972) on the moderating effect of degree of exposure and intimacy, Tarter (1969) on the influence of individualistic versus collectivistic orientations, and Wicker (1971) on the perceived consequences of three behaviors, the evaluation of the behaviors, and the judged influence of extraneous events on the behaviors, failed to show any consistent effects of these variables on intentions.

These explanations for the attitude-behavior discrepency imply that traditional measures of attitude, while somehow relevant to the predition of behavior, are insufficient. In the previous section Fishbein's theoretical description of the relationship between multiple-act behavioral or intentional criteria and attitude was presented. It was shown that if multiple-act criterion are considered then attitudes can be seen as being a function of intentions or behaviors and the evaluation of the consequences of these acts. However, if a single act is considered there may well be a large discrepancy between a person's general attitudes toward an object and a specific behavior towards it. In most of the empirical research on the attitude-behavior relationship a general measure of attitude and a specific behavior have been used. Within the framework of Fishbein's theoretical discussion (with empirical validation - Fishbein & Ajzen, 1974), and commensurate with reliability theory, it is quite expected that generalised attitudes would not be related to specific behaviors in such studies. Attitude has been defined as a "generalised predisposition to respond to an object in a consistently favourable or unfavourable manner", but as has been explained, it does not necessarily follow that any particular specific behavior can be predicted. The more specific a behavior or intention, the less likely it is to be consistent with generalised attitudes. In this respect, Fishbein has developed a model for predicting specific behavioral intentions and it is this model that is to be elaborated and tested in this study.

Fishbein's Model for the Prediction of Intentions

The discussion above indicates that a measure of a person's attitude toward the target of a behavior will not allow accurate prediction of a specific intention. As the intention concerned becomes more specific (in terms of the behavior, situation, or time), its relation to attitude will tend to decrease. Fishbein (1967c) and his associates (see Fishbein & Ajzen, 1975) have examined the determinants of specific behavioral intentions and developed a theoretical model for predicting them.

Dulany's theory of propositional control

Fishbein's (1967c) model was an extension of Dulany's (1961, 1968) model of propositonal control. Dulany's theory was largely developed within the context of studies of verbal conditioning and concept attainment and was concerned with predicting the probability of an individual's intention to make a particular verbal response. The central equation of the theroy can be expressed in linear multiple regression from as follows:

$$BI = [(RHd)(A)]\ W_1 + [(BH)(MC)]\ W_2,$$

where

BI = the subject's intention to make a particular response or class of responses

RHd = a "hypothesis of the distribution of reinforcement", that is, the subjects' hypothesis that the occurrence of the particular response will lead to a certain event or class of events.

A = the affective or subjective value of the reinforcer, that is, the subject's evaluations of those events

BH = the subject's "behavioral hypothesis", that is, his belief as to what he is expected to do, or what he should do in the situation.

MC = the subject's "intention to comply", that is, how much the subject wants to do what he believes is expected of him.

W_1 & W_2 = empirically determined beta-weights.

BH is further defined as the product of RHd and RHs where RHs is the hypothesis of the significance of the reinforcer.

It is seen that two basic components serve as the basic determinants of intentions in Dulany's theory. The first component is similar to an expectancy-value formulation in that it refers to the subject's expectation that a given response will lead to a certain event, and the subject's evaluation of the event. The second component essentially represents perceived "demands" and the motivation to comply with those demands. Each of the two components is assumed to contribute to the determination of intentions, but their relative importance may vary from one situation to another. Multiple regression analysis has been used by Dulany (1961, 1964, 1968) and his associates (Dulany & O'Connell, 1963, Dulany, Schwartz, & Walker, 1965, Schwartz, 1966) to estimate those weights and to predict behavioral intentions from the two components. The average multiple correlation between behavioral intention and the two components of the theory in

the context of verbal-conditioning experiments has been approximately .85, thus offering good support for the model.

Fishbein's extension of Dulany's model to social behavior

Fishbein (1967c) and his associates (see Ajzen & Fishbein, 1973; Fishbein & Ajzen, 1975) have extended Dulany's theorizing to an analysis of social behavior. Fishbein (1967c) proposed an alternative formulation of the theory on the basis that the first component had a certain resemblance to an expectancy-value formulation and that the second component could be viewed as involving the concept of normative beliefs. He reinterpreted and relabeled the theory's constructs in an attempt to reveal their relations to more familiar social psychological concepts. According to the theory, there are two major factors that determine behavioral intentions: an attitudinal factor and a normative factor. In its original formulation (Fishbein, 1967c, p. 489) the model was expressed as follows:

$$B \simeq BI = [(Aact)]\, W_o + [(NB)(Mc)]\, W_1, \qquad (4)$$

where

B = the behavior to be predicted from intentions

BI = the behavioral intention to be predicted by the model

Aact = attitudes towards performing a specific act in a given situation

NB = normative beliefs perceived to be governing the behavior in the given situation

Mc = motivation to comply with the norms

W_o and W_1 = empirically determined weights.

Aact is further defined in an expectancy-value formulation as follows:

$$Aact = \sum_{i=1}^{n} b_i \, a_i \qquad (5)$$

It is emphasised that the attitude under consideration is an attitude toward performing a given behavioral act, that is an evaluation of the consequences of performing a given behavior, and is not in attitude toward a given object.

An individual's intention to perform a specific act, with respect to a given stimulus object, in a given situation, is thus seen to be a function of:

1a. His beliefs about the consequences of performing a particular behavior (in a given situation), that is, the probability or improbability that the performance of behavior X will lead to some consequence Y_i (B_i).

1b. The evaluative aspect of B_i, that is, the S's evaluation of Y_i (A_i).

2a. A normative belief, that is, the S's belief about what he should do in this situation (NB).

2b. His motivation to comply with the norm, that is, his desire, or lack of desire, to do what he thinks he should do (Mc). (Fishbein, 1967c, p. 488).

Thus, the first component of Dulany's theory is conceptualised as being analagous to an individual's beliefs about the consequences of performing a specific behavior and the evaluative aspects of those beliefs. This measure of attitude is consistent with the work of Rosenberg (1956, 1965), Zajonc (1954), Fishbein (1963, 1965, 1967a,b) and others as expressed algebraically in the expectancy-value formulation of equation 5.

The second component of Fishbein's model was conceptualised as a normative belief, that is, a belief about whether the particular act should or should not be performed, multiplied by the motivation to comply with that norm. However, it is necessary to distinguish between an individual's belief about what he personally feels he should do and his belief about what "society" or his "significant others" say he should do. Fishbein (1967c) handled this problem by expanding the second component of equation 4 to include both types of norms:

$$B \simeq BI = [Aact]\ W_o + [(NBp)(Mcp)]\ W_1 + [(NBs)(Mcs)]\ W_2 \qquad (6)$$

where the subscripts p and s refer to personal and social norms respectively.

To this author there seems to be a problem in conceptualising motivation to comply and normative beliefs as two independent components. Normative beliefs are defined as beliefs that are perceived to be governing the behavior concerned, or as beliefs about whether the particular act should or should not be performed. Motivation to comply is then defined as the subjects desire or lack of desire to behave according to the normative beliefs. It seems that there is a lack of independence in these definitions as it is likely that a belief will not be perceived to be governing behavior unless the subject already feels that he should comply with that belief. There will always be the exceptional person who perceives that there is a lot of social pressure being applied to him to behave in one way and who will determine not to comply, but it is suggested that most people will, by definition, comply to a norm that they perceive to be

governing their behavior. This question about the independence of normative beliefs and the motivation to comply with them can and will be checked empirically in this study. The same question can be asked about the independence of all the other postulated components of attitude from each other and from related variables. Conceptually, there does not seem to be any doubt, but the assumption should nevertheless be empirically tested.

Rather than viewing attitude toward a stimulus object as a major determinant of behavioral intentions with respect to that object, Fishbein's theory identifies two kinds of variables that function as the basic determinants of intentions; attitudes toward the behavior, and normative beliefs (multiplied by the motivation to comply with them). The attitudinal and normative components are given empirical weights in the prediction equation, proportional to their relative importance in the prediction of behavioral intentions.. These empirical weights are assumed to vary with the kind of behavior that is being predicted, with the conditions under which the behavior is to be performed, and with the person who is to perform the behavior. For some behaviors, attitudinal considerations (the expected outcomes of the act) may be more important in determining behavioral intentions than are normative considerations (expectations of friends, family, significant others, etc). For other behaviors the reverse may be true. The relative importance of the two components may also be influenced by situational variables, such as the behavior's observability, and by personal characteristics and preference. Allowing the relative weights assigned to

the components of a model according to conditions allows for a fairly dynamic model, and one that could theoretically account for many previously seemingly desparate findings. However, it could also be viewed in a negative light as an unwillingness to set the model up for strong inference (cf. Platt, 1966). That is, it makes it difficult to disprove the model (cf. Popper, 1965, 1972).

Since adequate estimates of the weights for each individual with respect to each behavior in a given situation are not presently available, the practice is to use multiple regression techniques, and standardized regression coefficients (beta-weights) serve as estimates of the weights for the model's components.

Changes in the model

During tests of the model by Fishbein and his associates (e.g., Ajzen, 1971; Ajzen & Fishbein, 1969, 1970, 1972; DeVries & Ajzen, 1971; Jaccard & Davidson, 1972) various changes were made to the model (see next section for a review of these studies and for a detailed discussion about the changes). The personal normative beliefs and motivation to comply components were successively dropped so that the model is now written as follows (Fishbein & Ajzen, 1975):

$$B \simeq I = (A_B)\, W_1 + (SN)\, W_2 \qquad (7)$$

In this new equation intentions (I), and through them behavior (B), are postulated to be influenced only by attitudes toward performing a particular behavior in a given situation (A_B) and the subjective norms perceived to govern that

behavior (SN). The first component, A_B, is unchanged from Aact except for the label. The second component, SN, is changed and needs further discussion.

The subjective norm is the person's perception that most people who are important to him think he should or should not perform the specific behavior in question. According to the theory, the general subjective norm is determined by the perceived expectations of specific referent individuals or groups; and by the person's motivation to comply with those expectations. That is:

$$SN = \sum_{i=1}^{n} b_i \, m_i \qquad (8)$$

Where b_i is the normative belief (i.e., the person's belief that reference group or individual i thinks he should or should not perform behavior B); m_i is the motivation to comply with referent i; and n is the number of relevant referents. Thus, SN can be measured by summing the $b_i \, m_i$ product over a number of relevant referents. Alternatively, a generalised measure of SN can be obtained on one item as follows:

Most people who are important to me think

I should :___ : ___ : ___ : ___ : ___ : ___ : ___: I should not

Perform Behavior X

In two unpublished studies (King & Jaccard, 1973; Glassman & Birchmore, 1974) correlations between the two methods of measurement ranged from .625 to .910, providing good empirical evidence for the relation between SN and $\Sigma \, b_i \, m_i$.

Claims made for the model

Fishbein's model is claimed to accurately predict specific behavioral intentions at all levels of specificity, as long as the level of specificity is constant for the measurement of all components. For example if the behavioral intention is to "go to the hotel at 5.00 p.m. this Thursday" then the measure of attitude to the behavior must refer to this, not just to "going to the hotel", or "going to the hotel on Thursday evenings". Similarly the subjective norms must also refer to the specific behavior of interest.

The form of the multiple regression equation might imply that both components of the model are always necessary for the prediction of behavioral intentions (cf. Schwartz & Tessler, 1972). However, allowing the weights assigned to the components to vary with the kind of behavior that is being predicted, with the conditions under which the behavior is to be performed, and with the person who is to perform the behavior means that it is possible for one or other of the components to receive a zero weighting under some conditions. That is, while both components may generally be necessary and both contribute significantly to the prediction of behavioral intentions, there may well be situations where one or the other component is found to be unnecessary. Accordingly, tests of the necessity of the components of the model are rather meaningless. Of greater importance is to determine what the regression weights are under various conditions.

Strong claims are made for the model's sufficiency in explaining behavioral intentions (Fishbein, 1967c; Ajzen & Fishbein, 1973, Fishbein & Ajzen, 1975). That is, it is claimed that additional variables external to the model cannot have a direct influence on behavioral intentions. Rather, any influence must be indirect by influencing either of the two components or their relative weights. Even though a given variable may affect one of the two components, it will not necessarily influence intention unless that component carries a significant weight in determining the intention.

Discussion of empirical evidence regarding these claims follows the reviews of empirical tests of the model to be presented in the next section.

Empirical tests of the model

There are only eight published studies reporting empirical tests of Fishbein's model for predicting behavioral intentions from attitudinal and normative variables (Ajzen, 1971; Ajzen & Fishbein, 1969, 1970, 1972; Davidson & Jaccard, 1975; DeVries & Ajzen, 1971; Jaccard & Davidson, 1972; Schwartz & Tessler, 1972). Only one of these (Schwartz & Tessler) was an independent test; that is, all the others were carried out at the University of Illinois by Fishbein and his associates and students. At least eight other studies carried out at Illinois remain unpublished but have been reviewed by Ajzen and Fishbein (1973) and/or Fishbein and Ajzen (1975) (Carlson, 1968; Davidson, 1973; Darroch, 1971; Fishbein, 1966;

Fishbein, Ajzen, Landy & Anderson, 1970; Glassman, 1971; Hornick, 1970; McArdle, 1972).

To enable an assessment of the empirical evidence pertaining to Fishbein's model, the eight published studies will now be reviewed in some detail, then brief reviews of the unpublished studies will be presented.

Ajzen and Fishbein (1969) measured intentions to engage in eight different behaviors on a Friday night: going to a party, visiting an exhibition, watching a western on TV going to a concert, playing poker, going to a French movie, participating in a discussion, reading a mystery novel.

A major focus of the study was on whether the behavioral intentions related to a single behavior or to a choice between two behaviors. Behavioral intentions and the components Aobj, Aact, NBp, NBs, and Mc for each of eight different behaviors were all measured on a pencil and paper questionnaire. (Mc was not considered in the results, as multiplying NBs by Mc reduced the correlation with behavioral intentions). Behavioral intentions in a dichotomous choice situation were measured for all 28 possible pairs of the eight behavioral situations, and behavioral intentions in a multiple choice situation with eight alternatives was also assessed by asking subjects to rank order the eight behaviors according to the likelihood of his engaging in them on a Friday night. Subjects were 100 undergraduate students, 57 males and 43 females.

Over the eight acts the average multiple correlation for the three-component model (Aact+NBs+NBp) was .761.

For Aact, NBs, and NBp the respective correlations with BI were .618, .543, and .702, and the beta-coefficients were .255, .202, and .443. Attitudes toward the object were also highly correlated with BI ($\bar{r}$ = .622), as well as with Aact ($\bar{r}$ = .834), NBp ($\bar{r}$ = .643), and NBs ($\bar{r}$ = .439).

When Aact, NBp and NBs were held constant the correlations between Aobj and BI were greatly attenuated ($\bar{r}$ = .151) so that for most acts they were not significant. It should be noted however, that attitudes toward the object was just as good a predictor of behavioral intentions as attitudes toward the act was.

Better prediction of choice behavior was obtained if Aact toward alternative behaviors was considered. This did not, however, improve the overall prediction of behavioral intentions (for BI_2, $\bar{r}$ = .742, and for BI_8, $\bar{r}$ = .794).

Ajzen & Fishbein (1970) had their subjects play two Prisoner's Dilemma games differing in the extent to which the payoff matrices encouraged cooperation. The games were played either under cooperative, individualistic, or competitive orientations (cf. Deutsch, 1960). Behavioral intentions were measured after 8 "warm-up" trials, and the behavior predicted was the proportion of cooperative choices in the following ten trials.

Fishbein's model was related to the subjective expected utilities (SEU) model of behavioral decision theory (Edwards, 1954, 1961). The SEU of a given intention is a function of the subjective probability that certain outcomes will follow

that act (SP) multiplied by the respective subjective values (utilities) attached to these outcomes (U). The products are summed over all possible outcomes of the act: thus, $SEU = \Sigma SP_i U_i$. It can be seen that SEU is closely related to the definition of attitude toward an act ($Aact = \Sigma B_i a_i$).

In the Prisoner's Dilemma games, measures were obtained of the subjective probabilities of each of the game's four possible outcomes and of their utilities. In addition attitudes toward the act was measured by summing over four semantic differential seven-point scales: foolish-wise, good-bad, harmful-beneficial, rewarding-punishing. The perceived expectations of the other player were considered to be the relevant normative beliefs in the experimental situation, and a measure was taken of the normative beliefs as follows: My partner expects me to choose _____% X (cooperation), and _____% Y (defection). Behavioral intention was measured as follows:

What are your intentions for this game?

I intend to choose _____% X, and _____% Y.

Attitude towards the object (the other player) was measured by summing the five following seven-point evaluation semantic differential scales: wise-foolish, bad-good, sick-healthy, clean-dirty, and harmful-beneficial.

The sample consisted of 96 undergraduate students, 48 males and 48 females. Each subject played two games, one with a payoff matrix with a high Cooperation Index and one with a payoff matrix with a low Cooperation Index. Subjects were randomly assigned to the experimental conditions

(Cooperative, Individualistic, or Competitive), but players in a given game were always of the same sex.

Neither the game order nor the players sex had any significant effects on the dependent variables. Motivational orientation and Cooperation Index each produced strong main effects. The cooperative motivational orientation produced the highest degree of cooperative responses while the competitive orientation produced the least. Also as expected, there were fewer cooperative responses in Game 2 (with a low Cooperative Index) than in Game 1. These effects were observed in all dependent variables: Aact, SEU, NBs, BI, and B. In contrast no significant main effects or interactions were found for attitudes toward the object.

Behavioral intentions were highly predictive of behavior, $\bar{r}$ = .844, and Fishbein's model produced an average R^2 of .869 in the prediction of behavioral intentions. The average correlation with behavioral intentions and the standardized regression coefficients, respectively, were .745 and .392 for attitudes toward the act, and .812 and .570 for social normative beliefs. The average correlation between SEU and Aact was .652.

The relative importance of attitudes toward the act and social normative beliefs in predicting behavioral intentions varied as the authors expected: attitudes toward the act carried more weight than social normative beliefs in the competitive condition but less weight than social normative beliefs in the cooperative condition. That is, the player's beliefs about the expectations of the other player were

clearly more important than his own attitude in determining behavioral intentions under a cooperative motivational orientation. The two components of the model, Aact and NBs were highly intercorrelated in the individualistic and competitive orientation ($\bar{r}$ = .617) but not in the cooperative orientation ($\bar{r}$ = .112).

The correlations between the attitudes toward the other player (Aobj) and game behavior were low ($\bar{r}$ = .174), and this supports the contention that standard measures of attitude will not predict behavior.

These results provide some clear support for Fishbein's model and for a variety of hypothesis derived from it.

Dropping NBp and Mc from the model

It was during the analysis and reporting of the Ajzen and Fishbein (1970) study that the decisions to drop the motivation to comply components and personal normative beliefs from the model were taken. This appears to have been done in a rather casual way. For example, the only mention of personal normative beliefs in Ajzen and Fishbein (1970) is on p. 467 where they mention that:

> Elsewhere it was suggested (cf. Fishbein, 1967; Ajzen & Fishbein, 1969) that the normative component also included the individual's personal normative beliefs (NBp); i.e., his own beliefs as to what he should do in a given situation. It appears, however, that in many situations NBp may serve mainly as an alternative

measure of behavioral intentions.[3] Since NBp is of no consequence for purposes of testing the hypothesis in the present study, it is not treated here as part of the theory and no further reference to it will be made.

Footnote [3] read:

In fact, a measure of NBp was also taken in the present study and the statistical analyses revealed that it was essentially equivalent to BI. (Ajzen and Fishbein, 1970, p. 467).

Where is the evidence that "in many situations NBp may serve mainly as an alternative measure of behavioral intentions"? The only figures published by Fishbein and his associates are in Ajzen and Fishbein (1969) where NBp correlated .702 with behavioral intentions, while attitudes toward the act and social normative beliefs correlated .618 and .513 respectively with behavioral intentions. The fact that personal normative beliefs have a slightly higher (but not significantly so) correlation with behavioral intentions than do attitudes toward the act or social normative beliefs does not allow the conclusion that personal normative beliefs are equivalent to behavioral intentions. First, a correlation of .702, explaining just under 50% of the variance in behavioral intentions is not sufficiently high to be an alternative measure of behavioral intentions, and second, if it is high enough to be regarded as such, then in a similar way the correlation of attitudes toward the act with behavioral intentions is high enough for attitudes toward the act also to be considered an alternative measure of behavioral intentions.

The measurement of the motivation to comply with norms (Mc) was found to be unsatifactory by Ajzen and Fishbein (1969). While there is only the one published study in which this is the case, Ajzen and Fishbein (1970) claim that: "The measurement of this variable has repeatedly proved to be unsatisfactory (e.g., Ajzen & Fishbein, 1969)" (p. 468, italics added). A footnote does, however, indicate that more adequate measures of Mc can be obtained and reference is made to an unpublished source (Ajzen, 1969). Further data on this was presented in 1971 (Ajzen, 1971).

Ajzen (1971) used a different Prisoner's Dilemma game in the content of a study designed to produce changes in intentions and behavior by means of persuasive communications. The game was played under cooperative and competitive orientations

Based on the results of Ajzen and Fishbein (1970) it was predicted that changing attitudes toward the act would have more effect on the game behavior of competitively oriented players, and that changing normative beliefs regarding the other player would have more effect on the game behavior of cooperatively oriented players. One group under each motivational orientation was given the attitudinal message, another was given the normative message, and a third was treated as a control group and given no persuasive message.

Subjects were 216 introductory psychology students, one half being males and the other half females. Behavioral intention was measured with one item on a questionnaire,

as were social normative beliefs and the motivation to comply. Attitudes toward the act were measured on four seven-point semantic evaluative differential scales for both cooperation and competition -- the difference between Aact (cooperation) and Aact (competition) was used as the final measure of attitudes toward the act.

For the prediction of behavioral intentions under a cooperative motivational orientation, the regression coefficient of Aact was .112 (ns) while that of NBs (Mc) was .768 ($p<.01$). Under the competitive motivational orientation, the relative weights of the two components were reversed. The regression coefficients of Aact and NBs×(Mc) were .541 ($p<.01$) and .255 (ns), respectively. Comparable results were obtained for the prediction of actual game behavior (B). The regression coefficients of Aact and NBs×(Mc) were, respectively, .041 (ns) and .618 ($p<.01$) under cooperation and .450 ($p<.01$) and .189 (ns) under competition.

The persuasive messages did produce changes in the target variables. That is, the normative message under the cooperative orientation changed social normative beliefs, and the attitudinal message under the competitive orientation changed attitudes toward the act, while the attitudinal message in the cooperative condition did not significantly affect social normative beliefs and the normative message in the competitive condition did not significantly affect attitudes toward the act. Changes in behavioral intentions and actual behaviors were expected, with the cooperative group showing change when they received a normative message, and the competitive

group showing change when they received an attitudinal message -- these changes were significant at the .01 level and no other changes were significant.

The persuasive communications were found to have had marked effects on their respective targets, but they influenced behavioral intentions and behavior only to the extent that the target variable had a high regression weight in the prediction equation.

DeVries and Ajzen (1971) had 146 undergraduate students, half males and half females, answer a questionnaire about cheating behavior. Attitudinal and normative variables were measured for each of three types of cheating behavior, namely, "cheating in college", "copying answers from other college students' test papers", and "allowing other college students to copy from one's own test papers". Attitudes toward the act was defined as the sum of five seven-point semantic differential scales: bright-dark, cowardly-brave, good-bad, dirty-clean, harmful-beneficial. Normative beliefs were referenced to the subject's family, church, friends, and classmates, each being followed by a measure of the motivation to comply with those norms. Behavioral intentions were measured with one item for each of the three types of cheating behavior, and actual behavior was assessed from a self-report.

Sex, GPA, religiosity, grade level, and type of college (Calvinist or State) were the biographic variables considered, but none of them were related to behavioral intentions.

Over the three situations, the mean correlation between the self-report of cheating and behavioral intentions was .652. The mean correlation with behavioral intentions and the mean regression weight assigned for attitudes toward the act were .510 and .349 respectively and for social normative beliefs (summed over referents) they were .553 and .419. The mean multiple correlation for the prediction of behavioral intentions from attitudes toward the act and social normative beliefs was .642. The two components of the model had on average intercorrelation of .384.

Ajzen and Fishbein (1972) used four hypothetical decision situations involving a certain amount of risk, and obtained estimates of the probability that the risky option would lead to success or failure.

The four situations involved investing in a plot of land, having a dangerous operation, letting a house to a Negro family, and donating a kidney for a transplant. These four hypothetical situations in four different conditions of risk (high or low estimate of success as estimated by self or close family and friends) were given to 56 undergraduate students, both males and females. The subjects were randomly divided into the experimental conditions on the basis of a Latin square design such that each subject responded only once to each hypothetical situation and only once to each of the four conditions.

Behavioral intentions and social normative beliefs for each act were each measured by one seven-point scale ranging from "extremely probable" to "extremely improbable".

Attitudes toward the act (Aact) and the perceived attitudes of others (Aacto) were each measured on the following four semantic differential scales: foolish-wise, good-bad, harmful-beneficial, and rewarding-punishing. The subjects own subjective probability of success (SP), and the perceived probabilities of others (SPo), and the utilities of success and failure for the subject (U) and as perceived for others (Uo) were also collected.

It was hypothesised that Aact and NBs could be manipulated by; a) variations in SP producing related changes in Aact; and b) manipulations of SPo producing related changes in Aacto and NBs. These changes would have consequent effects on behavioral intentions depending on the regression weights assigned to them in the prediction equation.

As predicted, variations in P had significant effects on Aact, and variations in Po had significant effects on Aacto and NBs. Manipulations of Po also significantly affected Aact but manipulations of P had no significant effects on Aacto or NBs.

For all four risk situations attitudes toward the act and social normative beliefs correlated with behavioral intentions while the beta-coefficients were high for Aact and low for NBs ($\bar{r}$ = .756 and .404, and β = .714 and .133 for Aact and NBs respectively). The mean R^2 for predicting behavioral intentions from attitudes toward the act and social normative beliefs was .776.

As predicted, variations in P were reflected in behavioral intentions in all situations except the transplant one.

Variations in Po did not significantly effect intentions, approaching significance only in the transplant situation which is the one situation in which the normative component was found to carry a significant weight in the prediction of intentions.

In a second study by Ajzen and Fishbein (1972), 70 subjects were given the investment situation in the low risk condition. After answering the questionnaire they engaged in 15 mintues of unrelated activity, and were then asked to consider the situation again. Half of the subjects were then given a "normative" communication and the other half were given an "attitudinal" one. These communications were designed to reduce either the subject's subjective probability of success (attitudinal message) or the probability attributed to his close family and friends (normative message). Each subject then completed the questionnaire again.

The reduction of SP and SPo had, as expected, significant effects on Aact or NBs respectively. That is,the attitudinal message (which reduced SP) produced a considerable reduction in Aact, and the normative message (directed at SPo) had a much smaller effect on Aact. As expected, the attitudinal message had a much stronger impact on behavioral intentions than had the normative message.

Jaccard and Davidson (1972) studied the intended use of birth control pills and the associated attitudes to test Fishbein's model. They had 73 caucasion female introductory psychology students complete a questionnaire in which

behavioral intentions and attitudes toward the act were each measured on one seven-point scale. Belief about the act, evaluation of the consequences of the acts, normative beliefs, and the motivation to comply with them, were each measured using one seven-point scale for each belief. The beliefs about the act and the evaluation of the consequences of the acts were used to estimate attitudes toward the act and compare this with the derived measure. The correlation between Aact and $\Sigma B_i a_i$ was .792.

Both the attitudinal and normative beliefs components received significant regression weights in the prediction equation (.650 and .260 respectively) and the multiple R was .835.

Davidson and Jaccard (1975) used a questionnaire to assess the model's components for three family planning behaviors -- having a two-child family, having a child during the next 2 years, and using birth control pills. The respondents consisted of 270 married, caucasian women between the ages of 18 and 38 who were not currently married to a university student, stratified by religion and socio-economic status. All components of the model were measured on seven-point semantic differential type scales as in most other work by Fishbein and his associates.

Again there was good support for Fishbein's model in that the mean multiple R was .775. The mean correlation between Aact and $\Sigma B_i a_i$ was .753. The zero-order correlation and standardized regression coefficient respectively for $\Sigma B_i a_i$ were .689 and .441, and for NB×(Mc) were .685 and .432.

The two components were correlated with each other, $\bar{r} = .58$. There were no significant differences on the basis of religious affiliation, education, or socioeconomic status, even though there were differences between Catholics and Protestants on behavioral intentions. For this sample and this issue the two components take on about equal weighting in the prediction of behavioral intentions.

Schwartz and Tessler (1972) report the only independent assessment of Fishbein's model to date -- all other work has been by Fishbein and/or his colleagues and students at Illinois University. They studied intentions regarding three kinds of medical transplant: kidney, heart, or marrow, each to a relative or a stranger. Their subjects were 195 adults of whom 70 were randomly drawn from bus and airplane terminals and laundromats, and 125 were employees drawn from all levels of the local telephone company. The median age of the sample was 32, with 44% being male, and 67% married. All data was collected in a questionnaire, with attitudes toward the object being measured by 14 items. Personal normative beliefs were measured with one item for each of the six acts -- a moral obligation to donate was used as a measure, which is different from operationalisations of NBp used by Fishbein and his colleagues. Attitudes toward the act was measured by three semantic differential scales for each act, and social normative beliefs were assessed for each act. Behavioral intentions were measured with one seven-point scale for each act. Also measured was the subjects prior exposure to

the object, the perceived costs of donating, and ascription of responsibility (Schwartz, 1970).

Schwartz and Tessler were interested in testing the necessity and sufficiency of the model's components in the prediction of behavioral intentions. They found that all three components, Aact, NBs, and NBp were usually necessary -- that is all three components usually added significantly to the variance in behavioral intentions that was predicted.

The social normative beliefs component was found to be not necessary in the case of kidney transplants. The average correlations of Aact, NBp and NBs with BI were respectively .50, .67, and .38, and the means of the respective beta-coefficients were .27, .51, and .15, with the mean multiple R (for the three-component model) being .73.

The critical question for sufficiency is: Does the model mediate the influence of <u>all</u> available external variables on behavioral intentions? For 6 of 17 variables external to the model there was a significant zero-order relationship with behavioral intentions. When added to the model some of these variabels did make significant contributions to the amount of variance in behavioral intentions that was explained. The variables that made significant contributions for at least three of the six intentions were: attitudes toward the object, age, religiosity and occupational prestige, which had average partial correlations (after the effects of the three components of the model were partialled out) of .18, .20, .12, and .14 respectively. While these partial r's are

significant it must be noted that they are substantially less than the corresponding zero-order correlations, and that the increase in the amount of variance explained would be quite small. However, this failure to mediate the effects of four of the external variables examined, sheds strong doubt on the sufficiency of Fishbein's model.

Personal norms correlated more highly with behavioral intentions than any other components, and in fact adding attitudes toward the act and social normative beliefs into the predictive equation improved the prediction of behavioral intentions by an average of only 8% above that obtained by personal normative beliefs alone.

The relative weights of the model's components did not differ significantly according to individual differences -- age, sex, marital status, occupational prestige, religiosity, or ascription of responsibility.

The unpublished studies will now be briefly reviewed: these reviews rely heavily on information provided in Ajzen and Fishbein (1973) and Fishbein and Ajzen (1975).

Fishbein (1966) was concerned with intentions to engage in premarital sexual intercourse among undergraduates. Both the attitudinal and normative components correlated significantly with intentions ($\bar{r}_{A_B}$ = .718, $\bar{r}_{SN}$ = .801) and the multiple correlation was high ($\bar{R}$ = .893), but the relative weights differed for the two sexes (for females and males, respectively, the coefficients were .757 and -.148 for A_B, and .232 and .947 for SN). That is, attitudinal considerations were more important

than normative considerations for females, and vice versa for males.

Carlson (1968) observed differences in regression weights as a function of the kind of behavior under consideration when he attempted to predict responses to a 30 item form of Triandis's (1964) behavioral differential. Female subjects were asked to indicate their intentions to perform 30 different behaviors with respect to a "21-year-old, male African Negro student", and then supply measures of attitudes toward performing the behavior and personal normative beliefs. Five factors were extracted from the 30 behaviors and it was found that the normative component became more important in determining intentions as the behavior concerned became more intimate (marital factor) and the attitudinal component was more important for the formal social acceptance behaviors.

Hornick (1970) measured subjects attitudes toward their opponents in a two-person war game in which subjects could cooperate or compete by reducing or increasing the number of missiles they held. He created three experimental conditions by varying the opponents' cooperative or competitive strategy. The mean multiple correlation was .806.

Glassman (1971) asked women shoppers at a supermarket to indicate their intentions to buy two different brand names in each of four product classes (coffee, detergents, potato chips, and gasoline). He also assessed their attitudes toward buying each of the eight brands, their normative beliefs that each of five referents (mother, father, husband, consumer reports, advertising) thought they should buy each of the eight brands,

and their motivation to comply with each of the five referents. Evidence was obtained that the weights of the attitudinal and normative components varied with the target of the intention under consideration, because although attitudinal considerations were more important for all eight products, normative considerations significantly influenced intentions to buy two kinds of products, coffee and gasoline. With respect to these two targets, the perceived expectations of the women's husbands were of particular importance. The mean multiple correlation was .665.

Darroch (1971) employed a modified version of the DeFleur and Westie (1958) photographic-release technique. Subjects were asked to indicate their behavioral intentions with respect to releasing photos of themselves with a black or white confederate for a variety of purposes by signing a release form. The multiple correlation between the components of Fishbein's model and behavioral intentions was .647.

McArdle (1972) assessed intentions of alcoholics to sign up for a specific alcoholic treatment unit, as well as obtaining measures of their attitude toward that behavior and their normative beliefs regarding it. The multiple correlation between the two components of Fishbein's model and intention was found to be .740.

Discussion of empirical evidence

There seems to be evidence that Fishbein's model determines a high proportion of the variance in behavioral intentions. The average multiple correlation over the thirteen Illinois studies reviewed is .746, and Schwartz and Tessler obtained a similar level of prediction.

The sufficiency of the model. Being able to predict just over 50% of the variance in a social psychological variable is to be regarded as commendable, but it must also be remembered that there is 50% of the variance remaining to be explained. It is, therefore, to be expected, in this author's view, that the model will not be sufficient to explain variance in behavioral intentions. However, this is the claim that is repeatedly made for the model (e.g., Fishbein, 1967; Ajzen & Fishbein, 1973; Fishbein & Ajzen, 1975).

The results of testing the model's sufficiency by adding attitude toward the object to the prediction equation have been inconclusive. In the Ajzen and Fishbein (1969) study attitudes toward the object gave just as good a prediction of intentions as attitudes toward the act. They found that the correlation between attitudes toward the object and intentions was greatly attenuated when attitudes toward the act, personal normative beliefs, and social normative beliefs were held constant, but in several instances the partial correlation was still significant -- that is, the model failed to fully mediate the effects of attitudes toward the object.

In the Ajzen and Fishbein (1970) and Ajzen (1971) studies attitudes toward the object was clearly inferior to attitudes toward the act as a predictor of behavior. The weak relationship between attitudes toward the object and intentions reduced the meaningfulness of testing whether the model mediated the effects of attitudes toward the object, even though it supported Fishbein's position on attitude measurement.

In the Darrock (1971) and Hornick (1970) studies the correlation of attitudes toward the object with intentions was greatly reduced when attitudes toward the behavior and subjective norms were held constant, but in the latter study the partial-correlation ($r = .444$, $p<.05$) was still significant.

The correlation of attitudes toward the object and behavioral intentions in the Schwartz and Tessler (1972) study was also greatly attenuated when attitudes toward the act and the normative components were held constant, but once again it was still significant.

The evidence presented questions both the superiority of attitudes toward the behavior to attitudes toward the object as a predictor of behavioral intentions, and the sufficiency of the model as a mediator of the effects of attitudes toward the object. While the model generally greatly attenuates any effect due to attitudes toward the object, in many cases it does not remove it all together. How well does the model mediate the effects of other external variables?

There have not been many systematic attempts to assess the effects of other external variables, but several studies have included some of interest. Several external variables other than attitudes toward the object were measured in the Ajzen and Fishbein (1970) studies, but only motivational orientation and the contingencies of the payoff matrix in the Prisoner's Dilemma game had significant effects on intentions. These effects were greatly reduced when attitudes toward the act and subjective norms were held constant, but the effect of motivational orientation remained significant.

