

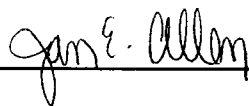
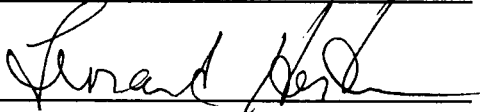
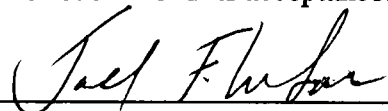
To the Graduate Council:

I am submitting herewith a dissertation written by Linda Diane Lehman entitled "Health Beliefs, Locus of Control, and Social Support as Predictors of Dietary Adherence in Adults with Diabetes." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Psychology.



Harold J. Fine, Major Professor

We have read this dissertation
and recommend its acceptance:



Accepted for the Council:



Vice Provost
and Dean of the Graduate School

**HEALTH BELIEFS, LOCUS OF CONTROL, AND SOCIAL
SUPPORT AS PREDICTORS OF DIETARY
ADHERENCE IN ADULTS WITH
DIABETES**

**A Dissertation
Presented for the
Doctor of Philosophy
Degree
The University of Tennessee, Knoxville**

**Linda Diane Lehman
August 1987**

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ABSTRACT

Adherence to diet has been identified as the biggest problem in diabetes. Diet is one of the most time-consuming aspects of the daily regimen and requires the greatest alteration in lifestyle. The literature has identified certain attitudes which may be important to an individual's efforts to adhere to a diet. This study is concerned with the ability of diabetes-specific measures of health beliefs, locus of control, and social support to predict adherence to an exchange diet. IDDM ($n = 30$) and NIDDM ($n = 53$) subjects completed the Beliefs About Diabetes and Diabetes Locus of Control Scales and provided information about their prescribed meal plan. After a 4-week interval, a 24-hour dietary recall was obtained and dietary adherence was assessed. Results indicated that subjects' health beliefs and locus of control expectancies differed according to their diabetes type, their treatment mode, the duration of their diabetes, and their age. Several relationships were also found between the health beliefs, locus of control, and social support variables. Barriers to diet and belief in the benefits of therapy correlated significantly with 24-hour recall measures of dietary adherence. Subjects' perceived adherence to diet was related to barriers, social support, and perceived controllability of diabetes. The psychosocial variables were more successful in predicting perceived adherence to diet than in predicting actual adherence based on dietary recall data. The clinical application of the concepts introduced by the health beliefs and locus of control models and the utility of these indices as tools for psychosocial assessment are discussed.

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INTRODUCTION

Diabetes is one of the most common of chronic diseases, affecting one out of every 20 persons in the United States. The numerous complications which occur as a consequence of the disease make it directly responsible for over 300,000 deaths annually in the United States, the third leading cause of death. Compared to the general population, persons with diabetes are 25 times more likely to suffer from blindness, 20 times more likely to suffer from renal disease, and twice as likely to experience heart disease and stroke (Davidson, 1981). However, recent research suggests that such complications may not be inevitable. Although still the subject of much debate, it appears that careful regimen management, producing good blood glucose control, may prevent or postpone some of these long-term complications.

Diabetes mellitus is divided into two main types: insulin-dependent diabetes mellitus (IDDM) and noninsulin-dependent diabetes mellitus (NIDDM). The onset of IDDM usually occurs early in life with few cases diagnosed over 30 years of age. The health care regimen for the person with IDDM involves blood glucose monitoring, injections of multiple types of insulin one or more times a day to control blood glucose levels, and a special diet. Onset of NIDDM is slow and usually comes after 30 years of age. Many individuals with NIDDM are overweight, a problem that contributes to the onset and severity of the disease. Treatment of NIDDM may include diet and injected insulin or oral hypoglycemic agents that increase the effectiveness of endogenous insulin. In many cases, dietary modification is adequate treatment. Frequently, the control of NIDDM requires a decrease in food intake and weight loss.

Faced with a chronic and life-threatening illness, the individual with diabetes is required to assume primary responsibility for regimen management. Diabetes, especially when managed with insulin, cannot be treated successfully without the cooperation of well-informed, motivated individuals. Daily care demands a tremendous alteration of lifestyle involving diet, exercise, medication, blood glucose testing, and foot care. Compliance with this regimen poses considerable difficulty for persons with diabetes and their physicians.

Researchers have shown that compliance behavior of persons with diabetes is multidimensional (Ary, Toobert, Wilson, & Glasgow, 1986; Cerkoney & Hart, 1980; Marquis & Ware, 1979). Individuals appear to make a separate determination about how much they are going to adhere to each small part of what has been prescribed. Consequently, adherence to one aspect of the regimen (e.g., medications) may be unrelated to degree of adherence to other aspects of the regimen (e.g., diet). Similarly, individuals who comply with one dietary recommendation do not necessarily comply with other dietary recommendations (Webb, Dobson, O'Connell, Tupling, Harris, Moxon, Sulway, & Leeder, 1984). The implication of this finding is that each aspect of the diabetic regimen must be considered individually.

Failure to adhere to an appropriate diet is one of the most common explanations of poor control in diabetes (Stone, 1961). Similarly, compliance with diet often has been shown to be associated with good control (Christensen, Terry, Wyatt, Pichert, & Lorenz, 1983; Ney, Stubblefield, & Fischer, 1983; Webb et al., 1984). Peterson, McLean, and Senator (1984) conclude that dietary factors seem to be of over-ruling significance in relation to control of NIDDM. They found that

compliance with the prescribed diet and quality of the diet was more important in influencing diabetic control than was compliance with medication.

Recently, adherence to diet has been identified by physicians and individuals with diabetes as the biggest problem in diabetes (House, Pendleton, & Parker, 1986; Lockwood, Frey, Gladish, & Hiss, 1986). A first step in helping patients to improve their dietary adherence is to understand the factors that influence noncompliance. Beliefs and attitudes about diabetes and availability of social support have been found to be related to compliance behaviors. If attitudes and other factors which compromise dietary adherence can be identified, health professionals can begin to interact with patients to devise strategies that will alter attitudes and behavior.

Several researchers have begun to address this problem over the past few years. The literature relevant to compliance with diabetes regimens in general and with dietary adherence in particular is reviewed in Chapter I. Chapter II discusses the difficulties encountered in the measurement of compliance and the factors which may influence it. Chapter III describes a study designed to identify attitudes and other factors which are important to an individual's efforts to adhere to a diet for diabetes. The ability of measures of health beliefs, locus of control, and social support to predict adherence to a diabetic exchange diet is examined in Chapters IV and V. The relationships among these psychosocial variables and of these variables to characteristics of the individual and diabetes is also discussed. Chapter VI discusses the clinical application of the concepts introduced by the health beliefs and locus of control models. The utility of the indices of health beliefs, locus of control, social support, and dietary adherence as tools for psychosocial assessment are illustrated.

CHAPTER I

ADHERENCE TO DIETARY REGIMENS

Dietary Treatment of Diabetes

The basic nutritional requirements for persons with diabetes are in general the same as those for all individuals (Bierman, Albrink, Arky, Connor, Dayton, Spritz, & Steinberg, 1971). Yet, because of the need to balance food with activity and medications, there are also special nutritional requirements which require a dietary prescription. The dietary objectives can be quite different in the treatment of the two types of diabetes.

The most important nutrition principle for individuals with IDDM is consistency (American Diabetes Association and The American Dietetic Association, 1986; Skyler, 1983). The amounts and types of food eaten at each meal should be about the same each day. In addition, meals should be eaten at about the same time each day with an emphasis on avoiding long delays between meals. In contrast, the majority of individuals with NIDDM are overweight and weight reduction is the primary challenge of treatment (American Diabetes Association and The American Dietetic Association, 1986). A meal plan which is individually designed to meet the needs of each person is considered essential (Bierman et al., 1971).

The *Exchange Lists for Meal Planning* (American Diabetes Association & The American Dietetic Association, 1986) were developed in order to facilitate the selection of a variety of food choices while remaining within a basic meal plan. The exchange group system divides food into six different groups: starch/bread, meat,

vegetable, fruit, milk, and fat. For each group a list is provided that includes foods with similar amounts of carbohydrate, protein, fat, and calories. Serving sizes for each food are provided to assure that one serving of a specific food is equivalent to one serving of any other food in the same group. Any food on a list can be exchanged or traded for any other food on the same list. In addition to prescribing the distribution of carbohydrate, protein, and fat throughout the day, a good meal plan will also outline a schedule of meal and snack times to ensure appropriate spacing of food.

It is clear that the diet regimen has many different aspects which are assigned variable importance according to an individual's unique situation. In examining adherence to the dietary regimen, one must consider adherence to (a) the general nutritional guidelines of increasing intake of carbohydrates and fiber, using alcohol in moderation, and limiting one's intake of fat, saturated fat, sugar, and salt; (b) recommendations for distribution of carbohydrate, protein, and fat throughout the day; (c) the prescribed daily caloric intake; and (d) the spacing or timing of meals and snacks.

Incidence of Dietary Noncompliance

The magnitude of noncompliance with dietary recommendations has been well documented in recent years. The incidence of noncompliance reported varies according to which aspect of the dietary regimen is examined and what methods are used to assess compliance. Watkins, Williams, Martin, Hogan, and Anderson (1967) and Williams, Anderson, Watkins, and Coyle (1967) reported that approximately 75% of their diabetic subjects did not adhere to their diet plans. More

recently, Ary et al. (1986) found that their diabetic subjects adhered only half the time to instructions to limit caloric intake. Cerkoney and Hart (1980) obtained compliance levels of 65% for diet among insulin-treated individuals. Peterson et al. (1984) found that 47% of their NIDDM subjects stated that they adhered strictly to their diet.

Christensen et al. (1983) found significant differences in level of adherence when measuring different aspects of the dietary regimen. Using 24-hour diet recalls, these investigators found that only 10% of IDDM subjects adhered to their planned exchanges 90% of the time. This reflects adherence to content and distribution of food according to individualized meal plans. When assessing adherence to meal and snack timing, Christensen et al. (1983) found that nearly two-thirds of the subjects adhered to their schedule of feedings at least 90% of the time.

Webb et al. (1984) studied four aspects of dietary compliance among persons with IDDM: (a) dietary composition (i.e., 45% of calories from complex carbohydrate), (b) body weight (90 - 110% of ideal weight), (c) carbohydrate spacing among meals, and (d) carbohydrate variation between days. Assessment revealed that only 13.9% of subjects satisfied the compliance criteria for dietary composition. Only 32.1% and 29.2% of subjects satisfied criteria for compliance with recommendations for carbohydrate spacing and variation respectively. The investigators concluded that compliance with one type of dietary recommendation is generally unrelated to compliance with others.

West (1973) suggested that we tend to underestimate the magnitude and number of obstacles to be overcome in successful diet therapy. For example, the diet prescription recommended may not be in accord with an individual's preferences

or cultural background. It may differ from the eating habits of family or friends. An individual may find it difficult to give up calories or certain proscribed foods. He or she may find frequent feedings on a fixed schedule to be inconvenient because of a work schedule or other commitments. An individual may lack sufficient intelligence, incentive, or self-discipline to follow a diet successfully. He or she may not understand the general goals and priorities of the diet, or the concepts of exchanges or substitutions. Lack of understanding may be due to the individual's own deficiencies or to inadequate education by physician or dietitian. In addition, the physician may have a limited understanding of the special goals, strategies, and priorities of diet therapy in the different kinds of diabetes.

Determinants of Compliance with Dietary Regimens

A great deal of research has been directed toward determining factors responsible for poor compliance with medical care recommendations. Many studies tend to focus upon easily measured characteristics of the individual, regimen, or illness which are usually neither predictive nor alterable. Glanz (1980) suggested that while an understanding of the relationships of these factors to compliance may identify persons at high risk of noncompliance, a more promising approach involves attempting to find psychosocial and related variables that are proven consistent predictors of compliance. Few studies have examined the relationship between these variables and compliance with dietary regimens specifically.

Demographic Factors

Many studies of compliance have examined demographic characteristics such as age, sex, education, and social class. With the exception of age, no consistent associations have been found between these factors and dietary compliance (Webb et al., 1984; Wilson, Ary, Biglan, Glasgow, Toobert, and Campbell, 1986). There is some evidence to suggest that noncompliance may be associated with the very young (Peyrot & McMurry, 1985; Schafer, McCaul, & Glasgow, 1986) and the very old (Becker & Maiman, 1975; Hopper & Schechtman, 1985).

Features of the Disease and the Regimen

The degree of behavioral changes a regimen requires, its duration and complexity, the degree to which it requires an alteration of lifestyle, and the amount of inconvenience and expense involved have all shown negative relationships to compliance levels (Becker, 1985; Cerkoney & Hart, 1980). In a study examining metabolic control, which is frequently used as an indicator of compliance among persons with diabetes, Davis, Hess, Harrison, & Hiss (1987) found differences associated with disease type and treatment mode. Individuals with NIDDM were found to have better metabolic control than those with IDDM, and NIDDM subjects treated with oral medications or diet alone were found to have better metabolic control than NIDDM subjects treated with insulin. Regimen complexity also was found to be significantly less for individuals with NIDDM and for persons treated with oral medications or diet alone. In a study examining compliance specifically, Ary et al. (1986) found no difference between individuals with IDDM and NIDDM in their adherence to instructions to limit caloric intake.

Knowledge of the Diet

Few studies have found consistent associations between an individual's general knowledge about diabetes and adherence to the diabetes regimen (Webb et al., 1984; Wilson et al., 1986). Becker (1985) has suggested that the provision of information appears beneficial for individuals who are motivated to comply but who are ignorant of the correct procedures. However, for already-knowledgeable but insufficiently motivated persons, additional information about the regimen is unlikely to enhance compliance.

Numerous studies indicate a widespread lack of adequate knowledge of diet among persons with diabetes (Lockwood et al., 1986; Watkins et al., 1967; West, 1973; Williams, Anderson, Watkins, & Coyle, 1967) and ignorance of the diabetic diet has been associated with poor control (Stone, 1961). However, even persons with good knowledge have been found to have poor diabetes management (Watkins et al., 1967) and control (Williams, Martin, Hogan, Watkins, & Ellis, 1967).

Psychological Factors

The literature contains an increasing number of studies concerned with the psychological aspects of diabetes. Hauser and Pollets (1979) have sorted these studies into four topic areas: (a) the role of psychological factors in the onset of diabetes, (b) the influence of the immediate environment upon the course of the disease, (c) the immediate response and long-term psychological adjustment of the individual after the onset of diabetes, and (d) the reaction of the family to the illness and the impact of diabetes upon the family structure. The relationship of psychological variables to diabetes control and regimen adherence generally falls into the second and third categories.

From their review of the literature, Hauser and Pollets (1979) concluded that psychological factors such as undesirable life events need to be considered in understanding fluctuations that occur in diabetic control. Peyrot and McMurry (1985) have described a conceptual model which hypothesizes that psychosocial factors can affect the metabolic control of diabetes both directly and indirectly through psychophysiological and behavioral mechanisms. Direct effects are those mediated by the psychophysiological processes associated with stress. Environmental stressors and personal characteristics, such as the Type A behavior pattern, which can increase individual responsiveness to stressors can increase glucose levels. Conversely, factors that buffer the effects of stress, including psychological coping responses and social support, can reduce the impact of stressors upon the individual. Indirect effects of psychosocial factors on metabolic control are those mediated by treatment behavior. Illness-specific beliefs, attitudes, and emotions act as motivators or inhibitors of self-care behavior. Individual attributes such as problem orientation can affect one's likelihood to engage in help-seeking or self-care behaviors. Indirect effects are those suggested by the health beliefs and locus of control models.

In their study of individuals with IDDM, Peyrot and McMurry (1985) found that persons who are in poor control of their diabetes tend to be extreme in anxiety level, either very high or very low, while those in good control are more moderate. Denial as a problem orientation or coping style was negatively associated with glucose control. Subjects scoring higher on scales measuring impatience and anger as behavioral responses to stress were found to have poorer metabolic control.

Mazze, Lucido, and Shamon (1984) found that anxiety, depression, and quality of life were related to metabolic control. In addition, improvement in

metabolic control was associated with improvement in these psychological variables. Similarly, worsening metabolic control tended to be associated with increased anxiety, depression, and problems of daily living.

Linn, Skyler, Linn, Edelstein, and Sandifer (1985) found that subjects who utilized methods of coping that use self-control had significantly better metabolic control and increased compliance. Self-control behaviors were defined as those with the following characteristics: (a) use of "self-statements" to control emotions and responses, (b) application of problem solving strategies, (c) ability to delay immediate gratification, and (d) perceived self-efficacy or belief in ability to cope. The investigators concluded that a high degree of self-efficacy and self-discipline is extremely important for regimen adherence over a long period of time and consequently for good metabolic control.

The few studies that have explored the relationship between psychological variables and dietary adherence specifically have produced inconsistent results. Webb et al. (1984) found that dietary adherence could not be predicted from current psychological state. In contrast, Wilson et al. (1986) found a negative association between anxiety and dietary self-care behaviors.

In summary, a great deal of attention has been devoted to the psychological correlates of compliance and diabetic control. Personality measures have not been successful in predicting compliance (Kirscht & Rosenstock, 1979; Mazze et al., 1984). Although many hypotheses have been advanced for the etiology and prognosis for management of obesity, little empirical support has been offered that predicts differences in adherence to weight loss regimens (Glanz, 1980). While anxiety, depression, and coping style have been related to glycemic control in a few studies (Linn et al., 1985; Mazze et al., 1984; Peyrot & McMurry, 1985), there is no

consensus about the contribution of these variables to compliance specifically (Webb et al., 1984; Wilson et al., 1986). Some specific attitudes and social support, however, have been found to be important in predicting adherence.

Health Beliefs

During the past two decades, considerable attention has been given to conceptualizing nonadherence as a problem in health-related decision making, where an individual is guided by attitudes and beliefs that may operate independently of knowledge and objective features of the medical condition and the regimen (Becker, 1985). Although several explanatory models are available, the Health Belief Model is a major organizing framework for explaining and predicting acceptance of health and medical care recommendations.

The health belief model. Rosenstock (1966) attributes the origins of this behavior motivation theory to a special case of Lewin's (1935) general field theory. Lewin, Dembo, Festinger, and Sears (1944) hypothesized that behavior depends mainly upon two variables: (a) the value placed by an individual on a particular outcome and (b) the individual's estimate of the likelihood that a given action will result in that outcome. As originally formulated, the Health Belief Model extended Lewin's theory to explain preventive health behavior.

The model proposes that the likelihood of a person taking a recommended health action is determined both by the individual's psychological state of readiness to take that action and by the perceived benefit of the action weighed against the perceived cost or barriers involved in the proposed action. The person's state of readiness to take action is determined by both the person's perceived susceptibility

or vulnerability to the particular condition and the perceived severity of the consequences of contracting the condition (Maiman & Becker, 1974).

The Health Belief Model also proposes that some stimulus is necessary to trigger the appropriate behavior by making the individual consciously aware of his feelings about the health threat. Such *cues to action* can be either internal, like perception of symptoms, or external, like interpersonal interactions, the impact of communications media, or personal knowledge of someone affected by the condition (Maiman & Becker, 1974; Mikhail, 1981).

The concept of health motivation was introduced into the model on the assumption that motives selectively determine an individual's perception of the environment. Health motivation refers to an individual's desire to attain or maintain a positive state of health and to avoid a state of illness (Mikhail, 1981). The major dimensions of the model that have been developed to explain motivation are perceived susceptibility, perceived severity, perceived benefits, perceived barriers or costs, and cues to action.

Although the model was formulated originally to explain preventive health behavior, it has subsequently been adapted for illness behavior (i.e., delay in seeking care) and sick-role behavior (i.e., compliance with medical regimens). Because some diagnosis of illness has already occurred in the case of sick-role behavior, the concept of personal susceptibility was modified to mean the probability of progressive effects or recurrence of the illness. This dimension also includes the individual's belief in the accuracy of the diagnosis (Becker & Maiman, 1975).

