RELATIONSHIP BETWEEN LOCUS OF CONTROL EXPECTANCIES AND DISEASE-RELATED LEARNING AND DISEASE CONTROL IN PERSONS WHO HAVE DIABETES

by

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DEDICATION

To My Lord Who Sustains Me,
And in Loving Memory of My Mother, Zanoa,
Who's Belief in My Ability To Succeed Encouraged
Me Over The Last Three Years

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CHAPTER I

INTRODUCTION

Statement of the Problem

Diabetes Mellitus (DM) is one of the most prevalent chronic illnesses in the United States today. The American Diabetes Association (Fact Sheet, 1983) estimates that at least 11,000,000 Americans have diabetes, and that 5,000,000 of them are undiagnosed. Prolonged exposure to high levels of blood glucose can cause serious life-threatening complications such as blindness, kidney failure, neuropathy, and cardiovascular disease (Kozak, 1982).

Authorities agree that proper control of diabetes is a very essential goal for normal growth and development, promotion of well-being, and possible postponement and/or prevention of the numerous long-term complications so often associated with the disease (Pirart, 1978; Tchobroutsky, 1978). They also agree that the major responsibility for its management lies with the patient, and before patients can assume such a responsibility they must have knowledge about the basic nature of diabetes and the procedures essential for self-care.

Treatment of diabetes involves a prescribed medical regimen which requires the patient to assume responsibility for self-care activities and make many day-to-day decisions concerning therapy. Medical prescriptions include a well

balanced diet, exercise, and often oral drugs (sulfonylureas) or insulin. The goal is to balance food intake and stress against exercise and available endogenous or exogenous insulin to approximate the 24-hour blood glucose profile of the normal individual. Unfortunately, achieving this type of balance is a much more complex task than it may appear and one which frequently presents an overwhelming challenge to the patient and his/her family.

Backscheider (1974) suggests that therapeutic diabetes self-care includes several components. The first component involves learning several new skills such as accurately measuring and administering insulin, testing urine and blood for glucose content and incorporating these into one's daily routine. In addition, self-care involves modification of an already existing practice such as activity levels and understanding how it relates to the health state. It also requires change in well established, often culturally derived, self-care routines such as food intake. Emotionally, diabetes exerts demands on the person through "placing value on oneself, directing concern to oneself, and placing regulations on oneself to produce consistency and order in daily living" (p. 1143). The patient must make a permanent adjustment in all these areas plus learn to monitor signs and symptoms of any change in the disease state and make decisions concerning appropriate course of action if self-care is to be therapeutic.

Depending on the individual's value of self and social relations, these personal demands may be relatively easy for some, may be difficult and require a period of adjustment for others, or extremely difficult or impossible to achieve for yet others (Backscheider, 1974).

Persons who have diabetes not only have been shown to have serious deficiencies in their fund of diabetes-related knowledge (Miller, Goldstein, & Nicolaisen, 1978) but a disturbing number of them also have very poor diabetes control (Harrower & Gilmour, 1982; Smith, Taylor, & Gordon, 1982; Stone, 1961; Watkins, Williams, Martin, Hogan, & Anderson, 1967). Health professionals have been concerned with these deficiencies and have sought to understand factors which may influence knowledge level and diabetes control.

A factor which has been suggested as influencing one's knowledge of diabetes and the degree to which the disease is controlled is the individual's orientation to "Locus of Control" (LC). LC refers to the degree to which an individual believes that life events are a direct consequence of one's own actions (internals) or a consequence of external forces beyond one's personal control (externals). Some studies suggest that chronically ill internally-oriented individuals are more likely to adhere to a medical regimen (Weaver, cited in Wallston & Wallston, 1978), initially have fewer problems with control

of the disease and are more informed about their disease (Lowery & DuCette, 1976) than the externally-oriented individuals. However, other studies have suggested the opposite. Key (cited in Wallston & Wallston, 1981) found that externally-oriented persons were more compliant with medication taking than internally-oriented persons. Also, there was no difference found in level of disease control regardless of LC in the study by Simonds, Goldstein, Walker, and Rawlings (1981). Finally, Lowery and DuCette (1976) found that among participants who had had diabetes for 3 years, those who scored internally had fewer problems with diabetes control than those who scored externally. However, among participants who had had diabetes for 6 years, those who scored internally incurred more problems with disease control and there was no difference between internally and externally-oriented persons in the amount of disease-related information they possessed. It can easily be seen that this issue is far from settled.