In the Devries and Ajzen (1971) study the biographic variables measured included sex, GPA, religiosity, grade level, and type of college, but none of them were related to behavioral intentions with regard to cheating.

Schwartz and Tessler (1972) found that five of their variables external to Fishbein's model were related to behavioral intentions. Three of these (age, religiosity, and occupational prestige) still had significant, although greatly attenuated, correlations with behavioral intentions when attitudes toward the act and normative beliefs (both personal and social) were held constant. In this study also, personal normative beliefs were much more closely related to intentions than social normative beliefs. In fact, in some conditions social normative beliefs made no significant contribution to the explanation of intentions if personal normative beliefs were already in the prediction equation; and holding attitudes toward the act and social normative beliefs constant did not remove the effects of personal normative beliefs.

This evidence on the effects of variables external to Fishbein's model further questions the sufficiency of the model in predicting behavioral intentions.

The relative weights of the components. An important facet of Fishbein's model for predicting behavioral intentions from attitudinal and normative components is that the importance of the two components is expected to vary with the behavior, with the situation, and with individual differences. Of importance for the future usefulness and/or development of the model

would be to define the conditions under which each component is most important. Thus, important questions concern whether or not one component consistently carries more weight, and how the relative weights vary according to behavior, situation and individual differences.

Ajzen and Fishbein (1969) found that personal normative beliefs carried approximately twice the weight of attitudes toward the act and social normative beliefs in the prediction of single behavioral intentions. This is surprising, since the recreational activity studied had little normative significance.

In the Prisoner's Dilemma studies (Ajzen & Fishbein, 1970; Ajzen, 1971), the relative weights of attitudes toward the act and social normative beliefs for predicting cooperation depended on the subject's motivational orientation. Attitudes toward the act carried the greater weight in the competitive condition, and social normative beliefs were more important in the cooperative condition.

DeVries and Ajzen (1971) found that the attitudinal and normative components received almost equal weights to predict intentions with regard to cheating behavior.

In the Ajzen and Fishbein (1972) study involving decisions in four risk situations, attitudes toward the act received a higher weighting than social normative beliefs. Similar results were found by Jaccard and Davidson (1972) for the prediction of intentions to use birth control pills among introductory psychology students. Davidson and Jaccard (1975), on the other hand, found the components to be equally important when predicting three family planning behaviors among non-university women.

In the Schwartz and Tessler (1972) study, personal normative beliefs were of greatest importance in predicting intentions to donate an organ for transplant, followed by attitudes toward the act, with social normative beliefs being least important.

Among the unpublished studies, Fishbein (1966) found that subjective norms explained most of the predictable variance in intentions to engage in premarital sexual intercourse for males, but that attitudes toward the act were more predictive for females. Carlson (1968) found that the weights assigned to the components varied according to the type of behavior, with the normative component being more important for intimate behaviors with a Negro man, and attitudinal factors being more important for social acceptance behaviors. Glassman (1971) found that subjective norms referenced to women's husbands were of great importance in predicting intentions to buy particular brands of coffee and gasoline than they were for other products.

Overall, there is considerable evidence that the relative importance of the attitudinal and normative components in the prediction of intentions varies with the type of behavior under consideration, with the situation in which the behavior is to be performed, with the target of the behavior, and with individual differences between actors. However, there is no systematic pattern among the data available so far that would allow specification of the conditions under which each component is most important. Nevertheless, it seems that it is often possible to predict relative weights on the basis of common-sense and a knowledge of the behavior of interest, the situation in which it's predictors are assessed, the situation in which the behavior is to take place, the target of the behavior, and the individual concerned.

The independence of the components of attitude. At no time during the development and testing of the model has the basic assumption of the independence of the postulated components of attitude -- attitudes toward the object, attitudes toward the act, social and personal normative beliefs, and the motivation to comply with normative beliefs -- been empirically tested. This is a basic assumption underlying the development of the model which should have been extensively tested. This could have been done by subjecting the items designed to measure all components to some form of factor analysis, the expectation being that a separate factor would be extracted for each postulated component. This does not mean to imply that these variables should be entirely unrelated to one another -- two variables can be factorially independent and still be moderately correlated with one another (that is, not be "statistically independent" in the normal sense of the word), and this possibility could occur if an oblique solution was extracted. The expectation is that the items making up one component have more variance in common with one another than they have in common with the items making up another component, even though they may have some variance in common with one another. If there is too much variance in common between the items measuring two components then it is implied that the two components are simply different measures of a common underlying construct (see Cook and Campbell, 1975). This possibility can be best examined by the factor-analytic method suggested above, which amounts to testing the hypothesis of single-factoredness (Brewer, Campbell & Crano, 1970).

It seems to be especially important to this author to test the hypothesis of single-factoredness for the social normative beliefs and motivation to comply components, because their conceptual independence has already been questioned earlier in this chapter. It would also seem to be important to test for the factorial independence of personal normative beliefs from behavioral intentions because, as will be discussed below, it has already been assumed by Fishbein and his associates that these two components are not factorially independent.

The status of personal normative beliefs. It is possible to interpret Dulany's (1968) behavioral hypothesis (BH) component as a personal normative belief, that is, as the person's own belief about what he should or ought to do. Accordingly, in his original formulation of the model, Fishbein (1967) included a component dealing with personal normative beliefs. However, by 1970 the view was:

> It appears, however, that in many situations NBp may serve mainly as an alternative measure of behavioral intentions. (Ajzen and Fishbein, 1970, p. 467).

In their 1973 review of the model, Ajzen and Fishbein said:

> However, empirical findings have repeatedly indicated that a subject's report of his personal normative belief serves mainly as an alternative measure of his behavioral intentions. Inclusion of personal normative beliefs in the theory, therefore, tended to confound, rather than clarify, the problem of understanding the determinants of behavioral intention. While there is a clear conceptual

> distinction between personal normative beliefs and behavioral intentions, the high relation between obtained measures of these variables suggests that it may be difficult to develop a satisfactory operationalization of personal normative beliefs. For this reason, personal normative beliefs have been deleted from the present version of the theory. (P. 43, footnote 9, italics added).

The absence of repeated empirical findings to indicate that a subject's report of his personal normative belief serves mainly as an alternative measure of his behavioral intention has already been discussed in a previous section.

In the Ajzen and Fishbein (1973) review there was no mention of the Schwartz and Tessler (1972) study. Schwartz and Tessler had operationalized personal normative beliefs to emphasize moral considerations, that is, as the person's feelings of moral obligation. They found this measure to be highly related to behavioral intention to be a transplant donor ($\bar{r}$ = .67), in fact, more closely related to intention than social normative beliefs ($\bar{r}$ =.38). Thus, in this case, personal normative beliefs made a far greater contribution to the explanation of behavioral intentions than did social normative beliefs.

In 1975, however, Fishbein and Ajzen said:

> However, empirical findings have repeatedly indicated that a subjects' report of his personal normative belief serves mainly as an alternative measure of his behavioral intention.. Inclusion of personal normative beliefs in the theory therefore tended to confound, rather than clarity,

> the problem of understanding the determinants of behavioral intentions. For this reason, personal normative beliefs have been deleted from the present version of the theory (Fishbein & Ajzen, 1975, pp. 305-306).

In a footnote they said:

> Although there is a clear conceptual distinction between personal normative beliefs and behavioral intentions, the high relation between obtained measures of these variables suggests that it may be difficult to develop a satisfactory operationalization of personal normative beliefs. Recently, Schwartz and Tessler (1972) have used a measure of personal normative beliefs that emphasizes moral considerations. Although the measure was highly related to intention, it did not account for all the variance in the criterion. (P. 306, footnote 6, italics added).

There are several points to be made following this quote. First, Fishbein and Ajzen mention the difficulty of developing a satisfactory operationalization of personal normative beliefs, but barely consider the results obtained by Schwartz and Tessler when they used an alternative operationalization. Second, Fishbein and Ajzen seem on one hand, to expect a "satisfactory operationalization" of personal normative beliefs to account for all the variance in behavioral intentions but, on the other hand, if it did so they would dismiss it as being an alternative measure of behavioral intention and thus confounding, rather than clarifying, the problem of understanding the determinants of behavioral intention. Third, the only reference to the Schwartz and Tessler study in the 500 odd pages of the Fishbein and Ajzen (1975) book is in the footnote

that has been quoted above. This is despite the fact that the study provides some valuable, and the only independent, evidence in support of the model though, of course, it also raises some questions about various aspects of the model and the tests made of it. In this author's opinion, the Schwartz and Tessler study is a very important one when the literature on Fishbein's work is considered -- it is the only independent assessment of the model to date, and there is no question that technically it was well executed and reported.

The findings in respect to personal normative beliefs can be said to be inconclusive, although they may not have been interpreted as such by Fishbein and his associates.

The Aims of this Study

The present study provides further independent tests of Fishbein's model for predicting behavioral intentions from attitudinal and normative variables. It considers attitudes, normative beliefs, and other variables in the prediction of behavioral intentions with respect to two issues completely different from each other and from any considered in previous research.

General Hypotheses

The hypotheses to be tested in this project are of two orders: those that are general to the model being tested; and those that are specific to the datum used for the tests. Only the general hypotheses will be outlined here, and the more specific ones will be presented in the chapters where they are examined.

The first hypothesis tests a basic assumption that has been made during all development and testing of Fishbein's model which, in this author's knowledge, has never been tested. It was hypothesised that the various components of attitude discussed by Fishbein and his associates during development and testing of the model -- attitudes toward the object, attitudes toward the act, subjective (social) norms, the motivation to comply with these norms, and personal normative beliefs -- should be conceptually and factorially independent from each other and from other variables measured for this study. That is, when all the items designed to measure all components are together subjected to a principle component analysis, then a factor should be extracted to represent each component. If the items that were meant to measure two or more components load on the same factor then this would mean that the hypothesis of single-factoredness (Brewer, Campbell & Crano, 1970) could not be rejected, and indicates that the components concerned have more variance in common than they have unique from one another.

Fishbein and his associates have found that the relative weights assigned to the components of the model vary according to the type of behavior concerned and individual differences. It could also be expected that the relative weights would vary according to the conditions under which the behavioral intentions and components of attitude are measured. Accordingly, the second hypothesis expected that the weights assigned to the two components of Fishbein's model, attitudes toward the behavior and subjective norms, in the prediction of behavioral

intentions should be different for different groups of people and for different conditions of measurement. This hypothesis implies that the intercorrelations between the components and of the components with behavioral intentions will be different for different groups of people and different conditions.

Considering the two attitudinal components, attitudes toward the object and attitudes toward the behavior, and the two normative components, social and personal, there are four possible models for predicting behavioral intentions made up of one attitudinal and one normative component. It has been claimed that Fishbein's model (attitudes toward the behavior plus subjective norms) should give better prediction of behavioral intentions than any of the other three models. However, it has been shown (Schwartz & Tessler, 1972) that attitudes toward the behavior are not always superior to attitudes toward the object in predicting behavioral intentions, and that subjective (social) norms are not always superior to personal normative beliefs. These findings give the basis for the third hypothesis: that the level of prediction of behavioral intentions given by one or more of the alternative two-component (one attitudinal and one normative) models would sometimes be better than that given by Fishbein's model. That is, it was hypothesized that Fishbein's model would not always give as good, or better, prediction of behavioral intentions than any of the other three models.

It has been repeatedly claimed that Fishbein's model is sufficient to predict behavioral intentions. This means that any other variable that is related to behavioral intentions

should exert its influence, not directly, but indirectly by being mediated by the model. However, there has been considerable evidence from past research (e.g., Schwartz & Tessler, 1972) that the model does not always mediate the effects of other variables on behavioral intentions. Thus, the fourth hypothesis is that variables external to Fishbein's model would sometimes make a significant contribution to the prediction of behavioral intentions over and above that accounted for by the model. That is, it was hypothesized that the model would not always be sufficient for predicting behavioral intentions. It is not easy to predict what variables will have a significant influence on the model. However, the work of Schwartz and Tessler (1972) suggests that the effects of personal normative beliefs are sometimes significant. Other variables might be connected with related behavioral intentions or with the effectiveness or usefulness of behaving in the required way.

General outline of the report

This empirical assessment of Fishbein's model is based on two data bases. Behavioral intentions, the components of the model, and other related variables, were all measured for two different types of issues on different groups of subjects. One of the attitude objects used was the learning of statistics, and the associated behavioral intention was the rated likelihood of learning statistics or further statistics. The subjects used were introductory psychology students, some of whom were currently learning statistics and some of whom were not doing so. The intentions and other variables concerned were all

assessed at the beginning of the academic year for both groups of students. The measures were subsequently readministered on two further occasions for the group learning statistics to provide further tests of the model under different conditions. The second study was designed as a further partial replication, and used a completely different type of issue (the nuclear generation of electricity, which is currently a controversial issue in New Zealand), and sample (from the general population). The behavioral intentions concerned an individual's willingness to take part in activities to support or oppose (depending on their attitudes toward the issue) nuclear power generation.

The method and results on the first issue, the learning of statistics, are presented in Chapters Two to Six. A description of the sample, measures, procedures, and analyses used is given in Chapter Two.

The first stage in testing Fishbein's model was to test for empirical evidence for the independence of the various components of attitude considered by Fishbein (attitudes toward the object, attitudes toward the act, social normative beliefs, personal normative beliefs, motivation to comply) from each other and from the other variables measured. This was done by subjecting the measures to principal component analysis. These analyses are reported in Chapter Three.

The second stage involved consideration of the effects of conditions (samples and times) on the measured variables and their interrelationships. This was done by examining the mean scores on each of the variables (including behavioral intentions) and their inter-correlations. This is reported in Chapter Four.

In the third stage, Fishbein's most recent model was examined. Of importance was the amount of variance in behavioral intentions accounted for by the model, and the relative weights assigned to the components. Following that, the sufficiency of the model was tested -- that is, did other variables, external to Fishbein's model, make significant contributions to the explanation of variance in behavioral intentions when they were added to the prediction equation that already included attitudes toward the act and subjective norms. Models alternative to Fishbein's model were also assessed to see if other models could explain more variance in intentions. These tests are reported in Chapter Five.

The results from the above analyses were not sufficient to adequately explain what was happening between the components of Fishbein's model, the other variables measured in this study, and behavioral intentions. It seemed desirable, therefore, to trace the causal links between the variables for each condition, and to see what these causal links might mean psychologically and what their implications are for Fishbein's model. This analysis is reported in Chapter Six.

In Chapter Seven the data from the second issue, the nuclear generation of electricity, is presented. This follows the same sequence and form as the analysis for the learning of statistics data (except that causal path analyses were not undertaken), so is not reported in quite as much detail. Again, some empirical evidence was obtained for the independence of various components of attitude. The adequacy of Fishbein's model for predicting intentions with regard to the establishment

of nuclear electricity generating plants in New Zealand was then assessed, and the results from this study were related to the results from the learning of statistics study.

Finally, the conclusions and implications for Fishbein's model of the findings from this series of studies are drawn together and discussed in Chapter Eight.

CHAPTER TWO

THE LEARNING OF STATISTICS DATA: METHOD

The issue

The attitude object used for this assessment of Fishbein's model is rather different from any that have been used previously, but is of interest to psychologists, especially those teaching statistics to psychology students. Statistics was the attitude object, the learning of statistics was the associated behavior, and the likelihood of learning statistics was the associated behavioral intention. It was felt that behavioral intention and actual behavior should be very closely related for this issue, for students are unlikely to say that they will take future statistics courses unless they actually intend to do so. Their intentions may change over time, of course, and this tends to reduce the correlation between behavioral intentions as measured and later overt behavior. However, if the decision to learn or not to learn statistics had to be taken at that point in time when intentions are measured they should correlate almost perfectly.

Subjects

Subjects were 287 introductory psychology students at the University of Waikato. One hundred and ninety five of them

were enrolled in course 18.103, a course that is compulsory for students intending to major in psychology and which contains a six-week statistics component. The other 92 subjects were enrolled in course 18.102 which is not compulsory and does not contain statistics. While the total enrollment in 18.102 was close to 200, the remainder of the students were also enrolled in 18.103 and were regarded as 18.103 students for the purpose of this study.

The median age of the subjects was 18.7 years, and there were approximately the same number of males and females.

The students learning statistics attended six weeks of lectures during the first term of the academic year, that is, during March and April. The total class of 195 was divided into four classes of 40-50 students and each class met for one two-hour session each week. This was in addition to their introductory psychology lectures.

Materials

A questionnaire headed "Feelings Toward Statistics" was designed to include two or more items to measure each of attitudes toward the object (Aobj), attitudes toward the behavior (A_B), social normative beliefs (SN), the motivation to comply with these (Mc), and personal normative beliefs (NBp).

As most of the students were assumed to have had little or no experience with statistics, the closest measure of attitudes toward the object that could be devised was attitudes toward mathematics. All subjects had some experience with mathematics in school and most were likely to have

strong feelings about the topic. All other measures follow directly from operationalisations of the components used by Fishbein and his associates and by Schwartz and Tessler (1972). Behavioral intentions with regard to the learning of statistics (BI), degree of commitment to doing well in statistics (COM), future behavioral intentions in psychology and the social sciences (BIP), and an estimate of performance in statistics (EST), were measured by one item each in the same questionnaire. All items were the same for all measurement times except for a change of tense where necessary as students experienced the act concerned. Each item consisted of a phrase or question with the response to be indicated by ticking a position on a seven-point scale. The items and the scale end-point used are shown in Appendix I. Items were administered in the order Aobj, NBp, COM, SN, Mc, A_B, EST, BIP, BI on all occasions, and direction of wording was randomly counterbalanced and the same direction maintained for all administrations.

Age and sex were also obtained on each occasion, and these were used to match subjects' responses for the three administrations.

Procedure

The students learning statistics (learning group) were asked to complete the measures on three occasions: i) at the beginning of the first statistics lecture; ii) at the end of the last formal statistics class and before the formal examination; and iii) about eight weeks later, after exam results were known. These three measurements will be referred to as the pretest, immediate posttest, and final posttest

respectively. During the same week as the pretest for the learning group, the 92 students not learning statistics (non-group) completed the questionnaire for the only time.

Of the 195 students learning statistics, 189 completed the questionnaire at the pretest, 160 at the immediate posttest, and 153 at the final posttest. However, only 105 of this sample gave data that was both complete and could be matched across the three measures. In the non-group, 84 subjects gave complete data.

Analyses

Most of the analyses were done on the Burroughs B6700 computer. The Statistical Package for the Social Sciences (SPSS) (Nie, Bent and Hull, 1970; Nie, Hull, Jenkins, Steinbrenner, & Brent, 1975) provided most of the data handling capacities and statistical routines needed. Occasional work was done on the IBM 1130 machine, using the IBM statistical package (IBM, 1967) and other self-written routines.

Analysis was done in several stages, and the remainder of this section will be set out in conformity with those stages, as will the following chapters.

Principal component analyses. One way of testing the validity and factorial independence of the components of attitude discussed by Fishbein, and of the other variables measured in this study, is to see if they are extracted as separate components from a principal component analysis.

For each of the four sets of data (non-group, pretest, immediate posttest, and final posttest) all the questionnaire items were subjected to such an analysis.

In all cases Cattell's (1966) scree test was used as the criterion for determining the number of factors extracted. It was expected that between 70% and 80% of the variance would be accounted for, and a minimum eigen-value as low as 0.60 was acceptable if the scree test indicated such a level (Jolliffe, 1971, 1972).

Component means and intercorrelations. Having decided that the variables being measured had some factorial validity, the basic unit of analysis used for most of the study was a "scale score" for each component. For each component the mean of the items making up that component, with reversals for direction of wording effects where necessary, was taken as the scale score for that component. This is consistent with the techniques used by other researchers in the field.

It could be argued that factor scores from the principal component analyses would be better measures of the constructs being assessed, but there are certain problems with this approach. First, there is the choice of orthogonal or oblique solutions. Orthogonal solutions are more acceptable from a mathematical point of view, but they would prevent the relationships between the variables which are present in the real world from being represented and analysed. They should, however, have more pure meaning, each factor being composed of variance that is unique from that represented by other factors. This might enable us to clarify the relationship

between attitudes toward the behavior and attitudes toward the object, which are usually correlated, and their relationship to behavioral intentions. However, there is no control over which way the component of variance that is common to the two attitudinal variables in the real world is partitioned when these components are each represented by unique variance. In set theory language, there is no control over whether X intersect Y ends up being partitioned with X or with Y. This sometimes leads to uncertainty about the true meaning of the orthogonal factors. For example, if the variance common to attitudes toward the behavior and attitudes toward the object ended up being partitioned with the variance unique to attitudes toward the object and if this measure of attitudes toward the object predicted behavioral intentions better than the unique variance portion of attitudes toward the behavior, then what conclusions could be drawn?

Orthogonal factors might overcome one problem that can be experienced with multiple regression, and that is the effects of multicolinearity of predictor variables and the bouncing beta weight (Farrar & Glauber, 1967). However, the question discussed above, on which components of variance are extracted with which factor, largely outweighs this advantage. In effect the problems of the partitioning of common variance and of the bouncing beta weight can be seen to be connected at this point.

Oblique factors, while overcoming some of the problems of orthogonal factors do not overcome the partitioning of variance problem.

Finally, there is the problem of maintenance of meaning structure across time and between groups. While there is no guarantee that a question has the same meaning to two different people or for one person at two different times, this is more easily controlled, followed and interpreted than any changes in structural space that are reflected in different factor score coefficients. It is bad enough that the weights assigned to the components of Fishbein's model are different for different people and at different times, without having the additional complexity of the weights assigned to the items that measure these components also being different.

In order to assess how the variables compared between groups and across time the mean scale scores were compared. Analyses of variance were done to test for significant differences.

The correlations between the scale scores were examined when considering the patterns of relationships between attitude components.

Tests of the model. Multiple regression was used for this, the SPSS method being a forward controlled step-wise procedure where the complete model is recalculated after each step (cf. Draper and Smith, 1966). First, attitudes toward the behavior and subjective norms were entered into the model, and the relative weights assigned to the two components and the percentage of explained variance in behavioral intentions assessed. The level of prediction given by the other three

possible two-component models was calculated and compared with that obtained from Fishbein's model. The sufficiency of the model was assessed by seeing whether other variables external to the model would significantly improve the prediction of behavioral intentions.

Tracing causal links in the model. Two tools not much used by psychologists, partial correlation and path analysis, were used to trace causal links in the model.

The method of path analysis was brought to the attention of the social sciences by Blalock (1964), who drew upon the writings of Simon (1954, 1957). As presented by Blalock it has become known as the Simon-Blalock technique, and is really a "special case" or "weak form" of path analysis (Boudon, 1968). The best references for social scientists appear to be (Blalock, 1964, 1971) and Kerlinger and Pedhazur (1973). Werts and Linn (1970) have given a description of the various possible applications of path analysis in psychology.

If certain assumptions can be made, partial correlations enable one to determine whether one variable has a direct or indirect influence on another. For example, if it is assumed that variable X is antecedent to both Y and Z and that all these variables are intercorrelated, then there are two possible causal chain models: $X \rightarrow Y \rightarrow Z$ or $X \rightarrow Z \rightarrow Y$. If one of the partial correlations $r_{xz.y}$ or $r_{xy.z}$ is zero or non-significant then it can be concluded that the variable partialled out is a mediating one. That is, if $r_{xy.z} = 0$, and all other relationships are positive, then it means that all

effects of X on Y are mediated by Z, and that the order of the causal chain is $X \rightarrow Z \rightarrow Y$. (But note that if it was not assumed that X was antecedent to both Y and Z, then $r_{xy.z} = 0$ could indicate the $X \rightarrow Y \rightarrow Z$ model as well). This argument can be extended to cases of more than three variables, and forms the basis of path analysis. Developed by Wright (1921, 1934, 1960), path analysis is a method for studying the direct and indirect effects of variables taken as causes of other variables taken as effects. It:

> ... is not intended to accomplish the impossible task of deducing causal relations from the values of the correlation coefficients. It is intended to combine the quantitative information given by the correlations with such qualitative information as may be at hand on causal relations to give a quantitative interpretation (Wright, 1934, p. 193).

> In cases in which the causal relations are uncertain, the method can be used to find the logical consequences of any particular hypothesis in regard to them (Wright, 1921, p.557).

In other words, path analysis is useful in testing theory rather than in generating it, so that it is the explanatory scheme of the researcher that determines the type of analysis to be applied to data, rather than the other way around. From results of path analysis a researcher is able to determine whether his data are consistent with an explanatory scheme -- if it is consistent then it lends support to it, but does not prove it.

This is not the place for an extended discussion about the concept of "cause", which is a controversial one among philosophers and scientists: adequate discussions can be found in Blalock (1964, 1971), Braithwaite (1953), Feigl and Brodbeck (1953), and Lerner (1965), while discussions of causality in relation to multiple regression can be found in Wold and Jureen (1953) and Wold (1970). Whenever words or phrases like "effects of variable X on variable Y", and "the influence of A on B", areused by behavioral scientists there is implication of causation, even though the word "cause" may not be used. This tendency to imply causation is also reflected in some of the methods used by behavioral scientists -- for example, proportions of variance are attributed to certain independent variables, or a presumed cause is partialled from two variables in order to observe whether the relation between them is spurious. "In sum, scientists, qua scientists, seem to have a need to resort to causal frameworks, even though on philosophical grounds they may have reservations about the concept of causation" (Kerlinger and Pedhazur, 1973, p.306). In this report there will be the same interchangeable use of terms like "effect", "influence", and "cause" as is evidenced in much scientific literature,when the phrase "X causes Y" really is shorthand for "something in X later causes Y" (Kenny, 1975). Consequently care has to be taken in making causal interpretations because, "The causal interpretation of any regression coefficient can almost always be alternatively explained by unmeasured common causes" (Kenny, 1975, p. 895).

In the Simon-Blalock technique the correlation coefficients are focussed on, while in path analysis the regression coefficients are. It is recognised by Blalock that "regression coefficients give us the laws of science" (Blalock, 1964, p. 51), but there are instances, especially in exploratory work, where the correlation coefficients are of legitimate interest. One such instance is where a correlation is expected to disappear, as has been described when discussing partial correlations above. For some sets of data, where the standard deviations of the independent variables are all similar, there will be little difference between the partial correlation and beta-coefficient for the same model.

In this report, partial correlation coefficients were used in initial exploratory analysis of parts of the complete extended model, and finally path coefficients were calculated for the complete model for each condition.

The Simon-Blalock and path analysis techniques require a number of assumptions:

i) A recursive system. That is, that there is a one-way causal flow in the system with reciprocal causation being ruled out.

ii) The relations between variables in the model are linear and additive with curvilinear, multiplicative and interaction relations being excluded.

iii) The residuals, that is, variables not included in the model that have causal effects on the variables in the model, are not correlated among themselves, nor with other variables in the system. This implies that all relevant variables are in the system.

iv) There is one or more exogenous variables, that is, variables whose variability is assumed to be determined entirely by causes outside the model. When two exogenous variables are correlated this correlation is treated as a "given" and sometimes remains unanalysed. Variation in endogenous variables, on the other hand, is explained by exogenous or other endogenous variables in the model.

CHAPTER THREE

PRINCIPAL COMPONENT ANALYSIS

For the type of data collected the best available method for checking that the questions are measuring separate constructs is principal component analysis. This only gives a test of the factorial validity of the constructs however, relying on common variance being shared by those items that are postulated to measure one construct and this variance being unique from that shared by other constructs in the measurement space.

It was hypothesised that the items used (not including item 16, which measures the construct to be predicted) would form eight factors, one for each component as listed in Appendix I. If the item designed to measure behavioral intentions was also included, then there were two possible expectations: either i) an additional separate factor would be extracted to represent it, or ii) since it is a criterion variable, to be predicted from some combination of all the others, it could be expected that the variance in behavioral intentions would divide up into several unique components that relate to each of its predictors -- that is, the item designed to measure behavioral intentions would load significantly on several of the factors that represent the predicting variables.

The results for the non-group are presented first, followed by the three administrations for the learning group. It was hypothesised that the basic factor structure (as the items are set out in Appendix I) would be the same for

all four analyses, although some of the loadings within a factor may vary across groups and times. That is, some of the correlations between the original items may be different for the four different correlation matrices. It was hypothesised, however, that any major differences would be between items in two different factors rather than between items in the same factor. If this is true it will be shown by the extraction of the same factors from each data set, although these factors may occupy a different structural space -- that is, the correlations between oblique factors may differ across data sets. The correlations between factors will be examined in detail in Chapter 4.

Solutions when behavioral intentions were not included

Results. The eigenvectors and the percentage of variance explained by each principal component when the item for behavioral intentions was not included are shown in Table 3.1. The cut-off point taken for the number of factors extracted is also shown. For the non-group, the scree test would give eight factors. However, since the eigenvalue for eight factors was less than the .60 criterion that was decided, on the seven factor solution was accepted. This accounted for 82.9 per cent of the total variance. For the pretest, the scree test gave a clear cut-off at eight factors to explain 84.6% of the total variance. The scree test gave a clear cut-off at nine factors for the immediate posttest to explain 88.3% of the total variance,

Table 3.1

Eigen-values, percent of variance, and cut-off points for the number of factors for the four sets of data

FACTOR	NON-GROUP			PRETEST			IMMEDIATE POSTTEST			FINAL POSTTEST		
	EIGEN VALUE	% OF VAR	CUM PCT	EIGEN VALUE	% OF VAR	CUM PCT	EIGEN VALUE	% OF VAR	CUM PCT	EIGEN VALUE	% OF VAR	CUM PCT
1	7.59	44.6	44.6	5.57	32.8	32.8	5.53	32.5	32.5	5.86	34.5	34.5
2	1.71	10.1	58.7	2.70	15.9	48.7	2.50	14.7	47.2	3.06	18.0	52.5
3	1.38	8.1	62.8	1.59	9.4	58.0	1.47	8.7	55.9	1.42	8.3	60.8
4	1.04	8.1	69.0	1.19	7.0	65.0	1.39	8.2	84.1	1.12	6.8	87.4
5	0.90	5.3	74.3	0.98	5.8	70.8	1.10	6.2	70.3	0.92	5.4	72.8
6	0.85	5.0	79.3	0.89	5.2	76.0	0.88	5.2	75.5	0.81	4.8	77.8
7	0.62	8.7	82.9	0.77	4.6	80.6	0.81	4.8	80.3	0.67	3.9	81.4
8	0.53	3.0	86.0	0.68	4.0	84.6	0.69	4.1	84.4	0.62	3.5	85.1
9	0.39	2.3	86.3	0.52	3.1	87.6	0.67	3.9	88.3	0.54	3.2	88.3
10	0.37	2.1	90.4	0.44	2.6	90.2	0.41	2.4	90.7	0.43	2.5	90.8
11	0.37	2.1	92.5	0.34	2.0	92.2	0.35	2.0	92.8	0.32	1.9	92.7
12	0.31	1.8	94.1	0.32	1.9	94.1	0.32	1.9	94.7	0.29	1.7	94.4
13	0.30	1.7	96.0	0.26	1.5	95.5	0.24	1.4	96.1	0.25	1.5	96.8
14	0.26	1.5	97.6	0.23	1.8	96.9	0.20	1.2	97.3	0.23	1.4	97.2
15	0.17	1.0	98.5	0.21	1.2	98.1	0.18	1.0	98.3	0.18	1.1	98.3
16	0.15	0.9	99.4	0.18	1.1	99.2	0.17	1.0	99.3	0.15	0.9	99.2
17	0.10	0.5	100.0	0.14	0.8	100.0	0.12	0.7	100.0	0.14	0.8	100.0

Note. Leading decimal points have been omitted

and eight factors for the final posttest to explain 85.1% of the total variance.

The loadings, communalities, and percentage of variance explained by each factor are shown in Tables 3.2 to 3.5. The percentage of variance explained by each factor is the sum of the squared loadings divided by the number of variables (using the pattern matrix for the oblique solution), so represents only the direct contribution of the factor rather than including that due to the intercorrelation of the factors. For all rotated solutions, no one factor accounted for less than 5.8% of the total variance, which is the amount contributed by one item.

In Table 3.2 it is seen that some of the factors extracted for the non-group are different from those hypothesised. The one major deviation from the hypothesised solution is that item 14 loaded with the items forming the attitudes toward the behaviour and attitudes toward the object factors rather than forming a separate factor for the estimate of performance (EST). Taking out eight factors did not rectify this -- instead various of the factors split up and made many factors uninterpretable.

Table 3.3 shows that for the learning group at their pretest eight factors were extracted as hypothesised. Six of them were exactly as expected, but the subjective norms and motivation to comply items are combined differently to expectation. A component was formed for each of the two referent groups, peers or experienced people, rather than one component for subjective norms and one for the motivation

Table 3.2

Varimax and oblique principal component loadings for the non-group

FACTOR	Solution Item	A_B Var	A_B Obl	SN Var	SN Obl	Mc Var	Mc Obl	NBp Var	NBp Obl	Aobj Var	Aobj Obl	COM Var	COM Obl	EST Var	EST Obl	BIP Var	BIP Obl	Communalities
A_B	1	77	-83									36						85
	2	-70	71	40	-31													79
	3	76	-78							56								79
	4	-76	79							-43								83
SN	5	55		-69	65													74
	6			89	-91													86
Mc	5a					-87	-85											86
	6a					90	92											87
NBp	7							83	-87									86
	8			32				-63	60	-45	-34							79
Aobj	9	-38								-81	-82							87
	10									69	78	48					38	83
	11	-30								-85	-88							84
	12	32								78	77							78
COM	13							32	-32			79	73					81
EST	14	72	71							44				-	-			79
BIP	15															96	-97	95
%age of Variance		20.6	18.1	10.1	8.5	10.6	9.4	8.8	7.8	19.8	16.8	7.5	6.6	-	-	6.5	6.6	

Note. 1. Leading decimal points have been omitted

2. For the oblique solution the percentage of variance figure represents only the direct contribution of the factor to the total variance of the variables, not the total contribution. That is, it is calculated from the pattern matrix (which the above loadings are from).

Table 3.3

Varimax and oblique principal component loadings for the pretest

FACTOR	Solution Item	A_B Var	A_B Obl	SN Var	SN Obl	Mc Var	Mc Obl	NBp Var	NBp Obl	Aobj Var	Aobj Obl	COM Var	COM Obl	EST Var	EST Obl	BIP Var	BIP Obl	Communalities
A_B	1	84	83															86
	2	-78	-75															80
	3	69	68											39				77
	4	-32	-23							35				-76	72			85
SN	5			-39	25	-65	62											70
	6			88	-89													89
Mc	5a					93	-97											91
	6a			-71	63	-43	36											77
NBp	7							88	-92									85
	8							-81	81									84
Aobj	9									86	-86							86
	10									-82	83							85
	11									85	-87							82
	12									-66	59			57	-50			79
COM	13											94	-97					96
EST	14													86	-80			86
BIP	15															98	-98	98
%age of variance		13.0	11.2	9.2	8.4	9.5	9.0	10.2	9.6	18.0	15.9	6.3	6.3	11.9	10.4	6.1	6.0	

Notes. 1. Leading decimal points have been omitted

2. For the oblique solution the percentage of variance figure represents only the direct contribution of the factor to the total variance of the variables, not the total contribution. That is, it is calculated from the pattern matrix (which the above loadings are from).

Table 3.4

Varimax and oblique principal component loadings for the immediate posttest

FACTOR / Solution Item		A_B Var	A_B Obl	SN Var	SN Obl	Mc Var	Mc Obl	NBp Var	NBp Obl	Aobj Var	Aobj Obl	COM Var	COM Obl	EST Var	EST Obl	BIP Var	BIP Obl	Communalities
A_B	1	81	-81															80
	2	-91	96															91
	3	88	-92															87
	4	-26	10							43				-73	74			84
SN	5			-95	-97													97
	6			(89)[a]	(-93)[a]													97
Mc	5a			-42	37	-81	-75											90
	6a					90	92											91
NBp	7							90	-93									87
	8							-89	91									86
Aobj	9									86	-82							85
	10									-80	85							79
	11									90	-90							89
	12									-72	62			40	-33			77
COM	13											94	-97					98
EST	14													86	-94			89
BIP	15															98	98	98
%age of Variance		15.5	14.5	6.7 (5.9)[a]	5.8 (6.6)[a]	10.2	5.8	10.8	10.3	18.1	15.5	5.9	6.0	9.4	8.6	6.1	6.1	

Notes 1. Leading decimal points have been omitted

2. For the oblique solution the percentage of variance figure represents only the direct contributions of the factor to the total variance of the variables, not the total contribution. That is, it is calculated from the pattern matrix (which the above loadings are from).