In the context of sick-role behavior, or chronic disease, the Health Belief Model asserts that participation by individuals in the management of their disease is associated with (a) acceptance of the diagnosis, (b) conviction of the severity of the

disease, (c) belief in the effectiveness of the treatment regimen, and (d) belief that barriers to the performance of recommended health behaviors can be overcome. These four Health Belief Model dimensions can be defined as follows:

1. *Perceived susceptibility* refers to an individual's perception of the level of personal susceptibility or vulnerability to a particular illness or condition. In the case of diagnosed illness, this dimension has been reformulated to include estimates of resusceptibility, belief in the diagnosis, and susceptibility to illness in general (Becker & Maiman, 1975).

2. *Perceived severity* refers to an individual's perception of the degree of seriousness of the consequences, both medical and social, which might result from contracting a condition or of leaving it untreated.

3. *Perceived benefits* refers to an individual's perception of the health action's potential benefits or effectiveness in preventing or reducing the disease threat (i.e., susceptibility to the condition or severity of the condition).

4. *Perceived barriers* refers to the perception of the physical, psychological, financial, and other costs or impediments related to initiating or continuing the recommended behavior. Barriers may include inconvenience, adverse side effects, and physical or emotional discomfort.

Evidence for the Health Belief Model. Janz and Becker (1984) summarized the results from 46 studies of the Health Belief Model, 29 of which were published since 1974, and 18 of which were prospective in design. Overall, these investigations provide substantial empirical evidence supporting Health Belief Model dimensions as important contributors to the explanation and prediction of individuals' health-related behaviors. Prior to 1974, it appeared that perceived

susceptibility was the most powerful dimension of the Health Belief Model. This may be because most of the early studies examined preventive health behaviors and few had attempted to measure perceived barriers. In the later research (1974 - 1984), the best results were obtained by the barriers dimension, followed by benefits, susceptibility, and severity. When all studies are combined, the barriers dimension again is the most powerful (Janz & Becker, 1984).

Although all of the Health Belief Model dimensions appear to contribute to an understanding of sick-role behaviors, barriers is the most powerful dimension. The dimension of susceptibility appears less important in sick-role behaviors than in preventive health behaviors. This may be due to difficulties in operationalizing the concept of vulnerability in instances where a diagnosis of illness has already been made. In contrast, the dimension of severity appears more meaningful to individuals diagnosed as ill or experiencing symptoms (Janz & Becker, 1984).

Studies of health beliefs and compliance in diabetes. The Health Belief Model has been somewhat successful in predicting compliance with diabetes regimens as well as with diet specifically. The majority of the research in this area has been published since Janz and Becker's 1984 review. These studies are summarized in Table 1.

In examining compliance with a diet regimen for diabetes, Alogna (1980) focused on a single Health Belief Model dimension, perception of severity of the disease. Fifty obese subjects with NIDDM were classified as compliant or noncompliant according to a set of criteria involving prior weight loss and blood glucose control. Severity was assessed with a "perception of severity of disease index" from the Standardized Compliance Questionnaire developed by Sackett and

Table 1

Studies Examining the Relationship Between Diabetes Compliance and Health Belief Model Dimensions

Investigator(s)	Design	Compliance Measure	Health Belief Model Dimensions Correlated with Compliance									
			Suscept		Severity		Benefits		Barriers		Total ^a	
			Rel Sig	Rel Sig	Rel Sig	Rel Sig	Rel Sig	Rel Sig	Rel Sig	Rel Sig	Rel Sig	Rel Sig
Alogna (1980)	R N = 50 NIDDM obese	Weight loss and glucose control	NM -		+ yes		NM -		NM -		NM -	
Cerkoney & Hart (1980)	R N = 30 IDDM	5 behavioral measures (direct observation and self-report): insulin administration, urine testing, hypoglycemia management, diet, and foot care	+ no		+ yes		+ no		+ no		NM -	
		total diet	- no		+ no		- no		- no		NM -	
Davis et al. (1987)	R N = 428 IDDM & NIDDM	Glycemic control	NM -		- yes		- yes		- yes		NM -	

Table 1 (Continued)

Health Belief Model Dimensions Correlated with Compliance												
Investigator(s)	Design	Compliance Measure	Suscept		Severity		Benefits		Barriers		Total ^a	
			Rel Sig	Rel Sig	Rel Sig	Rel Sig	Rel Sig	Rel Sig	Rel Sig	Rel Sig		
Glasgow et al. (1986)	R, P N = 50 IDDM	4 behavioral measures (self- report): glucose testing, diet, insulin injection, exercise	NM -	NM -	NM -	-	-	yes	NM -	-	NM -	
Harris & Linn (1985)	R N = 93 NIDDM males	4 self-monitoring/ objective measures	NM -	NM -	NM -	-	-	yes	NM -	-	NM -	
Harris & Linn (1985)	R N = 93 NIDDM males	5 behavioral measures (self- report and nurse evaluation): diet, medications, exercise, foot care, urine testing total	+	yes	+	yes	-	no	+	yes	NM -	
Harris & Linn (1985)	R N = 93 NIDDM males	Metabolic control	-	no	+	no	+	yes	-	no	NM	

Table 1 (Continued)

Health Belief Model Dimensions Correlated with Compliance												
Investigator(s)	Design	Compliance Measure	Suscept		Severity		Benefits		Barriers		Total a	
			Rel Sig		Rel Sig		Rel Sig		Rel Sig		Rel Sig	
Harris et al. (1982)	R N = 50 NIDDM males	5 behavioral measures (24-hr recall): diet, medications, exercise, foot care, urine testing	+ yes		NR	-	- yes		+ yes		NM	-
			(diet)				(diet, exercise)		(meds)			
			- yes		+ yes		- yes		NR	no	NM	-
Hopper & Schechtman (1985)	R N = 151 NIDDM	Metabolic control										
			NM	-	- yes		- yes		NM	-	NM	-
Peterson et al. (1984)	R N = 114 NIDDM	Self-evaluation of adherence to diet	NM	-	NM	-	+ yes		- yes		NM	-
			NM	-	NM	-	NR	no	NR	no	NM	-
Peyrot & McMurry (1985)	R N = 20 IDDM	Glucose control	NM	-	NM	-	NR	no	NR	no	NM	-
			NM	-	- yes		NM	-	NM	-	NM	-
					(extreme scores)							

Table 1 (Continued)

Investigator(s)	Design	Compliance Measure	Health Belief Model Dimensions Correlated with Compliance									
			Suscept		Severity		Benefits		Barriers		Total ^a	
			Rel Sig	NR	Rel Sig	NR	Rel Sig	NR	Rel Sig	NR	Rel Sig	NR
Webb et al. (1984)	P N = 183 IDDM	Diet (4-day food record)	NR	no	NR	no	NR	no	NR	no	NM	-
Wilson et al. (1986)	R N = 184 NIDDM	4 behavioral measures (self-report): diet, exercise, glucose testing, medications	NM	-	NM	-	NM	-	NM	-	+	yes (diet, exercise, glucose testing)
		Glucose control	NM	-	NM	-	NM	-	NM	-	+	no

Note. Health Belief Model dimensions are scored so that a higher score indicates a more strongly held belief. R = retrospective. P = prospective. Rel = Direction of relationship between Health Belief Model dimension and compliance. Sig = Statistically significant relationship.

^a Total Health Belief Model score.

Haynes (Sackett, Becker, MacPherson, Luterbach, & Haynes, 1974). Results demonstrated that compliant subjects viewed their illness as more serious than did the noncompliant subjects. Alogna concluded that perhaps these individuals are more realistic about the consequences of the disease and therefore are more motivated to take action to control their diabetes.

Cerkoney and Hart (1980) interviewed 30 subjects with IDDM in order to assess the relationship of health beliefs to adherence. Three items taken from the Standardized Compliance Questionnaire (Sackett et al., 1974) were used to measure each dimension of the Health Belief Model. Direct observation and self-report were used to assess degree of adherence to the regimen in the areas of insulin administration, urine testing, diet, hypoglycemia management, and foot care. A "total compliance score" was constructed across these measures.

Results indicated that the total compliance score was positively associated with each of the Health Belief Model components, but only the correlation with perceived severity attained significance. In addition, a combined "total Health Belief Model score" was found to be significantly related to the total compliance score. Cerkoney and Hart (1980) concluded that those subjects who perceive their diabetes to be serious, and respond to cues, tend to be more compliant with their regimen than those who do not have these perceptions. No significant associations were found between dietary adherence and any of the Health Belief Model dimensions.

Davis et al. (1987) administered the Diabetes Educational Profile to 56 IDDM and 372 NIDDM subjects to assess differences in psychosocial adjustment among individuals with different types of diabetes and with different treatment regimens. The investigators found that scores on scales assessing barriers to adherence, benefits of adherence, and susceptibility to complications were significantly related

to metabolic control. In addition, individuals with IDDM reported more benefits of adhering to the medical regimen. Compared with other treatment regimens, insulin-using NIDDM subjects reported more barriers to adherence, more benefits of adherence, and a higher perceived risk of complications.

Glasgow, McCaul, & Schafer (1986) developed a scale to assess barriers which may interfere with adherence to specific aspects of the diabetic regimen. Items were included to assess barriers to insulin injections, glucose testing, diet, and exercise. This barriers scale was administered to 65 individuals with IDDM. Subjects also completed a questionnaire assessing self-reported adherence to different areas of the IDDM regimen over the past week. In addition, data from 24-hour dietary recalls were compared to subjects' prescribed meal plans and expressed in terms of exchange and calorie deviations from dietary prescriptions.

Results indicated that the frequency of reported barriers was negatively associated with self-reported adherence in all regimen areas. Compared to the self-report measures, however, the relationship between barriers and the more objective measures of adherence was significant for fewer regimen areas. None of the caloric or dietary exchange measures from dietary recalls was significantly related to barriers scores. In addition, barriers scores were not strongly predictive of future adherence levels.

Harris and Linn (1985) used the 40-item Diabetes Health Belief Scale to assess health beliefs among 93 men with NIDDM. Compliance was measured behaviorally, using a combination of the subject's self-report and nurse's evaluation. Physiological measures were used to indicate both short-term and long-range control.

Individual correlations indicated that compliance was positively related to the Health Belief Model dimensions of severity, susceptibility, and barriers. A multiple regression analysis indicated that belief in the severity of the disease was the single best predictor of compliance. Individual correlations showed that metabolic control was positively related to compliance and a belief in the benefits of treatment. When compliance was combined with health beliefs in the regression analysis, however, the best predictors of good control were the attitudes that treatment helps, that symptoms call for seeking help, that susceptibility to diabetic complications is low, and that family support is important. The investigators concluded that health beliefs are better predictors of metabolic control than compliance itself.

Harris, Skyler, Linn, Pollack, and Tewksbury (1982) interviewed 50 males with NIDDM and obtained 24-hour recall information in five areas of behavior: medication use, dietary compliance, urine testing, exercise, and foot care. Physiological measures of compliance included glycosylated hemoglobin, fasting plasma glucose, fasting triglycerides, and urine glucose. Subjects' health beliefs were obtained with a questionnaire containing 71 items specific to diabetes adapted from that used by Hartman and Becker (1978). Behavioral and physiological compliance measures as well as the health belief items were rated on 4-point scales.

Results indicated that behavioral measures of compliance were significantly correlated with benefits of treatment, susceptibility, and psychological barriers. Dietary compliance was positively associated with feelings of susceptibility. Physiological measures of compliance were significantly associated with items indicating benefits of treatment, susceptibility, and severity.

A group of 151 low-income adults with NIDDM were assessed by Hopper and Schechtman (1985) in a study of factors associated with diabetes control.

Health beliefs were evaluated using researcher-generated items. Correlations were found between poor control and a lack of belief in the benefits of treatment, a perception that diabetes is not very serious, and high levels of reported problems with the self-care regimen, particularly diet.

Factors affecting compliance were studied by Peterson et al. (1984) in 114 subjects with NIDDM. Adherence to diet was assessed with a single questionnaire item. In addition, a "diet score" was calculated from recorded food and drink intake over a 4 day period. Dietary compliance and diet score were found to be significantly associated. Both measures were independently related to diabetic control. Health beliefs were measured with an 18-item questionnaire. Results suggested that patients who believe that diets are important in the treatment of diabetes and that following prescribed diets is not difficult are more likely to adhere to their diet.

Peyrot and McMurry (1985) studied psychosocial factors in diabetic control in 20 subjects with IDDM. Attitudes, or perceptions of diabetes were investigated using the investigators' adjective checklist. Subjects were classified as having good or poor glycemic control. Results indicated that the attitudinal extremes of optimism and pessimism were associated with poor control. These attitudes can be viewed as correlates of the Health belief Model dimension of severity.

The investigators suggested that optimism signals wishful thinking which may lead to complacency regarding the need for strenuous efforts at good glucose control. On the other hand, pessimism represents a perception of diabetes as hopeless which may also discourage intensive self-care efforts. Good adjustment involves an intermediate attitude that realistically acknowledges the difficulty of a rigorous treatment regimen and yet recognizes the value of this effort.

Webb et al. (1984) examined dietary compliance among 183 subjects with IDDM. Dietary adherence was assessed in terms of carbohydrate composition, weight, and carbohydrate spacing and variation. Health beliefs were measured by a 21-item questionnaire. The health beliefs examined included perceptions of (a) susceptibility to complications of diabetes, (b) concern about complications, (c) interference with lifestyle by diabetes, (d) barriers to dietary compliance, and (e) efficacy of diet to control diabetes and weight. Dietary compliance after a period of 6 months could not be predicted by health beliefs in this study.

In a study of 184 persons with NIDDM, Wilson et al. (1986) found health beliefs to be positively associated with dietary self-care behaviors. Health beliefs assessed included effectiveness of diet in controlling diabetes, lifestyle interference, and discomfort of self-care tasks. Adherence was evaluated using the Diabetes-Specific Assessment Battery, a self-report measure.

To summarize the results of these studies concerned with regimen adherence in diabetes, Janz and Becker's (1984) technique of the *significance ratio* was utilized. The number of positive and statistically significant findings of a Health Belief Model dimension were divided by the total number of studies which reported significance levels for that dimension. These results are presented in Table 2. Examination of the significance ratio across the 11 investigations reviewed reveals that the best results are obtained by the severity dimension (70%), followed by benefits (67%), barriers (57%), and susceptibility (50%). For the 7 studies examining dietary adherence independently, the benefits dimension is associated more frequently with compliance (40%), followed by barriers and susceptibility (33%), and severity (0%).

Table 2**Significance Ratios of Studies Examining the Relationship Between Health Belief Model Dimensions and Diabetes Compliance**

Compliance Measure	Significance Ratios for Health Belief Model Dimensions							
	Susceptibility		Severity		Benefits		Barriers	
Diet	1/3	(33%)	0/3	(0%)	2/5	(40%)	3/9	(33%)
Total ^a	3/6	(50%)	7/10	(70%)	10/15	(67%)	8/14	(57%)

^a Includes all studies and all measures.

The interpretation of these results is complicated by several factors. Each study has utilized different definitions of compliance as well as different methods for assessing it. Some studies have used measures of metabolic control to indicate compliance while others have utilized behavioral or self-report indices. Although regimen adherence is a factor in blood glucose control, many other variables are important as well. Another area of difficulty is the operationalization of the various Health Belief Model dimensions. Each study has utilized a different questionnaire to assess these beliefs. In addition, the dimensions of perceived susceptibility and perceived severity tend to overlap in these studies. The perception of one's susceptibility to the complications of diabetes and the perception of diabetes as a serious disease may not represent distinct dimensions.

Barriers to dietary adherence in diabetes. Recent studies have explored individuals' perceptions of the barriers that interfere with dietary adherence. Ary et al. (1986) asked a group of 208 persons with IDDM and NIDDM what they believed to be their most common reasons for nonadherence. They found that the results for IDDM and NIDDM subjects were quite similar. For dietary adherence, eating out in restaurants and refusing offers of inappropriate foods from others were consistently reported as the most frequently encountered barriers.

Daschner (1986) interviewed 21 subjects with IDDM or NIDDM to assess the problems perceived in adhering to a prescribed diet. Self-discipline, or willingness to exert self-control in making food choices, was most frequently mentioned as the most difficult problem. Emotions and events such as eating out and social gatherings were seen as equally problematic.

House et al. (1986) asked 90 NIDDM subjects and 50 physicians to state the major reasons for dietary compliance difficulties. Physicians overwhelmingly perceived motivational problems (i.e., lack of incentive or desire) as the reason for dietary noncompliance. Persons with diabetes, on the other hand, mentioned environmental causes (e.g., family, job, or economic conditions) slightly more frequently than they did motivational causes and they also placed considerable emphasis on somatic/physiologic factors (e.g., physical limitations such as visual or ambulatory restrictions that interfere with food preparation). The researchers emphasized the discrepancy between the perceptions of individuals with diabetes and the perceptions of physicians. Physicians viewed dietary noncompliance as being largely under the individual's control, whereas persons with diabetes maintained that their noncompliance was out of their control to a large extent. The investigators suggested that individuals with diabetes have a strong tendency to disclaim personal responsibility for failure to comply.

Kirkley (1982) studied 89 adults with diabetes to determine the types of situations in which individuals deviate from their prescribed diets. She found that the majority of dietary relapses occurred when the individual was busy with some activity, was tempted to eat by the presence of food, or experienced social pressure to eat. Counter to the investigator's expectations, emotions such as anxiety, frustration, and sadness were not a prominent cause of dietary relapse.

Locus of Control

Locus of control is an aspect of the social learning theory of Rotter (1966). According to this theory, "a reinforcement acts to strengthen an 'expectancy' that a particular behavior or event will be followed by that reinforcement in the future"

(p. 2). Through a learning process, individuals come to expect either that certain outcomes are a result of their actions or that they are a result of forces external to them. This perception of causal relationship is seen as a continuum between internality and externality rather than a dichotomy. As originally conceptualized, internal control refers to individuals who believe that reinforcements are contingent upon their own behavior, capacities, or attributes. External control refers to individuals who believe that reinforcements are not under their personal control but rather are under the control of powerful others, luck, chance, or fate.

Questioning the conceptualization of locus of control as a unidimensional construct, Levenson (1974) developed new scales in order to measure belief in chance expectancies as separate from powerful others expectancies. It was reasoned that people who believe the world is unordered would behave and think differently from people who believe the world is ordered but that powerful others are in control.

Locus of control and health. With the belief that measures for health behavior expectancies would reveal more consistent relationships between locus of control and health outcomes, Wallston, Wallston, Kaplan, and Maides (1976) developed the Health Locus of Control Scale. Later, impressed with Levenson's work and realizing that locus of control was not unidimensional, the Multidimensional Health Locus of Control Scale was developed (Wallston, Wallston, and DeVellis, 1978).

The newer instrument contains independent measures of internality and two distinct externality dimensions. Health internality refers to the extent to which a person believes health is a function of his or her behavior. Chance externality refers to the degree to which a person believes that health is unpredictable, or due to fate,

luck, or chance. Powerful others externality refers to a person's belief that health is largely determined by the actions of powerful others, either family members, friends, or health professionals (Wallston, Smith, King, Forsberg, Wallston, & Nagy, 1983). These scales are situation specific in that all items mention health or illness, yet they also generalize expectancies in that they deal with health in the abstract and do not refer to particular health behaviors or conditions (Wallston & Wallston, 1984).

Wallston and Wallston's work has focused on the application of social learning theory to the prediction of health behavior. According to this theory, a person is most likely to engage in a health behavior given a belief in internal health locus of control and a high valuing of health (Wallston & Wallston, 1984). Low belief in chance health locus of control should also facilitate health behavior. If one believes one's health is strictly a matter of chance; there is no reason to take action. The theory also predicts that high beliefs in powerful others health locus of control will facilitate health behavior that is recommended by health professionals. A person with high beliefs in internality and powerful others and low beliefs in chance health locus of control is considered to be someone who believes in control and contingencies. It is suggested that such a belief pattern may be particularly adaptive for persons with chronic illnesses who must rely on physicians to prescribe treatment regimens and where much of the responsibility for carrying out the regimen lies with the individual.