Nurses play a major role in educating the individual with diabetes concerning the various aspects of the disease management and identifying existing and potential problems which may affect control of the disease. Locus of Control appears to be an area for health professionals to investigate because of its suggested relationship to health behaviors and outcomes. For instance, if it can be established that an internally-oriented person will be more

self-directed in seeking information and will assume responsibility for his/her own diabetes management and an externally-oriented person will be more dependent on health professionals to provide information and make decisions concerning his/her management problems, then professional time could be saved by organizing instructional and follow-up programs which would best meet the needs of each group.

The present study will therefore examine the relationship between the diabetic individual's orientation to LC and his/her degree of knowledge and control of the disease.

Review of the Literature

This review will first discuss the literature related to the concept of Locus of Control and the health behaviors it is thought to influence. Control of diabetes and the variables believed to affect it will then be considered. Finally, the literature concerning knowledge of diabetes and the variables affecting it will be discussed.

Locus of Control

In this section a discussion of locus of control from a theoretical and operational perspective is presented. This is followed by a review of the behaviors which it is thought to influence.

Conceptualization and Operationalization of Locus of Control. The locus of control (LC) construct originating with Rotter (1966) from social learning theory postulates that an individual's behavior is a function of the expectancy that the behavior will lead to a particular reinforcement (reward) and the value of that reinforcement to the individual. Expectancies are said to develop through one's prior experiences in similar situations. When an individual perceives the outcome of his actions as the result of fate, chance, luck, or those in power, that individual is said to believe in external control. On the other hand, if the individual interprets the outcome as directly resulting from his own behavior that individual is said to believe in internal control. Consequently, it has been hypothesized (Rotter, 1966) that individuals holding an "internal belief" respond differently in a variety of situations from individuals holding an "external belief".

Assessment of locus of control beliefs has been typically via questionnaires. Among the earliest and most widely utilized in adults is Rotter's (1966) unidimensional Internal-External (I-E) Scale which orders individuals along a locus of control continuum ranging from highly internal to highly external. The I-E Scale measures beliefs about the nature of the world and how generalized expectancies are controlled. It is more predictive in novel or ambiguous situations, but Rotter (1975) contends

that a more situation-specific locus of control scale will enhance prediction of outcomes in areas where prior experience has been gained. The need for situation-specific LC scales is illustrated in Lowery and DuCette's (1976) study. The sample consisted of 90 subjects who had diabetes: 30 newly diagnosed, 30 had been diagnosed for 3 years, and 30 had been diagnosed for 6 years. The results indicated that in the newly diagnosed group internally-oriented persons had more information about diabetes than the externally-oriented persons. However, the difference decreased to insignificance in the 6-year after diagnosis group. Also, internally-oriented persons in the 6-years after diagnosis group had significantly more problems with diabetes than the externally-oriented persons. The investigators reasoned that the internally-oriented individual acquires more information about his illness when a situation is more novel, but as the illness continues and more information is accumulated the novelty of the situation diminishes and the effectiveness of predicting health-specific behavior from locus of control measured by the I-E Scale is reduced. Realizing the potential of more situation-specific scales Wallston, Wallston, Kaplan, and Maides (1976) developed a unidimensional Health Locus of Control (HLC) Scale to measure the more specific expectancy of health.