[a]The bracketed items formed on additional separate factor.

Table 3.5

Varimax and oblique principal component loadings for final posttest

FACTOR	Solution Item	A_B Var	A_B Obl	SN Var	SN Obl	Mc Var	Mc Obl	NBp Var	NBp Obl	Aobj Var	Aobj Obl	COM Var	COM Obl	EST Var	EST Obl	BIP Var	BIP Obl	Communalities
A_B	1	81	-78															82
	2	-87	87															86
	3	80	-77															81
	4	-31	22															85
SN	5			(-03)	(01)	54	-53	66	-52									80
	6			92	96			-44										96
Mc	5a					-64	62											79
	6a	38				74	-76											83
NBp	7							86	-87									86
	8	31						-85	85									85
Aobj	9									83	81							84
	10									-87	-88							83
	11									91	95							86
	12									-76	-60	-34	-32					83
COM	13											86	87					87
EST	14													80	89			88
BIP	15															94	-96	93
%age of Variance		19.8	13.1	6.4	7.6	8.4	6.4	13.8	11.4	15.8	16.2	7.0	6.9	7.0	7.6	7.1	6.9	

Notes. 1. Leading decimal points have been omitted

2. For the oblique solution the percentage of variance figure represents only the direct contribution of the factor to the total variance of the variables, not the total contribution. That is, it is calculated from the pattern matrix (which the above loadings are from).

to comply with them. Another minor, unexpected, but by hindsight sensible, result was that items 4 and 12, concerning the ease or difficulty of mathematics and statistics, tended to load with the estimate of performance factor. This pattern was repeated in the immediate and final posttest result.

At the immediate posttest nine factors were extracted, and this solution is shown in Table 3.4. This solution is different from the hypothesised one only in that the two items meant to measure subjective norms (items 5 and 6) formed two separate factors. Item 6, where the referent is peer group, formed a 'pure' factor on its own, while item 5, where the referent is older and more experienced people, had some variance in common with the motivation to comply with this subjective norm.

The factor solution at the final posttest produced eight factors as shown in Table 3.5. These factors are mostly as hypothesised. Again, however, it is the subjective norms and motivation to comply items which are least clear in their meaning distribution -- subjective norms referred to experienced people (item 5) tended to load with the personal norms items (items 7 and 8), and with the motivation to comply (items 5a and 6a). Subjective norms referred to peers, however, again formed a separate factor.

Discussion. For all four data sets the factor solution extracted accounted for more than 80% of the total variance in the data. For all rotated solutions, no one factor accounted for less than 5.8% of the total variance, which is the amount contributed by one item. Kaiser (1960) based his rule of using an eigenvalue cut-off of ≥ 1.0 for determining the number of factors to extract on the basis that any one factor should not explain less than that contributed by a single variable. It is seen in these data sets, that although an unrotated solution may not satisfy this criterion if the scree test and $\lambda \leq 0.6$ criteria are accepted, either rotated solution will satisfy it. When factor solutions are rotated the amount of variance explained by each factor tends to even out, so that factors that explained only a small amount in the unrotated solution explain more in the rotated solution and vice versa for the factors that were larger in the unrotated solution. It would be helpful to analysts if every statistical programme for factor analytic techniques recalculated the eigenvalues and percentages of variance for each rotated solution.

The overall results of the principal component analyses provide an initial validation of most of the separate attitudinal constructs that have been postulated by Fishbein. They also show that the other variables that were intended to be measured in this study are quite independent of each other and of the attitudinal and normative components derived from Fishbein's work.

Over the four data sets there are only two results that differ from the hypothesised solution. One, which has no serious implications, is that in all solutions for the learning group the estimate of performance factor was found to include some of the variance from the easy-difficult scales of the attitudes toward the behavior and attitudes toward the object factors. For the non-group the estimate of performance item actually loaded with the attitudinal factors.

The other finding which was different from that hypothesised concerned the subjective norms and the motivation to comply with them. The learning group seem not to distinguish between these two components, but rather distinguish the referents of these norms. There is one ready explanation for this -- there was large disagreement between what staff and senior students recommended and what student peers recommended. Obviously, staff and senior students would have recommended that the student should learn statistics, while many of the students felt that it was a waste of time and was unnecessary. It is noteworthy that at the final posttest these students clearly distinguished peer group norms, but had the meaning of subjective norms referenced to experienced people mixed in with the component concerning the motivation to comply with these norms. These results mean that the single-factoredness hypothesis for subjective norms and the motivation to comply with them cannot be rejected. Thus it seems that they are alternative measures of a common construct -- possibly people do not see norms as

governing behavior unless they are ready to comply to them. This contributes to support for the decision by Fishbein and his associates to drop motivation to comply from his model. The problem with subjective norms means that further exploratory analysis (reported in Chapter Four) was necessary to ascertain whether subjective norms or social normative beliefs should be used in the remainder of this report.

Overall, the principal component analyses have shown that most of the measured potential predictors of behavioral intentions have construct validity and factorial independence. The only exceptions were that social normative beliefs and the motivation to comply were confounded, and the estimate of performance was related to the difficulty items from the two attitudinal components.

Solutions when behavioral intentions were included

Results. The eigenvectors and the percentage of variance explained by each principal component when the item for behavioral intentions was included are shown in Table 3.6. For the non-group the scree test again gave eight factors, and this time they were all acceptable within the other criteria of an eignevalue $\geq .60$. This solution accounted for 84.5% of the total variance. For the pretest, the scree test gave a clear cut-off at eight factors, the same number as in the previous solution. This solution accounted for 83.2% of the total variance. For the immediate

Table 3.6

Eigen-values, percent of variance, and cut-off points for the number of factors for the four sets of data when the behavioral intentions item is included

FACTOR	NON-GROUP			PRETEST			IMMEDIATE POSTTEST			FINAL POSTTEST		
	EIGEN VALUE	% OF VAR.	CUM PCT	EIGEN VALUE	% OF VAR.	CUM PCT	EIGEN VALUE	% OF VAR.	CUM PCT	EIGEN VALUE	% OF VAR.	CUM PCT
1	7.91327	44.0	44.0	5.87978	32.7	32.7	5.86681	32.6	32.6	6.29409	35.0	35.0
2	1.71272	9.5	53.5	2.71101	15.1	47.7	2.54196	14.1	46.7	3.06179	17.0	52.0
3	1.40036	7.8	61.3	1.60777	8.9	56.7	1.47925	8.2	54.9	1.44211	8.0	60.0
4	1.04637	5.8	67.1	1.20072	6.7	63.3	1.40620	7.8	62.7	1.17395	6.5	66.5
5	0.99857	5.5	72.6	1.03391	5.7	69.1	1.12364	6.2	69.0	0.92116	5.1	71.6
6	0.86918	4.9	77.6	0.98070	5.4	74.5	0.89024	4.9	73.9	0.81553	4.5	76.2
7	0.64734	3.6	81.2	0.80761	4.5	79.0	0.82991	4.6	78.5	0.78540	4.4	80.5
8	0.58799	3.3	84.5	0.75037	4.2	83.2	0.69946	3.9	82.4	0.65070	3.6	84.1
9	0.50758	2.8	87.2	0.54010	3.0	86.2	0.68474	3.8	86.2	0.54031	3.0	87.1
10	0.37471	2.1	89.3	0.45941	2.6	88.7	0.54552	3.0	89.3	0.45897	2.5	89.7
11	0.35784	2.0	91.3	0.42904	2.4	91.1	0.37701	2.1	91.4	0.35672	2.0	91.7
12	0.32496	1.8	93.1	0.33150	1.8	93.0	0.34764	1.9	93.3	0.31670	1.8	93.4
13	0.30109	1.7	94.8	0.31220	1.7	94.7	0.32014	1.8	95.1	0.27240	1.5	94.9
14	0.29027	1.6	96.4	0.24960	1.4	96.1	0.23113	1.3	96.4	0.23249	1.3	96.2
15	0.23763	1.3	97.7	0.21159	1.2	97.3	0.19958	1.1	97.5	0.21728	1.2	97.4
16	0.16499	0.9	98.6	0.19703	1.1	98.3	0.17665	1.0	98.4	0.17404	1.0	98.4
17	0.14373	0.8	99.4	0.16893	0.9	99.3	0.16365	0.9	99.4	0.15280	0.8	99.3
18	0.10138	0.6	100.0	0.12873	0.7	100.0	0.11646	0.6	100.0	0.13356	0.7	100.0

Note. Leading decimal points have been omitted

and final posttests the same number of factors were clearly extracted by the same test criteria as for the solutions reported in the previous section. Nine factors accounted for 86.2% of the total variance for the immediate posttest, and eight factors accounted for 84.1% of the total variance for the final posttest.

The pattern of results for the varimax and oblique solutions are rather similar and lead to the same conclusions, so only the oblique solutions are presented. The factor loadings for the oblique solutions are presented in Table 3.7, where all loadings for the behavioral intentions item are shown, whether or not they are significant. For all the other items and components, the solutions are practically the same as those reported in the previous section for when the behavioral intentions item was not included. Therefore, the main interest in this section is in the pattern of the distribution of variance in behavioral intentions.

For the non-group, the behavioral intentions item loaded mostly on its own. It is recorded under the column for the estimate of performance factor, but just as in the previously reported solution, the item for this factor loaded heavily on the attitudes toward the behavior factor. For the remaining conditions, the behavioral intentions item loaded on several factors, not being restricted to any one particular factor. For the pretest, it loaded with subjective norms, personal normative beliefs, commit-

Table 3.7

Oblique component loadings for all groups when the behavioral intentions item was included

FACTOR	ITEM	Time	A_B 0	A_B 1	A_B 2	A_B 3	SN 0	SN 1	SN 2	SN 3	Mc 0	Mc 1	Mc 2	Mc 3	NBr 0	NBr 1	NBr 2	NBr 3	Aobj 0	Aobj 1	Aobj 2	Aobj 3	CCM 0	CCM 1	CCM 2	CCM 3	EST 0	EST 1	EST 2	EST 3	BIP 0	BIP 1	BIP 2	BIP 3
A_B	1		-22	-84	-79	-76																												
	2		72	76	96	88																												
	3		-73	-68	-94	-77																												
	4		67	23	11	26																				42		-72	69	54				
SN	5						-63		-95	-93								-56																
	6						89	-85	(-91)[a]																									
Mc	5a								39	31	85	-90	-75	66																				
	6a							54			-92	46	90	-65																				
NBp	7														90	88	93	-85																
	8														-61	-75	-92	86																
Aobj	9																		81	-87	-83	-82												
	10																		-79	85	85	86												
	11																		88	-87	-91	-96												
	12																		-70	57	65	63				-35	-34	49						
CCM	13																						82	89	-94	86								
EST	14		-55																								-34	90	-91	-88				
BIP	15																														97	98	-95	95
BI			10	05	-09	03	12	-53	08 (03)[a]	58	03	14	22	24	09	-42	11	-25	-02	-09	01	13	-09	37	-32	04	90	-24	-44	-31	-09	-11	-32	24

Notes. 1. Leading decimal points have been omitted

2. The bracketed item formed an additional separate factor.

ment to the act, and to a lesser extent with the estimate of performance. At the immediate posttest, it loaded with the estimate of performance, future intentions in psychology, commitment, and to a lesser extent the motivation to comply. At the final posttest, it loaded with subjective norms, the estimate of performance, and to a lesser extent personal normative beliefs, future intentions in psychology, and the motivation to comply.

Discussion. For all four data sets the factor solutions extracted again accounted for more than 80% of the total variance. The overall results for the items included in the previous analyses were replicated. Only in one case (for the non-group) did behavioral intentions form a separate factor almost on its own -- indicating an almost total factorial independence from its predictors. In the other cases, behavioral intentions loaded on several factors at once, which was the second expectation outlined at the beginning of this Chapter. It is reasonable that components of variance in a criterion variable that relate to its prediction should load on the factors that represent those predictors.

Over all these solutions, there is no way that it could be concluded that behavioral intentions is single-factored with any other variable. This provides further evidence that personal normative beliefs is not simply an alternative measure of behavioral intentions. The decision by

Fishbein and his associates to drop personal normative beliefs from the model on these grounds is, therefore, unsound.

The problem of normality

As with all attitude measurement data, many of the items had skewed distributions. Skewness induces biases in correlation coefficients, and therefore might effect principal component analysis results, in that extreme cases have inordinate effects on the correlation, just as they do on the mean. This problem is not normally dealt with in reported attitude measurement research, although factor analytic methods are often used. One reason for this may be that the correlation coefficient is robust under conditions of moderate skew; that is, it might only be severe skew that induces significant bias, such as in biographic data like income where most people will fall within a limited range but one or two cases might be in a range many times that of the 'normal' range. In attitude data, however, there is usually a limited scale, so that the level of skewness would typically be less than one.

To check on the effects of skewness on principal component results, skewness was calculated for all items. Then those items with a skewness significantly different from zero at the .05 level (Snedecor and Cockran, 1967) were subjected to recoding or to transformations to

normality [$\sqrt{x} + \sqrt{(x + 1)}$ or x^2]. The resulting scores were then subjected to principal component analysis, and the results compared with those reported in the previous section. The conclusions from these analyses are clear so it is sufficient to present only the oblique solutions for the learning group.

Results. The mean magnitude of skewness across every item for the three administrations to the learning group was 0.37, and ten items were significantly skewed for more than one of the administrations. These skewed items were recoded or transformed, and the resulting scores entered into the principal component analyses for which the eigenvalues and solutions are shown in Tables 3.8 and 3.9. The eignevalues gave a clearer scree test for the pretest and immediate posttest but a less clear cutoff for the final posttest, and the same number of factors were determined as for the raw data. When the solutions are compared with those in Tables 3.3, 3.4, 3.5, and 3.7 it can be seen that they are of exactly the same pattern. The only apparent difference is for items 6a and 8 loading on the attitudes toward the behavior factor at the final posttest. However, these items loaded on this factor with loadings of -.25 and .20 respectively for the raw data so there is no significant difference.

Table 3.8

Eigen-values, percent of variance, and cut-off points for the number of factors for the transformed data for the three administrations to the learning group

FACTOR	PRETEST			IMMEDIATE POSTTEST			FINAL POSTTEST		
	EIGEN VALUE	% OF VAR	CUM PCT	EIGEN VALUE	% OF VAR	CUM PCT	EIGEN VALUE	% OF VAR	CUM PCT
1	5.49	32.3	32.3	5.36	31.5	31.5	5.67	33.3	33.3
2	2.56	15.1	47.4	2.52	14.8	46.4	3.01	17.7	51.1
3	1.59	9.4	56.7	1.48	8.7	55.1	1.38	8.1	59.2
4	1.27	7.5	64.2	1.26	7.4	62.4	1.25	7.4	66.6
5	0.97	5.7	69.9	1.16	6.8	69.2	0.92	5.4	72.0
6	0.87	5.1	75.1	0.91	5.4	74.6	0.84	4.9	76.9
7	0.78	4.6	79.7	0.80	4.7	79.4	0.68	4.0	80.9
8	0.75	4.4	84.1	0.75	4.4	83.8	0.63	3.7	84.6
9	0.52	3.1	87.2	0.69	4.1	87.9	0.56	3.3	87.9
10	0.45	2.7	89.8	0.41	2.4	90.3	0.44	2.6	90.5
11	0.40	2.4	92.2	0.38	2.3	92.6	0.33	2.0	92.5
12	0.33	1.9	94.1	0.31	1.9	94.4	0.30	1.8	94.3
13	0.31	1.8	96.0	0.25	1.5	95.9	0.28	1.7	95.9
14	0.20	1.2	97.2	0.21	1.3	97.2	0.21	1.2	97.1
15	0.19	1.1	98.3	0.19	1.1	98.3	0.18	1.1	98.2
16	0.15	0.9	99.2	0.16	0.9	99.2	0.16	1.0	99.2
17	0.14	0.8	100.0	0.13	0.8	100.0	0.14	0.8	100.0

Note. Leading decimal points have been omitted

Table 3.9

Oblique principal component loadings on transformed data for the three administrations to the learning group

FACTOR	Time / Item	A_B			SN			Mc			NBp			Aobj			COM			EST			BIP		
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
	1	-82	-85	-71																					
A_B	2	76	94	89																					
	3	-73	-91	-64																					
	4	26	08	16															37	-67	77	-62			37
SN	5				-31	97	-01	60		-69			-37													
	6				84	95	97																		
	5a					-37		-93	-74	72															
	6a			-39	-67			34	91	-68															
	7										-74	-85	-81												
NBp	8			31							90	88	79												
	9													-83	80	84									
	10													83	-85	-83									
Aobj	11													-89	87	93									
	12													62	-59	-66				46	-39				
COM	13																-98	92	90						
EST	14																			85	-92	90			
BIP	15																						99	-98	-93

Notes. 1. Leading decimal points have been omitted

2. Times 1, 2, and 3 ref. respectively to the pretest, immediate posttest, and final posttest.

Discussion. It is evident that the amount of skew in this data has no significant effect on the structural space of these variables nor on any single factor loading. Therefore, the raw data will be used in all other analyses, so keeping interpretation easy.

Conclusion

The results presented in this chapter have demonstrated the stability of the data base as well as the construct validity and factorial independence of the attitude components of Fishbein's model and the other variables measured. How the mean scores on these variables and the relationships between them vary across the two groups of students and across different conditions will be examined in the next chapter.

CHAPTER FOUR

COMPARISONS ACROSS CONDITIONS

Mean Scores

Fishbein expects that the weights assigned to the components of his model will "... vary with the kind of behavior that is being predicted, with the conditions under which the behavior is to be performed, and with the person who is to perform the behavior" (Fishbein and Ajzen, 1975, p. 303). It also seems likely that mean scores on the components of attitude, both attitudinal and normative, will vary under those different conditions, and also with the conditions under which the attitudes are assessed. Considering the two groups of subjects in this study, it was hypothesised that the non-group would have less favourable attitudes toward statistics and learning statistics than the learning group would. For the learning group it was hypothesised that mean scores on many of the components would be more favourable at the pretest than at the post-tests. The two normative components (SN and NBp), however, were hypothesised to show a change towards more favourable attitudes. This should result from the presentation of normative messages during statistics and psychology classes advocating how necessary statistics is for psychology. It

was also hypothesised that attitudes toward the object (Aobj) would show no differences between groups and no change over time. Such a finding would support Fishbein's contention that attitudes toward the object is not a useful measure if interest is in future behavior, and it makes good sense in that our measure of Aobj refers to past experiences. Given that attitudes toward the object refer to past experience, changes in it would suggest test-retest unreliability of the attitude measures.

Analysis. For this analysis and all future analyses the scale score is simply the mean of those items that make up the scale being considered. Such a score had the advantage of allowing the comparisons across groups and times which are the subject of this chapter. To test the difference between the non-group and the pretest for the learning group, t-tests were calculated for each of the measured variables. One-way analyses of variance were calculated to test the differences across time for the learning group.

Results. The means and standard deviations for all measured variables are shown in Table 4.1. The results of the analyses of variance are shown in Table 4.2. The means, with significant differences indicated, are graphed for easier visual comparison in Figure 4.1. There were

Table 4.1

Means and standard deviations on each component for the four sets of data .

Component	A_B		SN		NB_s		Mc		NBp		Aobj		COM		EST		BIP		BI	
Condition	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
Non group	-.36	1.50	.30	1.43	-.06	1.50	.31	1.34	.26	1.37	-.02	1.55	.40	1.76	-.56	1.71	-.47	1.84	-.96	2.11
Pretest	.46**	1.15	1.00**	1.23	.55	.92	.32	1.36	1.12	1.21	.28	1.38	1.68**	1.25	.28	1.27	.41**	1.65	-.48	2.02
Immediate Posttest	-.15**	1.37	.56**	1.06	.37	.73	.16	1.35	1.40	1.31	.31	1.38	1.15	1.65	-.09	1.55	-.20	1.74	-.79	2.02
Final Posttest	.07	1.27	.72	1.17	.47	.76	.26	.69	1.30	1.33	.21	1.43	1.21	1.63	.08	1.28	-.40**	1.88	-.84	1.95

** indicates Duncan's new multiple range test results for the learning group only. The value for the time so indicated is significantly different from the values for the other two times at the .01 level. See Table 4.2 for the ANOVA results.

Table 4.2

Analysis of variance results for eight variables across three times for the learning group

Variable	Source	SS	DF	MS	F	P
BI	Time	6.17	2	3.08	0.77	.5
	Error	1247.68	312	4.00		
	Total	1253.85	314	3.99		
A_B	Time	19.78	2	9.89	6.18	.002
	Error	499.00	312	1.60		
	Total	518.78	314	1.65		
SN	Time	10.20	2	5.10	3.83	.02
	Error	415.46	312	1.33		
	Total	425.66	314	1.36		
NB_S	Time	1.97	2	.98	1.53	.22
	Error	220.66	312	.65		
	Total	222.63	314	.65		
Mc	Time	1.53	2	.76	.44	.64
	Error	593.47	312	1.74		
	Total	594.99	314	1.73		
NB_P	Time	4.08	2	2.04	1.20	.3
	Error	531.42	312	1.70		
	Total	535.50	314	1.71		
Aobj	Time	0.55	2	.28	.14	.9
	Error	606.51	312	1.94		
	Total	607.06	314	1.93		
COM	Time	17.42	2	8.71	3.75	.02
	Error	722.47	312	2.32		
	Total	739.89	314	2.36		
EST	Time	7.08	2	3.54	1.88	.1
	Error	586.43	312	1.88		
	Total	593.51	314	1.89		
BIP	Time	37.11	2	18.56	6.01	.003
	Error	962.74	312	3.09		
	Total	999.85	314	3.18		

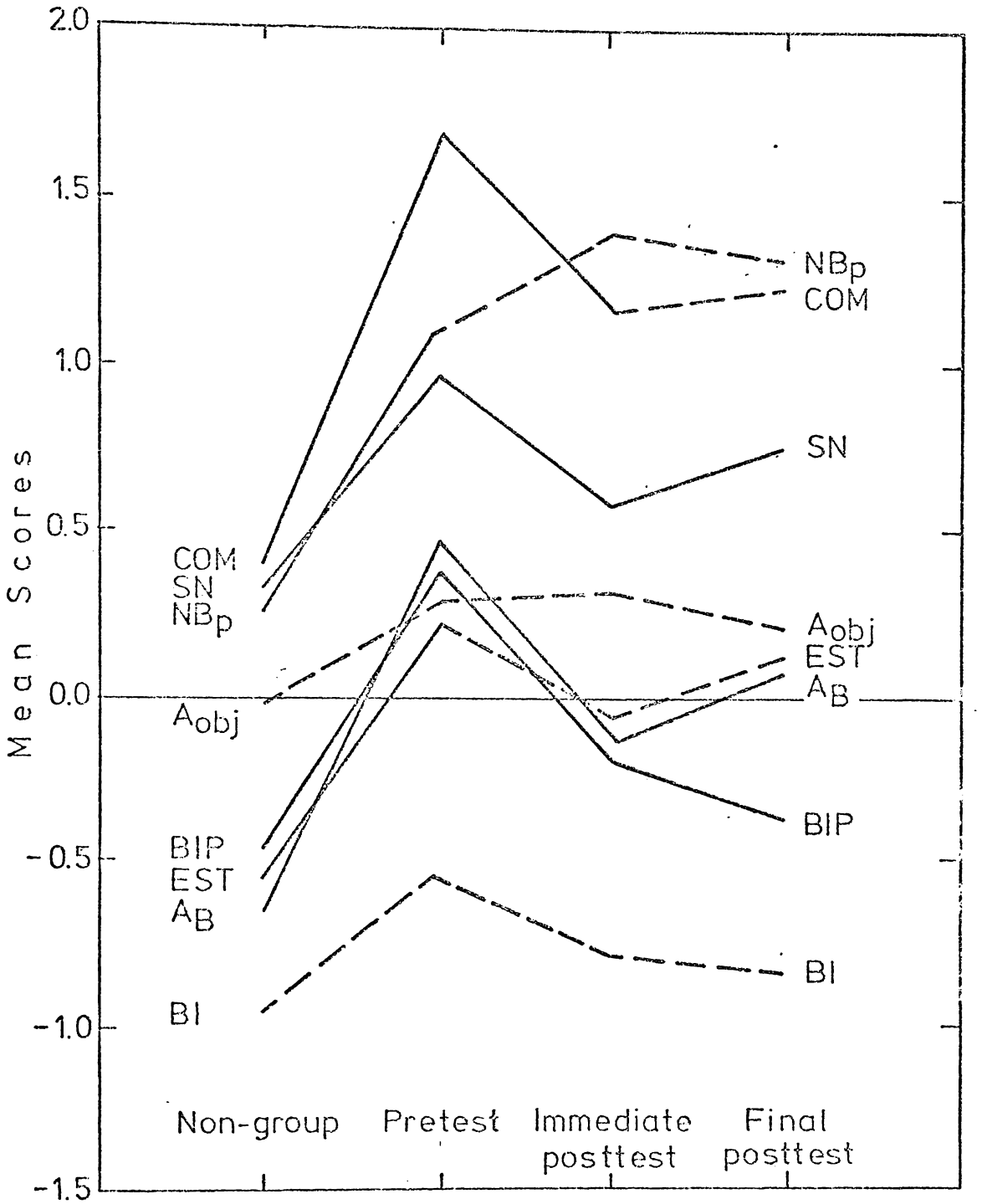


FIGURE 4.1 Means on measured components for the non-group and each of the three times for the learning group. (Significant differences are shown by solid lines, and nonsignificant ones by dashed lines.)

no significant differences between the non-group and the pretest for the learning group on behavioral intentions, attitudes toward the object, and motivation to comply but significant differences on all other variables. Over time, for the learning group, behavioral intentions and attitudes toward the object still showed no significant changes, and neither did social normative belief, motivation to comply, personal normative beliefs, or the estimate of performance. Attitudes toward the behavior, subjective norms, future intentions in psychology and commitment to doing well in statistics all showed similar patterns of change, becoming less favourable between the pretest and the immediate posttest, with no significant change between the immediate and final posttests. Scores on commitment, personal normative beliefs, and subjective norms were very high at the pretest, but commitment and subjective norms showed significant decreases by the immediate posttest.

Discussion. It is convenient to discuss these results considering all four measurement periods at once and referring to Table 4.1 and Figure 4.1.

As hypothesised there were large differences between the two groups of subjects, with the learning group showing more favourable attitudes on most variables. That is, attitudes toward the behavior, subjective norms, social

normative beliefs, personal normative beliefs, commitment to the behavior, an estimate of performance in the behavior, and intentions in a related area of behavior were all more favourable for the learning group than for the non-group. It is difficult to say whether these more favourable attitudes are due to an attribution process -- "I am here to learn statistics, therefore it must be good" -- or whether attitudes contributed to the decision to learn statistics. The greater favourability tended to decrease between the pretest and immediate posttest, however, so that there were no longer any significant differences between the two groups. This could be expected and might be due to the difficulty of the statistics course, though this was not reflected in the estimate of performance. It might be due to a general disillusionment with psychology as indicated by a decrease in the likelihood of majoring in psychology (BIP).

There were no significant differences on the measure of behavioral intentions, either between groups or across time for the learning group. This is partly due to the low score on all occasions and to the large standard deviations on this measure, but is unexpected and seems strange when compared with the large differences on the measures of attitudes toward the behavior and subjective norms which are meant to predict behavioral intentions. How can

attitudes toward the behavior and subjective norms be good predictors of behavioral intentions when they show significant differences between groups while behavioral intentions do not? This suggests that a prediction equation might be valid only for a particular group on a particular occasion, thus supporting Fishbein's suggestions of differential weights. Attitudes toward the object showed no differences between groups or across time, and this supports Fishbein's contention that this measure of attitude, while commonly used, is not a good one for reflecting changes. It also indicates some measure of reliability for the attitude scale used. It shows that one of the commonly accepted definitions of attitude -- namely, that it is a "stable predisposition" or a "consistency in responding" -- is valid when a "generalised" measure of attitude is considered. When more "specific" measures are considered, however, then the above definition is not valid as is shown by the changes across time for the other components of attitude.

Correlations between variables

If the weights assigned to the components of Fishbein's model are expected to vary with conditions, then this implies that the correlations of the predictors among themselves and of them with behavioral intentions will vary with

conditions. Variations in the relationships between all the variables measured for this study are examined in this section.

It was hypothesised that there would be changes in the correlations of variables with one another and with behavioral intentions across conditions. The only specific prediction made was that normative components would become more closely related to behavioral intentions over time. This follows from the presence of normative messages during the statistics classes that these students attended.

Results. The correlations between all measured variables are shown in Table 4.3. The correlations between attitudes toward the behavior, attitudes toward the object, and personal normative beliefs, of attitudes toward the object with commitment, and of the estimate of performance with attitudes toward the behavior, subjective norms, personal normative beliefs and attitudes toward the object were all significantly higher for the non-group than they were at certain times for the learning group. For the learning group the relationships between the predictors were relatively stable across time.

The correlations of all predictors with behavioral intentions are shown in the right-hand colum of Table 4.3

Table 4.3

Correlations of all measured variables with each other and with behavioral intention

Component	Condition	SN	NB_a	Mc	NB_p	A_{obj}	COM	EST	BIP	BI
A_B	non-group	48	22	16	61*	75*	43	80*	12	52
	pretest	27	19	10	32	65	22	56	-02	39
	immediate posttest	45	20	36*	37	47	31	58	-01	49
	final posttest	40	17	07	48	50	27	55	22	45
SN	non-group		36	16	54	42	26	40*	16	43
	pretest		68*	55	59	25	26	10	04	41
	immediate posttest		54	46	37	30	29	27	04	30
	final posttest		30	11*	54	18	30	23	36	62*
NB_a	non group			05*	17	25	24	14	05	20
	pretest			72	41	12	30	-07	11	33
	immediate posttest			52	38	12	21	07	11	26
	final posttest			59	14*	10	04	07	29	15
Mc	non group				-04*	18	-04	06	-08	10
	pretest				32	-01	13	-13	-05	23
	immediate posttest				31	15	20	16	-05	26
	final posttest				18	13	-10	04	20	01
NB_p	non group					63*	45	57*	15	39
	pretest					33	33	19	18	42
	immediate posttest					26	30	27	01	36
	final posttest					23	30	28	12	42
A_{obj}	non group						42*	71*	12	43
	pretest						18	52	-10	42
	immediate posttest						15	50	-08	33
	final posttest						-13*	51	01	45
COM	non group							37	19	22
	pre test							25	15	12
	immediate posttest							19	13	36*
	final posttest							15	19	14
EST	non group								23	57*
	pretest								-09	33
	immediate posttest								-11	40
	final posttest								17*	46
BIP	non group									35*
	pretest									15
	immediate posttest									20
	final posttest									40*

Notes. 1. Leading decimal points have been omitted

2. Correlations must reach .30 to be significant at the .05 level and .36 for the .01 level

3. An * indicates those cells where there are significantly different correlations. If it is at the top it is the non group which is different from one or more of the other tests; otherwise it indicates that one of the measures is different from one or more of the other two measures for the learning group. The difference between two correlations has to be of the order of .30 for the difference to be significant at the .05 level (t-test, Guilford, 1965, p. 190).

There were two cases where the correlation between a variable and behavioral intentions for the non-group was higher than for the learning group -- the estimate of performance, and future intentions in psychology. There were three cases where there was a significant change in the relationship between a variable and behavioral intentions over time for the learning group -- subjective norms became more closely related at the final posttest, commitment was more closely related at the immediate posttest than at the pretest or final posttest, and future intentions in psychology became more closely related over time.

Discussion. Clearly attitudes toward the behavior, attitudes toward the object, and personal normative beliefs were more closely related to each other for the non-group than they were for the learning group. Attitudes toward the behavior, subjective norms, attitudes toward the object, and personal normative beliefs were also more closely related to the estimate of performance in statistics for the non-group, which in turn was more closely related to behavioral intentions. This suggests the possibility that the estimate of performance might be an important predictor of behavioral intentions for this group. It also suggests that students who are not learning statistics at the time of

measurement of the attitude components do not make clear conceptual distinctions between these variables.

The correlations between attitudes toward the behavior, personal normative beliefs and behavioral intentions, together with their differential patterns of change discussed earlier in this chapter, indicate that while these variables may be related to each other they are certainly not the same thing. If it was to be claimed that personal normative beliefs was simply another measure of behavioral intentions one would also have to claim that attitudes toward the behavior, subjective norms, personal normative beliefs and attitudes toward the object are all equivalent measures of behavioral intentions. These results suggest, therefore, that the decision by Fishbein and his associates to drop personal normative beliefs from the model because they regarded it as simply an alternative measure of behavioral intentions was an unsound one.

Among the five significant differences in the relationships of the attitude components with behavioral intentions, the much higher correlations of subjective norms at the final posttest was most clear. This is support for the hypothesis that norms would become more important in the prediction of behavioral intentions after the experience of learning statistics in classes where normative messages were also

given. It makes good sense that students making decisions about their future should consider what their staff and more experienced students advise, and this advice should be reflected in subjective norms. Personal normative beliefs showed no such pattern, however, and this finding appears to support Fishbein's claim that subjective norms might be better indications of behavioral intentions than personal normative beliefs.

SN or NBs?

Results from previous studies have shown that multiplying social norms by the motivation to comply with them does not improve the contribution made by this component to the prediction of behavioral intentions. The correlation of Mc and NBs (= SN x Mc) with all other variables measured for this study were included in Table 4.3 There it can be seen that both these variables did not correlate as highly with behavioral intentions as SN did.

These results, together with the single-factoredness of subjective norms and the motivation to comply, support the decision made by Fishbein and his associates to drop motivation to comply from his model -- accordingly Mc and NBs will not be considered further in this study.

Intercorrelations over time.

The statement that the best prediction of future performance is given by past performance (Bertrand Russell, 1945) appears to make good sense, and is often assumed to be true. However, the truth or validity of this statement has rarely been tested (Super, 1969), because few researchers have bothered to collect data on enough variables over more than one occasion. The present data base, for which data on eight variables was collected on three different occasions represents a good opportunity to examine this question.

With regard to Fishbein's model, it is useful to consider the reliability of the measures used. For example, the relationships between behavioral intention at the final posttest and behavioral intentions at the immediate posttest and pretest need to be considered. This can be similarly done for each of the other measured variables.

Also useful would be to examine whether or not the best predictors of behavioral intentions at the final posttest are other variables measured at the final posttest, or whether variables measured at other times are better predictors.

In general, it was hypothesised: a) that a measure of a variable at one time would be best predicted by a

measure of that same variable on a previous occasion; and b) that the best predictors of behavioral intention at one time would be a previous measure of behavioral intention, together with other variables measured at the same time as the intention being predicted. To test these hypotheses the correlations between all variables over the three times will be considered.

Results and discussion. The correlations between all eight variables over three times are presented in Table 4 4. It is noted that the values in the diagonal of each cell are somewhat redundant as they have already been reported and discussed.

This correlation matrix is similar to a "multitrait-multimethod" matrix (Campbell and Fiske, 1959) -- perhaps it could be called a "multitrait-multimeasure" matrix. Just as in the multitrait-multimethod matrix, the values in the main diagonal cells should be consistently larger than any other entries -- that is exactly what hypothesis (a) suggests. In general, this was the case. The best results were for attitudes toward the object, for which the intercorrelations average .82 and were consistently higher than any others in the Aobj columns or rows.