Strickland (1978) found that, overall, research with the internal-external dimension suggests that beliefs about locus of control of reinforcement are influential in relation to health. The bulk of the research implies that when faced with health problems, internal individuals appear to engage in more adaptive

responses than do externals. In contrast, Wallston & Wallston's (1981) review of the literature found that with some samples, internality appears to be associated with desired behaviors, but more often adherence is related to holding external beliefs.

The literature on locus of control and weight loss has been conflicting. Balch and Ross (1975) found significant correlations between internal scores on Rotter's (1966) Internal-External Scale and success in a weight reduction program. Gierszewski (1983) found that health locus of control did not have a significant effect on the success of weight reduction. Tobias and MacDonald (1977) presented findings which indicated that patient assumption of greater personal responsibility, or internality, alone is not sufficient for successful weight loss.

Studies of locus of control and compliance in diabetes. In a study of dietary adherence, Alogna (1980) classified 50 obese subjects with NIDDM as compliant or noncompliant based on weight loss and glycemic control. She found no difference between compliant and noncompliant subjects on the Health Locus of Control Scale (Wallston et al., 1976).

Edelstein and Linn (1987) examined the relationship between Rotter's (1966) Internal-External Scale and diabetes control among 120 insulin-using men. Baseline and 6 month locus of control scores were used to predict control of diabetes at 6 and 12 months. Contrary to their expectations, the investigators found that an external personality orientation was associated with better diabetes control on follow-up. They suggested that duration of diabetes may account for these findings. The subjects had been diagnosed with diabetes for almost 12 years. It may be that the chronic nature of the disease with its unpredictable course, leads internally oriented persons to believe that their normal response based on increased information is

inadequate. Therefore, if they find that knowledge about diabetes does not lead to control of the disease, they may no longer comply with all the routine efforts to control it.

Lowery and DuCette (1976) hypothesized that an internal individual with diabetes will differ from an external person in the manner and extent to which he or she will seek the information necessary to assume control of the disease. They studied 30 newly diagnosed, 30 3-year, and 30 6-year subjects with diabetes. Locus of control was determined by the Internal-External Scale (Rotter, 1966) and diabetes control was defined as the number of problems per month. Results indicated that internal subjects had fewer problems at 3 years but significantly more problems at 6 years than the external subjects. External subjects showed a decrease over time in the number of problems associated with their disease, while internal subjects showed no decrease.

In a study of 52 subjects with NIDDM, Nagy and Wolfe (1984) used the Multidimensional Health Locus of Control Scale (Wallston et al., 1978) to predict compliance with the diabetes regimen. Compliance was assessed with self-report and physician-report measures. Although they reported a lack of relationship between the health locus of control scales and the compliance measures, a powerful others health locus of control was associated with the self-report measure. The investigators concluded that persons with a high regard for the influence of doctors on health outcomes are more likely to carry out self-management recommendations.

Peyrot and McMurry (1985) studied locus of control and diabetes control in 20 insulin-using subjects. A negative relationship was found between glycemic control and internal health locus of control. Schlenk & Hart (1984) explored the relationship between health locus of control and compliance in 30 subjects with

IDDM. Self-report and direct observation were used to measure compliance. The Multidimensional Health Locus of Control Scale (Wallston et al., 1978) was used to assess locus of control orientation. The investigators found adherence to diet significantly related to powerful others locus of control.

Internal locus of control was positively related to self-reported compliance and self-reported diabetes control in a study of 50 IDDM and NIDDM subjects 6 weeks after the diagnosis of diabetes (Wierenga, 1979). Powerful others locus of control also was positively associated with self-reported diabetes control. Locus of control was assessed with the Multidimensional Health Locus of Control Scale (Wallston et al., 1978).

In a study of 41 subjects with NIDDM, White, Carnahan, Nugent, Iwaoka, & Dodson (1986) found that internal health locus of control was significantly related to diabetic control. In addition, the more internal the individual's locus of control, the greater the tendency for improved diabetes control in response to a diabetes education or group management program. The internal scale of the Multidimensional Health Locus of Control Scale (Wallston et al., 1978) was used in this study.

The majority of the studies reviewed have examined the relationship between locus of control and metabolic control. One of these studies found control to be related to internal and external locus of control for subjects having diabetes for 3 years and 6 years respectively. Of the remaining four studies, one found no relationship between locus of control expectancy and control, one found control to be related to an internal locus of control, and two found control to be related to external expectancies. The two studies that examined self-reported diabetes compliance found it was positively related to a powerful others locus of control.

These studies suggest that the locus of control construct is an important determinant of diabetes compliance. The nature of the relationship between compliance and locus of control is not clear, but external expectancies appear to be more strongly related to compliance in these studies.

Social Support

Evidence is growing that social support (particularly support provided by the family) plays an important role in influencing compliance (Haynes, 1979; Levy, 1983). Social support seems to be especially important in long-term treatment plans that require continuous action on the part of the individual (Becker, 1985; Caplan, Robinson, French, Caldwell, & Shinn, 1976).

Studies of the importance of social influence in eating behavior have supported the value of groups in changing food habits (Glanz, 1980). Gierszewski (1983) studied 46 women participating in a nutrition class and weight control program. Social support was not correlated with weight loss in this study. In contrast, Rosenthal, Allen, and Winter (1980) found that husband involvement in a weight reduction program fostered greater weight loss in their study of 37 obese women.

Social support and compliance in diabetes. The importance of social support in diabetes control and regimen compliance, including dietary adherence, has been supported by the literature. In their study of 93 men with NIDDM, Harris and Linn (1985) found that a belief that environmental and family supports are helpful was associated with better metabolic control. Reported lack of social support in a crisis

with diabetes was associated with poor diabetes control in a group of 151 low-income adults with NIDDM (Hopper & Schechtman, 1985).

Heitzmann and Kaplan (1984) suggested that social support may operate differently for males and females. In a study of 37 individuals with NIDDM, they found that males who are highly satisfied with their supportive relationships also tend to have poor control of their diabetes. Conversely, satisfaction with support is associated with better control of diabetes for women.

Schafer et al. (1986) developed an instrument to assess family behavior that may support or interfere with adherence to the diabetes self-care regimen. In a study of 54 adults with IDDM, they found that negative scores on this questionnaire were consistently predictive of poor adherence to diet as well as to other aspects of the prescribed diabetes regimen.

Schlenk and Hart (1984) studied the relationship between social support and compliance in 30 subjects with IDDM. Social support for diabetes management was assessed with an 18-item questionnaire developed by Schlenk. The compliance measure consisted of self-report of activities and direct observation of self-care skills. Diabetes-specific social support was positively associated with several areas of regimen adherence, including adherence to diet and overall compliance.

In a study of 19 adults with diabetes, Schwartz, Springer, Flaherty, and Kiani (1986) found that persons with limited social support had much poorer glycemic control. Shenkel, Rogers, Perfetto, and Levin (1985) interviewed 41 individuals with IDDM. They found that significant others' beliefs in the importance of following the prescribed diabetic diet plan was a stronger predictor of the subjects' intentions to adhere to their diet than were the subjects' own beliefs.

In a study of 50 IDDM and NIDDM subjects 6 weeks after the diagnosis of diabetes had been made, Wierenga (1979) found that social support was significantly related to self-reported compliance and to a self-report measure of therapeutic outcome. Wilson et al. (1986) found perceived social support from significant others, specific to the performance of diabetes self-care behaviors, to be associated with dietary self-care behaviors among patients with NIDDM.

Levy (1983) suggested that social support may lead to adherence by providing an individual with feelings of success, information, or a reduction of environmental strain and stress. From her review of the literature, she concluded that the correlational evidence seems to support the positive relationship between social support and compliance or health outcome.

CHAPTER II

MEASUREMENT ISSUES

With the exception of the locus of control construct, each study reviewed has utilized a different measure for assessment of the psychosocial variables identified as determinants of compliance. Similarly, definitions and measures of compliance vary from one study to the next. Standardized ways of measuring these variables would facilitate evaluation and comparison of research findings. A discussion of the difficulties encountered and the solutions that some investigators have developed will provide a rationale for the measures selected for this study.

Assessing Health Belief

Model Dimensions

In response to critiques of research on the Health Belief Model, Maiman, Becker, Kirscht, Haefner, and Drachman (1977) developed scales to measure the primary Health Belief Model dimensions and tested them for predictive value, internal consistency, and relationships among beliefs. They presented data from a prospective study of mothers' adherence to a diet regimen prescribed for their obese children. The data indicated that the perception of susceptibility and the perception of severity dimensions of the model are sufficiently correlated to be considered together conceptually as components of a larger concept of "threat of illness" or "readiness to take health action". It is unclear whether these represent different constructs or are components of a larger concept concerned with motivation.

Maiman et al. (1977) reported that the data substantiate the independence of the dimensions of perceived threat, perceived benefits, and perceived barriers. They also found a separate dimension which they identified as "feeling of control" over the condition.

Jette, Cummings, Brock, Phelps, and Naessens (1981) also have presented findings which support the theoretical assumption that the Health Belief Model dimensions are sufficiently distinct to be considered different beliefs. In addition, they found that condition-specific measures of perceived susceptibility and severity of illness and situation-specific measures of perceived barriers are empirically distinct from general measures of these beliefs. Their evidence indicates that scales with items that refer to a specific health problem have higher reliabilities than scales composed of items referring to health in general. Ideally, separate scales should be constructed as the Health Belief Model is applied to each new health problem.

Efforts directed at developing standardized scales and assessing their validity and reliability have been successfully undertaken with regard to a variety of specific illnesses. Becker and Janz (1985) described the Diabetes Health Belief Scale (Given, Given, Gallin, & Condon, 1983) as the most recent and extensive attempt to construct and evaluate Health Belief Model indices.

Questionnaire items for this scale were derived from three sources: (a) a review and adaptation of previous instruments to measure concepts from the Health Belief Model, (b) a review of educational materials for individuals with diabetes involving descriptions of beliefs and reactions concerning the condition of diabetes and the therapeutic regimen, and (c) in-depth, open-ended interviews with a sample of 25 subjects concerning how these individuals believed their diabetes influenced

their lives, how the regimen helped to control the disease, and what problems they had experienced in adhering to prescribed therapy.

Statements were developed to evaluate 12 concepts related to individuals' beliefs about their diabetes and regimen. All items were scored using a 5-point Likert scale ranging from *strongly agree* to *strongly disagree*. These scales were administered to a sample of 156 individuals with diabetes drawn from 11 ambulatory centers, and the results were subjected to factor analysis and tests of internal consistency. The scales were then cross-validated on a second sample of 92 subjects with diabetes and subjected to tests for unidimensionality, internal and external consistency, and stability across both samples.

During several analyses, items that did not correlate as expected with their hypothesized clusters were dropped or combined with other clusters. In some cases, too few items remained to represent a construct adequately. In other cases, two constructs combined to form a measure of a more general construct. The six scales retained in the final questionnaire are described below.

1. *Control of Effects of Diabetes* measures individuals' beliefs that they are able to control diabetes. This scale represents a combination of the original personal responsibility and severity scales.

2. *Barriers to Diet* is a measure of perception of obstacles to following a diet.

3. *Social Support for Diet* measures the perception that individuals have other people to help them adhere to their diets.

4. *Barriers to Taking Medications* measures the perception of obstacles to taking prescribed medications.

5. *Impact of Job on Therapy* measures the perception that job pressures interfere with the diabetic regimen for those who work (i.e., following a diet and taking medications).

6. *Commitment to Benefits of Therapy* measures an individual's commitment to adhering to the prescribed therapy.

The scales are organized so that a higher score represents a more strongly held belief about the concept measured. The scales that emerged appear reliable and reproducible across two samples, and seem to measure distinct sets of beliefs about diabetes and the benefits of, and barriers to, undertaking therapy (Given et al., 1983).

Locus of Control Scales

As in health beliefs research, the importance of using locus of control scales constructed to fit each situation has been argued (Wallston & Wallston, 1984). Believing that the use of specific scales allows for more accurate prediction of specific behaviors in specific situations, the Health Locus of Control Scale (Wallston et al., 1976) and the Multidimensional Health Locus of Control Scale (Wallston et al., 1978) were developed.

Support for the use of these health-specific scales with medical populations is provided by Harris, Linn, and Pollack (1984). In a study of 93 men with diabetes, both Rotter's (1966) Internal-External and the Health Locus of Control scales were used to provide a general and specific measure of the individual's orientation regarding internal or external control. Significant correlations were found between the Health Locus of Control Scale and measures of health beliefs. Despite a

significant relationship between the two locus of control scales, no correlations were found between health beliefs and Rotter's Internal-External Scale. The authors concluded that although there is a relationship between the two approaches to locus of control, the health-oriented scale provides additional information which might otherwise have been missed.

The Health Locus of Control Scale is situation specific in that all items mention health or illness, yet it is also general in that it deals with health in the abstract and does not refer to particular health behaviors or conditions. There is support for the use of illness-specific scales with specific populations. Bloom (1979) found that by removing items that are not relevant to the target problem, the validity of the scale was enhanced and the test of the hypothesis was strengthened.

A diabetes-specific locus of control scale has recently been developed by Ferraro, Price, Roberts, and McKinley (Note 1). The Diabetes Locus of Control Scale is a 25-item questionnaire utilizing a 6-point Likert format ranging from *strongly agree* to *strongly disagree*. It consists of 8 internal, 7 powerful other, and 10 chance items. Results of the factor analysis confirmed the existence of three locus of control factors and provide support for the multidimensional nature of the locus of control construct. Preliminary criterion-related validity was assessed by correlating the three subscales of the Diabetes Locus of Control Scale with the corresponding subscales of the Multidimensional Health Locus of Control Scale. Results indicated that each Diabetes Locus of Control subscale correlated most highly with its Multidimensional Health Locus of Control Scale counterpart.

The relative value of utilizing a diabetes-specific scale or a general health scale was examined in a sample of 150 adults with diabetes. The Diabetes Locus of Control Scale and the Multidimensional Health Locus of Control Scale were

administered along with measures of diabetes information-seeking behavior. Among newly diagnosed subjects, the Diabetes Locus of Control Scale was found to be more useful than the more general Multidimensional Health Locus of Control Scale in explaining diabetes information-seeking behaviors (Ferraro et al., Note 1).

Measures of Social Support

A major problem with research concerning social support is the unclear definition of the concept (Levy, 1983). Schaefer, Coyne, and Lazarus (1981) have suggested that it is important to examine the quality of social support as well as its availability since quality may vary even within the same type of relationship. Recognizing the multiple components of social support, they studied social network size and perceived social support separately. Perceived social support involves an evaluation or appraisal of whether and to what extent a relationship or interaction is helpful. Their research demonstrates the differential relationship between the components of social support and outcome. The investigators suggest that perceived social support is more strongly associated with health outcomes because it is a more direct measure of the support afforded a person.

Wilson et al. (1986) examined the relationship of general and regimen-specific measures of social support to diabetes self-care behaviors. Perceived social support from significant others, specific to the performance of diabetes self-care behaviors, was assessed with 10 items. Five of the 10 items concerned support for following dietary requirements. These measures were compared with the Interpersonal Support Evaluation List, a 40-item questionnaire which assesses the perceived availability of general social support.

The regimen-specific measures of social support were more strongly associated with self-care behaviors than was the global measure of social support. The investigators concluded that the stronger relationships observed between regimen-specific measures and diabetes behavior may be due to the greater conceptual validity of regimen-specific measures.

Regimen Adherence Measurement

Compliance has been defined as "the extent to which a person's behavior (in terms of taking medications, following diets, or executing lifestyle changes) coincides with medical or health advice" (Haynes, Taylor, & Sackett, 1979, p. xv). Evaluation of compliance, therefore, involves the comparison of actual behavior to a known standard. Problems arise in the determination of the actual regimen prescription as well as in the measurement of behavior.

For some aspects of the regimen, prescriptions may never have been given. If they have been given, they may be nonspecific, not clearly communicated, or not documented in medical records. There are serious validity concerns about relying on patient recall of instructions. The fallibility of this approach has been demonstrated by Page, Verstraete, Robb, and Etzwiler (1981) among others. Another problem arises because individuals with diabetes are encouraged to play a very active role in managing their disease. In such cases, there may be no set prescription against which the individual's behavior can be assessed. The actual prescription varies and is subject to modification by the individual.

Even when data on prescriptions are available, there are several measurement and quantification problems involved in translating the concept of adherence to the

treatment of diabetes. Some of these problems, such as reliance on self-report measures, lack of standardized or well-validated measures of compliance, and failure of different measures of the same behavior to correlate with one another, are not unique to diabetes (Glasgow, Wilson, & McCaul, 1985). In addition, definitions of what constitutes compliance vary from study to study.

A frequently used indirect measure of compliance is the outcome of the treatment regimen. Achievement of the treatment goal would appear initially to be a good measure of compliance if the recommended regimen is truly effective. However, there is often not a straightforward link between health outcome and compliance. In diabetes research, metabolic or glycemic control is often used as an indicator of compliance. The problem with referring to compliance and control as a single, homogeneous entity is illustrated by Wilson et al. (1986). They found that the variables affecting glycemic control were different from those affecting regimen self-care behaviors. In addition, psychosocial variables were not related to control and did not enhance the ability to predict levels of control.

Metabolic control is extremely complex and evidence suggests that it is influenced by a number of factors including illness, physical activity, age, extent of and skill in carrying out self-care behaviors, and responsiveness of cells to insulin. It seems logical that psychosocial and behavioral variables would be more strongly related to behavioral variables, such as self-care behaviors, than to a physiological variable, such as glycemic control (Wilson et al., 1986).

Another problem involves the difficulty of comparing adherence scores across individuals with vastly different regimen prescriptions. Glasgow et al. (1985) have asserted that it is important for investigators to present information on regimen prescriptions since the interpretation of adherence data can vary

considerably depending on the stringency, appropriateness, and complexity of prescriptions given. Standardizing and documenting regimen prescriptions has the advantage of minimizing variance in adherence scores due to diverse regimen prescriptions.

The finding that diabetes regimen adherence is not a unitary construct, and that level of adherence to one aspect of the regimen is often unrelated to degree of adherence to other aspects of the regimen, presents an additional problem. The implication is that individual scales or measures must be utilized for each aspect of diabetes behavior an investigator wants to address. Rather than referring to individuals as good or poor compliers, Glasgow et al. (1985) have suggested that it is more appropriate to refer to levels of specific self-care behaviors as they occur in relation to specific regimen tasks.

Measurement of Dietary Intake

The nutrition literature contains many studies that address measurement evaluation questions. One of the most widely used approaches to the collection of dietary information is the 24-hour recall method. Respondents are asked to remember what and how much they ate over the last 24 hours. This convenient method is most likely to get high rates of subject cooperation because it makes the fewest demands on a subject's time and effort.

The 24-hour recall approach has been criticized because it does not provide a reliable estimate of the usual intake of the individual. Beaton, Milner, Corey, McGuire, Cousins, Stewart, de Ramos, Hewitt, Grambsch, Kassim, and Little (1979) found wide day-to-day variation in the composition of a self-selected diet. They concluded that the precision of the estimate of an individual's usual intake,

obtained from a single 1-day observation, is relatively low. These conclusions are in agreement with those of Todd, Hudes, and Calloway (1983). Both of these studies utilized a nonmedical population with no dietary restrictions, however, and one might expect that day-to-day variability would be less for a population attempting to follow a prescribed diet. This assumption is not supported by the literature. In a well-designed study of the dietary habits of persons with diabetes, Williams, Anderson, Watkins, and Coyle (1967) found that for most subjects there was much variability in total caloric intake and intake of carbohydrate, protein, and fat from day to day.

At the request of the U.S. Public Health Service, the Rand Corporation undertook an extensive project to identify and develop reliable, valid measures of diabetes compliance behavior (Marquis & Ware, 1979). As part of this project, they reviewed and evaluated the literature concerned with dietary measurement. They found that short-recall measures of dietary intake appear minimally biased but are subject to large amounts of measurement-error variance. They concluded that 24-hour recall measures of dietary intake have satisfactory measurement properties and probably represent an optimal research strategy given currently developed measurement options. If a 24-hour recall method is used, the reliability of the estimate can be improved if several dietary recalls can be obtained for the same individual. In comparison to other techniques it is generally agreed that for large groups of subjects, well conducted 24-hour recalls provide estimates of group average intakes that are comparable to those obtained with more cumbersome techniques (Beaton et al., 1979).

Assessment of Dietary Adherence

Webb et al. (1984) found that dietary behaviors are not closely associated and have stressed the importance of measuring the separate aspects of the dietary regimen. The distribution of carbohydrate, protein, and fat throughout the day, the daily caloric intake, and the spacing or timing of meals and snacks must be considered in the assessment of dietary adherence.

Christensen et al. (1983) have proposed a method for the quantitative assessment of dietary adherence in diabetes which takes into account the different aspects of the dietary regimen. In their study, actual dietary consumption was assessed by obtaining 24-hour diet recalls on a minimum of four occasions. This data was compared with individualized, prescribed meal plans based on the exchange system. Dietary adherence was assessed by counting the number of deviations from the planned number of feedings, exchanges, and caloric content.

Feeding deviations refers to the sum of meals or snacks that were added, deleted, or eaten more than one hour from the appropriate time. The sum is then divided by the total number of meals or snacks in the daily meal plan. *Exchange deviations* refers to the ratio of exchange additions and deletions to the total number of exchanges in the meal plan. Appropriate alterations of the meal plan are not counted as deviations. Alterations considered appropriate include treatment of mild hypoglycemic reactions, eating extra food for extra exercise, and substitutions among food groups. *Calorie deviation* refers to the ratio of calories consumed to calories in the meal plan. The total calories reported in the 24-hour recall and caloric content of the meal plan are calculated from published exchange lists.

Ney et al. (1983) proposed a related system of evaluating dietary adherence. This method requests that subjects keep daily records of exchanges eaten at each

meal or snack. Actual number of exchanges consumed is compared with the prescribed number. *Good* compliance is scored when the following criteria are met: (a) 75 - 110% of prescribed exchanges were consumed; (b) at least 75% of prescribed meals were consumed; (c) meals were consumed within 1/2 hour of normal time at least 75% of the time; and (d) high sugar foods were consumed one time or less per week. *Unacceptable* compliance is scored when (a) less than 50% or more than 125% of prescribed exchanges were consumed; or (b) the total number of prescribed meals were consumed less than 50% of the time; and (c) high sugar foods were consumed more than 3 times per week. *Acceptable* compliance is assumed when all of the criteria are not met for either the good or the unacceptable compliance categories.

In both of these systems, subjects are given individualized meal plans based on the exchange system. Their actual eating behavior is then compared with these prescriptions. These methods have the advantage of objective regimen prescriptions which are available for comparison. In addition, because all subjects have regimens which are similar in complexity, problems related to between-subject comparisons are reduced.

CHAPTER III

DESCRIPTION OF THE STUDY

Purpose

Health beliefs, locus of control, and social support have been identified as variables showing the strongest association with compliance behavior. The inconsistent findings reported in the literature, however, make the nature of the relationship between these variables and compliance unclear. One reason for the variability among studies has been the lack of standardized and consistent measurement of these psychosocial variables and compliance. Recently, several scales specific to diabetes have been developed to assess health beliefs, locus of control, and social support. The importance of using scales specific to the disease being investigated has been emphasized in the literature. To date, however, few studies have utilized the diabetes-specific scales which are now available. Use of scales specific to the aspect of the diabetes regimen being examined (e.g., diet) may also enhance research in this area.

Another important finding which has been emphasized in the literature is the multidimensionality of adherence behavior. Adherence to one aspect of the diabetes regimen does not imply adherence to another. Similarly, level of adherence to one aspect of the dietary regimen may differ from the level of adherence to another aspect of the diet. The implication is that each aspect of the regimen must be considered individually. Recently, a method has been developed for quantifying adherence to three aspects of the dietary regimen (Christensen et al., 1983). An additional

consideration is the general lack of correlation between different measures of the same behavior. It has been recommended that multiple measures of adherence be used.

Many of the previous research projects on the Health Belief Model have used a retrospective approach which assumes that the perceptions of the subjects were basically the same prior to carrying out the health-related action being studied. This assumption may not be valid. Becker, Maiman, Kirscht, Haefner, Drachman, and Taylor (1979) have suggested that "the relationship between health beliefs and compliance is at least partly bidirectional, with health beliefs becoming congruent with actual compliance as well as the reverse of this" (p. 81). Prospective designs, such as the one used in this study, may throw light on cause and effect relationships.

This study has utilized standardized measures of health beliefs, social support, and locus of control which are specific to diabetes. In some cases, the measures are specific to diet as well. The relationship between these measures and dietary adherence is examined. Several measures of dietary adherence are used. The hypotheses addressed in this study are presented below.

1. Diabetes beliefs will differ according to type of diabetes and treatment mode.
2. Diabetes beliefs will differ according to diabetes locus of control expectancy.
3. Dietary adherence will differ according to diabetes locus of control expectancy.
4. The influence of social support on dietary adherence will differ for persons with an internal diabetes locus of control expectancy and those with a powerful others diabetes locus of control expectancy.

5. A model characterized by diabetes beliefs, diabetes locus of control, and social support will be a more powerful predictor of dietary adherence than a model composed of diabetes beliefs alone.

Method

Subjects

Subjects were selected from patients of the Diabetes Treatment Center at Rose Medical Center in Denver, Colorado. All inpatients and outpatients treated at the center since its opening in 1985 were considered for inclusion in the study. Individuals were asked to participate if they were at least 18 years of age and if they had been prescribed an American Diabetes Association exchange diet. Each person had been given a written individualized meal plan and instructed in its use by a registered dietitian. Instruction on the exchange system was given individually and/or as a group as part of the Diabetes Treatment Center's regular education program. Individuals were excluded from the study if (a) they were visually impaired and unable to read the questionnaires, (b) they were being treated with dialysis for renal disease and, therefore, on a special diet, (c) they were pregnant, or (d) they were too ill to participate. All subjects were diagnosed with IDDM or NIDDM.

Procedure

The dietitian's patient records were reviewed to identify previous patients appropriate for the study. These individuals were sent a letter by mail which explained the nature of the study and requested their participation. The investigator

then contacted the subjects by telephone and assessed their willingness to participate. Questions about the study were answered at that time. Those persons agreeing to participate in the study were sent a packet of materials by mail. In order to maximize the number of questionnaires returned, a stamped, addressed envelope was included in the packet.

Patients currently involved in Diabetes Treatment Center programs were contacted in person in order to explain the study and request their participation. Inpatients were given a packet and asked to complete the questionnaires immediately prior to discharge (less than 24 hours) or after returning home. Outpatients and support group members were given a packet and asked to complete the questionnaires at home. Again, stamped, addressed envelopes were included in the packets.

Of the 152 individuals identified as appropriate for the study, 27 could not be reached by mail or phone, and 18 declined to participate. Packets were given to the 107 subjects who agreed to participate in the study.

Each packet included two "Consent to Participate in the Study" forms, one copy for the subject and one to be signed and returned to the investigator. The packet also included (a) an instruction sheet asking the subject to complete the questionnaires and return them by mail, (b) an Information Sheet requesting demographic information such as age and sex, information about the subject's diabetes, and a description of the subject's prescribed exchange diet, (c) the Beliefs About Diabetes Scale, and the (d) Diabetes Belief Scale (Diabetes Locus of Control Scale). A copy of these materials can be found in the Appendix.

If questionnaires were not received within a reasonable amount of time (2 - 3 weeks), subjects were contacted by phone and encouraged to return them.

Approximately 4 weeks after the questionnaire was completed, each subject was interviewed by the investigator regarding his or her dietary habits. The interview was conducted by phone at a time convenient to the subject. It included a 24-hour dietary recall and several questions about the subject's usual dietary habits. The 4-week interval was selected for the follow-up interview because many subjects were newly instructed in the exchange diet and a 4-week period allowed them time to gain experience with the diet and settle into a routine. The 4-week interval between completion of the questionnaires and assessment of dietary adherence also allowed evaluation of the ability of the psychosocial variables to predict future dietary adherence.

Of the 107 packets distributed, 83 were completed and returned. By the time of their scheduled 4-week follow-up interview, 3 subjects had become seriously ill and were unable to complete the study. Another 3 subjects were unable to be reached by phone for the interview. A total of 77 subjects completed both phases of the study.

Instruments

Demographic data. The following demographic information was obtained from the Information Sheet: (a) age and sex of the subject, (b) type of diabetes, (c) treatment mode, (d) duration of diabetes, (e) period of time since the subject was last instructed on his or her diet, and (f) living situation. Subjects below 30 years of age when diagnosed with diabetes, below 120% of their ideal weight, and treated with insulin were classified as IDDM. Subjects diagnosed after age 30 who were more than 120% of their ideal weight were classified as NIDDM regardless of

insulin use. All subjects treated with oral medication or diet alone were also classified as NIDDM. Classifications by these criteria were supported by the investigator's knowledge of the subjects' medical conditions. Treatment modes include insulin, oral medication, and diet alone. Living situation was assessed to determine whether a subject lives alone or with family or significant others who may be a source of support to the subject.

Diabetes beliefs. The Beliefs About Diabetes Scale (Given et al., 1983) was used to assess subjects' diabetes beliefs. This scale is composed of 6 subscales: (a) Control of Effects of Diabetes, (b) Barriers to Diet, (c) Social Support for Diet, (d) Barriers to Taking Medication, (e) Impact of Job on Therapy, and (f) Commitment to Benefits of Therapy. The Barriers to Taking Medication and Impact of Job on Therapy subscales were not included in the data analysis because these dimensions do not concern beliefs about diet and are not relevant to the present study. The Control of Effects of Diabetes subscale incorporates the Health Belief Model dimension of severity in combination with a dimension similar to that identified by Maiman et al. (1977) as "feeling of control" over the disease. The Barriers to Diet and Commitment to Benefits of Therapy subscales correspond to the Health Belief Model dimension of barriers and benefits, respectively. These three subscales constitute the measures of health beliefs for the purposes of this study. The Health Belief Model dimension of susceptibility is not included in the Beliefs About Diabetes Scale. Susceptibility has not been found to be an important dimension for sick-role behaviors, or behaviors occurring after an illness has been diagnosed. As discussed earlier, the perception of one's susceptibility to the

complications of diabetes and the perception of diabetes as a serious disease may not represent distinct dimensions.

The Beliefs About Diabetes subscales are organized so that a higher score represents a more strongly held belief about the concept measured by each subscale. Subscale scores were obtained by adding and averaging the item scores for each individual subscale. Item and subscale scores range from 1 to 5.

Social support. The Social Support for Diet subscale from the Beliefs About Diabetes Scale was used to measure perceived social support for diet. Subjects with high scores on this subscale feel that they have other people to help them adhere to their diets. The scores on this subscale also range from 1 to 5.

Locus of control. Measures of internal, powerful others external, and chance external locus of control were obtained from the Diabetes Locus of Control Scale (Ferraro et al., Note 1). As with the health belief scales, higher scores indicate a more strongly held attitude about the locus of control dimension represented. Subscale scores were calculated by averaging the item scores for each subscale. The subscale scores for this scale range from 1 to 6.

Dietary Adherence. Subjects' adherence to their prescribed diet was assessed with a 24-hour recall measure as well as with subject self-evaluation measures. The dietary recall and responses to self-evaluation questions were obtained by telephone interviews with the subjects approximately 4 weeks after completion of the questionnaires. The investigator conducted all interviews to avoid bias due to interviewer differences. The subjects were not fully informed about the nature of the

information to be obtained, nor were they given advance warning about the specific day they were to be interviewed. This procedure was followed in order to reduce the effects of study participation on dietary habits.

The 24-hour recall was obtained by requesting that the subjects describe everything eaten from the time they got up until the time they went to bed on the previous day. All meals and snacks were recorded along with amounts eaten. The time each meal or snack was eaten also was recorded. Subjects were prompted by the investigator regarding snacks, beverages, second helpings, estimation of serving size, and condiments such as margarine and salad dressing in order to maximize recall of foods and amounts eaten. Subjects also were questioned about alteration of the meal plan for extra exercise or hypoglycemia. A very rough estimate of reliability was obtained by asking subjects if the previous day had been typical of their usual eating habits.

Subjects were asked to describe their prescribed exchange diet at the time they completed the questionnaires. This included the times and exchanges recommended for each meal and snack. Although patient records were available which described each subject's prescribed diet, these were not used unless the subject was unable to describe his or her meal plan. The subject's reported prescription was selected for use in this study for two reasons. First, consistent with previous research, subjects reported prescriptions which were often different from the prescriptions in the dietitian's records. Comparison of dietary habits with reported prescriptions gives an indication of adherence to dietary recommendations as they are perceived by the subject. Second, like other aspects of the diabetes regimen, the meal plan can and should be updated and revised to fit with lifestyle and diabetes management changes. Many subjects reported changes in their meal

plan after consultation with their physician or on their own. In most cases, these changes were not indicated in the dietitian's records.

The data from the 24-hour recalls were analyzed by a registered dietitian and compared with the prescribed meal plans reported by the subjects. A quantitative description of this comparison was obtained by utilizing the method developed by Christensen et al. (1983). This method assesses dietary adherence by counting the number of deviations from the planned number of feedings, exchanges, and caloric content. Deviation scores are expressed in ratios. Feeding deviation and exchange deviation scores range from 0 to 1 with a lower score representing a better level of adherence. Calorie deviation scores range from 0 to 1 or more. High levels of adherence are indicated by scores nearest to 1.

Subject self-evaluation measures of dietary compliance were also obtained during the telephone interview. The first measure is a forced-choice question asking the subject whether he or she (a) follows the meal plan closely, (b) doesn't follow a set meal plan, but is more regular or consistent with meal and snack times and amounts eaten, or (c) may have followed the meal plan for a short while but now has returned to his or her usual eating habits. The second measure is composed of four true-false questions assessing adherence to general recommendations concerning fiber and fat (see Appendix). One point was assigned for each response indicating adherence to the area being assessed. Scores on this measure range from 0 to 4, with higher scores indicating a better level of adherence.

CHAPTER IV

RESULTS

Characteristics of the Sample

Demographic characteristics of the sample can be found in Table 3. Subjects range in age from 23 to 76 years with a mean of 50.7 years. They have been diagnosed with diabetes for an average of 10.6 years with a range of 1 week to 42 years. There are 47 females and 36 males in the sample. Less than one fifth (18.5%) of the subjects live alone. IDDM subjects account for 36% of the sample ($n = 30$). Of the 53 NIDDM subjects, 25 are treated with insulin, 18 are treated with oral medications, and 10 are treated with diet alone.

Table 4 presents the mean scores on demographic measures for groups of IDDM and NIDDM subjects. T-test comparisons of the group means show that the average age of NIDDM subjects is significantly greater ($M = 59.15$) than that of IDDM subjects ($M = 35.63$), $t(81) = 9.86$, $p < 0.001$. Subjects with IDDM have been diagnosed with diabetes significantly longer ($M = 15.43$) than those with NIDDM ($M = 7.92$), $t(81) = 3.726$, $p < 0.001$. Group means of NIDDM subjects divided according to treatment mode were also compared and are presented in Table 5. Significant differences between treatment groups were found in age [$F(2, 80) = 7.164$, $p < 0.01$] and duration of diabetes [$F(2, 80) = 5.98$, $p < 0.01$]. Scheffe post hoc comparisons as described by Ferguson (1976) reveal that NIDDM subjects treated with insulin are older than those treated with oral medications

Table 3**Characteristics of Subjects: Sex, Age, Duration of Diabetes and Living Situation**

	n	Mean	Range
Sex			
Male	36		
Female	47		
Age		50.7 yrs	23 - 76 yrs
21 - 30	11		
31 - 40	10		
41 - 50	18		
51 - 60	12		
61 - 70	23		
71 - 80	9		
Duration (in years)		10.6 yrs	1 wk - 42 yrs
< 1	7		
1 - 5	25		
6 - 10	17		
11 - 20	24		
21+	10		
Living Situation			
Alone	15		
With Spouse	55		
Other	11		

Note. Living situation was unavailable for 2 subjects.

Table 4

Characteristics of Subjects by Diabetes Type

	Diabetes Type			
	IDDM (n = 30)		NIDDM (n = 53)	
	Mean	SD	Mean	SD
Sex				
Male		50%		39.6%
Female		50%		60.4%
Age	35.63	9.87	59.15	10.74*
Duration of Diabetes	15.43	11.48	7.92	6.91*

Note. Duration is in years.

* $p < 0.001$.

Table 5**Characteristics of NIDDM Subjects by Treatment Mode**

	Treatment Mode (NIDDM Subjects Only)					
	Insulin (n = 25)		Pills (n = 18)		Diet (n = 10)	
	Mean	SD	Mean	SD	Mean	SD
Sex						
Male		44%		66.7%		60%
Female		56%		33.3%		40%
Age	59.76	9.02	60.94	11.26	54.40	13.34
Duration of Diabetes	10.04	6.95	7.13	7.32	4.03	3.89

Note. Duration is in years.

($p < 0.01$) and have been diagnosed with diabetes longer than those treated with diet alone ($p < 0.05$).

Relationships Between Demographic and Psychosocial Variables

Table 6 presents the mean scores on psychosocial variables for groups of IDDM and NIDDM subjects. With the exception of two locus of control subscales, there are no significant differences between groups. Comparisons of group means reveal that NIDDM subjects have stronger beliefs in powerful others locus of control than do IDDM subjects [$t(81) = 2.28, p < 0.05$]. IDDM subjects have stronger beliefs in chance locus of control than do NIDDM subjects [$t(81) = 2.23, p < 0.05$].

The mean scores on psychosocial variables for groups divided according to treatment mode are presented in Table 7. IDDM subjects are included in the insulin-treated group. Differences between treatment groups were found for the Commitment to Benefits of Therapy subscale [$F(2, 80) = 3.89, p < 0.05$]. Scheffe post hoc comparisons reveal that insulin-treated subjects have a stronger belief in the benefits of therapy than subjects treated with oral medications ($p < 0.05$). Differences also were found for the Powerful Others subscale of the Locus of Control scale [$F(2, 80) = 3.73, p < 0.05$]. Post hoc comparisons reveal that subjects treated with oral medications have stronger beliefs in powerful others locus of control than insulin-treated subjects ($p < 0.05$). This difference disappears, however, when IDDM subjects are removed from the analysis [$F(2, 50) = 1.82$]. The apparent difference is due to the large number of IDDM subjects in the insulin-treated group. As reported above, NIDDM subjects have stronger beliefs in

Table 6**Means and Standard Deviations of Health Beliefs, Social Support, and Locus of Control by Diabetes Type**

Psychosocial Variables	Diabetes Type			
	IDDM (n = 30)		NIDDM (n = 53)	
	Mean	SD	Mean	SD
Health Beliefs				
Control of Effects of Diabetes	3.74	.58	3.88	.53
Barriers to Diet	2.63	.82	2.58	.76
Commitment to Benefits of Therapy	4.40	.41	4.32	.40
Social Support for Diet	3.24	.97	3.49	.92
Locus of Control				
Internal	5.36	.56	5.55	.48
Powerful Others	3.07	.92	3.53	.85*
Chance	2.70	.96	2.23	.91*

* $p < 0.05$.