Correlations in the diagonal cell for other variables were also generally consistently higher than values anywhere

Table 4.4

Correlations between eight variables measured on three occasions

Variable[a]	BI_2	BI_3	A_{B1}	A_{B2}	A_{B3}	$AObj_1$	$AObj_2$	$AObj_3$	SN_1	SN_2	SN_3	NBp_1	NBp_2	NBp_3	EST_1	EST_2	EST_3	BIP_1	BIP_2	BIP_3	COM_1	COM_2	COM_3
BI_1	67	53	39	41	37	42	39	36	41	29	28		38	25	33	29	34	15	25	19	01	26	14
BI_2		55	34	49	49	36	33	32	35	30	38	33	36	34	21	40	46	07	20	22	03	36	02
BI_3			34	41	45	42	43	45	41	38	62	45	33	42	10	30	46	21	33	40	06	31	14
AB_1				49	52	65	64	66	27	26	11	32	35	15	56	46	49	02	07	18	22	07	-08
AB_2					76	42	47	45	35	45	33	27	37	43	25	58	47	-12	-01	11	09	31	07
AB_3						40	39	50	30	49	40	26	46	48	29	54	55	-07	04	23	21	27	27
$AObj_1$							83	82	25	20	12	33	24	16	52	44	48	-10	01	05	18	05	-23
$AObj_2$								84	20	30	14	27	26	19	46	50	48	-18	-08	-11	22	15	-11
$AObj_3$									18	25	18	29	32	23	53	46	51	-17	-06	01	20	03	-13
SN_1										39	47	59	30	43	10	17	26	04	03	10	26	19	04
SN_2											50	25	37	42	13	27	32	00	04	07	21	29	22
SN_3												29	38	54	-08	07	23	18	22	36	-02	22	30
NBp_1													42	42	19	23	20	18	21	22	33	10	-02
NBp_2														69	14	27	25	09	01	13	21	30	26
NBp_3															02	27	28	-06	06	12	22	27	30
EST_1																62	40	-09	-06	-05	25	-06	-21
EST_2																	56	-16	-11	-01	19	19	-04
EST_3																		01	05	17	25	23	15
BIP_1																			60	67	15	17	16
BIP_2																				64	01	13	15
BIP_3																					08	15	19
COM_1																						27	34
COM_2																							44

Note. Leading decimal points have been omitted

[a]Variable labels are the same as those used so far with the addition of a subscript to denote the time of measurement: 1 = Pretest, 2 = Immediate posttest, 3 = final posttest

else in the columns or rows for that variable. One exception was that attitudes toward the behavior at the pretest were more highly related to attitudes toward the object than to other measures of attitudes toward the behavior. This appears to be reasonable in that attitudes toward the behavior before the behavior had ever been experienced are likely to be influenced by attitudes toward the object which has been experienced. At later times the behavior had been experienced so that the later measures of attitudes toward the behavior were more highly related to one another. In a similar manner, subjective social norms at the pretest were more highly related to personal normative beliefs than to other measures of subjective norms. This is also reasonable in that normative beliefs would not have been well formed at the pretest because of the lack of exposure to, and experience with, the issue.

For the measure of commitment to the act of learning statistics, the intercorrelations were relatively low, but they were still higher than any other values in their columns or rows.

Within each cell, consistency among the correlations would indicate a stability in the structural space occupied by the variables, while inconsistency would indicate

instability or change. The results in Table 4.4 simply add further to the evidence already presented to show that there are some relationships that change over time and some that remain stable. For example, attitudes toward the object maintained a stable relationship with all other variables except commitment to the act. Commitment to the act was slightly positively related to attitudes toward the object at the pretest and immediate posttest but slightly negatively related at the final posttest. These results make sense in that it is reasonable to expect commitment to learning statistics to be related to how one felt about mathematical topics, but for this relationship to disappear or be reversed as the subject had experience with statistics and related it to psychology and social science research rather than just to mathematics.

In a similar way subjective (social) norms were related to further intentions in psychology at the final posttest but not at the other times. It is reasonable that the social norms (or advice), particularly of senior students and staff, should be more important after some exposure to the issues, behaviors, and people concerned.

Hypothesis (b) was more directly related to Fishbein's model, in that the relationship between behavioral intentions and attitudinal variables was considered. The results in Table 4.4 provide support for the hypothesis, in that

previous measures of behavioral intentions, and subjective norms as measured at the final posttest, were the variables that correlated most highly with behavioral intentions at the final posttest. The next highest correlations were with attitudes toward the behavior, attitudes toward the object and the estimate of performance in statistics, all as measured at the final posttest. Similarly, for behavioral intentions at the immediate posttest, the highest correlate was behavioral intentions at the pretest, followed by attitudes toward the behavior as measured at the immediate or final posttests.

In sum, both hypotheses (a) and(b) were largely supported. That is, in general the measures used were found to be reliable over time; a measure of a variable was found to relate more closely to other measures of that variable than to other variables; and behavioral intentions at one time were found to be more closely related to intentions on previous occasions, and attitudinal and normative variables at the same time, than to other variables measured at other times.

Conclusions

The results of this chapter have shown that the four conditions being studied are discriminated by their scores on some of the measured variables and the relationships between variables. As hypothesised, the non-group had more favourable attitudes than the learning group at the pretest, though most of this difference had disappeared by the final posttest. It is of interest that while most of the attitude variables showed these differences, behavioral intentions did not do so. This means that any particular sample of people under a particular condition represents an attenuated sample on most variables, and this probably contributes to different weights being assigned to components in a multiple regression equation.

There were a few differences in the relationships between variables according to conditions, and this must lead to differential weights being assigned in the prediction equation. Subjective norms became more closely related to behavioral intentions at the final posttest as was hypothesised, showing that the relative weights can sometimes be predicted.

Motivation to comply was found to not improve the relationship between social norms and behavioral intentions,

so supporting the decision by Fishbein and his associates to drop it from the model. Personal normative beliefs, however, were closely related to behavioral intentions, but no more so than attitudes toward the behavior, subjective norms, and attitudes toward the object, so suggesting that the decision by Fishbein and his associates to drop this component from the model was unsound.

The intercorrelations of all measured variables over time provided further evidence that the measures used were reliable, and that a variable measured at one point in time was usually most closely related to a previous measure of that same variable than to any other variables. More specifically, behavioral intentions at one point in time were found to be most closely related to an earlier measure of behavioral intentions, and to predictor variables measured at the same time as the behavioral intentions being predicted, than to any other measures.

CHAPTER FIVE

TESTS OF THE MODEL

The basic model

It has already been discussed why tests of necessity of the components of Fishbein's model are meaningless. To reiterate, allowing the weights assigned to the components to vary with conditions implicitly allows for one of them to be zero or non-significant in some situations. However, it is still of theoretical interest to establish the conditions under which this occurs. More generally, in future it may be of interest to establish what the weights are under different conditions. Therefore, conditions where weights reduce to zero, that is, conditions where one of the components is found to be unnecessary in the prediction of behavioral intentions, should be examined.

It was expected that attitudes toward the behavior, rather than subjective norms, would be of importance in predicting future behavioral intentions when the subject was already engaged in the behavior concerned. To be more specific, it was hypothesised that the weight assigned to the subjective norms component would be non-significant at the immediate posttest. On the other hand, at a point in time where a subject has had experience with the behavior, but is not currently experiencing it, and where he has to make a decision

of whether or not to engage in the behavior again in the future, it is likely that subjective norms will be of greater importance than attitudes toward the behavior. Attitudes toward the behavior might still have some influence, but the major effect will come from whether or not important others think he should engage in the behavior. This is especially likely to be the case when the behavior is one of importance to the subject's future. To be specific, then, it was hypothesised that at the final posttest subjective norms would be assigned a larger weight than attitudes toward the behavior.

No predictions were made about the relative weights assigned to the components at the pretest and for the non-group.

Results. Results of the multiple regression analyses when only attitudes toward the behavior and subjective norms were entered into the model are shown in Table 5.1. The proportion of variance in behavioral intentions explained by the model was between 25% and 43%, more variance being explained at the final posttest. The weights assigned to attitudes toward the behavior and subjective norms for the pretest were almost equal as expected, but for the non-group attitudes toward the behavior received a bigger weight. As expected, attitudes toward the behavior received a larger weight and subjective norms a non-significant one at the immediate posttest, while at the final posttest subjective norms received the larger weight.

Table 5.1

Multiple regression results for predicting behavioral intentions from attitudes toward the act and subjective norms

	Model	Beta-weight	F for Beta	Multiple R	R^2	F for Model
Non-group	A_B	41	14.82			
	SN	24	4.10	56	31	18.4
Pretest	A_B	30	11.54			
	SN	33	13.54	50	25	17.2
Immediate posttest	A_B	45	21.52			
	SN	10	1.08	50	25	16.9
Final Posttest	A_B	24	8.54			
	SN	52	40.37	65	43	38.2

Notes. 1. Leading decimal points have been omitted

2. F values need to be 3.96 for the non-group and 3.94 for the learning group to be significant at the .05 level.

Discussion These results support each of the hypotheses outlined above, and show that relative weights under some conditions can be predicted. The large weight received by attitudes toward the behavior for the non-group as compared with equal weights for the learning group at the same time (pretest), while not hypothesised, is readily explainable. It is likely that people who have already made a decision to not learn statistics would have been influenced more by their negative feelings toward mathematical topics than by advice from other people.

The proportion of variance in behavioral intentions explained by the model was low compared with other reported findings. One possible explanation for this is the fact that most of these subjects had little prior experience with the issue and behavior concerned. The increase to 43% at the final posttest supports this argument -- and this value is comparable with that obtained by Schwartz and Tessler (1972) using the three-component version of the model, and is not far away from the average of 54.6% over all studies by Fishbein and his associates (Fishbein and Ajzen, 1975).

A word of caution about comparing regression weights needs to be sounded. Part of the difference between the weights assigned to two correlated variables will be due to the variance the variables have in common, that is, their degree of multicolinearity (Blalock, 1963; Farrar & Glauber, 1967; Gordon, 1968). In set theory language, if two variables, X and Y, are correlated, then they have some variance in common

designated X intersect Y, and if X is entered into a regression model first (which occurs when X intersect Z is larger than Y intersect Z, where Z is the third variable, or in other words when the correlation between X and Z is greater than the correlation between Y and Z) then only the (Y - X intersect Y) intersect Z component of Y intersect Z is left to enter from Y. Consequently, the weight assigned to Y is not a true reflection of its total contribution, but only reflects its unique contribution after the contribution due to X has been made, that is, after the effects of X have been partialed out (cf. Draper & Smith, 1966). For example, in the results just reported, the relative weights assigned to attitudes toward the behavior and subjective norms do not necessarily accurately reflect the relative contributions made by the two components, because there is from 20-25% variance in common between them. The relative sizes of the two components' correlations with behavioral intentions might be a more accurate reflection of their influences.

Comparison with other two-component models

Four two-component models can be derived from the components of attitude discussed by Fishbein. They are the pairwise combinations of one attitudinal component (A_B or Aobj) and one normative component (SN or NBp). Fishbein has claimed that his A_B plus SN model should give better prediction of behavioral intentions than any other model, or at least that no other model should give better

prediction. The more conservative of the above claims was tested in this section; that is, it was hypothesised that none of the three alternative two-component models would give better prediction of behavioral intentions than Fishbein's model.

The multiple regression method was used again, and the amount of variance in behavioral intentions explained by each model was calculated.

Results and discussion. The beta-coefficients and the amount of variance in behavioral intentions explained by each of the four models derived from the four components of attitude discussed by Fishbein are shown in Table 5.2. The results of F-tests of the difference in the amount of variance explained by each model are shown in Table 5.3. The bottom two rows of Table 5.3 are F-test results for testing whether models containing attitudes toward the behavior gave better prediction than models containing attitudes toward the object, and similarly for subjective norms and personal normative beliefs.

For the non-group it is clear that models containing attitudes toward the behavior were better predictors of behavioral intentions than models containing attitudes toward the object, that models containing subjective norms gave better prediction of behavioral intention than models containing personal normative beliefs, and that Fishbein's model gave better prediction of behavioral intentions than any of the three alternative models. These results are exactly as hypothesised from Fishbein's work and they lend

Table 5.2

Comparison of four models by Beta-Coefficients and proportion of variance in BI explained

Model	Non-group		Pretest		Immediate Posttest		Final Posttest	
	Beta-Coef	F for Beta	Beta-Coef	F for Beta	Beta-Coef	F for Beta	Beta-Coef	F for Beta
A_B	40	14.82	30	11.54	45	21.50	24	8.54
SN	24	5.10	33	13.54	10	1.10	52	40.37
R^2	31		25		25		43	
A_B	45	14.15	29	10.04	42	21.20	32	11.01
NB_p	11	0.88	33	12.99	20	5.02	26	7.06
R^2	23		25		28		25	
Aobj	30	8.35	34	15.52	26	7.72	35	24.06
SN	30	8.38	32	13.86	22	5.44	55	60.65
R^2	26		28		15		50	
Aobj	31	5.96	32	12.60	26	7.62	37	19.21
NB_p	19	2.30	32	11.96	29	9.74	33	15.19
R^2	21		27		19		30	

Notes. 1. Leading decimal points have been omitted

2. F values need to be 3.96 for the non-group and 3.94 for the learning group to be significant at the .05 level.

Table 5.3

F-tests of the difference in the proportion of variance in BI explained by alternative models

Difference Tested	Non-group	Pretest	Immediate Posttest	Final Posttest
A_B + SN & A_B + NBp	4.35*	0	4.17*	26.87***
A_B + SN & Aobj + SN	7.25**	4.17*	13.33***	14.00***
A_B + SN & Aobj + NBp	14.49***	2.78	8.00**	19.40***
A_B + NBp & Aobj + SN	2.78	4.17*	18.06***	50.00***
A_B + NBp & Aobj + NBp	9.72**	2.74	12.50***	7.14**
Aobj + SN & Aobj + NBp	6.76*	1.39	4.94*	40.00***
A_B models & Aobj models[a]	8.51**	3.45	12.93***	10.00**
SN models & NBp models	5.59*	0.68	4.58*	35.51***

Note All differences are tested by $F = \left[(R_2^2 - R_1^2)/(k_2-k_1)\right] \Big/ \left[(1-R_2^2)/(N-k_2-1)\right]$ at k_2-k_1 and $N-k_2-1$ degrees of freedom.

[a] The mean R^2 for the two models considered together is used in each case.

* $p < .05$

** $p < .01$

*** $p < .001$

good support to his model. Unfortunately, the results from the other three conditions are not so clear.

At the pretest there was no significant difference in the effectiveness of attitudes toward the behavior models over the attitudes toward the object models, and there was no difference in the prediction given by the subjective norms and personal normative beliefs models. If however, the four models are considered separately, then the Aobj plus SN model was significantly better than both the A_B plus SN and A_B plus NBp models, though only at the 5% level. These findings at the pretest provide some evidence against Fishbein's model because it has been claimed that no other model should give significantly better prediction of behavioral intentions.

At the immediate posttest, models containing attitudes toward the behavior gave better prediction of behavioral intentions than models containing attitudes toward the object ($p < .001$). However, models containing personal normative beliefs gave slightly better prediction than models containing subjective norms ($p<.05$), so that overall the best prediction was given by the A_B plus NBp model. This model gave better prediction of behavioral intentions than Fishbein's model at the .05 level, so providing further evidence against the claims made for Fishbein's model.

At the final posttest there was strong evidence against Fishbein's model because models containing attitudes toward the object gave better prediction of behavioral intentions than models containing attitudes toward the behavior.

However, models containing subjective norms gave far better prediction than models containing personal normative beliefs, as Fishbein would expect. These results mean that the Aobj plus SN model gave the best prediction of behavioral intentions though, and it did so at a level far beyond that for any of the three alternative models. These findings are the most serious against Fishbein's model. It seems that at the final posttest all the influence of attitudes toward the object was not mediated by attitudes toward the behavior as Fishbein would expect.

The results of this section question the superiority of attitudes toward the behavior over attitudes toward the object, and of subjective norms over personal normative beliefs in the prediction or explanation of behavioral intentions. Under some conditions an alternative model provides better explanation of behavioral intentions than Fishbein's model does, contrary to the claims made for the model.

The sufficiency of the components

The low proportion of variance in behavioral intentions explained by Fishbein's model in the results reported so far suggest that the model is not sufficient to predict behavioral intentions. It has repeatedly been claimed that any variable external to the model can influence behavioral intentions only indirectly; that is, by influencing the attitudinal or normative components. To test the sufficiency of the model, other variables were allowed to enter the model

if they improved the prediction of behavioral intention by a portion significant at the .05 level. Attitudes toward the object and personal normative beliefs were allowed to enter the model first if they contributed significantly to the prediction of behavioral intentions because they were more important theoretically in the development of the model. On the basis of Fishbein's claims, it was hypothesised that the model would be sufficient, that is, that other variables would not make significant contributions to the explanation of variance in behavioral intentions.

Results. Table 5.4 shows the results when other variables were allowed to enter the model if they significantly improved the prediction of behavioral intentions. Attitudes toward the object and personal normative beliefs were allowed to enter first if they made significant contributions.

Neither attitudes toward the object nor personal normative beliefs entered the model for the non-group. At the pretest attitudes toward the object entered the model, and had the effect of reducing the contribution made by attitudes toward the behavior to non-significance. At the immediate posttest personal normative beliefs entered the model, reducing the contribution made by subjective norms to non-significance. At the final posttest attitudes toward the object entered the prediction model, again reducing the contribution made by attitudes toward the behavior to non-significance.

Allowing other variables to enter the model resulted

Table 5.4

Multiple Regression results when other variables were allowed to enter the equation to predict DI, with Aobj and NBp being allowed in first after A_B and SN

Condition	Model	Beta-Coef	F for Beta	Beta-Coef	F for Beta	Beta-Coef	F for Beta	Beta-Coef	F for Beta	Beta-Coef	F for Beta
Non-group	A_B	40	14.82	39	14.90	12	0.66				
	SN	24	5.10	20	4.06	20	4.22				
	BIP			27	9.00	22	6.19				
	EST					34	5.42				
	R^2		31		38		42				
Pretest	SN	33	13.54	31	12.30	30	11.73	34	14.99	36	17.39
	A_B	30	11.54	14	1.59	13	1.41	15	2.01	08	0.44
	Aobj			25	5.18	28	6.40	29	7.25	24	4.67
	BIP					17	4.03	20	5.63	21	6.72
	COM							-19	4.96	-22	6.75
	EST									21	4.02
	R^2		25		29		32		35		37
Immediate Posttest	A_B	45	21.52	40	16.63	36	14.06	37	15.29		
	SN	10	1.08	-05	0.28	02	0.06	02	0.04		
	NBp			19	4.14	16	2.77	16	3.00		
	COM					19	4.52	17	3.47		
	BIP							18	4.57		
	R^2		25		28		31		34		
Final Posttest	A_B	24	8.54	08	0.81	04	0.25	-03	0.11		
	SN	52	40.37	53	47.55	46	35.43	46	37.22		
	Aobj			31	15.11	34	19.01	28	11.73		
	BIP					22	8.92	20	7.87		
	EST							20	5.43		
	R^2		43		50		54		57		

Notes. 1. The results for the basic model are shown again in column one to make comparisons easier

2. Leading decimal points have been omitted

3. F values need to be 3.96 for the non-group and 3.94 for the learning group to be significant at the .05 level.

in a number of other variables making significant improvements to the prediction of behavioral intentions. Future intentions in psychology (BIP) entered the model for every condition, making a contribution to the explanation of behavioral intentions beyond the .01 level for the non-group and at the final posttest, and at the .05 level at the immediate posttest. At the pretest, the contribution of BIP was initially at the .05 level only, but when commitment to the act entered the model in a suppressor capacity, the contribution made by BIP increased to be significant beyond the .01 level. Commitment to the act also entered the model at the immediate posttest, and the estimate of performance made significant contributions for the non-group, and at the pretest and final posttest.

Discussion. The fact that attitudes toward the object entered the model to improve the prediction at the pretest and final posttest, and that personal normative beliefs did so at the immediate posttest, provides evidence that Fishbein's model is not always sufficient to explain the variance in behavioral intentions. At the pretest and final posttest, attitudes toward the object had more variance in common with behavioral intentions than did attitudes toward the behavior, and the reduction to non-significance of the contribution made by attitudes toward the behavior indicates that most of the variance that it had in common with behavioral intentions was also common to attitudes toward the object. This pattern of results, together with the pattern of

correlations between attitudes toward the object, attitudes toward the behavior, and behavioral intentions suggests that attitudes toward the object has a direct influence on behavioral intentions and possibly a causal influence on attitudes toward the behavior, rather than influencing behavioral intentions through attitudes toward the behavior -- this possibility will be explored further in the next chapter.

The fact that future intentions in psychology, the commitment to doing well in statistics, and the estimate of performance explained highly significant additional portions of variance in behavioral intentions is strong evidence that Fishbein's model is <u>not</u> sufficient to explain variance in behavioral intentions. That is, other variables are <u>not</u> always mediated by attitudes toward the behavior and/or subjective norms but may make unique contributions of their own.

Future intentions in psychology appear to be consistently important in the determination of whether or not to learn statistics in the future, and this makes good sense. The estimate of likely performance in statistics is also important in this respect for the non-group and at the pretest and final posttest for the learning group. It is noteworthy that when the estimate of performance entered the model it had the effect of reducing the contributions made by attitudes toward the behavior. This is especially noticeable for the non-group, and indicates that much of the variance in common between the estimate of performance and behavioral intentions is also in common with attitudes toward the behavior.

That is, it is possible that the estimate of performance has a causal influence on attitudes toward the behavior, and may act directly or indirectly on behavioral intentions -- this will be further explored in the next chapter.

Commitment to the act of learning statistics made a significant contribution to the prediction of behavioral intentions at the pretest and immediate posttest. It seems reasonable that commitment is an important variable for those people who are already learning statistics, and that it is not important for those people not learning statistics or even for the learning group after they have finished the statistics course and have been examined. The effect of commitment to the act at the pretest seems to be that of a suppressor variable, (as indicated by a negative Beta weight). When it entered the model it had the effect of increasing the Beta-coefficients for all other variables already in the model.

The proportion of explained variance in behavioral intentions was substantially increased when other variables entered the model, providing strong evidence against the claim of sufficiency for Fishbein's model. It is very clear that variables external to the model do influence behavioral intentions in a direct way, not simply indirectly by influencing attitudes toward the behavior and/or subjective norms.

Other models

So far we have examined alternative two-component models, and models that result when other variables are allowed to enter the model after attitudes toward the behavior and subjective norms. What happens when all variables are allowed to enter the prediction equation in any order -- that is, in the order determined by their level of unique contribution to the explanation of behavioral intentions?

It was possible to hypothesise some results on the basis of the results reported in previous sections of this chapter, particularly those in Tables 5.2 and 5.4. It was hypothesised that the most likely model for the non-group would be BIP plus EST plus SN. This was derived from Table 5.4, where it was seen that when the estimate of performance entered the model the effect of attitudes toward the behavior was reduced to non-significance. For the pretest it was hypothesised that the derived model would be the same as that shown in Table 5.4 with the exception that attitudes toward the behavior would not enter it. It was not possible to hypothesise what the full model for the immediate posttest would be because of the low beta weights associated with all variables except attitudes toward the behavior. For the final posttest it was hypothesised that the model derived would be the same as that shown in Table 5.4 except that attitudes toward the behavior would not enter it.

Results. The models derived when variables could enter in any order are shown in Table 5.5. For the non-group a model resulted that did not contain either of the

Table 5.5

Multiple Regression results for predicting BI
when all variables were allowed to enter the equation in any order
(where these results are different from those already reported).

Condition	Model	Beta-Coef	F for Beta	Beta-Coef	F for Beta	Beta-Coef	F for Beta	Beta-Coef	F for Beta
Non-group	EST	57	39.55	47	24.36	43	20.57		
	SN			24	6.35	23	5.82		
	BIp					21	5.79		
	R^2	33		37		42			
Pretest	Aobj	34	15.52	36	17.71	39	20.56	27	8/04
	SN	32	13.86	31	13.15	35	16.43	37	18.73
	BIP			17	4.24	20	5.79	22	7.00
	COM					-18	4.37	-22	6.71
	EST							23	5.69
	R^2	28		31		34		37	
Immediate Posttest	A_B	42	21.20	42	22.43	31	8.92		
	BIp	20	5.02	20	5.07	19	4.52		
	BIP			20	5.78	22	7.20		
	EST					20	4.02		
	R^2	28		32		34			
OR									
	A_B	42	23.01	43	24.71	31	9.35		
	COM	23	6.74	20	5.41	20	5.20		
	BIP			17	4.42	20	5.76		
	EST					21	4.37		
	R^2	29		32		35			
Final Posttest	Aobj	35	24.06	36	27.54	27	12.33		
	SN	55	60.65	47	41.49	45	39.75		
	BIP			22	9.61	20	7.83		
	EST					19	5.64		
	R^2	50		54		57			

Notes. 1. Leading decimal points have been omitted

2. F values need to be 3.96 for the non-group and 3.94 for the learning group to be significant at the .05 level

attitudinal components discussed by Fishbein, but consisted of EST, SN and BIP as hypothesised. At the pretest, the only difference between the model derived and that shown in Table 5.4 is the ommission of attitudes toward the behavior, which resulted in a slight increase in the Beta coefficients for the remaining predictors. Again, this was as predicted. At the immediate posttest, A_B plus COM plus BIP plus EST explained 35% of the variance in behavioral intentions. At the final posttest BIP and EST entered the Aobj plus SN model to increase the proportion of explained variance in behavioral intentions from 50% to 57%. This was as hypothesised.

Discussion. The model derived for the non-group shows that students' estimates of how well they would do in statistics (EST) is not mediated by their attitudes toward the behavior of learning statistics. The EST plus SN model explains 37% of the variance in behavioral intentions whereas the A_B plus SN model explains only 31%. This provides further evidence that variables other than those in Fishbein's model can be better predictors of behavioral intentions.

The model derived for the learning group at the pretest is the Aobj plus SN model, with other variables (BIP, COM and EST) entering the equation to substantially improve prediction. This is the same model as that derived for the non-group, but with the addition of Aobj and COM: but despite the larger number of predictors, the level of prediction was still lower for the learning group.

For the posttests, future intentions in psychology and the estimate of performance in statistics still entered the models, doing so with attitudes toward the behavior and commitment to the act at the immediate posttest, and attitudes toward the object and subjective norms at the final posttest.

It is noteworthy that future intentions in psychology and the estimate of performance in statistics entered the model for all four conditions. Evidently, future intentions in the social sciences and psychology is always of some importance in determining whether or not to learn statistics. This is a sensible enough result, but its importance lies in the fact that the effects of future intentions in psychology were not mediated by Fishbein's model. It seems that related behavioral intentions are of some importance in determining a specific behavioral intention. Similarly, the fact that an estimate of how well one would perform in statistics had some influence in determining intentions to learn or not to learn statistics seems reasonable. But again, the importance of the finding lies in the fact that the effects of an estimate of performance were not completely mediated by Fishbein's model. To be sure, a large portion of its effects were mediated by attitudes toward the behavior, but there remained a unique portion of variance large enough to make a significant contribution to the prediction of behavioral intentions. In fact, the pattern of results would suggest that while the estimate of performance has some causal influence on attitudes toward the behavior, it has an even more direct influence on behavioral intentions.

The results reported in this section indicate that there are alternatives to Fishbein's model which might explain more variance in behavioral intentions than his model does. In one case (the non-group) one variable alone, the estimate of performance explained as much variance in behavioral intentions as Fishbein's model (A_B plus SN) did. In all cases, the models derived in this section explained much more variance in behavioral intentions than Fishbein's model did.

Summary of results for each condition

So far results have been presented according to the tests made on Fishbein's model. It would be constructive and might make the results easier to draw conclusions from if summary results for each of the four conditions were presented here.

Non-group. For the non-group Fishbein's model explained 31% of the variance in intentions to learn or not learn statistics. Attitudes toward the behavior of learning statistics was of greater importance than subjective norms in this explanation, subjective norms making a contribution that was significant only at the .05 level. Fishbein's model gave a better prediction of intentions than any of the other three two-component models, which is as Fishbein would expect. Future intentions in the social sciences and psychology entered the model next, improving the proportion of explained variance in behavioral intentions by 7%. The estimate of performance in statistics if it was taken entered the model

next to increase the proportion of variance in behavioral intentions by a further 4% to bring the total variance explained to 42%. The influence of attitudes toward the behavior of learning statistics was reduced to non-significance when the estimate of performance entered the model, so that the final model consisted of EST plus SN plus BIP. It is noteworthy that the estimate of performance on its own accounted for just as much variance in behavioral intentions as Fishbein's model did.

Learning group -- pretest. At the pretest for the learning group Fishbein's model explained only 25% of the variance in behavioral intentions, and both components of the model were of equal importance. The Aobj plus SN model explained more variance in behavioral intentions than the A_B plus SN model, though this difference was significant only at the .05 level. Future intentions in psychology and the estimate of performance in statistics both made significant contributions to the explanation of variance in behavioral intentions, and commitment to the act of learning statistics entered the model in a suppressor variable capacity to increase the proportion of variance explained to 37%.

When the estimate of performance entered the model it had the effect of significantly reducing the contribution made by attitudes toward the object, though not to a non-significant level. This indicates some variance in common between the estimate of performance in statistics and attitudes toward statistics, and so the possibility of some causal link.

Immediate posttest. Subjective norms were found to be totally unnecessary in predicting intentions with regard to learning further statistics when students were near the end of their current statistics course but before they were examined. At thatpoint in time, how they felt about learning statistics was of prime importance, though personal normative beliefs also made a significant contribution. That is, how students felt about the necessity of statistics for psychology was of some importance. Fishbein's model again explained only 25% of the variance in behavioral intentions, and the A_B plus NBp model explained 28%. Their commitment to learning statistics, and their future intentions in the social sciences and psychology also made significant contributions when they were allowed to enter the model after the attitudinal and normative components. It is noteworthy, however, that as each new variable entered the equation, the previous one's contribution was reduced to non-significance. If the normative components were not forced to enter the model at the second step they never did so, and instead the students' estimate of their likely performance in statistics made a significant contribution to the prediction of intentions to learn or not learn further statistics, all variables maintaining a significant contribution with the final model explaining 35% of the variance in behavioral intentions.

Final posttest. At the final posttest the level of prediction obtained was substantially higher than in any of the other three conditions. This was likely because: a) the behavior concerned was to occur at a point in time closer

to the point of measurement than for any of the other conditions; and b) the students had more experience and information on which to base their attitudes, normative beliefs, and behavioral intentions. Fishbein's model explained 43% of the variance in intentions to learn or not learn statistics at this point, but an alternative model containing attitudes toward the object instead of attitudes toward the behavior explained 50% of the variance ($p<.001$). Subjective norms were much more important than the attitudinal component, as was predicted. Future intentions in psychology and the estimate of performance in statistics also made significant contributions to the explanation of variance in behavioral intentions in statistics, increasing the proportion of variance explained to 57%. Once again, when the estimate of performance in statistics entered the model the influence of the attitudinal component was significantly reduced.

Conclusions

In this chapter it has been shown that Fishbein's basic model for predicting behavioral intentions does not stand up well to tests of necessity and sufficiency. Under some conditions one or other of the components was found to be unnecessary. This, however, can be handled by the model -- it is expected that the weights assigned to the two components will vary according to other variables, and therefore one of the weights could sometimes be zero. The important point is that the relative weights assigned to the components can be

predicted if the conditions of measurement and circumstances of the proposed behavior are known.

It was also found that attitudes toward the behavior were not always superior to attitudes toward the object and that subjective norms were not always superior to personal normative beliefs. These findings are contrary to expectations from Fishbein's model.

A much more serious result for Fishbein's model is that it is not sufficient for explaining variance in behavioral intentions. That is, other variables were found to make significant contributions to the explanation of variance in behavioral intentions over and above that made by the two components of Fishbein's model. In many cases it is true that attitudes toward the behavior of learning statistics included most of the variance that a third variable like attitudes toward the object or the estimate of performance in statistics had in common with behavioral intentions. However, in many other cases the third variable concerned had much more variance in common with behavioral intentions than did attitudes toward the behavior, and so made a much greater contribution to the prediction or explanation of behavioral intentions. A question that remains is what causes what -- does the estimate of performance cause both attitudes toward the behavior and behavioral intentions, for example, or is the causal path different? Such questions will be explored by the use of causal path analysis in the following chapter.

CHAPTER SIX

TRACING CAUSAL LINKS IN THE MODEL

The results presented in previous chapters show that there is no one model that is best for predicting behavioral intentions under all conditions. It would seem desirable, therefore, to trace the causal links in the results for each condition, and try to see what these causal links might mean psychologically and what their implications are for Fishbein's model. Partial correlations and the path analysis technique were used to do this. The assumptions of path analysis were listed in Chapter 2, and one of them was the necessity of a recursive model. While many of the causal directions between variables in Fishbein's model, and an extension of that model to include other variables, are subject to little argument, a few might be more debatable. In some of these latter instances partial correlations will aid in determining the direction of cause. Partial correlations are also useful in allowing a step-by-step analysis of how variables exert their influence on BI.

The Four-Component Model

Considering first the four components of attitude that have been discussed by Fishbein, attitudes toward the behavior attitudes toward the object, subjective (social) norms, and personal normative beliefs, it was assumed that attitudes

toward the object and subjective norms are exogenous variables. It seems reasonable to assume that both attitudes toward the object and social norms are caused by influences not measured or included in the model, such as previous experience, what other people have advised, etc. Attitudes toward the behavior and personal normative beliefs can then be considered as being caused, at least partially, by attitudes toward the object and subjective norms as well as by other variables not yet being considered -- that is, they are endogenous variables. All four components may be assumed to influence behavioral intentions either directly or indirectly -- it is this that will be assessed by the partial correlations. The model as described so far is shown in Figure 6.1(i). Residuals or influences outside the system may have an effect on any or all components of the model. It is assumed that these residuals are uncorrelated. There may or may not be a correlation between attitudes toward the object and subjective norms, but any partial correlation will remain unanalysed as to direction of influence. The only link in the model not yet discussed is that between attitudes toward the behavior and personal normative beliefs. It was assumed that if there was any such relationship it would be attitudes toward the behavior that would influence personal norms regarding that behavior rather than vice versa.

If the relationships postulated by Fishbein are correct then this model should be simplified by the removal of certain of the links where partial correlations should be zero or non-

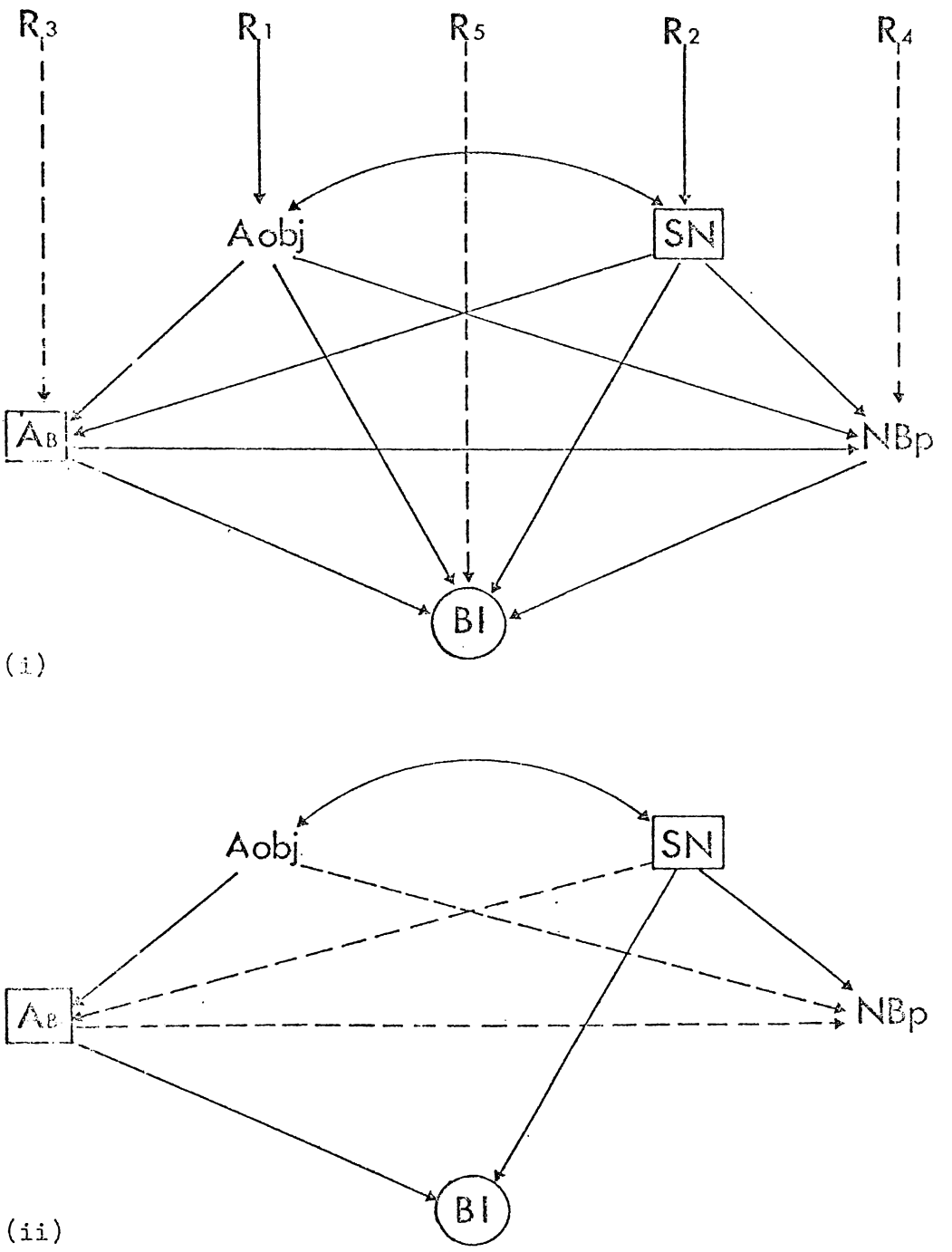


FIGURE 6.1 The path analysis model for two attitudinal and two normative variables:

(i) All hypothesised possible causal links for a recursive model

(ii) Hypothesised causal links as derived from Fishbein's theory.

significant. First, it was postulated that any effect of attitudes toward the object on behavioral intentions would be mediated by attitudes toward the behavior; that is, that the partial correlation between attitudes toward the object and behavioral intentions should be reduced to non-significance when the effects of attitudes toward the behavior are partialled out. Second, it was postulated that subjective norms act directly on behavioral intentions, rather than indirectly through personal normative beliefs, so that the partial correlation between personal normative beliefs and behavioral intentions should be non-significant. The resulting model is shown in Figure 6.1 (ii), where the residuals have also been removed for simplicity. Note that it was assumed that subjective norms would cause personal normative beliefs, and that it remains possible for attitudes toward the object to influence personal normative beliefs, subjective norms to influence attitude toward the behavior, and attitudes toward the behavior to influence personal normative beliefs (signified by dotted links) although such possibilities have not been discussed in the previous literature.

Results and discussion. The third-order partial correlations when correlating with BI and second-order partial correlations for the other links are shown in Diagram (i) of Figures 6.2, a) to d), where solid lines indicate significant values, and dotted lines non-significant ones.

FIGURE 6.2

Partial correlations and path coefficients for the four-component model for four conditions;

(a) non-group

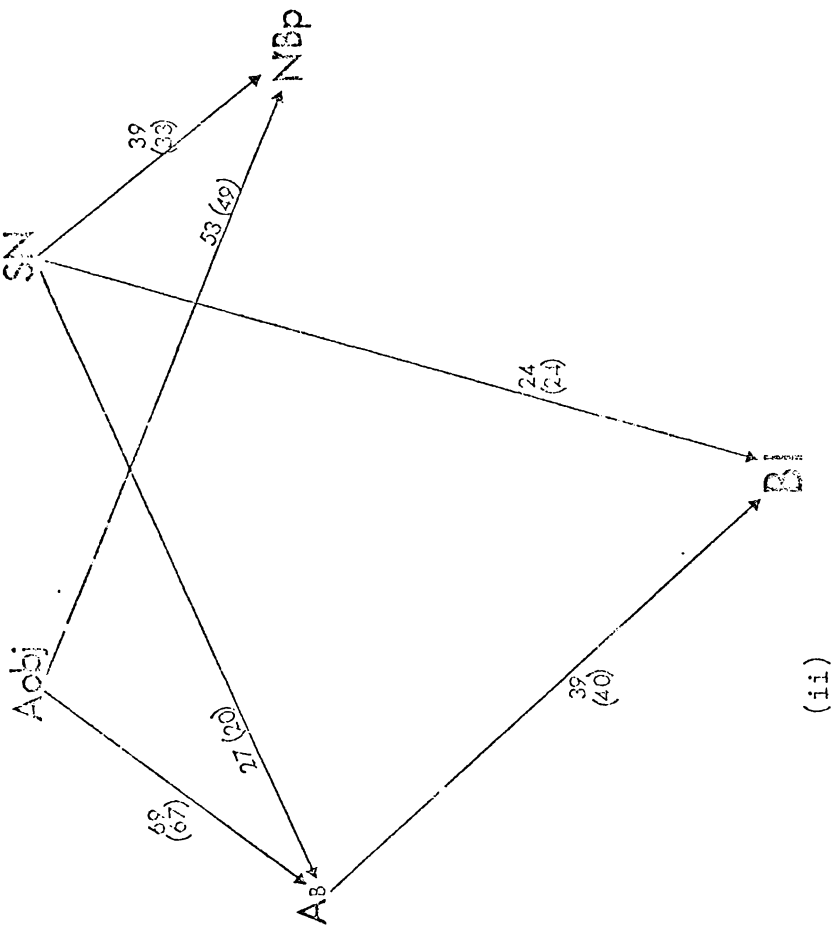
(b) pretest

(c) immediate posttest

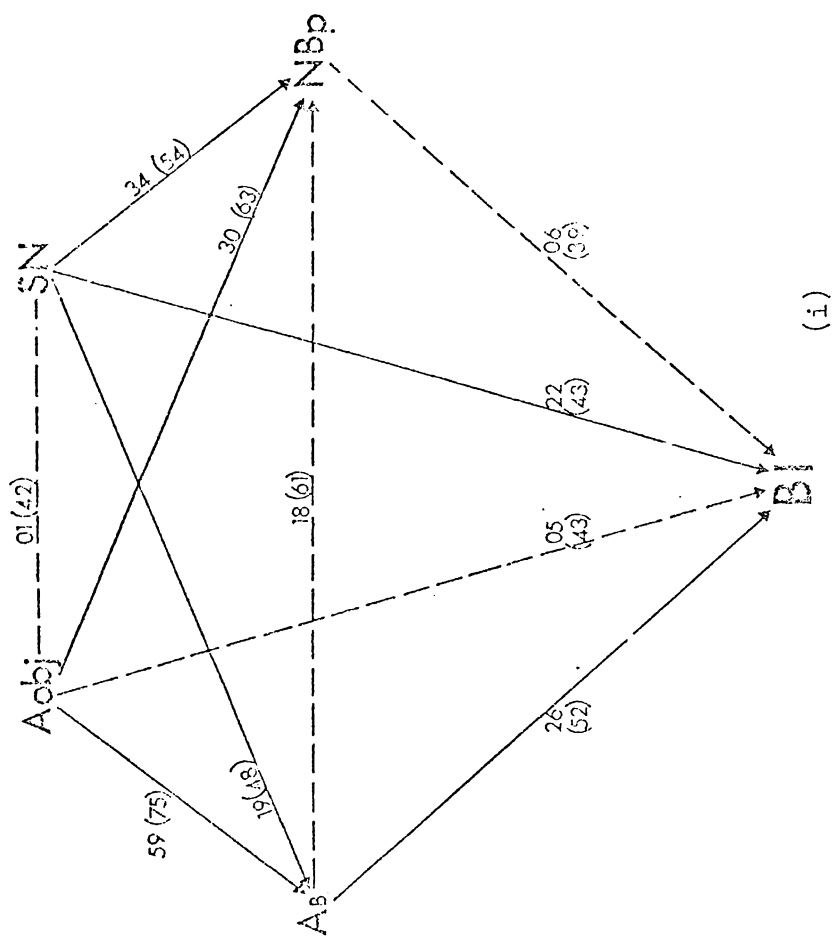
(d) final posttest:

(i) Partial correlations for all links in the model -- third-order for BI and second-order for remaining links, with zero-order correlations in brackets.

(ii) Partial correlations when only the significant links are considered. The path coefficients (standardised regression coefficients) are shown in brackets.

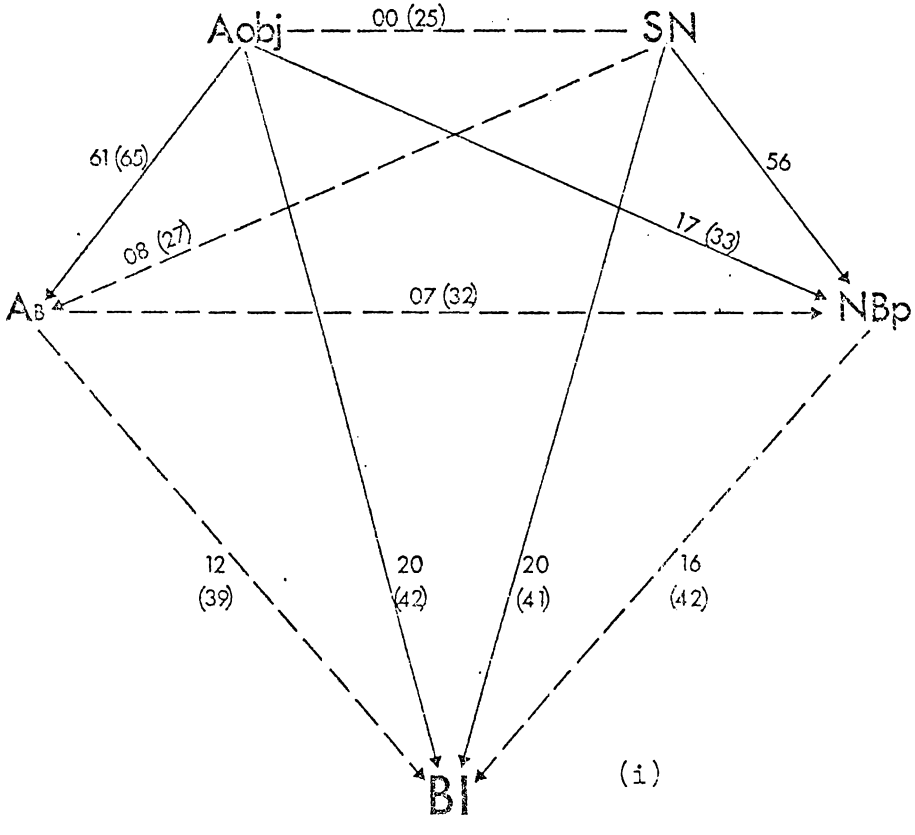


(ii)

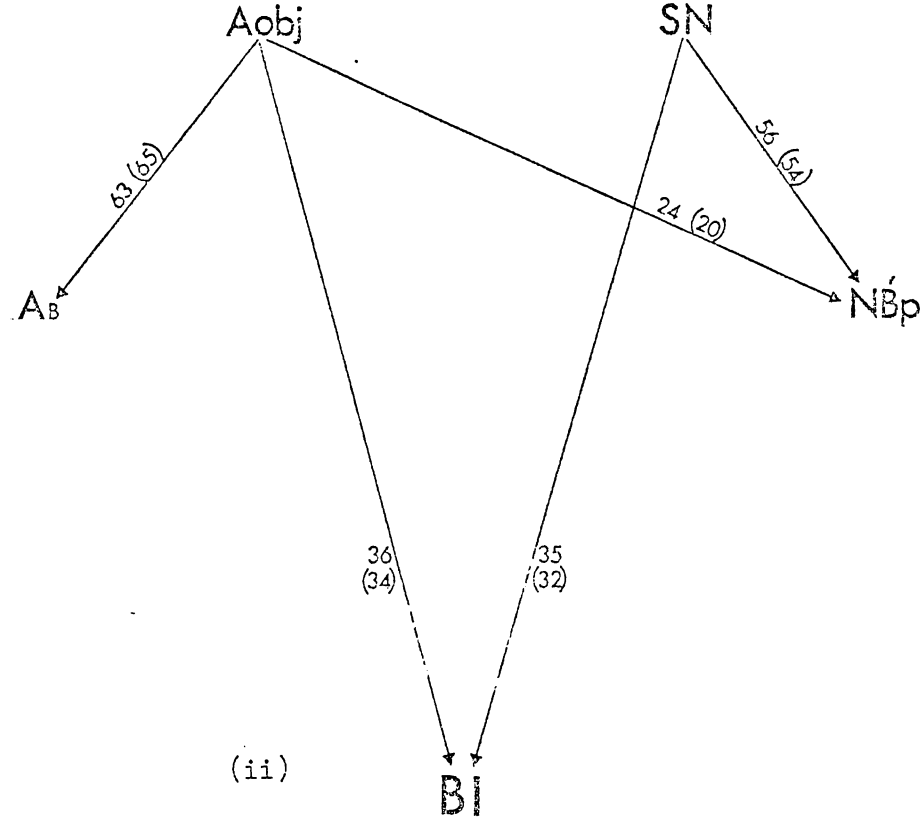


(i)

(a) non-group

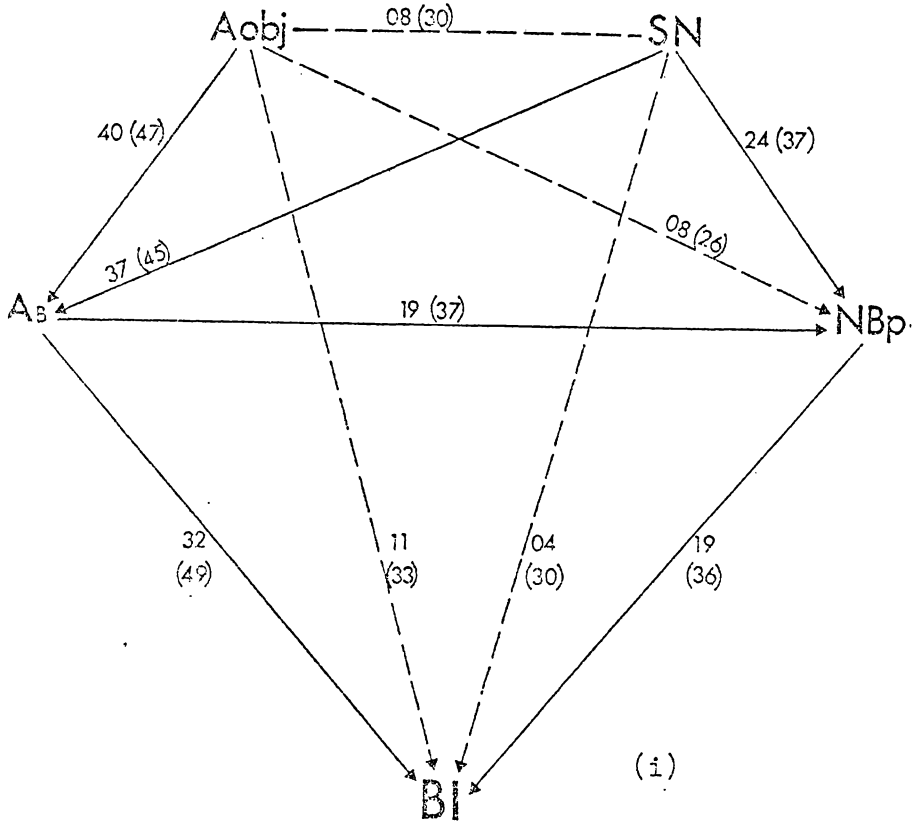


(i)

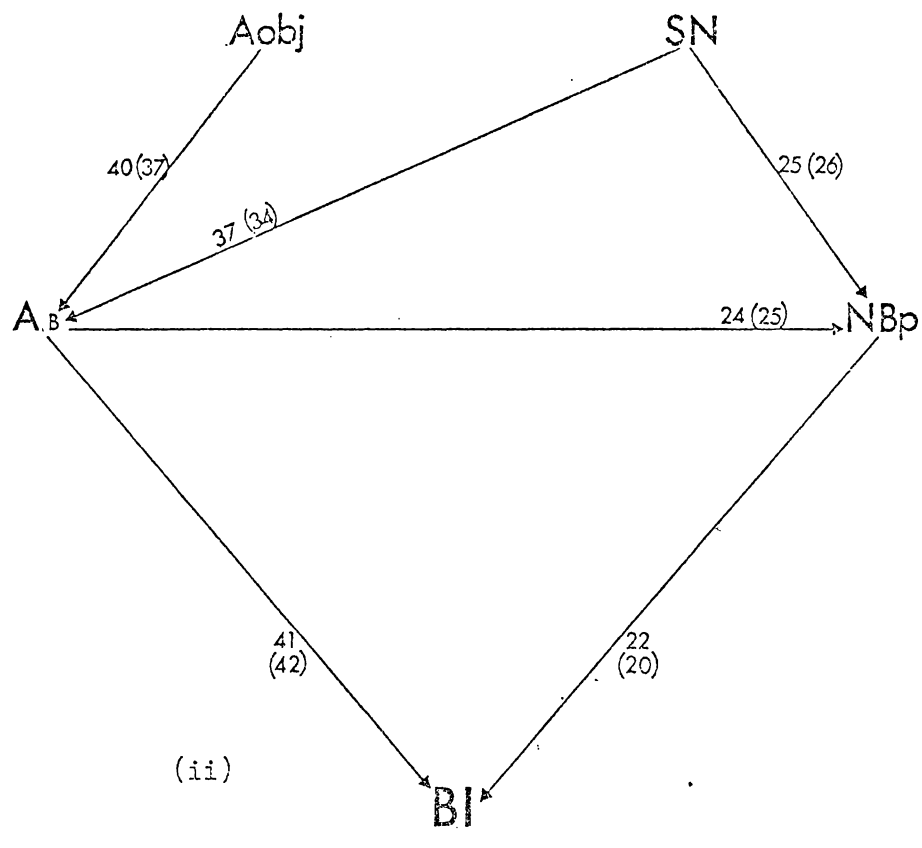


(ii)

(b) pretest

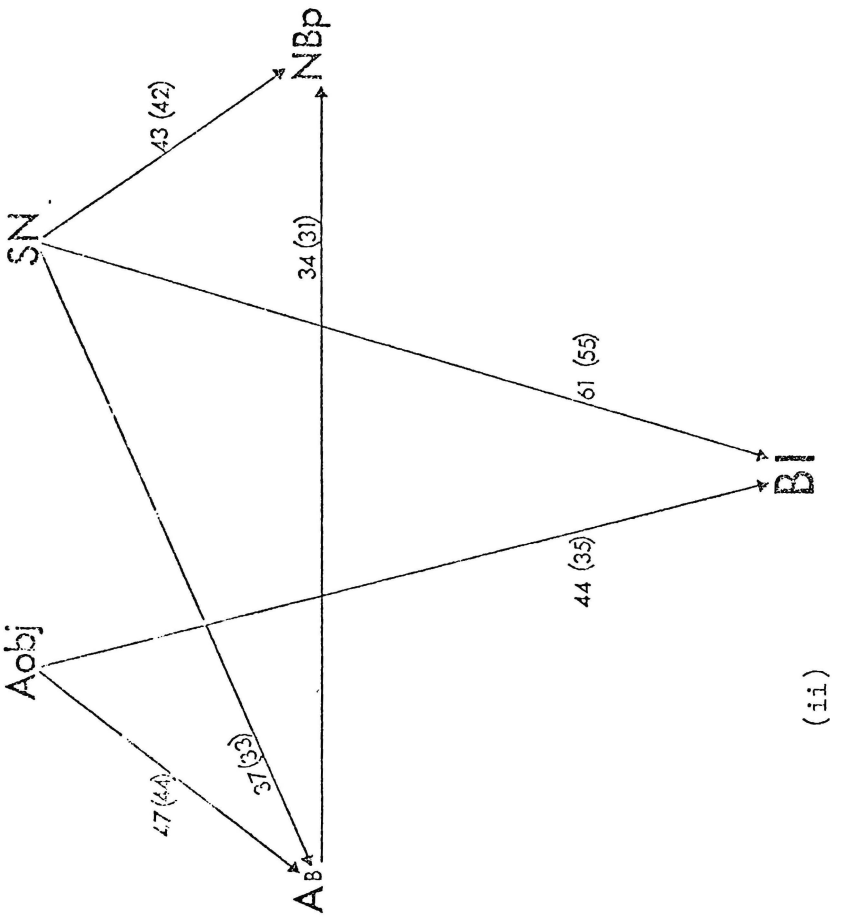


(i)



(ii)

(c) immediate posttest



(d) final posttest

Diagram (ii) in each of Figures 6.2 a) to d) shows the partial correlations and path coefficients (standardised regression weights) when only those variables making a significant contribution to the variable being predicted are partialled out in turn.

As before, the results for the non-group were exactly as would be postulated from Fishbein's model -- attitudes toward the behavior and subjective norms were the primary causes of behavioral intentions and the other links were reduced to non-significance when these were partialled out. There were also causal links between attitudes toward the object and attitudes toward the behavior, and between subjective norms and attitudes toward the behaviour, showing that attitudes toward the behavior was mediating some influence from these variables to behavioral intentions. Attitudes toward the object and subjective norms both had a causal influence on personal normative beliefs, which here appears to be another product of the model rather than a mediator.

At the pretest for the learning group attitudes toward the object had a direct effect on behavioral intentions rather than its influence being mediated by attitudes toward the behavior. Subjective norms still had a direct effect on behavioral intentions as expected from the model. In this case, both attitudes toward the behavior and personal normative beliefs appear to be products of the model.

The effect of subjective norms on behavioral intentions was mediated by personal normative beliefs at the immediate posttest rather than acting directly as expected by the model. Attitudes toward the behavior mediated the influence of attitudes toward the object and some of the influence of subjective norms on behavioral intentions. Attitudes toward the behavior also mediated some influence of subjective norms on personal normative beliefs.

At the final posttest the pattern was similar to that at the pretest, with attitudes toward the object and subjective norms both directly influencing behavioral intentions, rather than attitudes toward the object being mediated by attitudes toward the behavior.

In all four conditions any correlation between the variables assumed to be exogenous, attitudes toward the object and subjective norms, disappeared when the effects of attitudes toward the behavior and personal normative beliefs were partialled out, indicating no possibility of any influence between them. This confirms that the assumptions made when setting up the model are acceptable.

These results confirm the models derived by the pure multiple regression technique and clarify the causal paths within the model. They make it quite clear, for example, that the bouncing beta weight in the multiple regression results is not purely an artifact, but is due to the causal links in the model as demonstrated by the partial correlations and path coefficients. It should be even more illuminating to examine the causal links when the

other measured variables (EST, BIP and COM) are added to the model.

The Extended Model

The other variables measured for this study can be added to the system to give the more complex model shown in Figure 6.3. It was assumed that the estimate of performance was related to attitudes toward the object, attitudes toward the behavior, and behavioral intentions only, and so it was added to the left of the model. Future intentions in psychology and commitment to the act, on the other hand, were assumed to be related to norms and not to attitudes and so were added to the right of the model. All assumed non-relations can be regarded as hypotheses and tested with partial correlations or path coefficients, although there is some difficulty in that these constitute no-difference hypotheses.

Each one of the variables just entered into the model will be influenced by outside causes as well as any that might be indicated in the figure. This means that the estimate of performance may very well contribute some unique variance to attitudes toward the behavior not already contributed by attitudes toward the object, whether directly or indirectly through the estimate of performance. Future intentions in psychology is regarded as an exogenous variable -- it is difficult to conceive of intentions to learn psychology being influenced by any of the other measured variables. The only possible ways for future intentions in psychology to have an indirect influence on behavioral intentions if

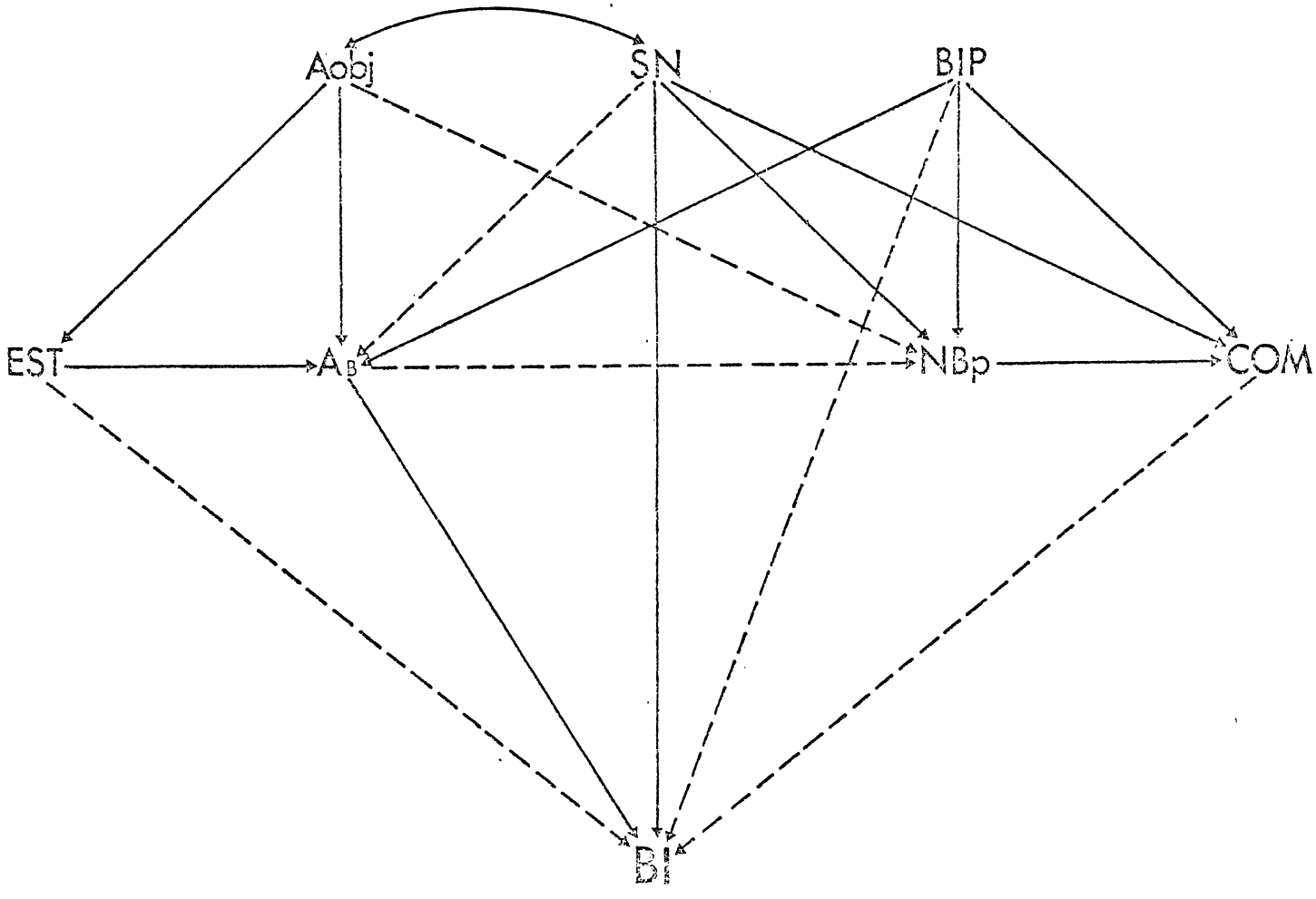


FIGURE 6.3 The postulated model when the additional variables -- estimate of performance, future intentions in psychology, and commitment -- are added. (The solid lines indicate those links that would conform to Fishbein's theory, while the dashed lines indicate other possible links).

Fishbein's model is correct is through attitudes toward the behavior, or by being correlated with subjective norms. Commitment to doing well in statistics is regarded as being caused by future intentions in psychology, subjective norms, and personal normative beliefs, and as such, under the constraints of the model must act directly on behavioral intentions if at all. The only other possibility is for commitment to doing well to influence the estimate of performance which in turn influences behavioral intentions through attitudes toward the behavior, but this seems unlikely to this author.

It is convenient to consider the model in two sections for some preliminary analysis, namely attitudes toward the object, attitudes toward the behavior, and the estimate of performance in one section, (the attitudinal components section), and the other variables in another, (the normative components section). There is one important difference between the two sections of the model being considered. For the attitudinal components it is postulated that behavioral intentions are influenced by an endogenous variable (A_B) which itself is caused, at least partially,by an exogenous one (Aobj). For the normative components, on the other hand, it is postulated that behavioral intentions are influenced <u>directly</u> by an exogenous variable (SN) without any other variables mediating its influence. This fact might make it more difficult for Fishbein's model to remain unchallenged because if the subjective norms is an exogenous variable there is no way for other variables such as personal normative beliefs, future

intentions in psychology, and commitment to doing well to be mediated by it. Compare this with the attitudinal components section where other attitudinal variables could always be mediated by attitudes toward the behavior. Here, attitudes toward the particular behavior is closest to behavioral intentions in the causal chain, whereas among the normative components subjective norms is furtherest away.

Partial correlations were calculated within each section and some of the assumptions and hypothesised relations described above examined. After that, the complete model was considered and final clarifications made. This exercise was done on each of the four sets of data.

The attitudinal components

Results. Considering the attitudinal predictors of BI (A_B, Aobj, and EST), first- and second-order partial correlations between BI and each of the predictors are shown in Figure 6.4.

Diagram (i) for the non-group shows that Aobj had no direct influence on BI when Aobj, A_B and BI were considered alone, that is, the influence of Aobj was mediated by A_B. If EST was in the model it also mediated the effects of Aobj (see Diagrm (ii)). However, when EST was considered as an antecedent to A_B it is seen in Diagram (iii) that it had a direct effect on BI which was not mediated by A_B. This continued to be true when all three components were considered in Diagram (iv), where it is seen that EST mediated the effect of Aobj, rather than A_B mediating it.

FIGURE 6.4

Partial correlations for the attitudinal components of the model for four conditions;

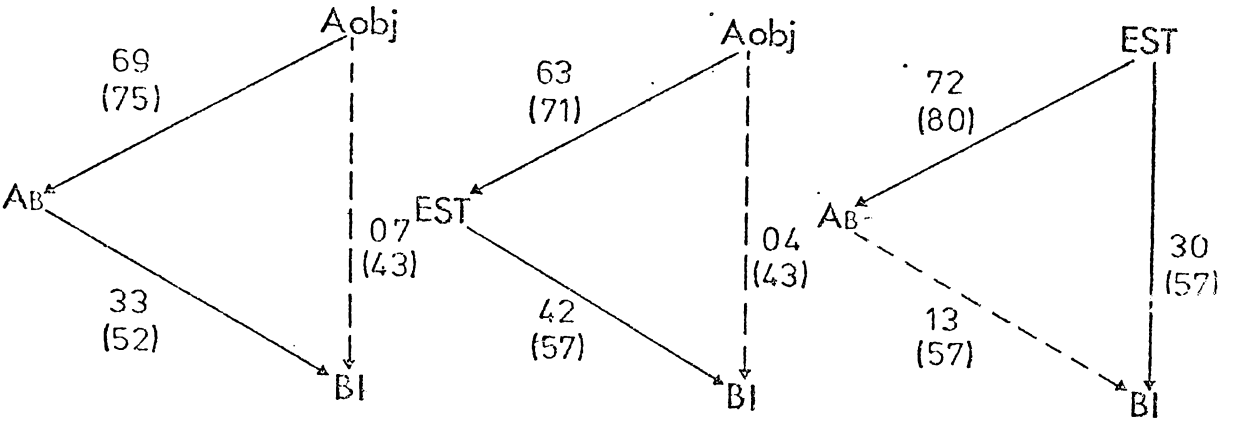
(a) non-group

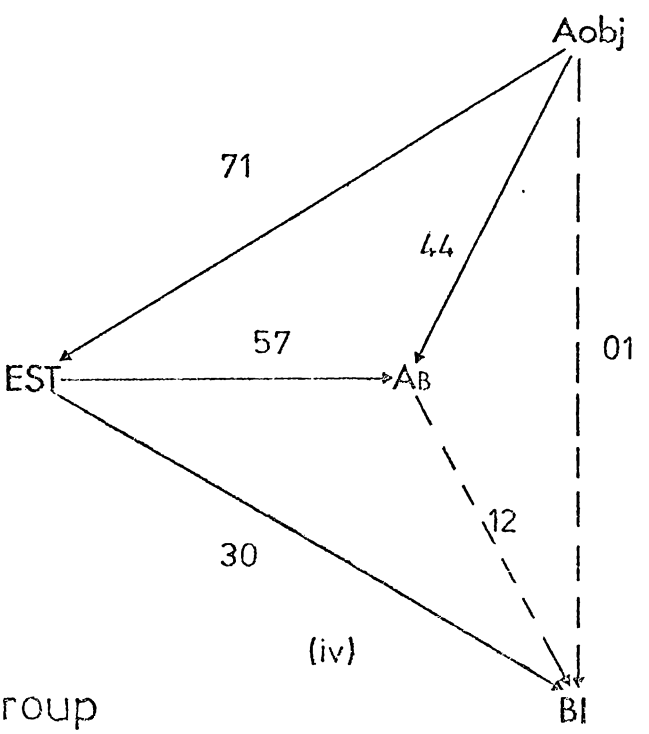
(b) pretest

(c) immediate posttest

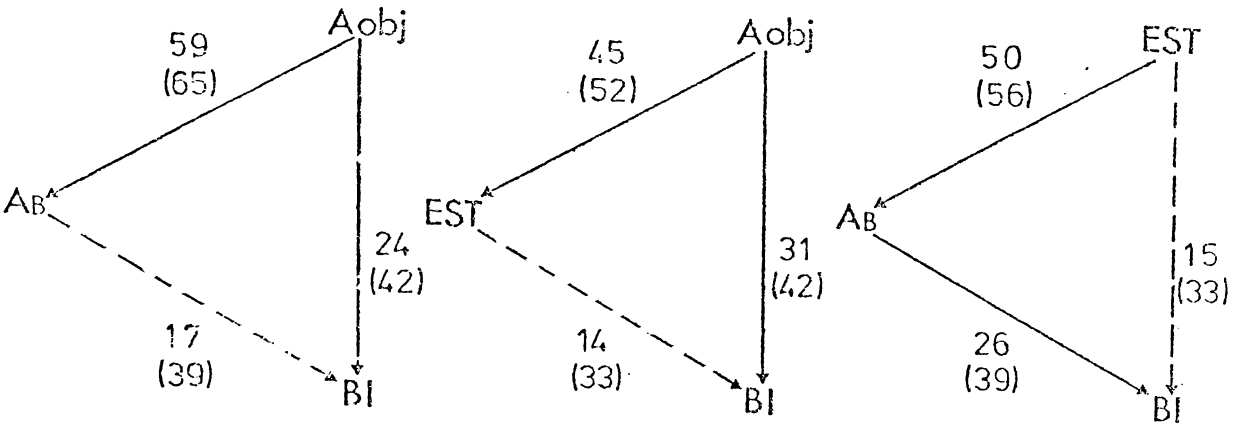
(d) final posttest

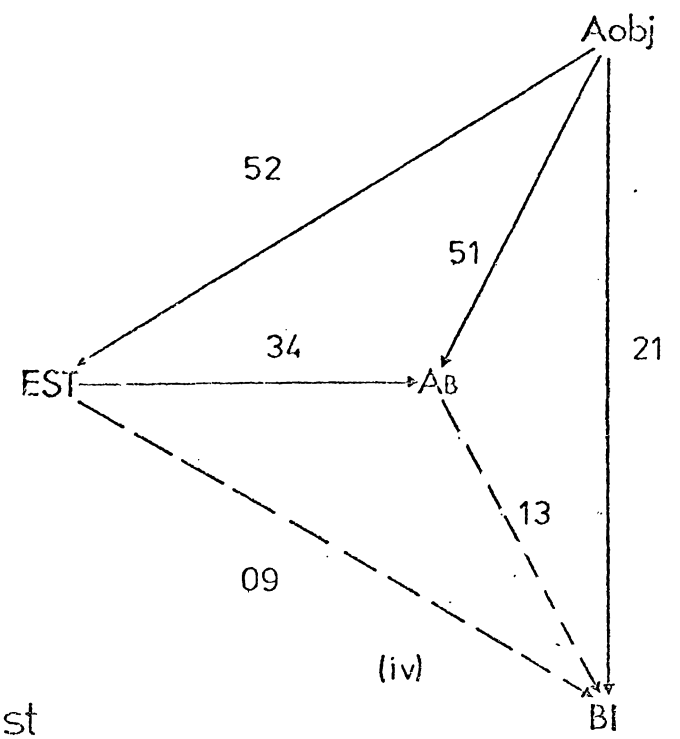
(Solid lines indicate significant links)


Aobj
69
(75)
AB
33
(52)
BI
07
(43)
(i)
Aobj
63
(71)
EST
42
(57)
BI
04
(43)
(ii)
EST
72
(80)
AB
13
(57)
BI
30
(57)
(iii)