Table 7**Means and Standard Deviations of Health Beliefs, Social Support, and Locus of Control by Treatment Mode**

Psychosocial Variables	Treatment Mode					
	Insulin (n = 55)		Pills (n = 18)		Diet (n = 10)	
	Mean	SD	Mean	SD	Mean	SD
Health Beliefs						
Control of Effects of Diabetes	3.76	.56	3.88	.60	4.10	.29
Barriers to Diet	2.55	.76	2.77	.93	2.56	.54
Commitment to Benefits of Therapy*	4.42	.38	4.12	.36	4.39	.51
Social Support for Diet	3.44	1.00	3.32	.86	3.33	.78
Locus of Control						
Internal	5.43	.50	5.47	.63	5.79	.16
Powerful Others*	3.19	.92	3.82	.84	3.52	.60
Chance	2.55	.96	2.18	.98	1.94	.65

* $p < 0.05$.

a powerful others locus of control. This remains a type difference rather than a treatment difference. No significant treatment group differences were found for the other psychosocial variables.

Pearson correlations between psychosocial variables and age and duration of diabetes are shown in Table 8. A negative correlation was found between age and Barriers to Diet ($p < 0.05$) indicating that younger subjects perceive more difficulties related to following their diet than do older subjects. Age was positively associated with powerful others locus of control ($p < 0.05$) and negatively associated with chance locus of control ($p < 0.05$). A negative correlation between duration and internal locus of control ($p < 0.01$) indicates that scores on internality are lower for those subjects who have had diabetes longer. Perceived ability to control the effects of diabetes was also found to decrease as duration of diabetes increased ($p < 0.02$).

Table 9 presents mean scores on the Social Support for Diet Scale for groups divided according to living situation. Perception of social support differs significantly for subjects in different living situations [$F(2, 78) = 6.168, p < 0.01$]. Scheffe post hoc comparisons revealed that subjects living with a spouse report a higher level of support than those living alone ($p < 0.01$).

Relationships Among Psychosocial Variables

Correlations between locus of control and health beliefs are shown in Table 10. A positive relationship is seen between internal locus of control and two of the health beliefs scales: Control of Effects of Diabetes ($p < 0.01$) and Commitment to Benefits of Therapy ($p < 0.01$). There is a negative association between chance locus of control and perceived ability to control the effects of

Table 8

Pearson Correlations Between Age and Duration of Diabetes and Health Beliefs, Social Support, and Locus of Control

Psychosocial Variables	Correlations Observed	
	Age	Duration
Health Beliefs		
Control of Effects of Diabetes	.051	-.262**
Barriers to Diet	-.217*	.034
Commitment to Benefits of Therapy	-.134	-.057
Social Support for Diet	.090	-.055
Locus of Control		
Internal	.021	-.382***
Powerful Others	.250*	-.087
Chance	-.228*	.080

* $p < 0.05$.

** $p < 0.02$.

*** $p < 0.01$.

Table 9**Means and Standard Deviations of Social Support by Living Situation**

Living Situation	Social Support for Diet		
	n	Mean	SD
Alone	15	2.82	.84
With Husband/Wife	55	3.65	.91
Other	11	3.07	.86

Table 10**Pearson Correlations Between Locus of Control and Health Beliefs and Social Support**

Psychosocial Variables	Locus of Control		
	Internal	External	Chance
Control of Effects of Diabetes	.317*	-.08	-.312*
Barriers to Diet	-.084	.031	.086
Commitment to Benefits of Therapy	.341*	-.017	-.173
Social Support for Diet	.196	.027	-.113

* $p < 0.01$.

diabetes ($p < 0.01$). No significant relationships were found between Social Support for Diet and any of the locus of control scales.

Analysis of variance comparisons of the mean scores on the health beliefs and social support scales according to locus of control type are presented in Table 11. These types suggested by Wallston and Wallston (1982) are determined by examining a subject's pattern of scores across the three locus of control dimensions. Subjects who score high on the internal subscale and low on the powerful others and chance subscales are considered to be *pure internals*. *Pure powerful others externals* are those who score high on the powerful others subscale and low on the internal and chance subscales. Similarly, a *pure chance external* is someone who scores high on the chance subscale and low on the internal and powerful others subscales. Subjects who score high on both the internal and powerful others subscales and low on the chance subscale are considered to be *responsible internals*. A significant difference was found between locus of control types on the Control of Effects of Diabetes scale [$F(3, 49) = 3.374, p < 0.05$]. Post hoc comparisons indicate that pure internals have a stronger belief in the ability to control the effects of diabetes than do pure chance externals ($p < 0.05$).

Correlations among social support and health beliefs scales are presented in Table 12. Social Support for Diet is positively associated with belief in the ability to control the effects of diabetes ($p < 0.01$) and negatively associated with perceived barriers to following a diet ($p < 0.01$). The Barriers to Diet subscale is negatively associated with all other health beliefs subscales: Control of Effects of Diabetes ($p < 0.01$) and Commitment to Benefits of Therapy ($p < 0.05$). Table 13 shows correlations among the locus of control scales. Internal locus of control is negatively correlated with chance locus of control ($p < 0.01$).

Table 11

Means and Standard Deviations of Health Beliefs and Social Support by Locus of Control Type

Psychosocial Variables	Locus of Control Type							
	Internal ^a (n = 13)		Powerful Others ^b (n = 9)		Responsible Internal ^c (n = 15)		Chance ^d (n = 16)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Control of Effects of Diabetes	4.18	.49	3.92	.27	3.91	.67	3.55	.54
Barriers to Diet	2.40	.73	2.22	.31	2.85	.87	4.30	.45
Commitment to Benefits of Therapy	4.52	.37	4.23	.41	4.50	.44	4.30	.45
Social Support for Diet	3.65	.71	3.31	1.02	3.38	.90	3.22	.92

^a Subjects who scored high on the internal subscale and low on the powerful others and chance subscales.

^b Subjects who scored high on the powerful others subscale and low on the internal and chance subscales.

^c Subjects who scored high on the internal and powerful others subscales and low on the chance subscale.

^d Subjects who scored high on the chance subscale and low on the internal and powerful others subscales.

Table 12**Pearson Correlations Among Social Support and Health Beliefs Scales**

Variables	Health Beliefs			
	Social Support	Control	Barriers	Benefits
Social Support for Diet		.374**	-.358**	.177
Control of Effects of Diabetes			-.319**	.201
Barriers to Diet				-.281*
Commitment to Benefits of Therapy				

* $p < 0.05$.

** $p < 0.01$.

Table 13

Pearson Correlations Among Locus of Control Scales

Locus of Control Scales	Locus of Control		
	Internal	Powerful Others	Chance
Internal		.036	-.287*
Powerful Others			.116
Chance			

* $p < 0.01$.

Dietary Adherence

The mean scores and ranges of dietary adherence calculated according to feeding deviations, exchange deviations, and calorie deviation are presented in Table 14. A frequency distribution of feeding deviation scores (Figure 1) indicates that 27% of subjects adhered to planned feedings 90% of the time. More than a third (38%) of the subjects adhered to planned feedings 60% of the time or less. Figure 2 presents the distribution of exchange deviation scores. Less than 4% of subjects adhered to prescribed exchanges at a 90% level. More than one fifth of subjects (22%) adhered to less than half of their prescribed exchanges. The frequency distribution of calorie deviation scores shown in Figure 3 indicates that 32% of these subjects consumed calories within 90% of their prescribed calorie level. Over half (58%) of the subjects adhered to their prescribed calories at an 80% level or better. Less than 10% of subjects consumed more than 110% of their prescribed calories, while more than half of the subjects (58%) consumed less than 90% of their prescribed calories.

Table 15 presents self-evaluated levels of dietary adherence for all subjects. Just over half of the subjects reported following their meal plan closely, while only 16% said they have made no changes in their eating habits since instructed in diet. A third of the subjects (32.5%) reported that although they do not follow a meal plan, they are more consistent with meal and snack times and amounts eaten. Evaluation of adherence to fat and fiber recommendations indicates that 64% of subjects have tried a high fiber food such as lentils, 40% avoid fried and other high fat foods, 83% tend to eat whole fruit rather than fruit juices, and 83% rarely eat foods high in

Table 14

Means, Standard Deviations, and Ranges of 24-Hour Recall Dietary Adherence Indices

Area of Adherence	Mean	SD	Range
Feeding Deviations	.29	.24	0 - .83
Exchange Deviations	.41	.22	.02 - 1.40
Calorie Deviation	.85	.18	.48 - 1.27

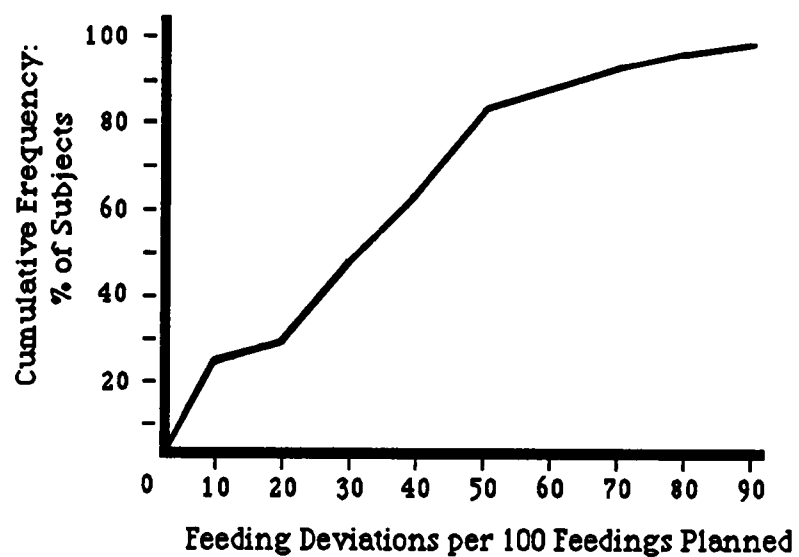
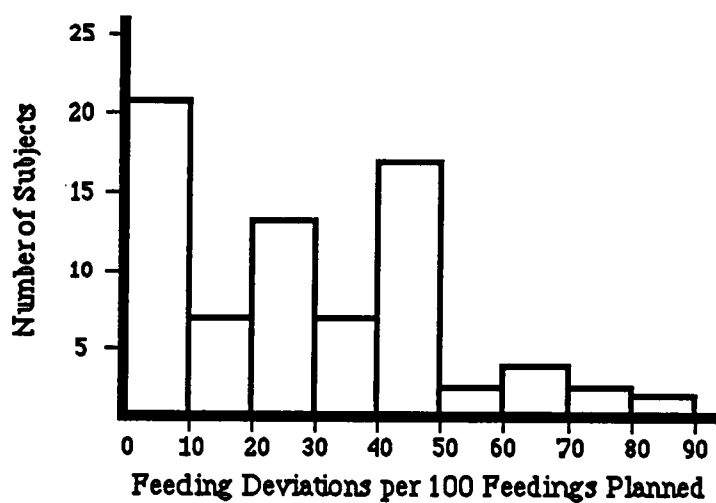


Figure 1. Frequency distribution and cumulative frequency of feeding deviations reported.

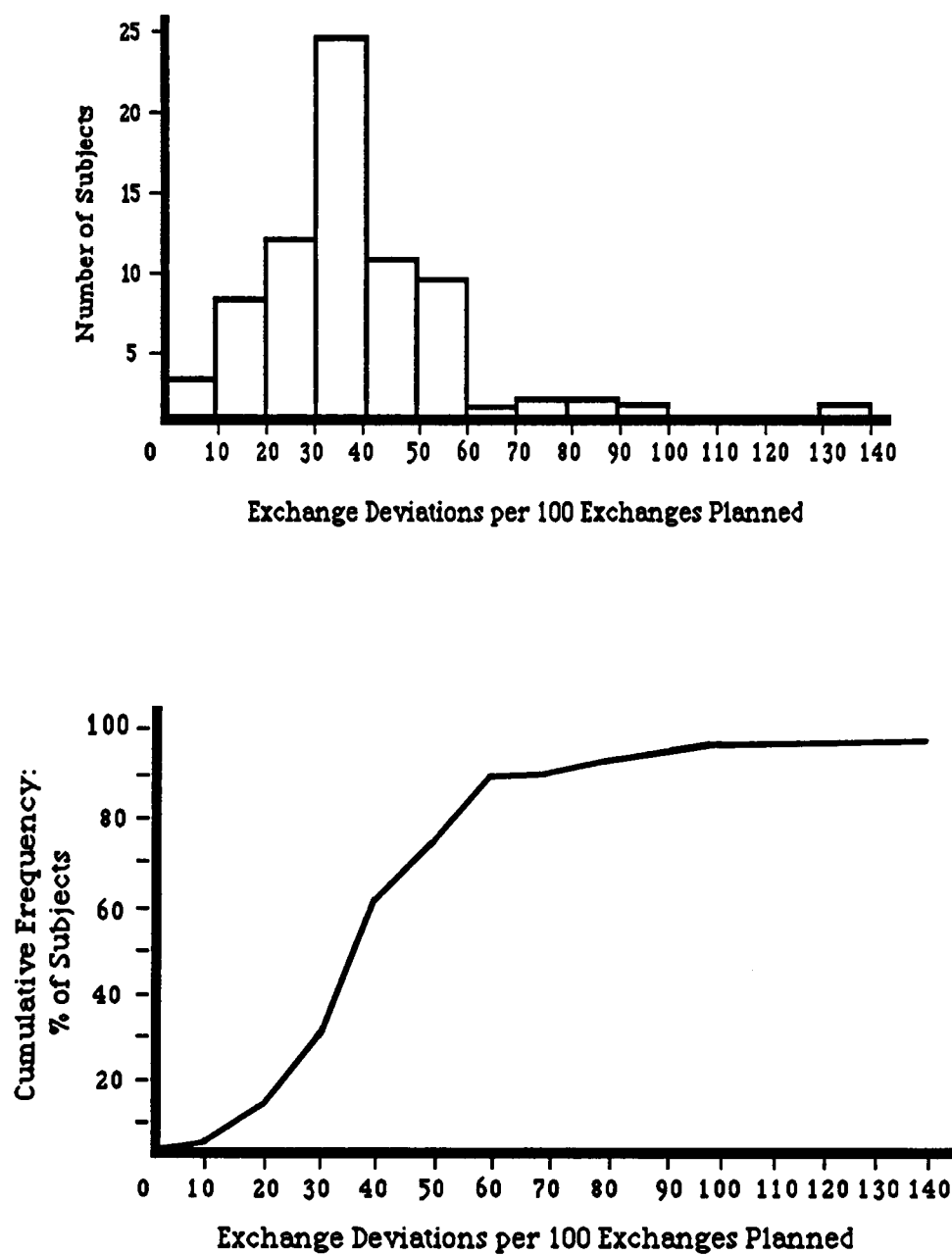


Figure 2. Frequency distribution and cumulative frequency of exchange deviations reported.

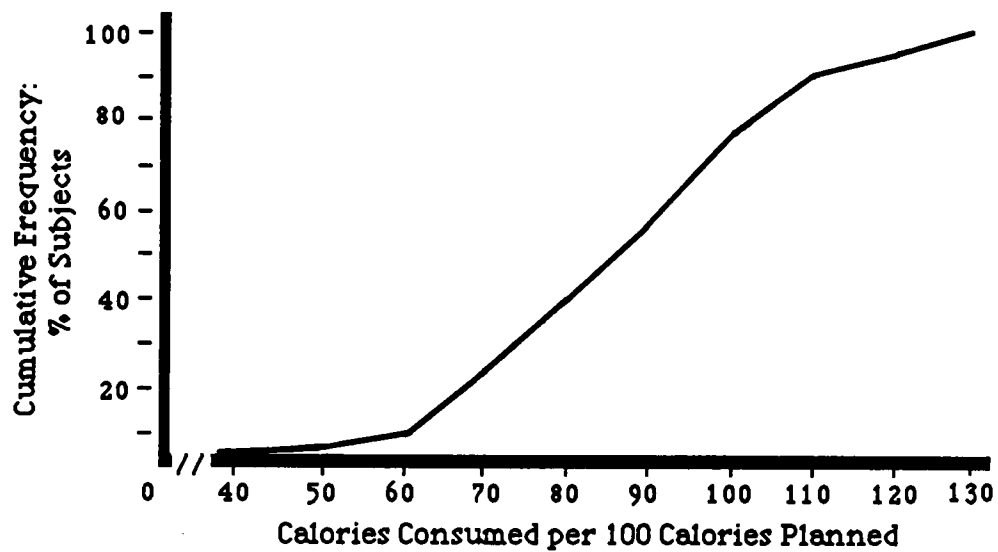
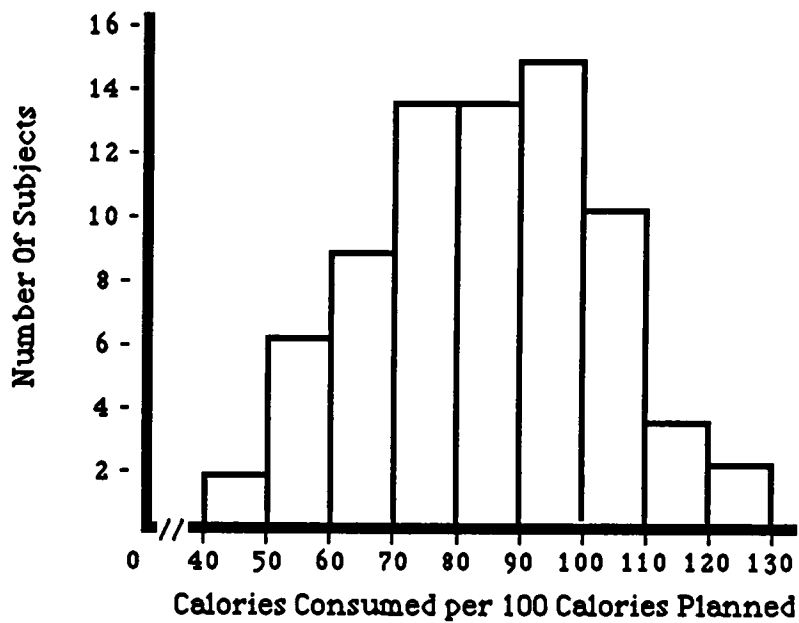


Figure 3. Frequency distribution and cumulative frequency of calorie deviation scores.

Table 15**Frequency Distribution of Self-Evaluation Indices of Dietary Adherence**

Area of Adherence	n	Percent
Meal Plan		
(1) Follows meal plan	40	51.9
(2) No plan but more consistent with times/amounts	25	32
(3) No meal plan/back to usual habits	12	15.6
Fat and Fiber		
(1) Has tried a high fiber food (e.g., lentils)	49	63.6
(2) Avoids high fat foods	31	40.3
(3) Eats fruit rather than juice	64	83.1
(4) Avoids saturated fats	64	83.1
Fat and Fiber Total		
Agrees with 4 items	11	14.3
Agrees with 3 items	39	50.6
Agrees with 2 items	20	26.0
Agrees with 1 item	7	9.0

saturated fat. Adherence to three or more of these recommendations was reported by 65% of subjects.

Pearson correlations between the objective, 24-hour recall indices of dietary adherence and the self-evaluation measures of adherence are presented in Table 16. There is a positive relationship between perceived adherence to meal plan and feeding deviations ($p < 0.05$). Subjects who reported following their meal plan closely had a higher level of adherence to the number and timing of scheduled meals and snacks.

Relationships Between Dietary Adherence and Psychosocial Variables

There were no significant correlations between the deviation scores and any of the psychosocial variables when all subjects were included in the analysis (Table 17). The results of analyses repeated for only those subjects who reported that the 24-hour recall represented their typical eating habits are presented in Table 18. For this group of subjects ($n = 61$), a significant relationship was found between calorie deviation scores and perceived barriers to diet ($p < 0.01$). This indicates that subjects who consumed less than the prescribed number of calories perceive fewer difficulties related to following their diet.

Further analysis of the relationship between psychosocial variables and adherence involved dividing subjects into groups according to level of adherence to each diet area. Subjects were divided into quarters according to their deviation score. The mean scores on psychosocial variables were compared for subjects in the top and bottom groups of each adherence area. Differences were found in only one

Table 16

Pearson Correlations Between 24-Hour Recall and Self-Evaluation Indices of Dietary Adherence

24-Hour Recall Indices: Area of Adherence	Self-Evaluation Indices: Area of Adherence	
	Meal Plan ^a	Fat and Fiber ^b
Feeding Deviations ^a	.229*	-.117
Exchange Deviations ^a	.089	-.030
Calorie Deviation ^c	.206	0

^a A lower score indicates a higher level of adherence.

^b A higher score indicates a higher level of adherence

^c A lower score indicates a smaller percentage of prescribed calories consumed and, therefore, a lower level of adherence.

* $p < 0.05$.

Table 17

Pearson Correlations Between Psychosocial Variables and 24-Hour Recall Dietary Adherence Indices

Psychosocial Variables	Area of Adherence		
	Feeding Deviations ^a	Exchange Deviations ^a	Calorie Deviation ^b
Health Beliefs			
Control of Effects of Diabetes	-.095	-.018	-.089
Barriers to Diet	.056	.011	.155
Commitment to Benefits of Therapy	-.123	-.099	-.073
Social Support for Diet	-.059	.068	-.178
Locus of Control			
Internal	0	.02	-.029
Powerful Others	.058	.025	-.097
Chance	.118	.036	.065

^a A lower score indicates a higher level of adherence.

^b A lower score represents a smaller percentage of prescribed calories consumed and, therefore, a lower level of adherence.

Table 18

Pearson Correlations Between Psychosocial Variables and 24-Hour Recall Dietary Adherence Indices for Subjects who Reported That 24-Hour Recall Represented Typical Eating Habits

Psychosocial Variables	Area of Adherence		
	Feeding Deviations ^a	Exchange Deviations ^a	Calorie Deviation ^b
Health Beliefs			
Control of Effects of Diabetes	-.098	-.013	-.102
Barriers to Diet	.062	-.013	.363*
Commitment to Benefits of Therapy	-.159	-.113	-.081
Social Support for Diet	-.099	-.091	-.203
Locus of Control			
Internal	-.035	.047	.072
Powerful Others	.103	-.042	-.09
Chance	.084	.092	.039

Note. $n = 61$.

^a A lower score indicates a higher level of adherence.

^b A lower score represents a smaller percentage of prescribed calories consumed and, therefore, a lower level of adherence.

* $p < 0.01$.

comparison. As can be seen in Table 19, the mean scores on Commitment to Benefits of Therapy are significantly higher for subjects with a high level of adherence to exchanges than for those in the low adherence group ($t = 2.092$, $p < 0.05$).

Table 20 presents correlations between psychosocial variables and self-evaluated dietary adherence. Several significant relationships were found in this analysis. Perceived adherence to meal plan is positively associated with Barriers to Diet ($p < 0.01$) and negatively associated with Control of Effects of Diabetes ($p < 0.01$) and Social Support for Diet ($p < 0.01$). Because the adherence to meal plan measure is structured so that a lower score reflects better adherence, the direction of these reported relationships must be reversed to understand the results. Subjects who report a high level of adherence to their meal plan also indicate fewer perceived obstacles to following their diet, a high level of social support for dietary adherence, and a belief in the ability to control the effects of diabetes. Adherence to fat and fiber recommendations is negatively associated with chance locus of control ($p < 0.05$).

Pearson correlations between Social Support for Diet and indices of dietary adherence according to locus of control type are presented in Table 21. A negative relationship was found between calorie deviation scores and perceived social support for dietary adherence for subjects classified as pure powerful others externals ($p < 0.01$). This suggests that for this group, subjects with greater perceived social support consumed a smaller percentage of prescribed calories. However, the influence of social support on dietary adherence is not significantly different for subjects with different locus of control expectancies. Similarly, a comparison of the

Table 19

Means and Standard Deviations of Health Beliefs, Social Support, and Locus of Control by High and Low Levels of Dietary Adherence as Measured by Exchange Deviations

Psychosocial Variables	Exchange Deviations: Level of Adherence			
	High ^a		Low ^b	
	Mean	SD	Mean	SD
Health Beliefs				
Control of Effects of Diabetes	3.92	.73	3.94	.54
Barriers to Diet	2.68	.79	2.67	.85
Commitment to Benefits of Therapy	4.57	.40	4.31	.31*
Social Support for Diet	3.46	1.06	3.50	.86
Locus of Control				
Internal	5.69	.51	5.58	.37
Powerful Others	3.24	.86	3.35	.90
Chance	2.07	.72	2.42	1.08

Note. $n = 17$ for both groups.

^a Subjects scoring in the top quarter of adherence as measured by exchange deviations.

^b Subjects scoring in the bottom quarter of adherence as measured by exchange deviations.

* $p < 0.05$.

Table 20

Pearson Correlations Between Psychosocial Variables and Self-Evaluated Dietary Adherence

Psychosocial Variables	Area of Adherence	
	Meal Plan ^a	Fat and Fiber ^b
Health Beliefs		
Control of Effects of Diabetes	-.303**	.108
Barriers to Diet	.296**	0
Commitment to Benefits of Therapy	-.116	.083
Social Support for Diet	-.291**	-.04
Locus of Control		
Internal	-.039	-.064
Powerful Others	-.021	-.096
Chance	.138	-.229*

^a A lower score reflects a better level of adherence to meal plan. Direction of correlations should be reversed when interpreting these results.

^b A higher score reflects a better level of adherence to meal plan.

* $p < 0.05$.

** $p < 0.01$.

Table 21

Pearson Correlations Between Social Support and 24-Hour Recall/Self-Evaluation Indices of Dietary Adherence by Locus of Control Type

Area of Adherence	Correlations with Social Support	
	Locus of Control Type	
	Internal ^a (n = 13)	Powerful Others ^b (n = 9)
24-Hour Recall		
Feeding Deviations ^c	.217	.380
Exchange Deviations ^c	-.043	.455
Calorie Deviation ^d	-.106	-.814*
Self-Evaluation		
Meal Plan ^c	-.215	-.162
Fat and Fiber ^e	-.290	-.017

^a Subjects who scored high on the internal subscale and low on the powerful others and chance subscales.

^b Subjects who scored high on the powerful others subscale and low on the internal and chance subscales.

^c A lower score indicates a higher level of adherence.

^d A lower score represents a smaller percentage of prescribed calories consumed and, therefore, a lower level of adherence.

^e A higher score represents a higher level of adherence.

* $p < 0.01$.

influence of social support on perceived dietary adherence revealed no differences between subjects with an internal and those with a powerful others locus of control.

The relationships reported in Tables 17 and 18 indicate that health beliefs, social support, and locus of control are poor predictors of dietary adherence as measured by feeding, exchange, and calorie deviations. As can be seen in Table 20, however, these psychosocial variables are predictive of dietary adherence as measured by self-evaluation indices. Because the Health Belief Model postulates that its various belief components occur in combination to induce action, it is necessary to proceed from correlation between an individual measure and adherence to the level of multivariate analysis. Multiple regression models provide information on the degree to which a set of psychosocial indices are capable of predicting the dependent variable and examine the relative contributions of the indices in explaining variance.

Tables 22 and 23 present the results of multiple regression analyses for the two self-evaluation indices of adherence. Those psychosocial variables which correlated significantly with the dependent variable were included in the analysis along with those demographic variables which accounted for a significant portion of the variance. In predicting adherence to meal plan, duration of diabetes, Control of Effects of Diabetes, and Barriers to Diet accounted for 20% of the variance [$F(3, 73) = 6.026, p < 0.01, SEE = 0.678$]. A longer time since diagnosis of diabetes, a strong belief in the ability to control the effects of diabetes, and low perceived barriers to diet were predictive of a better level of adherence to the meal plan.

In predicting adherence to fat and fiber recommendations, the following variables accounted for 22% of the variance: (a) sex, (b) living situation, (c) period

Table 22

Prediction of Self-Evaluated Adherence to Meal Plan (Multiple Regression Analysis)

Independent Variables	Dependent Variable: Adherence to Meal Plan			
	SS	df	MS	R ²
Duration of Diabetes, Control of Effects of Diabetes, and Barriers to Diet				
Regression	8.301	3	2.767	.199*
Residual	33.517	73	.459	
Total	41.818	76		

* $p < 0.01$.

Table 23

Prediction of Self-Evaluated Adherence to Fat and Fiber Recommendations (Multiple Regression Analysis)

Independent Variables	Dependent Variable: Adherence to Fat and Fiber			
	SS	df	MS	R ²
Sex, Living Situation, Date Last Instructed in Diet, Chance Locus of Control				
Regression	11.536	4	2.884	.222*
Residual	40.411	70	.577	
Total	51.947	74		

* $p < 0.05$.

of time since the subject was instructed in diet, and (d) Chance Locus of Control [$F(4, 70) = 4.996, p < 0.05, SEE = 0.76$]. Being female, living alone, recent instruction in diet, and a low chance locus of control expectancy were predictive of adherence to fat and fiber recommendations.

CHAPTER V

DISCUSSION

Relationships Between Demographic and Psychosocial Variables

It was anticipated that diabetes beliefs would differ according to type of diabetes and treatment mode. This hypothesis was supported. Insulin-treated subjects indicated a stronger belief in the benefits or efficacy of medication and diet therapy than did those subjects treated with oral medications. This finding is understandable due to the greater likelihood of hyperglycemia and hypoglycemia in those persons treated with insulin. For these individuals, the consequences of noncompliance with timing of medication and food are often acute and unpleasant. Thus, insulin-treated subjects are more aware of the importance of diet and medications for their daily functioning and diabetes control.

There were no differences between groups on the dimension of internal locus of control; all subjects believed strongly that their diabetes is controllable through their own actions. However, IDDM subjects believed more strongly that the control of their diabetes is a matter of chance. The severity of the metabolic disturbance in IDDM and experiences with difficult-to-control blood sugars may have influenced these subjects' beliefs. Individuals with IDDM tend to have more labile blood sugars which can be influenced by stress, emotion, and unpredictable hormonal secretions.

NIDDM subjects believed more strongly in the ability of powerful others, such as physicians, family, or friends, to influence the control of their diabetes. This difference is more difficult to understand. It may be a result of the age difference between these groups. NIDDM subjects are significantly older than those with IDDM, and age also was positively related to a belief in the influence of powerful others on diabetes control. This suggests that older NIDDM subjects may hold attitudes consistent with a traditional physician-patient model. In this model, the physician is seen as taking primary responsibility for health care decisions.

In addition to diabetes type and treatment mode, several other demographic factors were found to be related to the psychosocial variables. Locus of control was found to differ according to age. As mentioned above, older subjects indicated a more strongly held belief in a powerful others locus of control. Younger subjects endorsed items indicating a stronger belief in the influence of chance on diabetes control. This finding is probably not independent of diabetes type, however. IDDM subjects are significantly younger than those with NIDDM, and tend to believe more strongly in chance locus of control expectancies. In addition, the Health Belief Model dimension of barriers is related to age in this study. Younger subjects reported a greater level of perceived barriers to diet.

The finding that subjects living with a spouse perceived a greater amount of social support for dietary adherence was expected. This suggests that an individual's living situation can be used as a preliminary means of assessing available social support. Further assessment would be required to determine if a specific individual perceives his or her spouse as helpful.

It has been suggested that health beliefs, instead of preceding and determining compliance behavior, develop along with compliance as a consequence of experience gained during treatment. The relationship between duration of diabetes and psychosocial variables illustrates the assumption that health beliefs are influenced by one's experiences. Those subjects who have lived with diabetes for a longer period of time indicate a decreased belief in the controllability of their diabetes and in the ability to control their diabetes through their own actions. It appears that the chronic nature of diabetes with its unpredictable course challenges the conviction that an individual's actions can control the disease. With increasing experience with diabetes, individuals learn that diabetes may not be controllable, and that their actions do not always result in the desired consequences. For example, it is currently believed that the long-term complications of diabetes may be partially determined by genetic factors. Good diabetes management may not be enough to prevent a particular individual from having problems with vision or kidney disease.

Relationships Among Psychosocial Variables

It was expected that diabetes beliefs would differ according to diabetes locus of control expectancy. This was supported by the data. Internal locus of control expectancy was positively related to perceived ability to control the effects of diabetes and belief in the benefits of therapy. Subjects with a strong chance locus of control expectancy perceived their diabetes to be more severe and less controllable. The results obtained when subjects were divided according to locus of control type are similar. Subjects identified as pure internals viewed their diabetes as less severe and more controllable than those subjects identified as pure chance externals.

Individuals who strongly perceived their diabetes to be a consequence of their own actions were less likely to believe that their diabetes control is a matter of chance. On the other hand, those individuals who perceived their diabetes as largely uncontrollable were more likely to view their diabetes control as a matter of luck or fate.

These findings are consistent with the locus of control literature. Individuals who have a strong belief in the efficacy of their own actions in controlling diabetes also would be expected to believe that their diabetes is controllable, and thus, less severe. Medication and diet therapy are examples of behaviors or actions that an individual can take to influence diabetes control. Thus, the Benefits of Therapy scale also taps into subjects' beliefs in self-efficacy and the controllability of diabetes. Other studies have found greater internality to be associated with belief in the benefits of health behaviors (McCusker & Morrow, 1979) and with declining perceptions of severity (Harris et al., 1984).

The significant negative correlation between internal and chance locus of control in this sample supports the notion of a continuum of perceived control. Rather than reflecting an internal-external continuum, these relationships indicate that the subjects in this study perceived contingencies as ranging from controllable to uncontrollable. To the extent that one's actions are not effective in controlling diabetes, diabetes control is perceived as a matter of luck.

The relationships between the various health beliefs dimensions and social support are also of interest. Those subjects with more strongly perceived barriers to following a diet viewed their diabetes as less controllable and saw therapy as less beneficial. Social support was also found to be related to barriers in this study. Those subjects who perceived a lack of support from significant others also

perceived more obstacles to following their diet. Just as social support serves as a buffer against stress, it also may function as a mediating variable which reduces the perception of difficulties. In this study, social support is related to the perception that diabetes can be controlled. In this case, social support may function as a mediating variable which enhances perceived self-efficacy.

Dietary Adherence

The diversity of scores on the measures assessing different aspects of dietary adherence supports the multidimensionality of the concept of dietary adherence. Subjects in this study adhered most closely to prescribed calorie level. Over half of the subjects consumed 80% to 120% of their prescribed calories. Almost one-third consumed 90% to 110% of the calories prescribed. The most surprising finding is the high percentage of subjects who ate less than the recommended number of calories. Only 10% of subjects consumed more than 110% of prescribed calories while 58% consumed less than 90% of prescribed calories. Because of this distribution of scores, subjects who consumed fewest calories were identified as least compliant. This may be misleading in some cases. For those subjects whose primary dietary goal is weight loss, consuming fewer calories may represent greater adherence. Examination of each individual situation would be necessary to determine whether a decreased calorie intake is appropriate. For some subjects, decreased calorie intake may result in poor blood sugar control and hypoglycemia.

Subjects exhibited only moderate success in adhering to the number and timing of scheduled meals and snacks. Almost one third of the subjects adhered to 90% of their scheduled feedings, and 62% adhered to their scheduled feedings at

least 60% of the time. Along with calorie intake, consumption of meals and snacks at regular times is very important for glycemic control. This is especially true for insulin-treated individuals, and a greater level of adherence would be desirable in this important area. However, the level of noncompliance that this data suggests may be misleading. It is appropriate for individuals to adjust their snacks and meal times to accommodate changes in work schedule or special social situations. Mid-morning or afternoon snacks may be deleted because blood sugars are running higher than usual and snacks are not necessary to prevent hypoglycemia.

Adherence to prescribed exchanges was extremely poor. Only 4% of subjects adhered to 90% of prescribed exchanges, and 22% adhered at less than a 50% level. Such a minimal level of adherence raises questions about the utility of prescribing meal plans based on the exchange system. The exchange system may be too complex for routine adherence by most individuals. A meal plan based on more general guidelines might be more successful in promoting dietary adherence.

Although they reported a higher level of adherence than was found in this sample, Christensen et al. (1983) also found that adherence to prescribed exchanges was extremely poor. In their study, 10% of IDDM subjects adhered to 90% of prescribed exchanges. In contrast to the sample described here, two-thirds of Christensen et al.'s subjects adhered to 90% of scheduled feedings.

An aspect of the research design used in this study may have contributed to the appearance of higher levels of noncompliance. The meal plans used for comparison were not reviewed for appropriateness at the time of the study. Although appropriate for an individual's situation and medications at the time they were prescribed, they may not reflect changes since that time. Subjects were instructed to describe the exchange diet "your dietitian gave you." Two subjects

described meal plans prescribed for them when they were pregnant. One of the subjects stated that she continues to follow that plan. The other subject stated that she now consumes half the calories prescribed in the meal plan. She correctly followed directions in that she described the most recent meal plan given her. However, she had not consulted the dietitian since her pregnancy and the meal plan obviously was not appropriate for her at this time. She had altered the calorie level according to her present needs, but this was not reflected in the plan she reported. Other subjects stated that they had eliminated their snacks after a change in their medication regimen but had not revised their meal plan prescription. In some cases, the originally reported meal plan was revised in accordance with the subjects' current goals. However, other cases may have gone uncorrected because the discrepancy was not evident. This problem highlights the need for regular, periodic review of an individual's meal plan with a dietitian or physician.

The level of adherence indicated by the self-evaluation indices is consistent with that found by Peterson et al. (1984). Greater than 50% of subjects reported that they follow their meal plan closely. One-third of the subjects stated that they are more consistent with meals and snacks and amounts eaten. Only 16% of subjects stated that they follow no meal plan at all. When asked about adherence to fiber recommendations, 83% indicated that they eat whole fruit rather than fruit juice, and 64% reported having eaten high fiber foods such as lentils or dried beans. Avoidance of foods high in saturated fat was reported by 83% of subjects, but only 40% had been successful in eliminating foods high in fat (e.g., fried foods). Overall, these self-evaluations suggest a fairly good level of adherence. To assess the degree to which perceived adherence corresponded to actual adherence, the self-evaluation measures were correlated with the deviation scores from the 24-hour

recall data. Only one significant relationship was found. Those subjects reporting better perceived adherence to meal plan also adhered better to the number and timing of scheduled meals and snacks.

Relationships Between Dietary Adherence and Psychosocial Variables

It was hypothesized that dietary adherence would differ according to diabetes locus of control expectancy. It was anticipated that an internal or powerful others locus of control expectancy would be positively correlated with dietary adherence, while a chance diabetes locus of control expectancy would be negatively related to adherence. This hypothesis was supported for adherence to fat and fiber recommendations.

No significant differences in dietary adherence were found between groups when examining 24-hour recall data. Similarly, there were no differences in perceived adherence to meal plan for subjects with different locus of control expectancies. There was, however, a significant negative relationship between perceived adherence to fat and fiber recommendations and chance locus of control. Unlike timing of meals and snacks, nonadherence to fat and fiber recommendations results in no immediate consequences. Recommendations to increase fiber and reduce fat are intended to reduce the risk of heart disease and other long-term problems associated with diabetes. Individuals must hold the belief that the actions they take now will benefit them in the long run. This attitude is not consistent with the belief that diabetes control is a matter of chance.

Previous research had suggested that the influence of social support on dietary adherence would differ for persons with an internal locus of control expectancy and those with a powerful others expectancy (Gierszewski, 1983). It was expected that social support would be more important for those individuals who perceive others to be in control of their health. This hypothesis was supported. A significant relationship was found for subjects in the pure powerful others external group. These are subjects who believed strongly in the influence of others on their diabetes control and who believed that their own actions and chance have little effect on their health. For this group, subjects who perceived a high level of support from others consumed fewer calories.

The final hypothesis explored by this study proposed that the Health Belief Model would be strengthened by the addition of locus of control and social support variables. The addition of these variables did not enhance the ability of the Health Belief Model to predict dietary adherence in this study. Thus, the hypothesis was not supported.