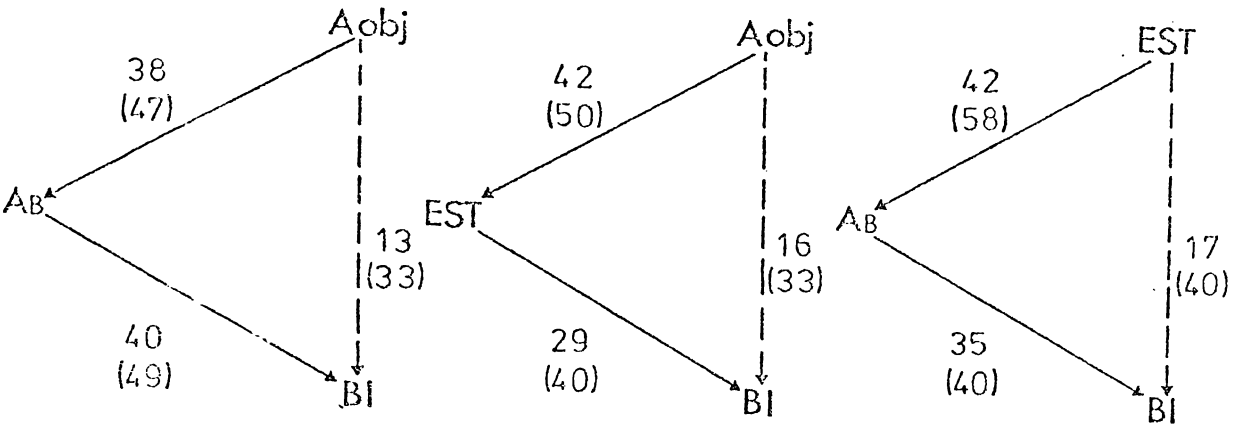

Aobj
71
44
57
EST
AB
01
12
30
BI
(iv)

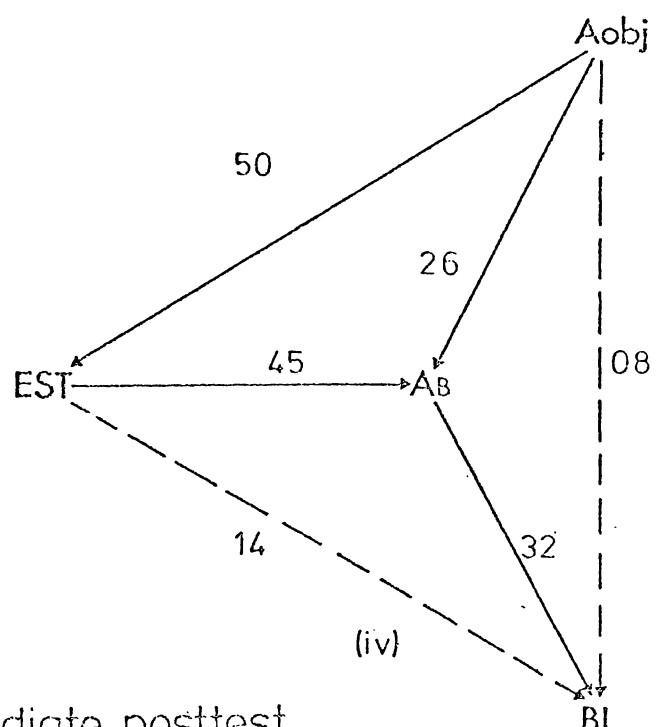
(a.) Non-group


Aobj
59
(65)
AB
24
(42)
17
(39)
BI
(i)
Aobj
45
(52)
EST
31
(42)
14
(33)
BI
(ii)
EST
50
(56)
AB
15
(33)
26
(39)
BI
(iii)

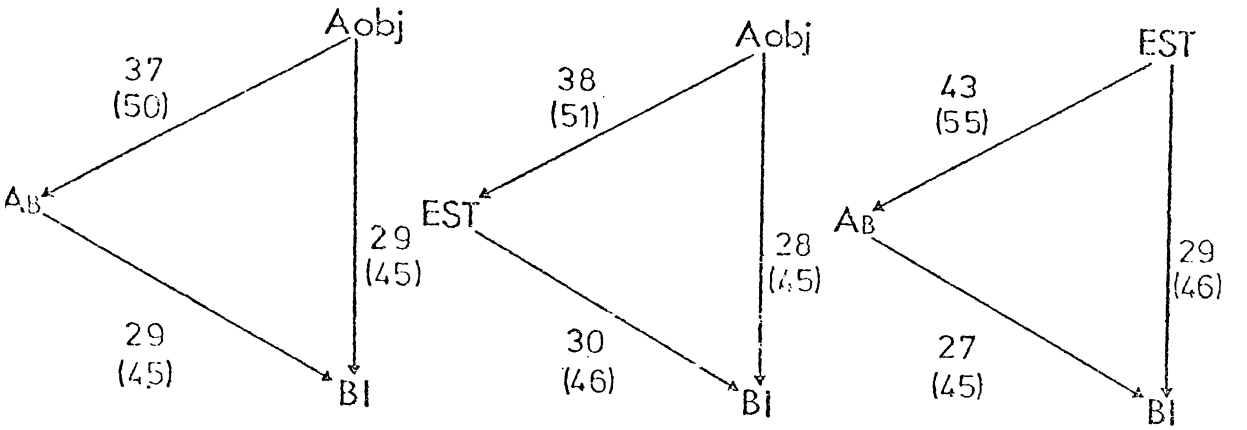

Aobj
52
51
34
21
EST
AB
13
09
(iv)
BI

(b.) Pretest

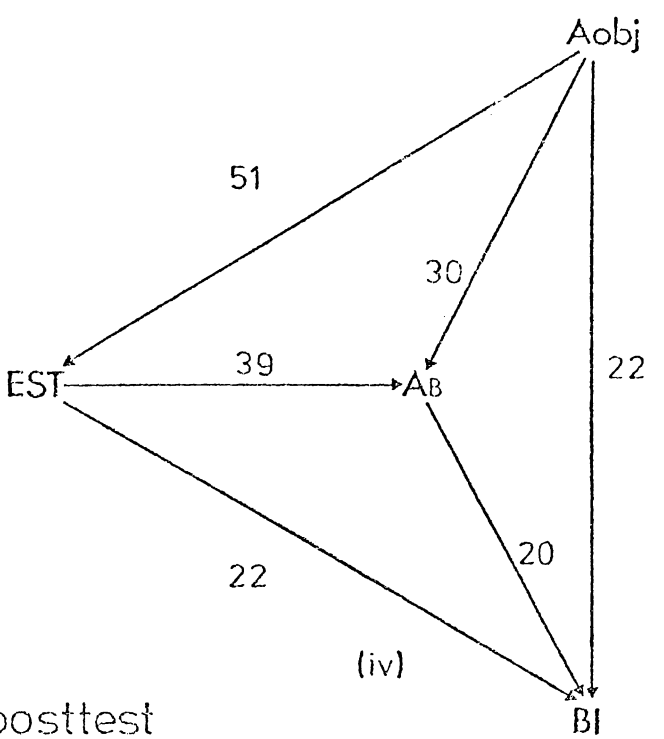




(c.) Immediate posttest



(i) (ii) (iii)



(iv)

(d.) Final posttest

For the pretest it can be seen (Diagram (i)) that although A_B was caused by Aobj, it did not mediate the influence of Aobj on BI. The same type of thing occurred with EST (see Diagram (ii)), though the effects of EST were mediated through A_B if only they were in the model (Diagram (iii)). In the complete model, however, Aobj still influenced BI directly, not being mediated by either EST or A_B.

In part c) of Figure 6.4 it is seen in Diagram (i) that A_B mediated the influence of Aobj on BI at the immediate posttest. If EST was in the model with Aobj then it mediated the effect of Aobj, and when EST and A_B were both in the model it was A_B that mediated most of the influence. When the complete model was considered it is seen that A_B mediated all effects of BI from both Aobj and EST.

The picture at the final posttest is more complex than at any other occasion. Diagram (i) of part d) of Figure 6.4 shows that Aobj and A_B both had an effect on BI; that is, not all of the effect of Aobj on BI was mediated by A_B. The same is true for EST when it was in the model with Aobj. When A_B and EST were both in the model they both still had direct effects on BI, and in the complete model (Diagram (iv)) all three components had a direct effect. That is, for both EST and Aobj all effects were <u>not</u> mediated by A_B.

Discussion. The mediation of the effects of attitudes toward the object by the estimate of performance for the non-group, while not supporting Fishbein's model does seem to make good sense for this sample. These students had no experience with the behavior concerned and had already made a decision not to have any experience with it in the near future. It seems likely that their estimate of how well they would do if they did learn statistics would have a primary influence on their decision, rather than their attitudes toward the behavior per se. While this result shows that attitudes toward the behavior do not always mediate the effects of other variables, it must be remembered that attitudes toward the behavior on their own explained just as much of the variance in behavioral intentions ($r = .39$) as the estimate of performance did on its own ($r = .33$).

The results for the pretest of the learning group also go against Fishbein's model, but again a good explanation is easy to derive. It makes sense that people who have no experience with the behavior concerned are more likely to be influenced directly by their attitudes toward the object rather than indirectly by their attitudes toward the behavior itself. As to why this group's intentions were influenced directly by attitudes toward the object while the non-group's intentions were influenced through the estimate of performance, this is probably due to the fact that this group had already decided to learn some statistics (in 18.103) while the other group had already decided not to. And as discussed above it is reasonable to expect the non-group to be heavily

influenced by the estimate of how well they would do, while many of the learning group had probably decided to learn statistics to satisfy some course requirement, rather than being influenced too much by how well they thought they would do in it.

The results for the immediate posttest are exactly as would be postulated from Fishbein's model. The amount of variance in behavioral intentions explained by attitudes toward the behavior at the immediate posttest (r^2 = 24%) was much more than that explained by the attitudinal components at the pretest (R^2 = 7%).

At the final posttest the effects of neither attitudes toward the object nor the estimate of performance were mediated by attitudes toward the behavior -- all three components contributed significantly and equally to the explanation of variance in behavioral intentions. These are the most serious results for Fishbein's model so far, although it remains to investigate what happens when SN and the other variables are added to the model. There is also a ready explanation for these results, for it is reasonable to assume that the students at this point in time were using more information from different sources to make their decision of whether or not to learn further statistics. As well as the components of variance in the estimate of performance and attitudes toward the object that are common to attitudes toward the behavior, there are other components caused by residual variables that must still be important in

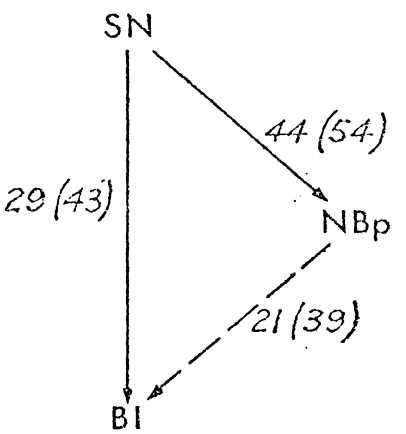
determining intentions. Because they had experienced an examination and knew their results, students had a much better idea of how they would perform in statistics than at any previous occasion. These results therefore indicate that students might be more rational in their decision-making than Fishbein's model would have them be.

As far as the attitudes toward the object, the estimate of performance, and attitudes toward the act components of Fishbein's model are concerned then it seems that at times when subjects had little information, attitudes toward the object or the estimate of performance are important in determining behavioral intentions, while during experience with the behavior concerned attitudes toward the behavior are the prime determiners, but after greater experience all elements of the model have some unique variance to add to the prediction.

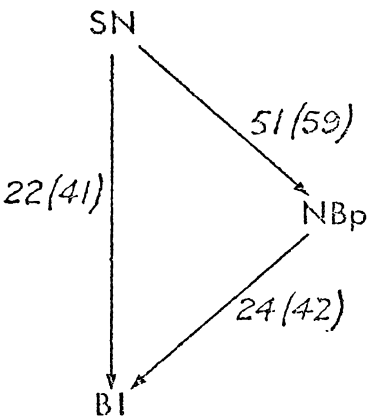
The normative components

Results. Partial correlations for the normative components of the model (SN, NBp, BIP and COM) are shown in Figures 6.5 and 6.6.

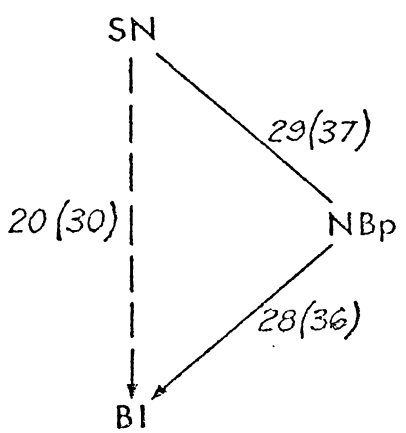
Figure 6.5 shows the results for the SN, NBp, BI triangle. For the non-group, partialling out SN reduced the correlation between BI and NBp to a value significant at only the .05 level. At the pretest, however, the partial correlations for both SN and NBp were significant, indicating that personal normative beliefs had some unique contribution to make to the explanation of variance in behavioral intentions. The influence of NBp was even more marked at the immediate



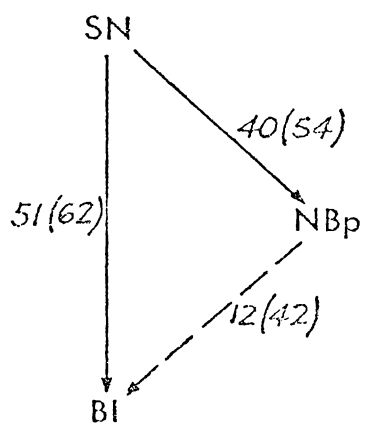
(a.) Non-group



(b.) Pretest

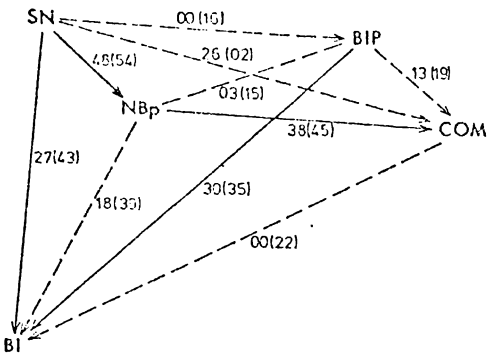


(c.) Immediate posttest

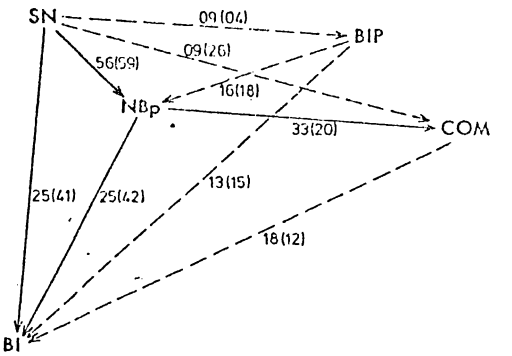


(d.) Final posttest

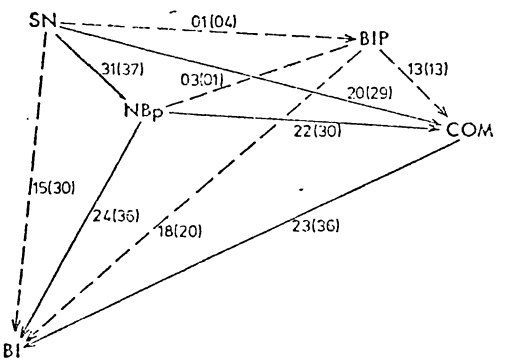
FIGURE 6.5 Partial correlations (with zero-order correlations in brackets) for the normative components of the model for four conditions; (a) non-group, (b) pretest, (c) immediate posttest, and (d) final posttest. (Solid lines indicate significant links).



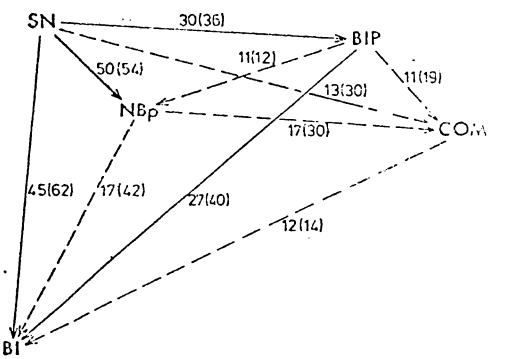
(a.) Non-group



(b.) Pretest



(c.) Immediate posttest



(d.) Final posttest

FIGURE 6.6 Partial correlations and path coefficients (in brackets) for the normative components plus measures of commitment and future intentions in psychology for four conditions; (a) non-group, (b) pretest, (c) immediate posttest, and (d) final posttest.

posttest, where the partial correlation between BI and SN was reduced so that it was significant only at the .05 level. At the final posttest, however, the major influence again was SN.

When the complete right-hand side of the model was considered, for the non-group it is seen in Figure 6.6 that BIP had a major influence on BI, and there was no relationship between BIP and SN.

At the pretest, adding BIP and COM to the model did not change the causal influences on BI as discussed in the previous section.

At the immediate posttest, some of the effects of SN were still mediated by NBp. In addition, more of the effects of SN and some of the effects of NBp were mediated by COM.

Social norms still provided the major influence at the final posttest, but BIP again had a significant influence on behavioral intentions. The partial r between BI and BIP was markedly different from the zero-order correlation though, and this would be because BIP was correlated with SN at this point in time.

Discussion. The fact that partialling out subjective norms reduced the correlation between behavioral intentions and personal normative beliefs to a low level for the non-group is some support for Fishbein's model. As predicted by the model, most of the contribution of subjective norms to the explanation of behavioral intentions was direct rather than being mediated by personal normative beliefs. For the learning group, however, some influence of subjective norms on behavioral intentions was mediated by personal normative beliefs, and this

is evidence against the model's postulates. It seems that if a student has decided that he wants to major in psychology or the social sciences then he is willing to learn the statistics that others are telling him are necessary, or that if he has decided not to major in the social sciences then he does not have to worry about doing statistics and no-one is urging him to do so.

The implications of these results for Fishbein's model are difficult to draw. It seems that under some conditions -- e.g., having commited oneself not to undertake the behavior (non-group), or having commited oneself to doing or not doing a related or requisite behavior (i.e. having decided whether or not to major in the social sciences) -- the major normative influence on behavioral intentions are social, but under other conditions these are mediated by personal normative beliefs.

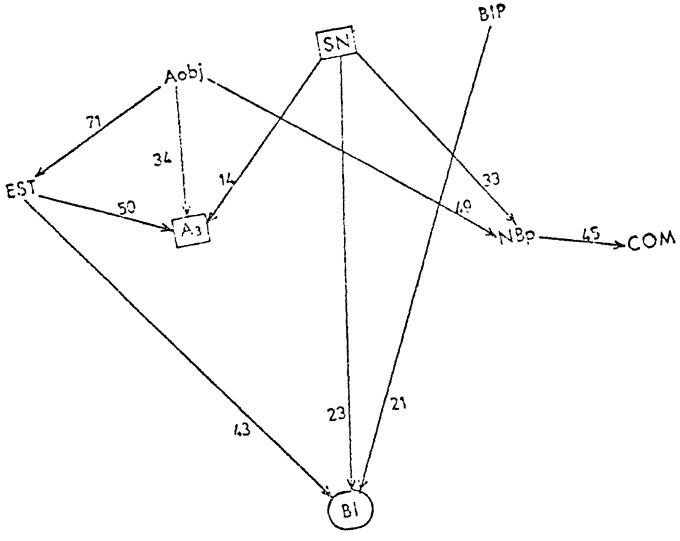
Adding the other measured variables (BIP and COM) to the normative components sometimes changed the model. Future intentions in psychology and the social sciences had a direct influence on behavioral intentions for the non-group and at the final posttest for the learning group. There was no relationship between future intentions in psychology and subjective norms for the non-group, although there was at the final posttest, and in neither case did future intentions in psychology relate to the attitudinal components. These results provide further evidence directly against the postulate that the effects of all other possible influences on behavioral intentions will always be mediated by the model.

The influence of commitment to doing well on behavioral intentions at the pretest and immediate posttest provides further evidence against the claims for the model. Here some of the influence of subjective norms on behavioral intentions might be mediated by personal normative beliefs and commitment to doing well, though the influence of commitment to doing well on behavioral intentions could be unique. How much a student is commited to the behavior in question at the time of measurement seems to have an influence on whether or not that behavior will be undertaken again in the future. These results support the discussion of the final posttest results in the previous section -- that a decision about future intentions in the social sciences was likely to be related to social norms about whether or not statistics should be learned.

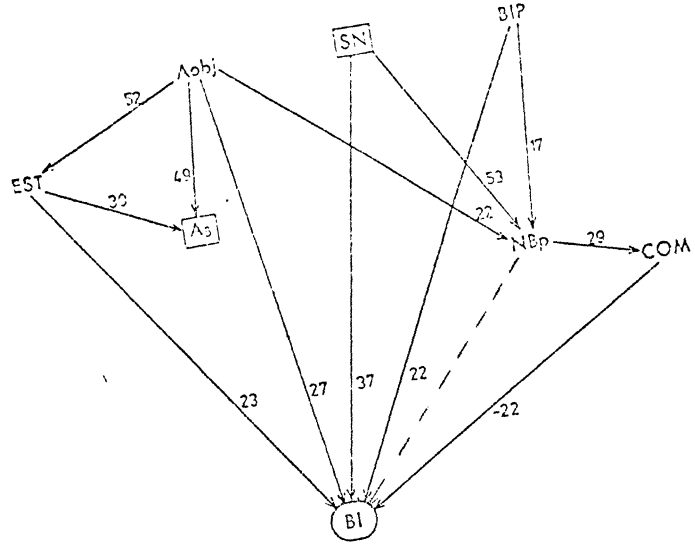
The findings that future intentions in psychology and commitment to doing well contributed significant explanation to the variance in behavioral intentions appears to be another challenge to the sufficiency of Fishbein's model, but the partial correlations when the complete model is considered must be presented before further discussion.

Completing the extended model

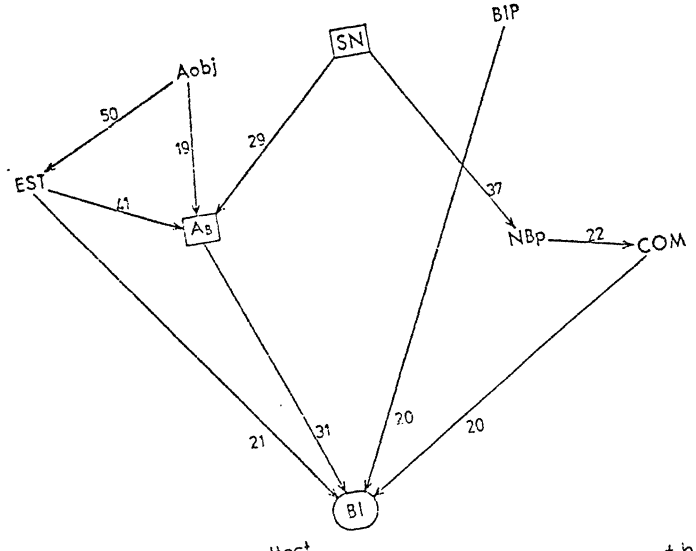
Results. The path coefficients when all components are considered in the model are shown in Figure 6.7. For the non-group EST, SN and BIP still had direct effects as found in the previous results for the sections of the model.



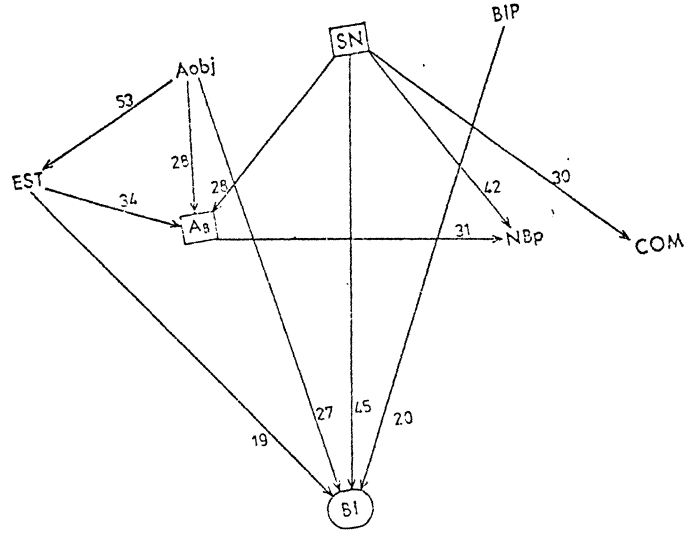
(a.) Non-group



(b.) Pretest



(c.) Immediate posttest



(d.) Final posttest

FIGURE 6.7 The path coefficients for the complete extended model.

The two sections are linked by Aobj having an influence on NBp and SN having an influence on A_B.

At the pretest, path coefficients indicated a direct effect of Aobj and SN as has been seen in previous results. There were also direct effects from EST, COM and BIP, and some from NBp.

There were also differences in the model at the immediate posttest when all components were considered together. A_B and COM still had a direct influence on BI. The influence of NBp was replaced by one from BIP, and a direct influence of EST was added.

At the final posttest A_B no longer had an influence on BI, but the right-hand side of the model remained unchanged from the earlier results with SN and BIP making direct contributions.

Discussion. The results for the non-group were unchanged by putting all sections of the model together. Attitudes toward the behavior and personal normative belief both appear to be alternative products of the model for this example.

There were changes induced in the model for the pretest when all components were considered. The estimate of performance which had no direct effect when the attitudinal components were considered above does so when all components were considered. The finding is difficult to interpret, but must be a result of the interconnections between the two halves of the model, and of not partialling out attitudes toward the behavior here (which occurred for Figure 6.4b).

That is, the estimate of performance had some variance in common with behavioral intentions which is unique from variance in attitudes toward the object, although it may not be unique from variance in attitudes toward the behavior The reasons for the direct effects of future intentions in psychology and commitment to doing well appear to be interconnected. It seems that the influence of attitudes toward the object or personal normative beliefs decreased the variance personal normative beliefs had in common with behavioral intentions so that it no longer had a significant effect on behavioral intentions. This increased the chances of future intentions in psychology having variance in common with behavioral intentions and so a direct link was formed. Personal normative beliefs still had some effect on behavioral intentions, however, it being mediated by commitment to doing well. The negative coefficient for the commitment to doing well indicates that it is probably a suppressor variable, allowing the contributions made by the other predictors to be increased.

The results at the immediate posttest also showed differences from the earlier ones. It seems that the effects of personal normative beliefs were no longer significant because of some variance in common with the subjective norms, which seems to have a causal influence on both attitudes toward the behavior and personal normative beliefs. That is, some of influence of subjective norms was mediated by attitudes toward the behavior, so that there was not a

significant portion to be mediated by personal normative beliefs. The significant contribution of the estimate of performance seems to be a result of a smaller portion of attitudes toward the object being mediated by attitudes toward the behavior because of the influence from subjective norms, The direct effect of future intentions in psychology would appear to result because of the other changes described above.

There is only one minor change from the earlier results of the final posttest. Attitudes toward the behavior no longer had an influence on behavioral intentions and this appears to be due to the variance that it had in common with subjective norms which itself had a direct effect on behavioral intentions. At the immediate posttest, effects of subjective norms were mediated by attitudes toward the behavior, but here they had a direct influence on behavioral intentions. This has already been explained by the increased importance of subjective norms after the statistics course was completed.

The changes in the models when different combinations of variables are considered may be used to make a general point about model building. A model may very well be correct when considered in isolation but that does not mean that it will remain unchanged when other variables are considered or when the level of measurement or construct changes.

Overall, these results show that because one model gives good prediction of a dependent variable it does not necessarily mean that the components of that model are the causes of the dependent variable, or that they are <u>the best</u> predictors of it under all conditions.

The claim of Fishbein that attitudes toward the behavior and subjective norms should mediate the influence of all other variables on behavioral intentions is a claim that these components are the closest influences on behavioral intentions in the causal chain. This has been shown to be incorrect because under some conditions attitudes toward the behavior or subjective norms do not necessarily enter the causal chain at all because other variables which might or might not be related to them have direct causal influences on intentions (e.g., attitudes toward the object, the estimate of performance, and future intentions in psychology) and at other times the effects of subjective norms are mediated by personal normative beliefs and/or commitment to the act.

Considering All Three Times Together

In Chapter Four the correlations between all eight variables over all three times of measurement were presented in a "multitrait-multimeasure" matrix. Considering the path coefficients over three times should clarify those relationships still further. It was hypothesised that the variable measured at the final posttest should be best predicted by a previous measure of that same variable, and then by other variables measured at the same time. For example, behavioral intentions at the final posttest should be predicted by behavioral intentions as measured at the immediate posttest and by subjective (social) norms as measured at the final posttest. Similarly, behavioral intentions at the immediate posttest should be best predicted by behavioral intentions as

measured at the pretest and by attitudes toward the behavior as measured at the final posttest. Similarly, behavioral intentions at the immediate posttest should be best predicted by behavioral intentions as measured at the pretest and by attitudes toward the behavior as measured at the immediate posttest.

This analysis was divided into three phases to allow for an easier step-by-step interpretation of results. First, only those variables in Fishbein's final model (A_B, SN, and BI) were considered, next the two attitudinal plus the two normative components were considered, and finally a complex model involving all measured variables was calculated.

A_B plus SN model

Results. Figure 6.8 shows the results when only Fishbein's model is considered. Behavioral intentions at the final posttest (BI_3) were influenced most by subjective norms at that same time (SN_3) and behavioral intentions at the immediate posttest (BI_2). BI_2 was influenced by BI_1 and A_{B2}. SN_3 was caused by SN_2, SN_1, and BI_2, and A_{B3} was caused by A_{B2}, A_{B1} and SN_3. SN_2 was caused by SN_1, and AB_2 by A_{B1} and BI_1. BI_1 was caused by A_{B1} and SN_1 as expected by Fishbein.

Discussion. These results largely support the hypothesis that the best predictor of a variable is a previous measure of that variable. In all cases, a previous measure or previous measures of the predicted variable contributed to

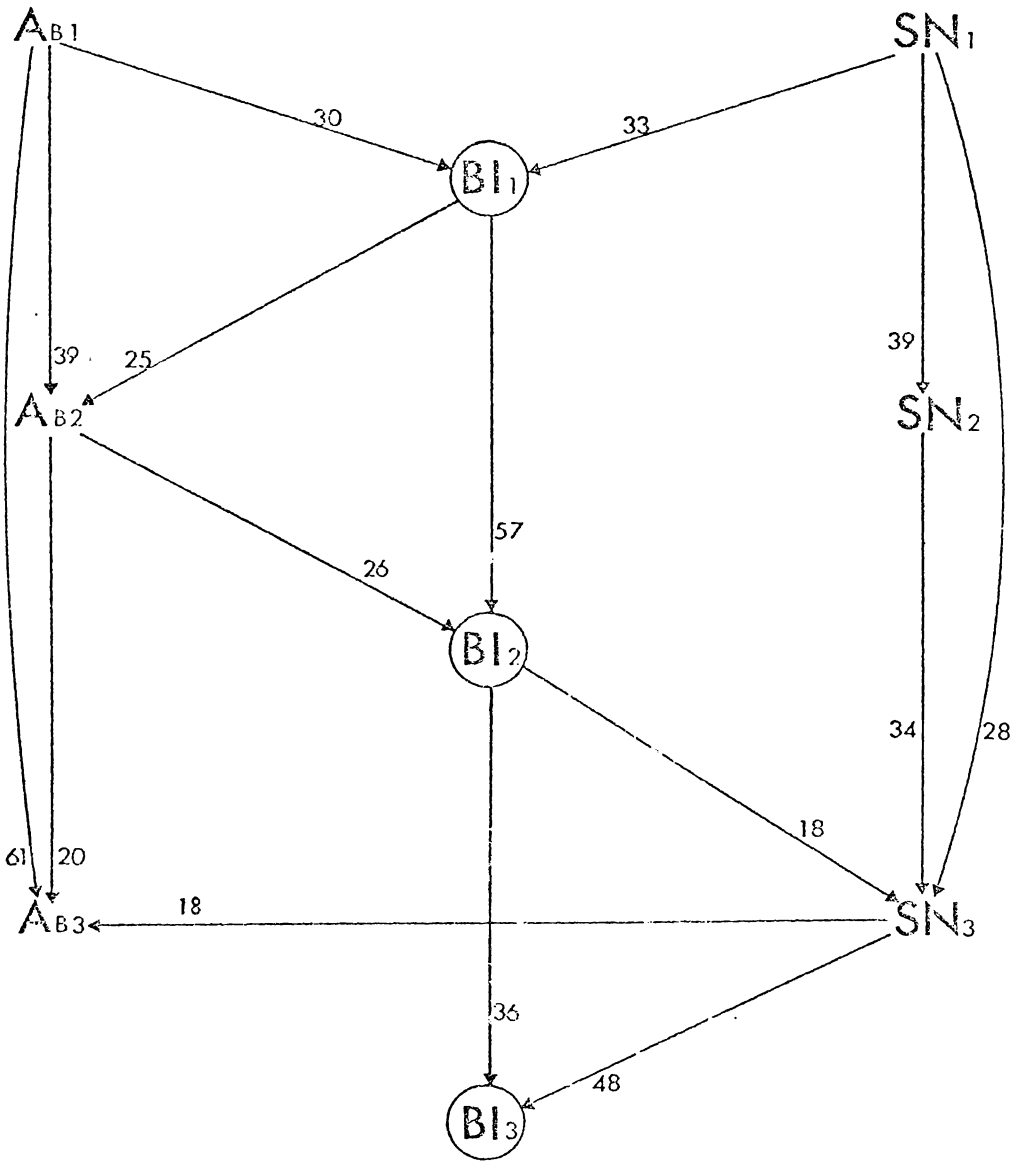


FIGURE 6.8 Path coefficients for the components of Fishbein's model measured at three times.

the prediction. In most cases this previous measure gave the best prediction. The only exception was that behavioral intentions at the final posttest were best predicted by subjective norms at the same time -- however, the zero-order correlations are not significantly different, being .62 for BI_3 - SN_3 and .55 for BI_3 - BI_2.

The four-component model

Figure 6.9 shows the path coefficients when the two attitudinal components and two normative components are considered for the prediction of behavioral intentions. These results are substantially the same as those shown in Figure 6.8 with the added complexity of two more variables at each time (Aobj and NBp). Just as for A_B and SN, Aobj and NBp were best predicted by previous measures of them.

All variables considered

The path diagram becomes rather complex when all measured variables are considered, as can be seen in Figure 6.10. However, the results are simply an extension of those already reported, and it is again true that any variable is usually best predicted by a previous measure of that variable plus other variables measured at the same time or immediately prior to it in the causal chain. Occasionally, however, a variable at the final posttest was significantly influenced by another variable measured at the pretest. For example, commitment to the act at the final posttest was influenced not only by previous measures of commitment and

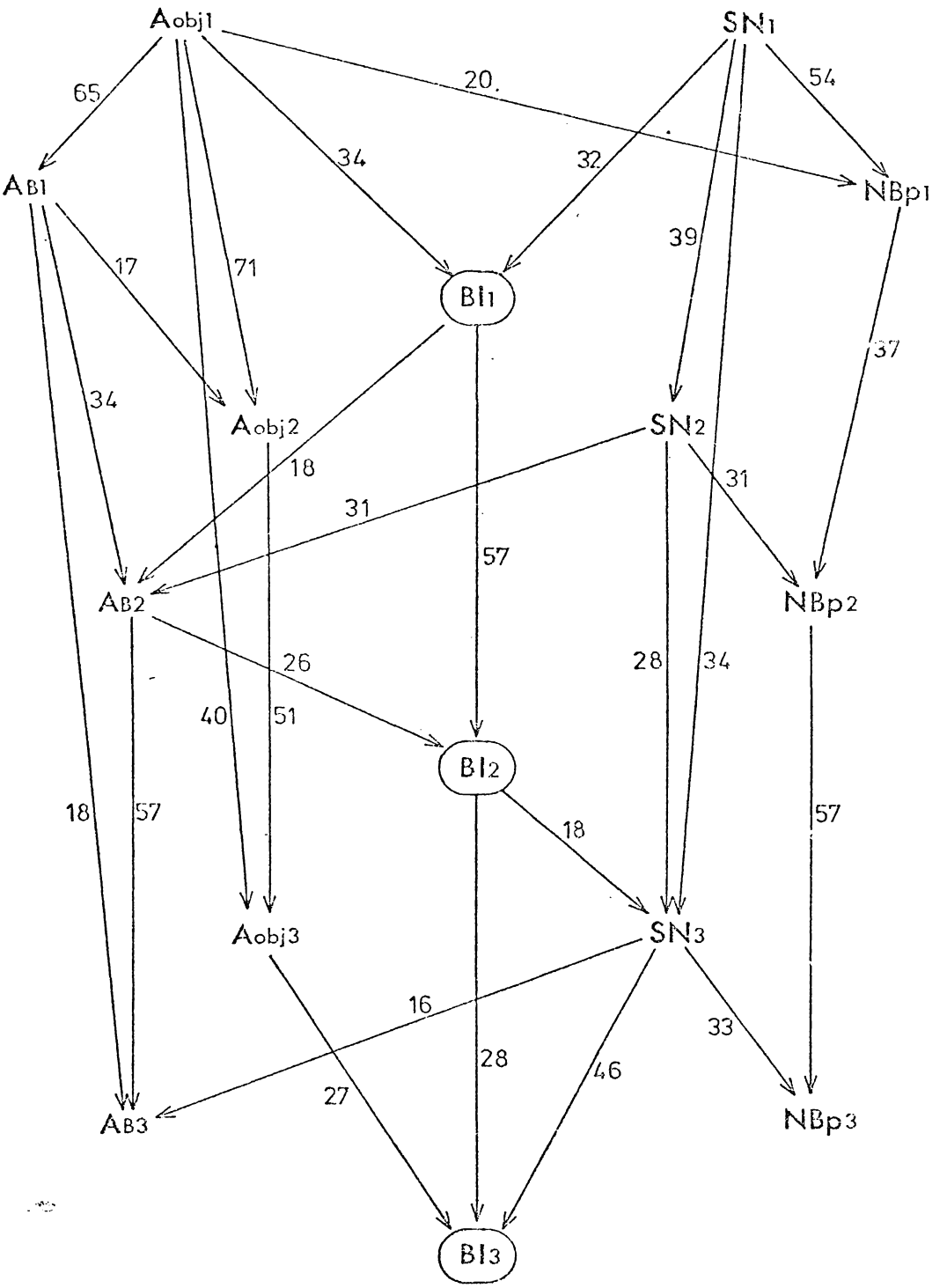


FIGURE 6.9 Path coefficients for the four-component model over three times.

other variables measured at the final posttest (A_B and SN), but also by behavioral intentions at the pretest. Also some different variables related more highly to a predicted one than did a previous measure. For example, the estimate of performance at the immediate posttest gave a better prediction of attitudes toward the behaviour at the immediate posttest than did attitudes toward the behavior as measured at the pretest. This, however, makes reasonable sense as it was shown in Chapter 4 that attitudes toward the behavior at the pretest are more highly related to attitudes toward the object than to subsequent measures of attitudes toward the behavior, and this was likely to be because the subjects had no previous experience with the behavior concerned (learning statistics in a psychology course).

Discussion

Overall, the consideration of the eight measured variables over three times gives good support to the hypothesis that the best predictor of a variable should be a previous measure of that variable. With regard to Fishbein's model, these results show a consistency over time within the measured variables, and a reasonable consistency over time of stated behavioral intentions, but no consistency in the way the measured predictors relate to behavioral intentions. For example, Figure 6.8 highlights the changes in weights assigned to the two components of Fishbein's model according to condition -- both components were equally important at the pretest, only attitudes toward the behavior were

influential at the immediate posttest, and only subjective norms at the final posttest.

Conclusions from Path Analyses Results

Within the assumptions of the recursive model used, the results reported in this chapter reinforce the conclusions reached in the previous chapter, and clarify the links between the variables related to behavioral intentions. One major postulate of Fishbein's model is that the influence of any other variables on behavioral intentions will always be mediated by the model. That is, the components of the model are postulated to be sufficient to explain variance in behavioral intentions. It is noteworthy, however, that Fishbein himself (Fishbein and Ajzen, 1975) has quoted studies carried out in his university where attitudes toward the behavior did not mediate all of the influence of attitudes toward the object on behavioral intentions, although its influence was significantly reduced.

The results of this chapter clearly show that Fishbein's model is not always sufficient to explain variance in behavioral intentions. For example, the influence of an estimate of performance in statistics on behavioral intentions in learning statistics was not always fully mediated by attitudes toward the behavior of learning statistics for the non-group or at the final posttest for the learning group. Similarly, attitudes toward the object were not always fully mediated by attitudes toward the behavior at the pretest and

the final posttest for the learning group.

On the normative components side of the model, personal normative beliefs were shown to mediate the effects of subjective (social) norms for the pretest and immediate posttest of the learning group. The claim that subjective norms could mediate the effects of some other variables was shown to be almost impossible in that subjective norms is most likely to be an exogenous variable. Thus, its effects can be more easily mediated by another variable such as personal normative beliefs than other variable's effects be mediated by it. Even if the assumption that it is an exogenous variable was wrong, the results would still show that it cannot mediate all effects of personal normative beliefs, future intentions in psychology, or commitment to the act of learning statistics.

Fishbein has claimed that his model should give better prediction of behavioral intentions than any other model, but I do not think that he has ever explicitly claimed that attitudes toward the behavior and subjective norms are the direct causes of, or closest influences on, behavioral intentions. However, the claim that the model should mediate all influence of any other variables implies this. It has been clearly shown in this chapter that because one model gives good prediction of behavioral intentions it does not necessarily mean that the components of that model are the causes of behavioral intentions, or that they are the best predictors of it under all conditions. It is

possible that the variables concerned are mediated by or are mediators of other variables; for example, subjective norms were sometimes mediated by personal normative beliefs if they were considered in the model, and attitudes toward the behavior sometimes mediated attitudes toward the object and estimates of performance if they were considered in the model. That is, Fishbein's model may give a reasonable prediction of behavioral intentions if it is considered in a vacuum, but as soon as other variables are considered the picture becomes rather more complex.

The results of path analysis when all three times for the learning group were considered at once further suggests that a model for explaining behavioral intentions needs to be dynamic rather than static. This comment can probably be applied to most theories in psychology. Instead of regarding variables as being static at the (usually) one time of measurement, a dynamic system needs to be considered where all variables are affecting all other variables. For example, behavioral intentions at time one can influence some of the variables normally regarded as influencing behavioral intentions as well as behavioral intentions at time two.

Overall, path analysis has raised many questions about the claims made for Fishbein's model, and helped clarify some of the links within it.

CHAPTER SEVEN

THE NUCLEAR POWER DATA

All of the foregoing data and analyses were obtained from the two groups of subjects, the non-group and the learning group, and on the one topic, the learning of statistics. It is imperative in work of this nature that data from different groups of people and on different topics be examined. What applies for the attitudes and behavior of introductory psychology students towards learning statistics need not necessarily apply to the attitudes and behavior of other samples towards other issues. However, to exhaust all possible combinations of types of people and types of issues is also clearly impossible. Within the constraints of time and availability of resources this author was able to examine data from one other sample on an issue totally different in nature from the learning of statistics.

Attitudinal and Behavioral Issue

The establishment of nuclear power stations in New Zealand was the attitude issue used. This is currently a very controversial issue, as no nuclear power stations have yet been established in New Zealand though it is being seriously considered. Approximately 35.5% of the sample used supported such a proposal and the remaining 64.5% opposed it. The

behavioral intention assessed was a multiple criteria (see Fishbein and Ajzen, 1974) rated likelihood of taking part in certain activities in support (for supporters) or opposition (for opposers) of the establishment of nuclear power stations in New Zealand (see materials section below for fuller details).

Method

Subjects

The subject sample consisted of 84 people living in Birkenhead, a suburban borough of Auckland with a population of about 16,000 (1971 census). It is the closest suburban area to Helensville, the site where a nuclear power plant has been proposed, being about 25 miles away. Thus, the attitude issue was very salient for these people.

The sample was selected by the use of a "grid overlay" method. A 9 x 9 grid was laid over a map of the borough and one of the 81 squares randomly selected by the use of random number tables. A second 9 x 9 grid was laid over the square chosen and one of those 81 squares randomly chosen -- this indicated one individual lot. If this final square ended up in the middle of the sea or wasteland or farmland, then the selection process was started again. If it ended up close to a lot, then the closest lot was selected. Six interviewers conducted 15 (or less) interviews each, interviewing the person over 18 years who last had a birthday. They started at the lot selected by the above procedure, and

went to every fifth house eastward. If the person who last had a birthday was not at home then the interviewer called back -- only 12 call-backs were necessary, as interviewing was done on a Saturday morning.

By the above procedure a sample representative of the general population of the area was chosen. Fortysix of them were male, and 38 were female. Eight of the subjects were aged between 18 and 24, 38 were 25-34, 15 were 35-44, 12 were 45-54, 5 were 55-64, and 6 were 65 or over.

Materials

The measuring instrument consisted of 52 questions, each followed by a five-point scale which was labelled at the extremes and, where appropriate, at the mid-point. The attitudinal items used, and the end-points of the scales are shown in Appendix II. There they are ordered for ease of reading -- in the questionnaire they were ordered: Importance of the issue, attitudes toward the object, Conservation, Effectiveness of support and opposition, attitudes toward the behavior, behavioral intentions, personal normative beliefs, subjective norms, motivation to comply, and Safety.

The other 10 items were designed to assess the subject's knowledge of nuclear power issues. These were scored as right or wrong, with degrees of wrongness where this was scaleable, and one score computed for knowledge by summing across the itmes. These items are shown in Appendix III.

Finally, biographic data on each subject was collected. This included sex, marital status, age, and length of residence in Birkenhead.

Analyses

These data were analysed in a similar way to the analyses reported in Chapters Three and Five for the learning of statistics issue.

First, a principal component analysis was carried out. For this analysis the items making up the measures of behavioral intentions and attitudes toward the act were not included with the remaining items. One reason for this is that the multiple-act criteria used itself was likely to divide into components just as in the work of Triandis (1964). A second reason is that while the items measuring these two components referred to acting in a particular way in support (or opposition) of an issue, all other items were bipolar with supportive ratings at one extreme and opposition ratings at the other. Thus, once it was established that certain items actually did measure attitudes toward the object, for example, then it was necessary to "fold" the score, that is, to represent the score as the absolute difference from the neutral point, to make it comparable with the behavioral intentions and attitudes toward the behavior measures if the complete sample were considered. If, however, only supporters or only opposers were considered, this would not have been necessary. As in the previous principal component analyses, the criterion for selecting the number of factors was the scree test.

Scores for each of the factors (components) were then calculated by taking the mean of the items contributing to the factor. The score for attitudes toward the act was the

sum of items one to seven, and the score for behavioral intentions was the sum of items 28 to 34. All scores were calculated so that higher scores represented favourability or support for nuclear power and lower scores represent unfavourability or opposition. The folded score attitudes toward the object represents intensity of feelings, from a low score for those subjects who are neutral or only very weak supporters or opposers to a high score for those subjects who are strongly in support or opposition. The means on each of the measures and the correlations between them are reported.

Multiple regression analysis was again used to test Fishbein's model.

Hypotheses

It was hypothesised that many of the findings from the learning of statistics data could be replicated.

The components of the model as well as the other variables measured were expected to have factorial validity. They were also expected to have different relationships to behavioral intentions for the two different groups of people.

It was expected that different prediction equations would be derived for the two groups of people, opposers and supporters of nuclear power. That is, the weights assigned to the two components, attitudes toward the behavior and subjective norms, would be different for the two groups.

Specifically, it could reasonably be expected that normative beliefs, particularly personal normative beliefs, would be more important for opposers of nuclear power, and that attitudes toward the behavior would be more important for supporters of the issue.

The expected importance of personal normative beliefs for opposers would also provide additional evidence to suggest that the dropping of personal normative beliefs from Fishbein's model was premature.

There is no reason to believe that Fishbein's model should be any more sufficient in explaining behavioral intentions with regard to the opposing or supporting of nuclear power than it was found to be for the learning of statistics. In fact, the above expectation that personal normative beliefs should be most important for opposers assumes that Fishbein's model is not sufficient for predicting the behavioral intentions of opposers. It could also be reasonably expected that the perceived effectiveness of action would have an influence in the determination of behavioral intention, especially for supporters.

Results and Discussion

Principal component analysis

The principal component analysis included the items that were expected to measure SN, Mc, NBp, Aobj, Importance of the issue, Safety, Conservation, and Effectiveness of support or opposition factors. The items measuring attitudes toward

the behavior and behavioral intentions were not included. Seven factors were extracted which accounted for 77.3% of the variance. The eigenvalues are shown in Table 7.1 where it is seen that the scree test gave a clear cut at seven factors. The factor loadings (pattern matrix) are shown in Table 7.2 where it is seen that factors were produced to correspond fairly well with those hypothesised. One statistical problem with this analysis is the effect of the first factor accounting for so much of the variance and having so many of the items loading on it. This reduces the chance of obtaining a good factor structure for the remaining items (cf. Guilford, 1975). Accordingly, the items not making up the attitudes toward the object factor were analysed separately to produce the six-factor solution shown in Table 7.3. The normative belief components were more clearly separated in this solution -- the personal normative beliefs item did not load on the subjective norms and motivation to comply factor, and the two factors correlated only .23. In both solutions the subjective norms and motivation to comply items loaded together, just as they sometimes did for the learning of statistics data. The conservation, safety, and effectiveness factors were clearly produced, but the importance item tended to be confounded with the social norm or conservation item.

In general there is good factorial validity for the components as they were hypothesised. Again, however, the hypothesis of single-factoredness between subjective norms and the motivation to comply could not be rejected.

Table 7.1

Eigen-values, percent of variance, and cut-off point for the number of factors for the nuclear power data.

FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
1	7.67949	38.4	38.4
2	2.31631	11.6	50.0
3	1.46169	7.3	57.3
4	1.37966	6.4	63.7
5	1.05750	5.3	69.0
6	0.88298	4.4	73.4
7	0.77978	3.9	77.3
8	0.66905	3.3	80.6
9	0.64737	3.2	83.9
10	0.51901	2.6	86.5
11	0.49222	2.5	88.9
12	0.42779	2.1	91.1
13	0.39577	2.0	93.0
14	0.31188	1.6	94.6
15	0.28434	1.4	96.0
16	0.25290	1.3	97.3
17	0.21360	1.1	98.4
18	0.16961	0.8	99.2
19	0.10007	0.5	99.7
20	0.05900	0.3	100.0

Table 7.2

Oblique principal component loading for
the nuclear power data

FACTOR	Item	Aobj	SN&Mc	NBp	Conservation	Effectiveness	Safety	Importance	Communalities
Aobj	11	77							76
	12	88							82
	13	96							86
	14	80							76
	15	91							85
	16	81							71
	17	50					-34		70
	18	-80							86
	19	-47		42					80
	20	50							58
SN & Mc	8		-66					-41	75
	9		92						84
NBp	10		-39	-57					68
Conservation	24			-66	43				71
	25				89				86
Effectiveness	26					79			74
	27					90			82
Safety	22						95		83
	23						75		73
Importance	21							86	83

Note. Leading decimal points have been omitted.

Table 7.3

Oblique principal component loadings for the nuclear power items after Acbj was extracted

FACTOR	Item	SN&Mc	Safety	Conservation	Effectiveness	Importance	NBp	Communalities
SN & Mc	8	79						79
	9	-86						81
Safety	17		-76					65
	22		87					73
	23		85					74
Conser-vation	24			84				76
	25			73		42		76
Effect-iveness	26				-87			81
	27				-83			80
Import-ance	11					89		86
NBp	10						87	92
%age of Variance		24.6	17.6	12.5	9.9	8.0	5.9	78.5

Note. Leading decimal points have been omitted

Mean scores

The mean score on each measured component was calculated by taking the mean of the items making up that component (as set out in Appendix II, and as validated by the principal component analysis for most components), with adjustment being made so that a neutral attitude received a zero score, a favourable or supporting attitude a positive score, and an unfavourable or opposing attitude a negative score. The scores for attitudes toward the behavior and attitudes toward the object, however, were calculated to reflect the strength of the attitude, whether opposing or supporting. That is, a high scorer was likely to have strong attitudes toward the issue (Actj) whether these were opposing or supporting, be favourably disposed to action to support this attitude, and be more likely to act to support the attitude, while the low scorer would have less intense attitudes and would be unlikely to take action in support of their attitudes.

The mean scores on all measured components are shown in Table 7.4 where it is seen that attitudes toward the behavior and behavioral intentions were slightly positive. That is, people were generally willing to take some action in support of their attitudes. This willingness did not depend on whether the subject was an opposer or supporter of nuclear power. The $A_{B(p)}$ and $A_{B(E)}$ scores are respectively the pleasantness and effectiveness scales of the attitudes toward the behavior items. They are of interest in that opposers seem to think that they would find acting in support of their attitudes to be much more pleasant and personally rewarding than supporters would.

Table 7.4

Mean scores and standard deviations on the measured components for the nuclear power data

COMPONENT	WHOLE SAMPLE X	SD	OPPOSERS X^a	SUPPORTERS X	t
BI	3.72	.84	3.77	3.64	
A_B	3.58	.57	3.66	3.43	
$A_B(P)$	3.58	.72	3.72	3.33	2.37*
$A_B(E)$	3.57	.69	3.59	3.53	
SN	.51	1.16	.59	.37	
Mc	-.12	1.48	-.17	-.03	
NBs	.36	1.04	.42	.25	
NBp	.59	1.20	.91	.03	2.23*
Aobj[b]	2.25	.67	2.45	1.91	3.55**
Aobj(not folded)	-.62	1.26	-1.40	.80	7.69***
Importance	1.24	.99	1.22	1.27	
Safety	-.85	.97	-1.20	-.22	4.47***
Conservation	.11	1.07	.29	-.22	
Effectiveness	.75	1.16	.82	.62	
Knowledge	17.54	3.14	17.61	17.40	

Notes. 1. Most scores are derived so that neutral attitudes score zero, favourable attitudes score positive and unfavourable attitudes score negative on a scale from -2.0 to +2.0.

2. Scores for A_B and BI indicate attitudes and intentions with respect to acting in accordance with ones support or opposition. That is, they are scaled from a low likelihood of acting to a high liklihood while other scores are bipolar from extreme opposition or unfavourable attitudes to extreme support or favourable attitudes.

a) The standard deviations for the two subgroups did not differ from that for the whole group or from each other for any variable.

b) The Aobj score is similar to that for A_B and BI in that it represents the intensity of attitude whether supporting or opposing rather than whether the subject is an opposer or supporter. The Aobj (not folded) score, on the other hand is bipolar from opposition to support.

* p .05

** p .01

*** p .001

Attitudes toward the object, as measured on the unfolded score, were slightly unfavourable, but this is just a reflection of the fact that there were more opposers in the sample (and presumeably in the population of Birkenhead) than there were supporters. The folded score on attitudes toward the object is a measure of the intensity of opposition or support and the score indicates that people generally had fairly strong feelings on this issue (the maximum possible score is 3.0), with opposers having more unfavourable attitudes than supporters had favourable attitudes.

The importance score also indicates that most people considered the issue to be very important. The safety score indicates that most people considered nuclear power to be unsafe, but this score clearly discriminates the opposers from the supporters with nuclear power being considered much more unsafe by opposers than by supporters.

The scores on the conservation component were close to neutral indicating that the sample did not, on the whole, consider energy conservation to be very beneficial, or perhaps they did not find it very relevant to the issue. The positive effectiveness score indicated that people felt that action in support of their attitudes (whether these attitudes were in opposition or support of the issue) should be effective in preventing or ensuring the development of nuclear power.

The scores on the normative components generally reflected positive beliefs about action in support of attitudes. That is, these people felt that important others thought they

should take some action relative to their attitudes, and they felt a personal commitment to this themselves. Personal normative beliefs discriminated opposers from supporters, with opposers feeling a greater commitment toward acting to try and prevent the introduction of nuclear power into New Zealand than the supporters felt toward acting to try and ensure its introduction. The motivation to comply with social norms was generally neutral.

The two groups did not differ in their level of knowledge about nuclear power.

Correlations between components

The correlations between the component scores for the whole sample and for the opposers and supporters separately are shown in Table 7.5. In general attitudes toward the behavior, subjective norms, personal normative beliefs, and behavioral intentions were significantly intercorrelated, just as they were for the learning of statistics data. The importance of the issue and the perceived effectiveness of action were also significantly related to behavioral intentions. Knowledge about nuclear power generation related to behavioral intentions only for the opposing group.

Attitudes toward the object did not correlate as highly with behavioral intentions as did attitudes toward the behavior, subjective norms, or personal normative beliefs, which again supports Fishbein's contentions.

Just as for the learning of statistics data, the perceived social norms multiplied by the motivation to comply with them (NBs)

Table 7.5

Correlations between components for the nuclear power data

	$A_{B(P)}$	$A_{B(E)}$	SN	Mc	NBs	NBp	Aobj	Imp	Safe	Conserv	Effect	Know	BI
A_B Whole Group	82	80	43	24	12	34	24	40	08	-02	38	12	52
Opposers	84	84	54	43	14	36	07	36	09	02	38	30	45
Supporters	79	78	25	-06**	05	21	37	59	15	35	36	-18**	64
$A_{B(P)}$ Whole Group		32	35	21	07	37	32	31	-01	11	17	08	46
Opposers		42	55	43	09	44	21	30	-09	-12	27	20	60*
Supporters		22	05**	-08**	-01	16	33	43	34**	27	00	-10	26
$A_{B(E)}$ Whole Group			35	18	12	18	05	34	02	21	46	12	39
Opposers			36	30	14	18	09	30	25	16	38	31	16
Supporters			34	-01	09	17	25	49	-12	29	57	-17**	75**
SN Whole Group				46	06	37	16	28	02	-02	28	20	42
Opposers				49	03	34	16	37	08	01	35	22	45
Supporters				39	20	41	07	00	-20	49**	12	13	34
Mc Whole Group					60	28	10	07	-08	-13	14	15	38
Opposers					62	48	23	16	-24	-11	27	26	44
Supporters					56	02**	-15	-24	-52	20	-12	-11	16
NBs Whole Group						16	22	04	-25	05	02	10	06
Opposers						34	28	01	-33	10	06	10	02
Supporters						-27	-04	15	-15	-11	-13	12	14
NBp Whole Group							40	20	-04	-16	29	16	46
Opposers							51	26	-27	-01	30	26	56
Supporters							-06**	17	10	50**	25	01	32
Aobj Whole Group								38	-31	16	15	02	25
Opposers								40	-37	18	19	01	29
Supporters								53	12**	-14	-02	00	12
Importance Whole Group									-03	-05	27	16	37
Opposers									-06	-06	31	20	40
Supporters									32	-10	20	04	31
Safety Whole Group										21	-08	04	-15
Opposers										20	-11	-14	-25
Supporters										-16	06	33**	-09
Conservation Whole Group											-03	-16	-08
Opposers											06	-23	-17
Supporters											16	-07	28**
Effectiveness Whole Group												21	42
Opposers												27	30
Supporters												08	65
Knowledge Whole Group													16
Opposers													31
Supporters													-17**

Notes. 1. Leading decimal points have been omitted.

2. Correlations must reach; .22 to be significant at the .05 level for the whole group,
.27 to be significant at the .05 level for the opposers,
.35 to be significant at the .05 level for the supporters.
.28 to be significant at the .01 level for the whole group,
.35 to be significant at the .01 level for the opposers,
.45 to be significant at the .01 level for the supporters,

** indicates a significant difference in correlation between the two groups. The difference between the correlations has to be of the order of .40 to be significant at the .05 level (z test, Guilford, 1965, p.159).

did not relate as closely to behavioral intentions as subjective norms (SN) did. This supports the decision by Fishbein and his associates to drop motivation to comply from the equation and substitute social normative beliefs with the more general subjective norm.

A key difference between opposers and supporters was that the behavioral intentions of the opposers were more influenced by the pleasantness of the action than by its effectiveness, while for supporters the opposite was the case with effectiveness having more influence than pleasantness. Thus, it seems that opposers are sometimes out for personal gratification, although to be fair they are less likely to act if they lack knowledge.

Multiple regression: Tests of Fishbein's model

A_B plus SN model The multiple regression equations when A_B and SN are forced to predict behavioral intentions are shown in the top row of Table 7.6. There it can be seen that the model was not highly predictive. It did, however, give a better prediction for the supporter, but most of this predictive capacity came from the contribution made by attitudes toward the behavior, with subjective norms not making a significant contribution. For the opposers, the contribution made by both components only just reached significance. Overall, subjective norms do not seem to influence behavioral intentions with respect to this issue.

Table 7.6

Multiple regression results for predicting behavioral intentions from attitudinal and normative components : comparison of four models

MODEL	WHOLE SAMPLE		OPPOSERS		SUPPORTERS	
	Beta-Coef	F for Beta[a]	Beta-Coef	F for Beta[a]	Beta-Coef	F for Beta[a]
A_B	42	17.31	30	4.35	59	16.17
SN	24	5.40	29	4.04	19	1.70
R^2	32		26		45	
A_B	42	19.70	29	5.93	60	16.90
NB_p	32	11.50	45	14.61	20	1.85
R^2	36		38		46	
AobJ	19	3.43	22	3.29	10	0.31
SN	39	15.02	41	11.19	33	3.39
R^2	21		25		13	
AobJ	08	0.53	01	0.00	14	0.65
NB_p	43	15.92	55	16.72	33	3.40
R^2	22		31		13	

Notes. 1. Leading decimal points have been omitted

2. F values need to be 3.96 for the whole group, 4.02 for the opposers, and 4.17 for the supporters to be significant at the .05 level.

Other two-component models The above results, where subjective norms rarely made a significant contribution suggest that subjective norms may not be necessary to the model for this issue for this group of people. They also suggest that other models might give better prediction of behavioral intentions -- this is opposed to Fishbein's claim that no other model should give better prediction.

The multiple regression results for the alternative two-component (one attitudinal and one normative) models are shown in the remainder of Table 7.6. There, it is seen that for all three subject groupings the A_B plus NBp model gave the highest prediction of behavioral intentions. In the case of supporters, however, this was not significantly better than the prediction given by the A_B plus SN model; neither type of normative belief made a significant contribution above that made by attitudes toward the behavior.

These results go against the claims made for Fishbein's model. That is, under some conditions his model does not give the best prediction of behavioral intentions -- sometimes alternative models give better prediction. These results also indicate that it is sometimes necessary to have personal normative beliefs in the model, which is contrary to the early decision mady by Fishbein and his associates to drop this component.

The sufficiency of the model The low level of prediction in the above results suggests that the model may not be sufficient to predict behavioral intentions. When the other

measured variables were allowed to enter the equation it was found (see Table 7.7) that for the whole group the effects of personal normative beliefs were not partialled out (partial r = .31) so that personal normative beliefs entered the model. When personal normative beliefs was allowed to enter the model before subjective norms it did partial out practically all effects of the subjective norms (partial r = .17, p>.05) (see Table 7.8). The effectiveness of acting in support of one's attitudes also entered the model to increase prediction to 40%.

For the opposers, subjective norms did not partial out the effects of personal normative beliefs and if personal normative beliefs entered the model first it did not partial out all effects of subjective norms either. Instead, both normative components entered the equation, and together they partialled out all effects of attitudes toward the behavior. An alternative model contained personal normative beliefs and attitudes toward the behavior, which together partialled out the effects of subjective norms.

For the supporters, the effects of both subjective norms and personal normative beliefs were partialled out by attitudes toward the behavior so that neither normative component made a significant contribution to the explanation of behavioral intentions. Instead, the effectiveness of acting in support of attitudes entered the model. That is, people who felt that action would be effective in ensuring that nuclear power is introduced into New Zealand were more likely to act than people who felt that action would be ineffective.

Table 7.7

Models when other variables were allowed to enter after A_B and SN had been forced in

	MODEL	BETA-COEFFICIENT	F FOR[a] BETA	MULTIPLE R	R^2	F FOR[a] MODEL
Whole group	A_B	33	10.73			
	SN	15	2.41			
	NBp	29	8.97			
	Conservation	-18	4.33			
	Effectiveness	19	4.26	67	45	12.53
Opposers	A_B	19	2.06			
	SN	20	2.41			
	NB_p	42	12.47	64	41	11.59
Supporters	A_B	37	11.26			
	SN	13	1.41			
	Effectiveness	52	24.30			
	Residence	-34	11.02			
	Knowledge	-21	4.30	88	77	16.11

Note. Leading decimal points have been omitted

[a]F values need to be 3.96 for the whole group, 4.02 for opposers, and 4.17 for supporters to be significant at the .05 level.

Table 7.8

Models when all variables were allowed to enter in order of magnitude of contribution to explanation of behavioral intentions

	MODEL	BETA-COEFFICIENT	F FOR[a] BETA	MULTIPLE R	R^2	F FOR[a] MODEL
Whole group	A_B	35	13.20			
	NBp	28	9.04			
	Effect-iveness	21	4.66	63	40	17.77
Opposers	NBp	46	15.42			
	SN	29	6.31	12	39	16.02
	A_B	29	5.93			
	NBp	45	14.61	62	38	15.74
Supporters	Effect-iveness	49	19.76			
	A_B	45	16.66			
	Residence	-33	10.44	85	72	22.46

Note. Leading decimal points have been omitted.

[a]F values need to be 3.96 for the whole group, 4.02 for opposers, and 4.17 for supporters to be significant at the .05 level.

Length of residence in Birkenhead and amount of knowledge on the issue also entered the model for supporters. That is, people with longer residence and people with more knowledge were less likely to act in support of nuclear power, even though they were supporters. The knowledge score did not enter the model when variables were allowed to enter in order of contribution to the explanation of behavioral intentions (see Table 7.8).

When attitudes toward the behavior was scored into its two components, pleasantness of the act, and effectivenss of the act, there was a marked difference between opposers and supporters in which component influenced behavioral intentions. For the whole group the two components [($A_{B(P)}$ and $A_{B(E)}$] correlated almost equally with behavioral intentions ($r = .45$ and $.40$ respectively). For the opposers $A_{B(P)}$ correlated much higher with behavioral intentions ($r = .60$) than did $A_{B(E)}$ ($r = .16$) while for supporters $A_{B(E)}$ correlated higher with behavioral intentions ($r = .25$) than did $A_{B(P)}$ ($r = .26$). Consequently, the best predictive model for opposers contained $A_{B(P)}$ with personal normative beliefs, and for supporters it contained $A_{B(E)}$ with effectiveness and length of residence (See Table 7.9).

These results replicate those found for the learning of statistics data in showing that there are alternatives to Fishbein's model which gave a higher level of prediction of behavioral intentions than his model did.

Table 7.9

Models for predicting behavioral intentions for opposers and supporters when the pleasantness and effectiveness components of A_B were scored separately

	MODEL	BETA-COEFFICIENT	F for[a] BETA	MULTIPLE R	R^2	F for[a] MODEL
Opposers	$A_{B(P)}$	45	15.49			
	NBp	36	10.11	69	47	22.67
Supporters	$A_{B(E)}$	49	13.46			
	Effect-iveness	37	7.96			
	Residence	-27	6.02	84	70	20.13

Note. Leading decimal points have been omitted.

[a]F values need to be 3.96 for the whole group, 4.02 for opposers, and 4.17 for supporters to be significant at the .05 level.

Discussion. These results from testing Fishbein's model support many of the findings reported for the learning of statistics data. It was found that the relative weights assigned to attitudes toward the behavior and subjective norms could sometimes be predicted -- just as predicted, the attitudes toward the behavior component received a larger weight for the supporters, and personal normative beliefs was the best predictor for the opposers. This importance of personal normative beliefs for some people is against Fishbein's contentions. Fishbein's model was also again found to be insufficient for predicting behavioral intentions. That is, the components of the model did not partial out all effects of other variables on behavioral intentions. Personal normative beliefs had a significant influence on behavioral intentions for the whole group and for the opposers, as did effectiveness of action for the whole group and the supporters, the effectiveness of energy conservation for the whole group, and residence and knowledge for supporters.

It was also shown that attitudes toward the behavior can be composed of different elements or components such as pleasantness and effectiveness, and that these elements have differential influence on behavioral intentions for different groups of people. Thus, the behavioral intentions of opposers were more influenced by the pleasantness of the action while the intentions of supporters were more influenced by the effectiveness of the action. It may be suggested that supporters are more rational and that opposers are swayed more by emotional or gratification motives. The significant

difference between opposers and supporters in the level of prediction achieved (39% for opposers and 72% for supporters) suggests that opposers are a much more amorphous group of people than supporters, that is, they are probably opposers for many different reasons, with many different motivations for their action or lack of it.

Conclusions

Results for the nuclear power issue largely replicated those reported for the learning of statistics issue. The components of attitude, normative beliefs and other variables were found to have factorial validity, except that again motivation to comply was found to be confounded with social norms. Supporters and opposers were discriminated by their scores on some, but not all, of the measured components. Attitudes toward the behavior, the normative components and behavioral intentions were highly intercorrelated, and the importance of the issue and the perceived effectiveness of action were also significantly related to behavioral intentions. Knowledge about the issue was only slightly related to behavioral intentions and then only for the opposers.

Just as for the learning of statistics data, the perceived social norms multiplied by the motivation to comply with them (NBs) did not correlate as highly with behavioral intentions as subjective norms (SN) did.

Fishbein's model was not highly predictive of behavioral intentions for this data, explaining only 26% of the variance

for opposers but a better 45% for supporters. Subjective norms were found to be unnecessary for supporters, never contributing significantly to the prediction of behavioral intentions. While subjective norms made a significant contribution to the explanation of behavioral intentions for opposers, personal normative beliefs made a far bigger contribution which could not be mediated by the model. The model did not mediate the effects of some other variables either -- that is, it was not sufficient to predict behavioral intentions.

The further conclusions to be drawn from these results when considered in conjunction with those from the learning of statistics data will be discussed in Chapter Eight.

CHAPTER EIGHT

CONCLUSION

The conclusions and implications for Fishbein's model derived from the results of this study are discussed according to the overall hypotheses given in Chapter One. Further implications are then drawn from the path analyses reported in Chapter Six, and some general issues related to Fishbein's model are discussed.

Hypothesis One

The first stage in testing Fishbein's model consisted of checking that each of the components of attitude were factorially independent from one another and from other variables measured. The components discussed by Fishbein, such as attitudes toward the object, attitudes toward the behavior, social normative beliefs, personal normative beliefs, and motivation to comply seemed to be conceptually independent, but no empirical test of this had been previously reported.

Principal component analysis of all the items designed to measure each of these components, plus the items designed to measure other variables, was used for this purpose. The hypothesis was that each of the components named above plus the other variables measured, should be represented by a separate factor. Even though oblique factors may be related

to one another, and thus are not completely statistically independent, the separate factors formed do have "factorial independence" -- that is there is more variance in common shared by the items making up that factor than there is in common with groups of items making up other factors.

Results from both data bases largely supported the hypothesis. For all four conditions in the learning of statistics data, and for the nuclear power data, separate factors for (1) attitudes toward the object; and (2) personal normative beliefs were extracted. Items for attitudes toward the behavior could not be included in the principal component analysis for the nuclear power data, but they formed a clear factor for all four conditions of the learning of statistics data.

Subjective norms and the motivation to comply with them were extracted in separate factors only once -- for the group not learning statistics. In all other cases, including that of the nuclear power data, subjective norms and the motivation to comply with them were confounded. This finding provides some support for the decision to exclude motivation to comply from the model, for it indicates that subjective norms themselves probably already contain an element of the motivation to comply with them. That is, a belief would not be perceived as a norm governing behavior unless it was also perceived as being strong enough to be complied with. The possibility that normative beliefs and the motivation to comply with them would not be independent was suggested in Chapter One when Fishbein's model was

first presented. For these two conceptualised components the hypothesis of single-factoredness (Brewer, et al; 1970) was not rejected.

The other variables measured in each study were found to be represented by separate factors. For the learning of statistics data, there were factors extracted to represent commitment to doing well in statistics, an estimate of performance in statistics, and future behavioral intentions in psychology and the social sciences. For the nuclear power data, there were factors extracted to represent the importance of the issue, the safety of nuclear power, the effectiveness of the conservation of energy, and the effectiveness of action supporting one's attitudes.