The Health Belief Model dimensions showed a stronger relationship with adherence indices than did locus of control. For those subjects who reported that the 24-hour period sampled for the study was typical of their usual eating habits, a positive relationship was found between perceived barriers to diet and percentage of calories consumed. Subjects who perceived fewer difficulties associated with limiting calories tended to eat less. As discussed earlier, however, a reduction of calories beyond that prescribed may not be appropriate. Another relationship emerged when only subjects with extremely high or extremely low levels of adherence were considered. Those subjects with high levels of adherence to prescribed exchanges believed most strongly in the efficacy of therapy. On the other

hand, those subjects with low levels of adherence to prescribed exchanges indicated a lower commitment to the benefits of therapy.

Self-evaluated adherence to meal plan was associated with several psychosocial variables. Subjects reporting a high level of adherence to their diet perceived fewer barriers and more social support related to following their diet. They also viewed their diabetes as less severe and more controllable than subjects reporting poor adherence.

The Health Belief Model dimensions were much more successful in predicting perceived adherence based on subject self-evaluation than in predicting adherence based on 24-hour recall data. Several demographic variables were found to be important predictors as well. Using a multiple regression model, a high level of perceived adherence to meal plan was best predicted by a combination of variables: (a) a longer period of time since diagnosis, (b) few perceived barriers to dietary adherence, and (c) a belief in the ability to control the effects of diabetes. A high level of perceived adherence to fat and fiber recommendations was best predicted by a combination of being female, living alone, recent instruction in diet, and a low belief in chance locus of control.

The relationship between self-evaluated adherence and objective measures of adherence deserves further investigation. Clearly, self-evaluation measures of adherence are easier to obtain. Much of the Health Belief Model research has utilized such measures. The lack of relationship between health beliefs and adherence in studies utilizing more objective measures of dietary adherence may be a consequence of inadequate measurement of usual eating habits. On the other hand, perceived adherence and actual adherence may represent distinct dimensions which have different determinants.

The Health Belief Model has been described as phenomenological. As a phenomenological model, it is concerned with an individual's experience and perceptions. The Health Belief Model dimensions are described as perceived susceptibility, perceived severity, perceived barriers, and perceived benefits. Similarly, perceived social support is considered an influential determinant of adherence. The locus of control dimensions are also concerned with an individual's perception of the world. For example, an individual with an internal locus of control expectancy is someone who believes, or perceives, that his actions have consequences and are effective in producing change. One might expect that there would be a greater correspondence between two phenomenological variables than between a phenomenological variable and an objective one. It follows that health beliefs, perceived social support, and locus of control would be more highly correlated with perceived adherence than with actual adherence.

Conclusions

Summary of Results

The results of this study provide support for four out of five of the study hypotheses.

Hypothesis 1. It was found that diabetes beliefs differ according to type of diabetes and treatment mode. Insulin-treated subjects indicated a stronger belief in the benefits of therapy. IDDM subjects believed more strongly that the control of their diabetes is a matter of chance. NIDDM subjects believed more strongly in the ability of powerful others to influence the control of their diabetes. A longer

duration of diabetes was associated with a decreased belief in the controllability of diabetes and a decrease in internal locus of control.

Hypothesis 2. Diabetes beliefs also were found to differ according to diabetes locus of control expectancy. Internal locus of control was positively related to perceived ability to control the effects of diabetes and belief in the benefits of therapy. Subjects with a strong chance locus of control perceived their diabetes to be less controllable.

Hypothesis 3. It was found that dietary adherence differed according to diabetes locus of control expectancy. A negative relationship was found between perceived adherence to fat and fiber recommendations and chance locus of control.

Hypothesis 4. The results indicated that the influence of social support on dietary adherence differs according to locus of control expectancy. Subjects categorized as pure powerful others externals who also perceived a high level of social support consumed fewer calories.

Hypothesis 5. The addition of locus of control and social support variables did not enhance the ability of the Health Belief Model to predict dietary adherence in this study. The Health Belief Model dimensions showed a stronger relationship with adherence indices than did locus of control or social support. Subjects who perceived fewer barriers to diet tended to consume fewer calories. Adherence to prescribed exchanges was positively related to a belief in the benefits of therapy. Perception of adherence to meal plan was associated with increased social support

and fewer barriers to diet as well as a belief in the controllability of diabetes. As mentioned above, perceived adherence to fat and fiber recommendations was associated with a decreased belief in chance locus of control.

Study Limitations and Recommendations

There are several aspects of the methodology used in this study which may have influenced the results. The measurement of dietary adherence in this study revealed several problems. The meal plan prescriptions used for comparison were not always appropriate for an individual's current situation. A better procedure would involve the review and revision of the meal plan with each subject prior to his or her participation in the study.

Another problem involved the use of a single 24-hour recall measure. The question of the accuracy of self-report measures has been raised in the compliance literature. In general, subjects have been found to under-report food consumption and over-report adherence to other regimen tasks. However, this report bias has been described as minimal (Becker, 1985; Marquis & Ware, 1979). In the present study, an under-report bias, if present, may have contributed to the range of calorie deviation scores and to the finding that many subjects consumed fewer calories than were prescribed. Previous research also has emphasized the variability in day-to-day food consumption. Adherence level based on a single sample of an individual's eating habits cannot be assumed to represent an overall level of adherence. Multiple 24-hour samples for each subject would provide a more reliable estimate of dietary adherence.

The diabetes-specific measures of health beliefs, social support, and locus of control used in this study had not been used previously in studies of regimen

adherence. Therefore, the utility of these measures in predicting adherence has not been established. The correlations between the psychosocial variables and adherence in this study suggest that these measures can be used successfully in future research.

The present study used a prospective design to examine the ability of psychosocial variables to predict future dietary adherence. A study designed to measure concurrent as well as future prediction would provide additional information about the relationship between these variables and adherence. A longitudinal study incorporating measures of adherence and diabetes beliefs obtained at different time intervals would contribute to an understanding of how diabetes beliefs, adherence, and the relationship between diabetes beliefs and adherence change over time.

Implications of the Study

The results of this study highlight the importance of considering diabetes type, treatment mode, and duration when studying health beliefs and locus of control expectancies. These differences also are important to consider when developing education programs and treatment plans for individuals and groups. For example, because they tend to have a powerful others locus of control expectancy, older individuals with NIDDM may respond best to an emphasis on working closely with their physician and following instructions. Involvement of family members may be especially important for this group. Persons treated with oral medications or diet may need more help in understanding how treatment is helpful to them.

The extremely poor adherence levels to prescribed exchanges raises questions about the utility of prescribing such a meal plan. A meal plan based on the

exchange system might best be limited to individuals who are exceptionally motivated and who believe strongly in the benefits of therapy. An emphasis on more general guidelines may result in better adherence levels for most people. In contrast to adherence to exchanges, adherence to prescribed calories and reported adherence to fat and fiber recommendations was quite good. A focus on developing strategies to deal with the barriers associated with following a reduced calorie diet may enhance adherence among those who are working on weight loss.

The importance of social support has been demonstrated in relation to adherence and psychosocial adjustment. Social support is associated with a reduction in the magnitude of perceived barriers to diet and an increase in perceived self-efficacy. For those individuals with a pure powerful others expectancy, social support has been shown to be especially important for adherence. The development and enhancement of support systems for individuals with diabetes is an important area which deserves attention from health professionals.

The clinical application of the concepts introduced by the health beliefs and locus of control models are discussed in the following chapter. Indices of health beliefs, locus of control, social support, and dietary adherence can provide important information about an individual's psychosocial adjustment to diabetes.

CHAPTER VI

CLINICAL APPLICATIONS

The concepts introduced by the health beliefs and locus of control models recently have been applied to clinical work in addition to the research area. An understanding of these concepts as they relate to diabetes management and psychosocial adjustment to diabetes can be helpful in working with individuals with diabetes. The Health Belief Model dimension of perceived susceptibility can be illustrated by the newly-identified person with diabetes who frequently exhibits a reluctance to accept the diagnosis (Becker & Janz, 1985). This is related to the stage of shock and disbelief encountered in the normal adjustment process to diabetes. It may also be related to a sense of denial that anything is wrong, or that one's lifestyle must change. Diagnosis is often questioned by those diagnosed with borderline diabetes. In this case, the individual may have mild difficulties with glucose and fat metabolism which can be managed with exercise and diet. If an individual has no symptoms and blood sugars are adequately controlled, he or she may assert that the diabetes does not exist. In diabetes management, these attitudes are problematic only if they are associated with inadequate self-care behaviors. Too often, however, chronic denial of diabetes results in an associated denial of the need for self-care behaviors such as attending to diet, blood sugar monitoring, and regular physician visits. In such cases, lack of acceptance of the disease and all that the disease entails frequently results in hospitalization.

With the perceived severity dimension, any deviation from a moderate or appropriate level of concern signals the need for intervention. A realistic

appreciation of the seriousness of diabetes is valuable for enhancing compliance motivation. However, a person's perception of the severity of his or her condition can be so extreme as to immobilize the individual with fear and anxiety. A sense of hopelessness and depression which interferes with appropriate self-care also may result. On the other hand, denial of the seriousness of diabetes often is associated with the neglect of important self-care activities.

The perceived benefits dimension may be seen in an individual's lack of faith in the efficacy of one or more aspects of the treatment plan (Becker & Janz, 1985). This may occur when the person does everything right in following the diabetes regimen, yet blood sugars remain out of control. In other cases, an individual may doubt that following the treatment plan will really prevent the long-term complications frequently associated with diabetes. In addition to the role of health beliefs in determining health actions, it is easy to see how a person's experience with diabetes also might influence his or her health beliefs. Increasing an individual's realistic perception of the efficacy of the regimen and the benefits of taking action should enhance compliance.

Perceived barriers to carrying out different aspects of the regimen are frequently encountered as threats to compliance among persons with diabetes. Some individuals may object to the pain of finger sticks necessary for blood sugar monitoring. Others may describe a work environment which makes it difficult for them to monitor blood sugar, eat on time, or take injections.

Many health education programs emphasize individual responsibility and internal locus of control beliefs. An equally important approach to enhancing regimen adherence may be to design interventions based on individual locus of control expectancies. For those individuals with a strong internal locus of control

expectancy, effective interventions may include allowing more choice of treatment, more involvement of the individual in making choices, and a strong emphasis on personal responsibility.

Work with individuals who express a strong chance locus of control expectancy should focus on moving them to a belief that their health can be controlled, even if it is dependent on others. A belief that events can be controlled is preferable to a belief that health is a matter of luck. Stressing reliance on social support systems and the importance of compliance with health professionals' instructions may be effective for persons with a strong powerful others locus of control expectancy.

It is generally proposed that changes toward increased internality indicate adaptive changes. However, the individual's ability to tolerate the anxiety that may come from increased self-reliance must be considered. Most people occasionally need to share some of the burden of responsibility for health care. At times, a certain amount of belief in chance expectancies may reflect good reality-testing. The most adaptive beliefs may be held by individuals who recognize the need to use a health professional as an appropriate resource, but who also see that actions of their own, based on knowledge and sound medical advice, are necessary for health.

Examination of individual subject scores reveals a great deal about an individual's beliefs and attitudes about diabetes. The following case examples illustrate the utility of these scales in assessing an individual's level of adjustment to diabetes and in identifying factors which may impact on adherence. Table 24 presents scores on health beliefs, social support, locus of control, and dietary adherence for four individuals who participated in the study.

Table 24**Selected Individual Subject Scores on Health Beliefs, Social Support, Locus of Control, and Dietary Adherence Indices**

Variable	Case Scores			
	1	2	3	4
Health Beliefs ^a				
Control of				
Effects of Diabetes	4.50	3.75	3.50	4.63
Barriers to Diet	1.00	2.40	3.40	3.40
Commitment to				
Benefits of Therapy	4.62	4.08	3.77	4.92
Social Support for Diet ^a	4.25	3.00	3.00	3.50
Locus of Control ^a				
Internal	5.88	5.00	5.00	5.63
Powerful Others	2.43	3.71	4.14	2.14
Chance	1.80	3.22	3.50	1.80
Dietary Adherence				
Feeding Deviations ^b	0	.67	.67	0
Exchange Deviations ^b	.21	.54	.85	.02
Calorie Deviation ^c	.96	.68	1.20	.97
Self-Evaluation				
Follows Meal Plan	yes	no	yes	yes
Fat and Fiber ^d	4	2	3	3

^a A higher score indicates more strongly held beliefs in the area measured.

^b A lower score indicates a higher level of adherence.

^c Scores nearer to 1 represent a higher level of adherence.

^d A higher score indicates a higher level of adherence.

Case 1

Description of Subject

Susan is a 24 year old married female who has had IDDM for 13 years. She was hospitalized twice in the diabetes unit during the past 18 months. Susan is well-educated about diabetes and generally exhibits a high level of motivation to take care of herself. She is active in a diabetes support group.

Susan changed physicians several times during this 18 month period. She had difficulty finding a physician who was comfortable with the degree of autonomy she wished to have in managing her diabetes. Like many individuals who have lived with diabetes for a long time, Susan feels like she knows more about herself and her diabetes than a physician who has known her only a short time. She is more comfortable with a physician in the role of consultant.

Susan has experienced marital difficulties during the past year and this stress may have contributed to a decline in her level of self-care behaviors. She acknowledged that she had been more negligent than usual in following her diet and had felt the need for a break from her usual routine. Susan's neglect was evident in the results of a recent medical examination. Susan's response was one of shock and depression and a renewed effort to manage her diabetes as well as possible. Because the development of insulin antibodies reduced the effectiveness of the insulin regimen she had been on, Susan began insulin pump therapy. She was given a revised 1200 calorie meal plan less than 1 month prior to participation in the study. Because of the nature of insulin administration with the pump, Susan no longer needed to include snacks in her meal plan.

Assessment Results

Susan scored above the IDDM group mean on the health beliefs scale which measures perception of ability to control diabetes and on the scale measuring commitment to benefits of therapy. She scored well below the mean on the barriers to diet scale. Susan also indicated a high level of social support for diet.

Susan's scores on the locus of control scales indicate that she is a pure internal type. She scored above the mean on the internal subscale while scoring below the mean on the powerful others and chance subscales. This indicates that Susan believes that her diabetes is controllable through her own actions rather than dependent on other persons or a matter of luck.

Susan reported that she follows her meal plan closely and that the 24 hour period sampled for the study is typical of her usual eating habits. She was within the top 25% of subjects in all areas of dietary adherence. She adhered perfectly to the scheduled number and timing of meals. She adhered to prescribed exchanges at a 79% level and to prescribed calories at a 96% level. She also reported that she avoids foods high in fat and saturated fat. She eats whole fruit rather than juices, and she has tried high fiber foods such as lentils or dried beans.

Discussion

Susan endorses beliefs that are considered important for optimal adherence to the diabetes self-care regimen. She believes strongly that diet and medication therapy is effective in controlling diabetes. She also believes that her own behaviors can be effective in controlling the effects of diabetes. A high level of perceived social support for dietary adherence and a perception of few obstacles to following a diet suggest that dietary adherence is not a problem area for Susan. Following her

diet does not appear to require a great deal of effort, and she is successful at a more than adequate level.

Susan's low score on the powerful others locus of control scale suggests that she may have difficulty relying on others for help with her diabetes. This is illustrated by her difficulty working with physicians who do not support her need for autonomy in the management of her diabetes. Susan's need to be in control often prevents her from using her physician's expertise in a productive way. Because her diabetes is difficult to control, Susan does need to find a nonauthoritative physician she can trust and work with closely. In contrast to her difficulties with physicians, Susan is very successful at using social relationships for support. She also seems quite comfortable asking for advice and assistance from health professionals.

Case 2

Description of Subject

Mark is a 34 year old male who lives with his wife and young child. He has had IDDM for over 2 years. During that time period he has been hospitalized four times for poorly controlled blood sugars, severe hypoglycemia, and ketoacidosis. He has attended many diabetes education classes, but continues to have severe problems with diabetes management. Mark works as a truck driver and is frequently on the road or out of town. Six months prior to participating in the study, he was instructed in the exchange system and prescribed a 3200 calorie meal plan with three meals and three snacks.

Assessment Results

Mark scored just above the IDDM group mean on the health beliefs scale measuring belief in ability to control the effects of diabetes. Mark's scores on the locus of control scales indicate that he is a pure external type. He scored below the mean on the scales measuring commitment to benefits of therapy, barriers to diet, and social support for diet. He scored below the group mean on the internal locus of control scale and above the mean on the powerful others and chance locus of control scales.

Mark stated that he follows no meal plan and that the 24 hours sampled for the study is typical of his usual eating habits. He was in the lowest 25% of subjects in all areas of dietary adherence. He adhered to the number and timing of meals and snacks at a 33% level. He adhered to prescribed exchanges at a 46% level and consumed only 68% of prescribed calories. Mark reported that he has eaten high fiber foods such as lentils and dried beans. He also tends to eat whole fruit rather than juices. However, he continues to eat foods high in fat and saturated fat.

Discussion

Mark perceives limited social support for his efforts at dietary adherence. His perception of few obstacles to following a diet may be a consequence of making no effort to follow a diet. Mark's scores on the health beliefs scales suggest that he believes that medication and diet therapy is not effective and that diabetes is not necessarily a serious disease. He does not see his actions as impacting on his diabetes control. Rather, he perceives his diabetes control as dependent on others or a matter of luck.

Mark presents as an individual who has not accepted the fact that he has a serious disease for which he must make adjustments in his lifestyle. He does not appreciate that he must take responsibility for his illness and that his diabetes can be controlled by his self-care behaviors. Mark will continue to have serious, and even life-threatening, problems with diabetes unless his attitudes and beliefs change. Further evaluation would reveal whether or not these attitudes are present in other areas of his life or are limited to diabetes.

Case 3

Description of Subject

Pat is a 42 year old married female who has had NIDDM for 20 years. She is extremely obese and is treated with insulin. Pat was admitted to the diabetes unit at the request of her brother who was concerned about her self-neglect. Pat reluctantly participated in diabetes education classes and asserted that the staff had nothing to offer her. She was quite knowledgeable about diabetes but seemed to make no effort to watch her diet or manage her diabetes as well as she could. She exhibited a strong need to be in control of her treatment and resisted most suggestions. As the staff persisted with nonjudgemental and nonauthoritative interactions, Pat gradually became more receptive and was able to work with the dietitian to develop a meal plan acceptable to her.

During her hospitalization Pat learned that the vision problems she was experiencing were not reversible. In addition, she was told that she could expect to lose her remaining vision within a few years. Pat was able to share her feelings of anger and sadness with the staff. She was faced with difficult decisions about her

future. She reported a history of taking care of relatives for most of her adult life. She was now caring for a disabled husband. She was uncertain whether her husband would be able to provide her with the support she would need as her vision deteriorated. For the first time Pat decided that she would make her own needs a priority. As part of her effort to take better care of herself, she expressed an intention to follow the 1200 calorie diet prescribed for her. Three meals and three snacks were recommended. Pat was instructed in diet just prior to participation in the study.

Assessment Results

Pat scored below the NIDDM group mean on the health beliefs scales measuring perceived ability to control the effects of diabetes and perception of the efficacy of treatment. Her score on the social support for diet scale was below the group mean and her score on the barriers to diet scale was above the mean. Pat's scores on the locus of control scales indicate that she holds a below average belief in internal locus of control and above average beliefs in powerful others and chance locus of control. This indicates that she is a pure external type.

Pat stated that she tries to follow her meal plan closely and that the 24 hour period sampled for the study is typical of her usual eating habits. This assertion is in contrast with the level of adherence suggested by her deviation scores. She is among the lowest 25% of subjects in two areas of adherence. Pat adhered to number and timing of scheduled meals and snacks at a 33% level. She adhered to prescribed exchanges at a 15% level and she consumed 120% of prescribed calories. Pat reported that she avoids foods high in saturated fat but continues to

consume high fat foods. She tends to eat whole fruit rather than juices and she also has eaten high fiber foods such as lentils and dried beans.