In the case of the four conditions for the learning of statistics data, if the item designed to measure behavioral intentions was included in the principal components analyses then a separate factor was not extracted to represent it; rather it's variance spread over several factors. This indicates that behavioral intentions itself does not have sufficient unique variance to be regarded as statistically independent from all of it's possible predictors, and this is acceptable for a criterion variable. However, these results also indicate that behavioral intentions is not single-factored with any <u>one</u> other variable. This finding provides tangential support for Fishbein's model by showing that no one <u>single</u> component of attitude would be <u>sufficient</u> for explaining behavioral intentions -- rather, a combination of them is required.

Further evidence for the independence of the measured variables comes from the differential pattern of mean scores across conditions. For example, there were no significant changes across conditions in attitudes toward the object (which supports Fishbein's contentions) or behavioral intentions, while there were substantial differences for most other components. Such results do, however, suggest that behavioral intentions are not as closely related to components of attitude as might be expected.

There is also evidence here to show that the decision to drop personal normative beliefs from the model because they seemed to be 'an alternative measure of behavioral intentions' was unsound, because the hypothesis of single-factoredness was clearly rejected. If personal normative beliefs were simply an alternative measure of behavioral intentions then the correlation between them would have been so high that they would have been extracted in one factor.

Overall, the principal component analyses showed that most of the components of attitude discussed by Fishbein were indeed factorially, as well as conceptually, independent from each other (except for the case of motivation to comply with norms, which was discussed above) and from the other variables measured in these studies. This clearly illustrates that there are many different components of attitude which are often erroneously assumed under one "generalised" attitude. As Fishbein has pointed out, it is of theoretical importance that attitudes toward a behavior can be independent of attitudes toward the issue or object concerned. Similarly, it may

also be important with regard to some issues that personal normative beliefs are factorially independent from normative beliefs referenced to other people. For example, for some issues, normative beliefs referenced to different significant others (such as mother, father, teacher, Prime Minister, peer) may be of differential importance. Other psychological variables, such as the salience of the issue, or the degree of ego-involvement in it, may effect the degree of relationship between components of attitudes under different conditions. Under some circumstances attitudes toward an issue, such as nuclear power, which concerns the subject himself or his immediate family may very well form a factor separate from attitudes toward the issue which are referenced to others -- that is, a self-other orientation may become apparent.

Hypothesis Two

The second general hypothesis tested was that the weights assigned to the components of Fishbein's model would be different for different groups of people and under different conditions. This hypothesis was confirmed by the multiple regression results presented in Chapter Five. For example, it was found in the learning of statistics data that attitudes toward the behavior had a greater influence on behavioral intention than did normative beliefs for the group not learning statistics and at the immediate posttest for the group learning statistics, while normative beliefs were more influential at the final posttest. With regard to the nuclear

power data, attitudes toward the behavior were more influential for supporters of the issue and normative beliefs were more influential for the opposers.

The above results, together with those reviewed in Chapter One, do not, however allow for any precise specification of what the conditions are for either of the models components to be assigned a greater or lesser weight. At the moment this is possible on an intuitive basis only; more tests of the model, where the different conditions are specified and defined psychologically, need to be carried out to answer this problem. At present, it could be hypothesised that behaviors which involve personal and/or intimate interaction (such as cooperative behavior in the Prisoner's Dilemma games and intimate behavior with a Negro), or which are more personal in nature (such as donating one of your organs for transplant), or for which advice is usually sought (such as deciding which courses to take at university) are more likely to be influenced by normative beliefs. For each of these classes of behaviors, there is likely to be a greater degree of ego-involvement.

The above hypothesis would not, however, satisfactorily explain why subjective norms were important for females but not for males in determining intentions to engage in premarital sexual intercourse (Fishbein, 1966). This suggests that sometimes the referent of subjective norms is likely to be a factor determining the weight assigned to that norm, as in the case of Glassman's (1971) women subjects for whom norms referenced to their husbands but not those referenced to any-

one else were of importance in predicting intentions to buy particular brands of coffee or gasoline. Thus, making use of a "finer" component of the normative variables as they are now postulated might sometimes improve the level of prediction of behavioral intentions obtained from Fishbein's model.

The finding from the nuclear power data that an "effectiveness" component of attitudes toward the behavior related to behavioral intentions for the supporters but not for the opposers, while a "pleasantness" component of attitudes toward the behavior related to behavioral intentions for opposers but not supporters, suggests that the attitudinal components as they are now conceptualised might also be divisable into finer components which themselves have a differential influence on behavioral intentions. In some cases, making use of these finer components as predictors may improve the level of prediction obtained, as it did for the opposers for the nuclear power data for example.

The findings that differential weights were assigned to the components depending on conditions also followed from the pattern of correlation between the predictor variables and of them with behavioral intentions. However, the differences between conditions in mean scores on the predicting variables with no such difference in behavioral intentions raises the question: How can attitudes toward the behavior and subjective norms be good predictors of behavioral intentions when they show big differences across conditions while behavioral intentions do not? The differences in means across conditions implies that there is attenuation, or at least bias, in the measurement

of the predictors, which itself would lead to the slope of the regression line for the different conditions being different. Thus, while assigning different weights to the components of the model appears to made good psychological sense the reasons for these differential weights seem to be as much statistical as psychological. This suggests that in future studies it would be advisable to code the "conditions" and enter them into the prediction equation as another direct predictor variable, or in an interactive capacity with the other predictors, rather than deriving different equations for different conditions.

Hypothesis Three

It has been repeatedly claimed that Fishbein's model should give better prediction of behavioral intentions than any alternative model, but the empirical results of Schwartz & Tessler (1972) and of others have shown that other models sometimes give better prediction. The third hypothesis expected that one or more of the three alternative two-component (one attitudinal and one normative) models would sometimes explain significantly more variance in behavioral intentions than Fishbein's model.

There is strong evidence from all conditions in both data bases to support this hypothesis. For the learning of statistics data Fishbein's model was not significantly bettered only for the group not learning statistics. For the group learning statistics, the superiority of attitudes toward the behavior over attitudes toward the object was

questioned at the pretest and final posttest, and the superiority of subjective norms over personal normative beliefs was questioned at the immediate posttest. For the nuclear power data, models containing personal normative beliefs gave a better prediction of behavioral intentions than Fishbein's model. This was especially true for the opposers.

These results seriously question the superiority of both components of Fishbein's model over their alternatives. Of these results, the superiority of personal normative beliefs over subjective norms under some conditions, means that it is imperative that the place of personal normative beliefs in the prediction of behavioral intentions be reconsidered. It could be hypothesised that personal normative beliefs have a greater influence on behavioral intentions than subjective (social) norms when the consequences of the behavior are very important to the individuals' goals (such as gaining a degree, attaining a preferred lifestyle, etc) or when the issue is one of "moral" salience to the individual (such as the conservation of the environment or energy, the consequences of nuclear power, or the desirability of donating time, money, or body organs to help others). This, in turn, suggests that some measure of "ego-involvement" or "self-arousal" is important in determining the influence of normative beliefs on behavioral intentions.

Hypothesis Four

There is strong evidence from both data bases and all conditions that Fishbein's model is not sufficient for explaining behavioral intentions. The level of prediction attained by the model is generally too low to support a claim of sufficiency, and in every case the effect of at least one other variable on behavioral intentions was not reduced to non-significance when the effects of the model were accounted for.

For the learning of statistics data, a related behavioral intention, future intentions in psychology and the social sciences, was an important predictor of behavioral intentions. It entered the model for every condition. Another important variable was the estimate of performance in statistics, which entered the model for all conditions except at the immediate posttest. The degree of commitment to the behavior also entered the model in two of the conditions. For the nuclear power data, the model did not mediate all the effects of personal normative beliefs for the opposers, and of the effectiveness of action, length of residence in Birkenhead, and knowledge of the issue for supporters. It appears reasonable that in some conditions certain bther variables' should have some influence on behavioral intentions over and above that exercised by attitudes toward the behavior and subjective norms. Such variables might be related to the consequences of the behavior (e.g., performance, effectiveness), measures of personal involvement in the behavior or its consequences (e.g., commitment, personal normative beliefs of

a "moral" type), social factors such as length of residence in an area where the issue is of importance, and knowledge about the issue. It is note-worthy that some of these variables are rather similar to those suggested above as being related to the importance of personal normative beliefs and also to those suggested by Cook and Flay (to appear, 1977) as being of importance for the long-term persistence of attitude change (arousal, self-relevance).

The fact that personal normative belief is one variable that significantly improves the prediction of behavioral intentions again shows that the decision to drop it from the model was an unsound one. In some cases -- for example, at the immediate posttest for the learning of statistics data, and for the whole group and the opposers in the nuclear power data -- personal normative beliefs actually gave a better level of prediction of behavioral intentions than did subjective norms. At the same time, personal normative beliefs were not so closely related to behavioral intentions that they could simply be assumed to be an alternative measure of them. If they were to be assumed to be such, then so could the other components of attitude originally discussed by Fishbein, as well as several other predictor variables such as future intentions in psychology and the estimate of performance for the learning of statistics data. All of these variables are clearly conceptually independent, and have been shown to be factorially independent as well.

It must be concluded that personal normative beliefs, along with many other variables such as related behavioral

intentions, possible consequences, personal involvement, social factors, and knowledge, should be considered as being of some importance in the prediction of behavioral intentions. Much more work needs to be done in the attitude - behavior domain before a model for predicting behavior or behavioral intentions from only two predictors that is anywhere near being sufficient under all conditions can be proposed.

Path Analyses

There have been three major contributions made by the path analyses of the learning of statistics data reported in Chapter Six. First, they gave a clear demonstration of the causal links within a model for predicting behavioral intentions. This was in addition to the information about which variables were the best predictors of behavioral intentions that was obtained from previous multiple regression analyses. Second, it was found that no one causal network gave a satisfactory explanation of the data over all conditions, as all the causal links within a model may be very different under different conditions. However, the causal links that were traced were easy to explain. Third, they illustrated how a model may be correct when a certain number of variables are considered, but as soon as additional variables are considered the whole model may change due to the inter-relationships of the new variable(s) with all existing variables. This point deserves further discussion.

It has been suggested that a model may be assumed to be correct when a set number of variables are considered, but as soon as additional variables are included some of

the relationships may change and the model will change. For example, if attitudes toward the behavior and subjective norms are considered as the only possible causes of behavioral intentions then a model can be set up to represent this and, as has been shown by Fishbein and his associates, Schwartz and Tessler (1972), and the results presented in this report, a reasonably good level of prediction can be obtained. However, as soon as variables external to the model are considered then the picture changes. These additional variables may relate to attitudes toward the behavior, subjective norms, and behavioral intentions in a way that would improve prediction but would not be expected under the assumptions of the original model.

An example of this was when the estimate of performance in statistics (EST) and attitudes to the object were added to the attitudinal components of the model (see Figure 6.4). For the group not learning statistics it could initially have been reasonably concluded that attitudes toward the behavior had the most direct influence on behavioral intentions [Figure 6.4, a), (i)]. However, when the estimate of performance was added to the model it became clear that it had a direct effect on behavioral intentions as well as an influence on attitudes toward the behavior [Figure 6.4, a), (iii)]. That is, the earlier explanation that attitudes toward the behavior are the most direct cause of behavioral intentions is no longer acceptable. In fact, it is now known to be wrong because of the extra information that has been contributed by adding the estimate of performance to the model.

The general idea that considering a different set of variables changes the model is also true if variables already present in the model are divided into "finer" components. It was shown earlier that both attitudes toward the behavior and subjective norms could be divided into smaller components of variance, and that this affected the model differentially across conditions. For example, for the nuclear power data, attitudes toward the behavior could be divided into the effectiveness of the behavior, which influenced behavioral intentions for supporters of nuclear power, and into the pleasantness of the behavior, which influenced intentions for the opposers.

The path analyses for the group learning statistics when the three measures of all variables were considered together provides further evidence for the way models can change as different sets of variables are considered. This is shown in the way that the model, and the causal links within it, change over the three times, and in the way it becomes more complex as additional variables are considered (see the sequence of Figures 6.8 to 6.10). For example, behavioral intentions at an earlier occasion always entered the model to predict behavioral intentions at a later time, and when this occured the model changed yet again. For example, when intentions at the immediate posttest was used to predict intentions at the final posttest the estimate of performance no longer entered the model, probably because it was partially caused by previous behavioral intentions. Similarly, future intentions in psychology no longer entered the equation to predict intentions at the immediate posttest when intentions at the pretest was used as a predictor.

It is important to realise that the set of variables considered has some influence on the model that will be accepted. It means that while Fishbein's model may be fairly adequate for predicting behavioral intentions if the only other measures one has are of attitudes toward the behavior and subjective norms, it does not necessarily follow that it gives the "tne best" prediction or explanation of behavioral intentions or that it is sufficient. In fact, it would be rather naive to expect that such a simple model could give an adequate explanation of behavioral intentions, let alone overt behavior. As has been shown, prediction can usually be improved by considering a more complex model -- and more complex models are necessary in the long run to increase our understanding of the interrelationships and cause-effect patterns among the related variables. Thus, while Fishbein's model has been of value in our growth of understanding of the relationships between components of attitudes and behavioral intentions, it cannot be considered to be the final answer.

Theoretical and empirical implications

It has been shown that more complex models are sometimes more adequate than Fishbein's model for explaining or predicting behavioral intentions. What the variables are that influence behavioral intentions and whether or not these are in addition to those variables considered by Fishbein are important points that need to be established.

In this study several variables improved the prediction of intentions to learn statistics or to engage in action

in support or opposition of nuclear power. For the learning of statistics, these variables were future intentions in psychology, an estimate of performance in statistics, commitment to doing well in statistics, and personal normative beliefs. For the nuclear power issue, the variables were personal normative beliefs, the effectiveness of the action, and the length of residence in the area where a nuclear power station was proposed. Similar results have been found in earlier work with Fishbein's model. In the Prisoner's Dilemma games of the Ajzen and Fishbein (1970) studies, motivational orientation (cooperative vs. competitive) and the contingencies of the payoff matrix had significant effects on behavioral intentions. Carlson (1968) found personal normative beliefs important for predicting intentions to engage in intimate behavior with a Negro. Schwartz and Tessler (1972) found that age, religiosity, and occupational prestige had significant effects on intentions to donate a body organ for transplant, and personal normative beliefs were always very important.

It might be unrealistic to expect to derive an elegant model for explaining behavioral intentions from such a heterogeneous collection of variables. The most that can be hoped for is to isolate some tentative, general points of communality in order to suggest data-verified directions that future research might take. First, most of these variables seem to be concerned with the degree of importance of the issue or behavior to the subjects; that is, the degree of "self-relevance", or "ego-involvement". Second, some of

these variables seem to be concerned with the degree of "emotional affect" or "arousal" that the issue or behavior induces in the subject. As pointed out earlier, these variables are similar to some of those proposed by Cook and Flay (to appear, 1977) to explain the long-term persistence of attitude change. In their review of over 100 studies where attitude change was assessed immediately after the attitude change attempt and reassessed after a delay of from two days to two years, Cook and Flay found that four general factors seem to have been present in most of the studies where there was persistence of attitude change. Two of these, "self-relevance" and "arousal" are the same as the variables proposed above to be of importance in predicting behavioral intentions. If an issue is very relevant to a person then he is more likely to intend to do something with regard to that issue. Similarly, if an issue arouses intense feelings or emotions in an individual then he is more likely to take some action with regard to that issue in order to reduce the arousal.

In some ways these two classes of variables ("self-relevance" and "arousal") may not always be independent, but it is possible to think of issues and individuals where there is a great deal of self-relevance on an intellectual level but not on the emotional level. For example, the variable, "future intentions in psychology," that influenced intentions to learn statistics can be seen to be very important or relevant to the person, but not necessarily arouse much emotional affect. In the nuclear power data

it was shown how supporters were more influenced by the effectiveness of the behavior while opposers were more influenced by the pleasantness of it. It seems that supporters feel that the issue is a very important one for them, but they are very rational about it, while the opposers feel more emotionally aroused by the issue. Personal normative beliefs seem to be important for issues that induce high "arousal", such as nuclear power for the opposers, donating a body organ for transplant, or intimate behavior with a Negro. It can be seen that considering the degree of self-relevance or arousal level of issues might help to explain some of the conflicting findings in the literature.

Another major point that needs to be established is the exact degree of the relationship between behavioral intentions and overt behavior. If one is interested in overt behavior, then it does not matter how well behavioral intentions can be predicted if they do not relate closely to behavior or if an entirely different model is required for predicting behavior. Overt behavior has not often been measured in studies where components of attitudes and behavioral intentions have also been measured, and when it was behavior was sometimes closely related to behavioral intentions (e.g., Ajzen & Fishbein, 1970; Ajzen, 1971, for Prisoner's Dilemma games), and sometimes not (e.g., Schwartz and Tessler, 1972 , for volunteering to donate transplant organs). Fishbein and Ajzen (1975) report other studies where the correlation between behavioral intentions and overt behavior ranged from zero to the high .80's.

Behavioral intentions are not always the best predictor of overt behavior. For example, Schwartz and Tessler (1972) found that the best predictor of overt behavior was the interaction between personal normative beliefs and ascription of responsibility. Ascription of responsibility had no influence on behavioral intentions. Thus, the best model for predicting overt behavior will not always be the same as the best model for predicting behavioral intentions, even when there is a good correlation between the two. Of course, for behavioral intentions to be a good predictor of overt behavior demands that the specificity of the behavioral intentions measured must be at the same level as the specificity of the behavior concerned. Also, the closer in time to the actual behavior that behavioral intentions are measured the higher the relationship is likely to be.

The evidence from Schwartz and Tessler discussed above shows that sometimes a variable that has no influence on behavioral intentions nevertheless effects overt behavior. Further research is required to establish conclusively that this is a general phenomena. When it is conclusively established that behavioral intentions are not always sufficient to explain or predict behavior then the types of variables which influence behavior but not necessarily behavioral intentions will need to be determined.

There is no doubt that some of the independence of overt behavior and behavioral intentions is because of the influence of environmental variables -- but what are the psychological variables that influence behavior? Here, the

results from Schwartz and Tessler (1972) are worthy of consideration. The variable that Schwartz and Tessler found influenced overt behavior but not behavioral intentions was ascription of responsibility (in interaction with personal normative beliefs, which gave the best prediction of intentions). Ascription of responsibility is a measure of the amount of responsibility an individual attributes to himself, relative to the amount he attributes to another or others, for the consequences of his own behavior. Thus, in the Schwartz and Tessler study, those individuals who attributed more responsibility to themselves and who also morally believed that they should donate on organ for transplant, were more likely to make an actual donation three months later. This variable seems to have much in common with those that were proposed above as being of importance in influencing behavioral intentions, and that were previously suggested to be of importance in making attitude change persist over time, that is, variables such as "self-relevance", "emotional arousal", or "ego-involvement".

Variables that influence overt behavior but not behavioral intentions could be related to Campell's (1963) concept of "threshold". Overtly behaving has a higher threshold or "hurdle" than stating one's behavioral intentions, which in turn has a higher threshold than stating one's attitudes or normative beliefs. It takes "something more" to overtly behave than it does to state one's intentions, and the variable that gives this "something more" is likely to be self-relevant, emotionally arousing, or related to level

of commitment. Whether or not this is different to the variables suggested to be of importance in explaining behavioral intentions, or whether it is just a matter of degree, needs to be established.

This discussion suggests that a more comprehensive model for predicting a specific behavior needs to be developed. A developmental - integrative approach, where previous experience with the behavior concerned is included in the model to predict future behavior, seems to be required. Such a model is presented in Figure 8.1. A basic axiom of measurement states that, with context or environment reasonably constant, the best predictor of what a man will do in the future is what he has done in the past (Russell, 1945; Owens, 1968). Because environmental contingencies have an important influence on intentions and behavior they also need to be included in the model -- for example, a student cannot very well enrol in a statistics course in a following academic year if he does not return to university through lack of finance. As Fishbein's work has shown, attitudinal and normative variables are important in determining behavioral intentions, though the results of this study show that the exact way these variables should be conceptualised and operationalised is not yet clear. Accordingly, attitudinal and normative variables are entered in the model but they are not yet further specified. It has been suggested that the other variables found in this study to improve the prediction of behavioral intentions have "self-relevance" in common, so this variable is included in the model. Having all these

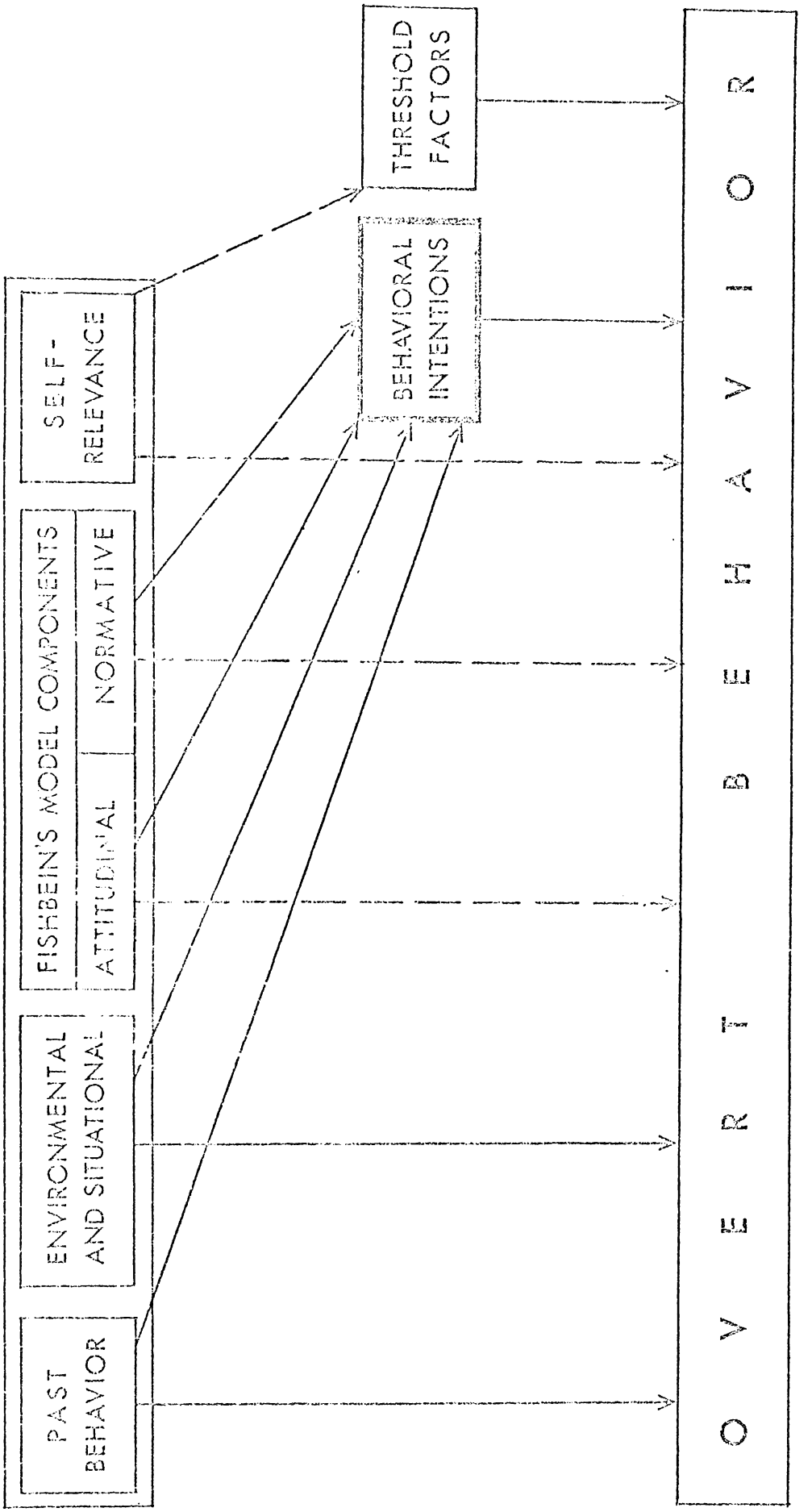


FIGURE 8.1 A developmental-integrative model for the prediction of specific behavioral intentions and overt behaviors.

factors to predict behavioral intentions, overt behavior can then be predicted from intentions, or from the original predictors themselves. Environmental contingencies, some of which might effect overt behavior but not behavioral intentions, and past experience with the specific or related behavior, are both likely to have a direct influence on overt behavior. The "threshold" factor discussed above is hypothesised to have an influence on overt behavior in addition to all factors considered so far. The myriad determinants of each of the predictors could be added to have their influence from the top of the model. All stages of the model need to be specified in such a way that they can be falsified (Platt, 1966; Popper, 1965) and experimental studies, in which conditions are manipulated, set up to test them. The variance attributable to individual differences could be handled by grouping people into homogeneous groups (Owens, 1968) and either setting up different models for each group or coding "group membership" as a predictor variable. It is possible, however, that individual differences might all be accounted for by the "self-relevance" or "threshold" factors.

Summary of Conclusions

The findings and implications of the empirical assessment of Fishbein's model reported here may be briefly summarised as follows:

Most of the components of attitude discussed by Fishbein during development of his model -- attitudes toward the object,

attitudes toward the behavior, subjective (social) norms, personal normative beliefs, and the motivation to comply with norms -- are conceptually and factorially independent of one another, of behavioral intentions, and of other variables measured in this study -- e.g., commitment to the act, an estimate of performance, a related behavioral intention, the effectiveness of action. The only exception to this was that social normative beliefs and the motivation to comply with them were found to be so highly correlated as to be "single-factored". This finding, however, simply adds further evidence to the reasons for dropping motivation to comply from the model.

The relative weights assigned to the components of the model vary according to the type of behavior concerned, the conditions under which the components and behavioral intentions were measured, and individual differences. This was shown by the differential patterns of intercorrelations between the predictors and behavioral intentions and by the regression coefficients assigned in multiple regression analysis, and are in support of Fishbein's contentions. However, neither the results from this study nor those from previously published research suggest a clear specification of the conditions under which the model's components are assigned greater or lesser weights. It is suggested that behavioral intentions regarding issues that are more ego-involving may be more highly influenced by normative components. Although these findings support Fishbein's model, another finding -- the fact that mean scores on the predicting variables were significantly

different for different conditions while the mean score on behavioral intentions was not -- suggests that differential weights according to condition may be a statistical artifact of attenuation of measurement. It is, therefore, suggested that in future studies "condition" should be entered into the equation for predicting behavioral intentions instead of separate models being derived for each condition.

The superiority of attitudes toward the behavior over attitudes toward the object, and of subjective norms over personal normative beliefs can be seriously questioned. This was evidenced when alternative two-component (one attitudinal and one normative) models gave significantly better prediction of behavioral intentions than Fishbein's model did.

The fact that personal normative beliefs sometimes gave better prediction of behavioral intention than subjective norms did, together with the finding that personal normative beliefs was factorially independent of behavioral intentions, provides evidence in addition to that of Schwartz and Tessler (1972) that the early decision by Fishbein and his associates to drop the personal normative beliefs component from the model was unsound. Personal normative beliefs seem to be of importance in predicting behavioral intentions when the consequences of the behavior are very important to the individual's goals or when the issue is one of "moral" salience. It is imperative that the place of personal normative beliefs in the prediction of behavioral intentions be reconsidered.

Fishbein's model is not sufficient to explain variance in behavioral intentions -- the level of prediction can be improved by variables external to the model for which the components of the model do not mediate effects. Variables that were not mediated by the model were ones concerned with related behavioral intentions, the consequences of the behavior, degree of involvement, social factors such as length of residence in an area where the consequences may be felt, and knowledge -- all of which seem to involve "self-relevance" or "arousal". Introduction of such other variables into a model sometimes changes the causal links established, and it is, therefore, important that much more work be done in the attitude-behavior domain in the search for a parsimonious, but nevertheless more complex, model for predicting behavioral intentions and ultimately overt behavior.

APPENDICES

APPENDIX I

The items and their scale end-points used to measure attitudinal and normative components, other variables, and behavioral intentions with regard to learning statistics.

Hypothesised Component	Item Number [a]
Attitudes toward the behavior (A_B)	Taking statistics in 18.103 (would be)[b] (is going to be) (has been):
	1. punishing - rewarding
	2. good - bad
	3. unpleasant - pleasant
	4. easy - hard
Subjective Norms (SN)	5. Regardless of your personal views, would the people older than you (or with more experience than you) whose opinions you value most think that learning statistics is something that you ought to do or something you should not do?
	Should not do - Ought to do
	6. Regardless of your personal views, would the people of your own age (or at the same educational level as you) whose opinions you value most think that learning statistics is something that you ought to do or something you should not do?
	Ought to do - Should not do
Motivation to comply (Mc)	5a. To do as these people think I should is (or would be):
	good - bad
	6a. To do as these people think I should is (or would be):
	bad - good
Personal Normative beliefs (NBp)	7. Do you think that statistics is <u>necessary</u> in psychology?
	Not necessary at all - Absolutely necessary

	8.	I believe that all students majoring in psychology should learn statistics. Completely agree - Completely disagree
Attitudes toward the object (Aobj)		I have always found arithmetic and mathematics to be:
	9.	good - bad
	10.	punishing - rewarding
	11.	pleasant - unpleasant
	12.	difficult - easy
Commitment (CoM)	13.	Do you (would you) feel a personal commitment to doing as well as you possibly can (could) in statistics? Absolutely no commitment - completely committed
Estimate of performance (EST)	14.	How well do you think you will (would) do at statistics? Very poor - Very well
Future intentions in psychology (BIP)	15.	<u>If</u> you do well in your undergraduate course will you do graduate work (and therefore research) in psychology or the social sciences? Definitely would not - Definitely would
Behavioural intentions (BI)	16.	If there is (was) no university requirement for you to do so, how likely is it that you will (would) learn statistics? (Non-group and Pretest) Assuming that it is <u>not</u> compulsory for you to do so, how likely are you to learn further statistics? (Posttests). Completely unlikely - Completely likely

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[a] Items are numbered here for ease of reference only. They were always administered in the order Aobj, NB_p, COM, SN, Mc, A_B, Est, BIP, and BI on all occasions.

[b] Alternative wordings are for the two different groups and the three different times.

APPENDIX II

The items and their scale end-points used to measure attitudinal and normative components, other variables, and behavioral intentions with regard to the nuclear generation of electricity in New Zealand

Hypothesised Component	Item Number[a]
Attitudes toward the behavior (A_B)	If one supports (opposes)[b] a proposed development or alteration there are a number of actions that you as an individual may take in an attempt to influence the final decision. With that in mind <u>how do you rate</u> the following actions with regard to the introduction of Nuclear power generation into New Zealand in terms of: (i) their effectiveness (i.e., how much effect do you think each action will have) (ii) whether you personally would find each action pleasant or unpleasant to perform. 1. A Rally to support (oppose) the issue a) very ineffective - very effective b) very pleasant - very unpleasant 2. A Petition supporting (opposing) the issue (to be published in a newspaper)[c] 3. Information supporting (opposing) the issue 4. Contributing $1 to a supporting (opposing) organisation 5. Voting for the Parliamentary Party which supports (opposes) the development 6. Letters to the Editor 7. A T.V. programme supporting (opposing) the development

Subjective norms (SN)

8. Regardless of your own views, do people whose opinions you value most think that supporting (opposing) the development of nuclear power is something you

Should not do - ought to do

Motivation to comply (Mc)

9. To do as these people think I should, would be in my opinion:

very good - very bad

Personal Normative beliefs (NRp)

10. What degree of commitment or moral obligation do you feel toward supporting (opposing) nuclear power

absolutely no commitment - complete commitment

Attitudes toward the object (Aobj)

For each of the methods of electricity generation listed below, please indicate how you would rate them in terms of desirability, that is, how much would you like to see each of them developed in New Zealand?

11. Nuclear Power Stations[d]

completely desirable - completely undesirable

How would you rate the introduction of nuclear power into New Zealand from the point of view of:

12. Yourself (and family if this applies)

Beneficial - Detrimental

13. Your community

Beneficial - detrimental

14. The environment

Beneficial - Detrimental

In your opinion, nuclear power as a form of electricity generation for New Zealand is:

15. Necessary - Unnecessary

16. Safe - Dangerous

17. Thoroughly tested - Insufficiently tested

18. How would you rate yourself on the scale below with regard to your feelings about the introduction of a nuclear power plant into New Zealand?

Strongly oppose - Strongly support

19. H ow would you rate yourself on the scale below with regard to your feelings about the introduction of a nuclear power station within 16 kilometers (10 miles) of your home:

Strongly support - strongly oppose

20. At present there is for New Zealand no real alternative to nuclear power

Strongly agree - strongly disagree

Importance of issue

21. In my opinion the possible introduction of nuclear power into New Zealand sometime in the future is an issue which is:

Very important - very unimportant

Safety

Items 16, and 17, plus;

Some of the issues that have arisen with regard to the desirability of nuclear power are listed below. Please indicate how you feel about each of them.

22. Accidental radiation release

Highly likely - Impossible

23. Waste product storage (as it is presently carried out overseas)

Very dangerous - very safe

Conservation

Rather than cater for a growing demand, a suggestion has been made to conserve energy/ electricity.

24. How effective could the conservation of energy be?

Very ineffective - very effective

25. How effective will the conservation of energy be?

Very ineffective - very effective

Effectiveness of support or opposition

26. How effective can public support be in making sure this proposed development is introduced?

Very effective - very ineffective

27. How effective can public opposition be in making sure this proposed development is not introduced?

Very effective - very ineffective

Behavioral intentions (BI)

If it appeared likely that a nuclear power station would be constructed in New Zealand how willing would you be to engage in the following actions?

28. Join in a support (opposition)rally

Completely willing - Completely unwilling

29. Write a letter to the editor[e]

30. Vote for the party supporting (opposing) the development

31. Sign a petition supporting (opposing) the issue (to be published in a newspaper).

32. Find out more information about nuclear power

33. Set aside time to watch a T.V. program about the development

34. Contribute $1 to a supporting (opposing) organization

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a Item numbers are here allocated for the conveneince of discussion, not in the order in which they were administered.

b Items with alternative wording were written in full in the two forms and only the appropriate form given to each subject after it was ascertained (on item 18) whether he/she was a supporter or opposer.

c Each of items 1 to 7 were followed by the same two scales.

d Eight different methods were listed. Data from the others are of no interest for this report.

e Each of items 28 to 34 were followed by the same scale.

APPENDIX III

The items used to test subjects' knowledge on the nuclear generation of electricity.

1. With regard to a firm decision at Government level it would appear that:

   :____: a decision has already been made to introduce nuclear power

   :____: a decision won't have to be made until 1977 at the earliest

   :____: a decision won't have to be made until 1990 at the earliest

   ____: a decision has already been made not to introduce nuclear power for at least 20 years:

   :____: a decision has already been made never to introduce nuclear power into New Zealand

   :____: dk

2. In 1972 there were how many nuclear power plants in operation in the world?

   145____ 65____ 190____ 31____ 104____ dk____

3. It has been suggested that by 1977 there will be approximately

   180____ 50____ 260____ 105____ 230____ dk____

   in operation

4. Present official estimates indicate that one 100 MW nuclear power station (i.e., a similar size to the coal-burning plant at Huntly) would cost New Zealand approximately:

45____ 100____ 300____ 420____ 600____ dk____ million dollars

5. In comparison to coal or oil fired stations of a similar size nuclear power stations are:

much more expensive	somewhat more expensive	about the same	somewhat less expensive
:_____:	:_____:	:_____:	:_____:

much less expensive :_____: dk:_____: to build.

6. What is the possibility of a convential nuclear power station exploding like a nuclear bomb?

Impossible :____:____:____:____: highly likely

7. Although information is limited, it would appear that

0____ 1____ 3____ 7____ 10____ nuclear power plants in the world have already exploded.

8. All thermal power stations (nuclear, coal, oil, natural gas) use water for cooling. Compared with coal, oil and natural gas, nuclear power plants add how much/less heat to this cooling water

50% less	25% less	about the same	25% more	50% more
:_____:	:_____:	:_____:	:_____:	:_____:

9. Nuclear power plants are designed to be operated for how many years?

5-10 years	25-30 years	40-50 years	50-55 years	60-65 years
:	:	:	:	:

10. A number of areas have already been investigated in New Zealand as possible sites for a nuclear power station

True:____: False:____:

If you answered "true" to question 10 please indicate which areas these were:

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