Discussion

Pat's perception of many obstacles to following a diet and her perceived lack of social support for dietary adherence would be expected from her history. Her poor level of dietary adherence also is not unexpected. The discrepancy between Pat's level of adherence and her perception that she was following her meal plan may be understood if her current eating habits are seen as an improvement. It is likely that Pat's previous level of adherence was much poorer and that limiting her calorie intake to 120% of that prescribed represents a positive change.

Pat's scores on the locus of control scales indicate a belief that there is little she can do to control her diabetes and that her health is dependent on others or a matter of chance. Consistent with this is Pat's view of diabetes as a serious illness that cannot be controlled. Similarly, medication and diet therapy is not seen as effective. These attitudes are concerning because they suggest feelings of helplessness and hopelessness. In part, they may be a consequence of Pat's experiences with diabetes. They may reflect feelings associated with her vision loss or her labile and difficult-to-control blood sugars. They also may indicate more pervasive feelings of depression and hopelessness associated with chronically unmet needs.

Case 4

Description of Subject

Richard is a 36 year old married male who was diagnosed with IDDM 3 months prior to participation in the study. At diagnosis Richard was admitted to the diabetes unit for initiation of insulin therapy, medical management of his blood glucose, and extensive diabetes education. Although anxious and a bit overwhelmed by the large amount of new information, Richard was motivated to learn all that he could. His wife was very supportive during this time and participated in diabetes education classes when she could. Richard was instructed in the exchange system and given a meal plan to follow at home. He is not overweight and a 2400 calorie plan was recommended. Three meals and midmorning, afternoon, and bedtime snacks were scheduled to prevent Richard's blood glucose from dropping too low between meals.

Assessment Results

Richard scored above the IDDM group mean on all health beliefs scales. His scores indicate that he believes strongly that the effects of diabetes can be controlled and that diabetes is not necessarily a serious disease. He also believes strongly in the benefits of therapy for diabetes, both in terms of diet and medications. Richard does perceive many obstacles to following his diet, however. Richard scored above the group mean on the scale measuring social support for diet.

The locus of control scales indicate that Richard is a pure internal type. He scored above the mean on the internal subscale while scoring below the mean on the powerful others and chance subscales. This suggests that Richard believes that

diabetes is controllable through his own actions rather than dependent on other persons or a matter of fate.

Richard reported that the 24-hour period sampled for the study was fairly typical of his usual eating habits. He stated that he tries to follow his meal plan closely. This is reflected in his deviation scores; he was within the top 25% of subjects in all areas of adherence. Richard adhered perfectly to the prescribed number and timing of meals and snacks. He adhered to prescribed calories at a 97% level. Richard also reported that he avoids foods high in fat and saturated fat, and he eats whole fruit rather than fruit juices.

Discussion

Richard endorses beliefs considered important for optimal adherence to the diabetes self-care regimen. He believes in the effectiveness of treatment and that his behaviors can be effective in controlling the effects of diabetes. However, his low score on the powerful others locus of control scale suggests that Richard may have difficulty turning to others for help. Further evaluation would be necessary to determine if Richard's internality prevents him from appropriately relying on his physician or other people. Richard's occasional participation in a diabetes support group suggests that he is aware of the benefits of social support. He also perceives a high level of support for adherence to diet at home. His ability to use the support of others may influence his level of adherence, or at least reduce the amount of stress created by these efforts.

Richard's extremely high level of adherence to his meal plan suggests that a great deal of energy is devoted to this area of self-care. His perception of a high degree of obstacles to following a diet supports this assumption. This is also

supported by clinical observation. While health care professionals are delighted to see such a high level of adherence, there is also concern about Richard's psychological adjustment. Hopefully, as Richard gains more experience with his meal plan, he will become more comfortable with his ability to follow it and adherence will require much less concentration and energy. If he continues to expend such a high level of energy, diabetes management and dietary adherence may interfere with other important areas of functioning. In addition, the stress created by such perfectionistic strivings may be detrimental to blood glucose control.

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APPENDIX

LETTER INVITING SUBJECTS TO
PARTICIPATE IN THE STUDY



4567 East Ninth Avenue/Denver, Colorado 80220
303/320-2490

The Diabetes Treatment Center is conducting a study to learn more about the things that influence how well people follow their diabetic diet. I am writing to tell you about the study and to ask for your participation. Your involvement is voluntary, of course, and you may decide not to participate.

The study will help us to identify attitudes and factors which are related to success in following a diabetic diet. If you agree to participate, you will be asked to complete two questionnaires about your beliefs and attitudes as they relate to diabetes and your diet. You will also be asked to describe the exchange diet prescribed for you. The questionnaires will take about 30 minutes to complete. You will be contacted by phone 4 weeks later and asked to provide information about your diet. This interview will last about 15 minutes.

About 60-100 subjects will be needed for this study. The study may have no direct benefits to you, and no fee will be paid for your participation. However, the results of your questionnaires will be discussed with you if you wish.

Your identity will be kept confidential, and the results of the study will not be reported in terms of individuals. I will be contacting you by phone to ask if you would like to participate in the study. If you would like to be involved, or if you have questions about the study, please call me at 320-2490.

Diane Lehman

Diane Lehman
Program Counselor

CONSENT FORM



4567 East Ninth Avenue/Denver, Colorado 80220
303/320-2490

CONSENT TO PARTICIPATE IN THE STUDY

"Health Beliefs, Locus of Control, and Social Support As Predictors of Dietary Adherence in Adults with Diabetes"

The purpose of this study is to learn more about the attitudes and factors which are related to success in following a diabetic diet. You will be asked to complete two questionnaires about your beliefs and attitudes as they relate to diabetes and your diet. You will also be asked to describe the exchange diet prescribed for you. The questionnaires will take about 30 minutes to complete. In 4 weeks you will be contacted by phone and asked to provide information about your diet. This interview will last about 15 minutes.

About 60-100 subjects will be needed for this study. Although the study may have no direct benefits to you, and no fee will be paid for your participation, the results of your questionnaires will be discussed with you if you wish. There is no known risk or discomfort associated with the procedures used in this study.

Your identity will be kept confidential, and the results of your questionnaires and interview will not be made available to anyone, including your doctor (with the exception of possible review by the Institutional Research Review Board). Your name and other information that might identify you will be removed from the questionnaires and interview material, and stored separately in a locked cabinet. The results of the study will not be reported in terms of individuals.

If you have any questions about the study, either now or later, please contact Diane Lehman, Program Counselor, at the Diabetes Treatment Center, 320-2490. Your participation in this study is voluntary, and you may refuse to participate. You may withdraw at any time during the study without penalty.

I have read and understand the explanation of this study and agree to participate.

Name (please print)

Date

Signature

COVER LETTER AND INSTRUCTION SHEET



4567 East Ninth Avenue/Denver, Colorado 80220
303/320-2490

Thank you for agreeing to participate in our study. Please read and sign the attached consent form, and keep one copy for yourself.

Complete the attached information sheet, including the description of your exchange diet plan, and the two questionnaires. Note that the pages are printed on both sides. If possible, please answer all questions in one time period (about 30 minutes).

Within the next few days, return the packet which includes: (1) signed consent form, (2) completed information sheet, and (3) both questionnaires. I have enclosed an addressed, stamped envelope for your use.

I will be calling you in 4 weeks for a brief telephone interview. If you have any questions, contact:

Diane Lehman
Diabetes Treatment Center
Rose Medical Center
4567 E. Ninth Avenue
Denver, CO 80220
320-2490

INFORMATION SHEET

Case #: _____ Date: _____
 Name: _____ Phone #: _____
 Best time to reach me by phone: _____

Age: _____ Sex: _____ Male _____ Female

Who do you live with? (Check all that apply)

- _____ alone
- _____ with husband/wife
- _____ with adult children
- _____ with dependent children
- _____ other; please describe: _____

How long have you had diabetes: _____

How do you take care of your diabetes?

- _____ insulin
- _____ diabetes pills
- _____ diet

When did you last talk with a dietitian about your diet?

- _____ less than 1 month ago
- _____ 1 to 6 months ago
- _____ 6 months to 1 year ago
- _____ more than 1 year ago

Please describe the exchange diet your dietitian gave you?

Calorie level: _____

	MILK	VEGETABLE	FRUIT	BREAD	MEAT	FAT
Breakfast Time _____						
Snack Time _____						
Lunch Time _____						
Snack Time _____						
Dinner Time _____						
Bedtime Snack Time _____						

BELIEFS ABOUT DIABETES SCALE

BELIEFS ABOUT DIABETES

Everyone has certain beliefs about diabetes and what helps them to feel better. Below is a list of statements that some people believe about diabetes and the benefits of treatment. Since we are trying to get your feelings or beliefs, please indicate the extent of your agreement with each statement. There are no right or wrong answers.

Please answer all questions in the following way:

If you Strongly Agree with the statement, then circle (1) Strongly Agree.

If you Agree with the statement, then circle (2) Agree.

If you are Undecided about the statement, then circle (3) Undecided.

If you Disagree with the statement, then circle (4) Disagree.

If you Strongly Disagree with the statement, then circle (5) Strongly Disagree.

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
1. I believe my diabetes will cause me to be sick a lot.	1	2	3	4	5
2. I believe my diabetes will have a bad effect on my future health.	1	2	3	4	5
3. So many doctors have talked with me I don't know what to do for my illness.	1	2	3	4	5
4. I believe my diabetes is well controlled.	1	2	3	4	5
5. I believe I can control my diabetes.	1	2	3	4	5
6. A person with diabetes should stick to his/her treatment even if he/she doesn't think he/she is getting better.	1	2	3	4	5
7. If my diabetes was getting worse I would get help.	1	2	3	4	5
8. In general, the doctor has helped my diabetes.	1	2	3	4	5
9. I am not interested in controlling my weight.	1	2	3	4	5

Everyone who has diabetes has to follow some guidelines for eating (or a diet) to help control diabetes. The following statements describe beliefs some people have about the diet they must follow. Please indicate the extent of your agreement with each statement by circling one choice for each statement.

10. Following my diet does not interfere with my normal daily activities.	1	2	3	4	5
11. I would have to change too many habits to follow my diet.	1	2	3	4	5
12. I believe that my diet will help prevent diseases (complications) related to diabetes.	1	2	3	4	5

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
13. I believe my diet will help control my diabetes.	1	2	3	4	5
14. I must follow my diet even if I don't think I am getting better.	1	2	3	4	5
15. Following a prescribed diet is something a person must do no matter how hard it is.	1	2	3	4	5
16. I must follow my diet even if I am getting better.	1	2	3	4	5
17. In general, I believe that my diet for diabetes will help me to feel better.	1	2	3	4	5
18. Controlling weight is something a diabetic must do no matter how hard it is.	1	2	3	4	5
19. My personal life does not interfere with my diet.	1	2	3	4	5
20. It has been difficult following the diet the doctor ordered for me.	1	2	3	4	5
21. I have had time to follow the diet the doctor ordered for me.	1	2	3	4	5
22. I have others around who remind me to eat the right foods.	1	2	3	4	5
23. I can count on my family when I need help following my diet.	1	2	3	4	5
24. My family helps me follow my diet.	1	2	3	4	5
25. I have no one to help me control my weight.	1	2	3	4	5
26. Some patients have to take insulin or pills (medications) to help control their diabetes. Do you take insulin <u>or</u> pills? (CHECK ONE)					

1. Yes, take insulin ____
2. Yes, take pills ____

3. No, do not take insulin or pills ____

Go to #37

Please indicate the extent of your agreement with each of the following statements which describe beliefs some people have about the medications they must take. Circle one choice for each statement.

27. I could take my medication regularly if my family problems weren't so great.	1	2	3	4	5
28. I am confused by all the medication the doctor has given me.	1	2	3	4	5
29. I would have to change too many habits to take my medications.	1	2	3	4	5
30. I am not interested in taking my medications regularly.	1	2	3	4	5

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
31. Taking my medications interferes with my normal daily activities.	1	2	3	4	5
32. I believe that my medications for diabetes will help me to feel better.	1	2	3	4	5
33. I must take my diabetic medications even if I don't think I am getting better.	1	2	3	4	5
34. I believe that my medications will control my diabetes.	1	2	3	4	5
35. Taking medications is something a person must do no matter how hard it is.	1	2	3	4	5
36. I believe that my medications will help prevent diseases (complications) related to diabetes.	1	2	3	4	5
37. Do you work outside your home for money either full-time or part-time? (CHECK ONE)					
☐ Yes ☐ No  GO TO NEXT PAGE 					
38. If I changed jobs it would be easier to take my medications.	1	2	3	4	5
39. My job does not interfere with taking medications.	1	2	3	4	5
40. I worry so much about my job that I can't take my medications.	1	2	3	4	5
41. If I changed jobs it would be easier to follow my diet.	1	2	3	4	5
42. My work makes me so tired it is hard to follow my diet.	1	2	3	4	5
43. I could control my weight if the pressures of my job weren't so great.	1	2	3	4	5
44. It has been difficult to follow the work habits prescribed.	1	2	3	4	5

SCORING GUIDE: BELIEFS ABOUT DIABETES SCALE

BELIEFS ABOUT DIABETES

<u>Scale 1</u>	<u>Scale 2</u>	<u>Scale 3</u>	<u>Scale 4</u>	<u>Scale 5</u>	<u>Scale 6</u>
1 _____	10 _____	22 _____r	27 _____r	38 _____r	9 _____
2 _____	11 _____r	23 _____r	28 _____r	39 _____	12 _____r
3 _____	19 _____	24 _____r	29 _____r	40 _____r	13 _____r
4 _____r	20 _____r	25 _____	30 _____r	41 _____r	14 _____r
5 _____r	21 _____		31 _____r	42 _____r	15 _____r
6 _____r				43 _____r	16 _____r
7 _____r				44 _____r	17 _____r
8 _____r					18 _____r
					32 _____r
					33 _____r
					34 _____r
					35 _____r
					36 _____r

T _____	T _____	T _____	T _____	T _____	T _____
/8 _____	/5 _____	/4 _____	/5 _____	/7 _____	/13 _____

<u>Scale 1</u>	<u>Scale 2</u>	<u>Scale 3</u>	<u>Scale 4</u>	<u>Scale 5</u>	<u>Scale 6</u>
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r = Item is reverse scored.

DIABETES LOCUS OF CONTROL SCALE

DIABETES BELIEF SCALE (DLOC)

This is a questionnaire designed to determine the way in which different people view certain important diabetes-related issues. Each item is a belief statement with which you may agree to disagree. Beside each statement is a scale which ranged from Strongly Agree (1) to Strongly Disagree (6). For each item we would like you to circle the number that represents the extent to which you disagree or agree with the statement. Please make sure that you answer every item and that you circle only one set of numbers per item. This is a measure of your personal beliefs; obviously, there are no right or wrong answers.

Please answer these items carefully, but do not spend too much time on any one item. As much as you can, try to respond to each item independently. When making your choice, do not be influenced by your previous choices. It is important that you respond according to your actual beliefs and not according to how you feel you should believe or how you think we want you to believe.

	Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree
1. Through constant effort, I can greatly reduce my chances of developing diabetic complications.	1	2	3	4	5	6
2. Avoiding diabetic complications is largely a matter of good fortune.	1	2	3	4	5	6
3. Having regular contact with other people who have diabetes is the best way for me to avoid developing diabetic complications.	1	2	3	4	5	6
4. No matter what I do, I'll probably develop diabetic complications.	1	2	3	4	5	6
5. If I take care of myself, I can minimize diabetic complications.	1	2	3	4	5	6
6. My family has a lot to do with whether or not I will develop diabetic complications.	1	2	3	4	5	6
7. If I'm able to avoid diabetic complications, it's because other people (for example, doctors, nurses, family, friends) have been taking good care of me.	1	2	3	4	5	6
8. The main thing which affects whether I will develop diabetic complications is what I do for myself.	1	2	3	4	5	6
9. If I avoid diabetic complications, it's because of my efforts.	1	2	3	4	5	6
10. If it is God's will, I will develop diabetic complications.	1	2	3	4	5	6

	Strongly Agree	Moderately Agree	Slightly Agree	Slightly Disagree	Moderately Disagree	Strongly Disagree
11. If my diabetes goes out of control, it is my own behavior which determines how soon I get back in control again.	1	2	3	4	5	6
12. Having regular contact with other people who have diabetes is the best way for me to keep my diabetes in control.	1	2	3	4	5	6
13. If it's meant to be, my diabetes will stay in control.	1	2	3	4	5	6
14. If I take the right actions, I can keep my diabetes in control.	1	2	3	4	5	6
15. The main thing which affects my diabetic control is what I do for myself.	1	2	3	4	5	6
16. No matter what I do, if my diabetes is going to go out of control it will.	1	2	3	4	5	6
17. When my diabetes goes out of control, it's usually by accident.	1	2	3	4	5	6
18. No matter what I do, my diabetes is likely to go out of control.	1	2	3	4	5	6
19. When I'm able to keep my diabetes in control, it's usually because other people (for example, doctors, nurses, family, friends) having been taking good care of me.	1	2	3	4	5	6
20. When my diabetes is controlled, it's because of my efforts.	1	2	3	4	5	6
21. My family has a lot to do with my diabetes being in control or out of control.	1	2	3	4	5	6
22. If it is God's will, my diabetes will stay in control.	1	2	3	4	5	6
23. Most things that affect my diabetes happen by accident.	1	2	3	4	5	6
24. Having regular contact with my doctor is the best way for me to keep my diabetes in control.	1	2	3	4	5	6
25. With all the stresses of modern life, my diabetes is bound to go out of control.	1	2	3	4	5	6

SCORING GUIDE: DIABETES LOCUS OF CONTROL SCALE

DIABETES BELIEF SCALE (DLOC)

<u>Internal LOC</u>	<u>Powerful Others LOC</u>	<u>Chance LOC</u>
1 _____r	3 _____r	2 _____r
5 _____r	6 _____r	4 _____r
8 _____r	7 _____r	10 _____r
9 _____r	12 _____r	13 _____r
11 _____r	19 _____r	16 _____r
14 _____r	21 _____r	17 _____r
15 _____r	24 _____r	18 _____r
20 _____r		22 _____r
		23 _____r
		25 _____r
TOT _____	TOT _____	TOT _____
/8 _____	/7 _____	/10 _____

r = Item is reverse scored.

SELF-EVALUATION OF ADHERENCE TO MEAL PLAN

Which of the following statements would you say **most closely** describes your dietary changes since instruction in diet?

- (1) I have been following my meal plan closely.
- (2) I followed my meal plan for a short while then went back to my usual eating habits.
- (3) I don't follow any set meal plan, but I am **more regular** with meal and snack times and amounts eaten.

SELF-EVALUATION OF ADHERENCE TO FAT AND FIBER RECOMMENDATIONS

How would you answer these questions, true or false?

- (1) I have tried a dried bean, pea, or lentil dish since learning about fiber.
- (2) Sometimes I eat fried foods or gravies or sausage.
- (3) I tend to eat fresh fruit rather than juices.
- (4) I rarely use real butter, shortening, or regular milk (whole milk).

VITA

Linda Diane Lehman was born in Galveston, Texas on June 22, 1955 and raised in Fort Worth, Texas. She received a Bachelor of Science degree in Psychology from Texas Christian University in December 1976. In June 1977 she moved to San Francisco, California where she lived for three years while employed at Langley Porter Institute at the University of California, San Francisco.

She was accepted into the graduate program in Clinical Psychology at the University of Tennessee, Knoxville in September 1980. In August 1984, after completing her coursework for the doctoral degree, she moved to Denver, Colorado. In August 1985 she completed an APA-approved predoctoral internship in Clinical Psychology at the University of Colorado Health Sciences Center.

The author was employed at the Diabetes Treatment Center at Rose Medical Center in Denver, Colorado while conducting her dissertation research. This research was completed and submitted for approval in June 1987. She received the Doctor of Philosophy degree with a major in Psychology in August 1987. She plans to specialize in child clinical psychology.