As research on LC continued, evidence accumulated pointing to LC as a multidimensional rather than a unidimensional construct (Levenson, 1974). It was suggested that Rotter's I-E Scale (1966) actually measured the three dimensions of Internality, Powerful Others, and Chance (I,P,C). Levenson (1974) reasoned that externally-oriented individuals who believe in a chaotic and unpredictable world (chance) think and behave differently from individuals who believe in a predictable and ordered world but that the control lies with powerful others. In the case of powerful others a potential for internal control may also exist. It was further expected that the individual who believes in chance also thinks and behaves differently from the individual who believes that he himself is not in control (low I scale scores). Following Levenson's (1974) lead, Wallston, Wallston, and DeVellis (1978) revised their HLC scale into a Multidimensional Health Locus of Control (MHLC) Scale. The MHLC, like Levenson's (1974) Scale, consists of three subscales entitled Internal Health Locus of Control (IHLC), Chance Health Locus of Control (CHLC), and Powerful Others Health Locus of Control (PHLC).

In the belief that health locus of control is multidimensional, Lau and Ware (1981) developed another health-specific multidimensional scale which they called Health-Specific Locus-of-Control (HLC) Questionnaire. This

questionnaire was created with three subscales similar to the Wallston, Wallston, and DeVellis' (1978) scale (Chance Health Outcomes [CH] and Provider Control Over Health [PC], measuring the externality aspect, and Self Control Over Health [SC] measuring internality) and a fourth dimension called General Health Threat (GT) which further delineates the externality aspect.

To establish construct validity of the four dimensions of their scale, Lau and Ware (1981) utilized a group of 326 psychology students between the ages of 15 and 30, 60% females and 35% nonwhite. They found through factor analysis that each of the four dimensions of the HLC scale correlated consistently with the interpretation implied by the names assigned to the scales. A number of relationships were reported by the investigators. They found that individuals with high scores on the PC measure were inclined to have strong favorable attitudes toward the quality of medical care services in general. The belief in CH correlated highly and significantly with belief in chance in general and in respect to health outcomes. Also, individuals with high scores on the SC measure were inclined "to believe less strongly in the roles that chance and health threats play in determining health outcomes and more strongly in providers, although they tend to view providers as inaccessible" (p. 1154). Finally the GT dimension seemed to have a high correlation with health

threats and the belief that these threats cannot be diagnosed by doctors.

The strength of Lau and Ware's (1981) new scale includes eliminating the possibility of an acquiescent response set bias by balancing each dimension in terms of directions of item wording. Its major weakness in application to ill persons is its reliance on a population of healthy university students to validate the findings. Although this newly devised scale holds much promise, it needs to be tested with chronically ill individuals before its usefulness with this population can be determined.

Factors Affecting Locus of Control

In considering the LC construct one needs to take into account a number of factors which Rotter (1975) identified as potentially affecting its ability to predict behavior. These factors are: the novelty of the situation (previously discussed), the value of the reinforcement for a specific behavior, and the alternative behaviors available to the individual. Rotter also warned against the erroneous assumption that it is good to be internally-oriented and bad to be externally-oriented.

Rotter (1975) contends that the value of reinforcement for a specific behavior needs to be present in order for LC to be predictive. The value of reinforcement in health-related situations has been studied by several

investigators. Working with healthy college students in two separate samples, Wallston, Wallston, Kaplan, and Maides (1976) and Wallston, Maides, and Wallston (1976) found that individuals classified as high health-value internal (using their HLC scale) indicated an interest in reading more pamphlets about hypertension than high health-value externals or subjects classified as having low health value, regardless of their HLC category. It was also found that the number of pamphlets chosen was not related to HLC nor health value alone, but was related to the combined action of both constructs. Although these findings were duplicated by Wallston and MCLeod (cited in Wallston & Wallston, 1981) in further work on hypertension, the same relationship was not found when subjects were asked to respond to statements about herpes. No explanation was given to account for these results. A possible reason for the mixed findings may be a function of the perception of these disparate illnesses among healthy individuals.

Another factor discussed by Rotter (1975) which may affect the predictive capabilities of the locus of control concept is alternative behaviors available to the individual. For example, if a prediction is to be made on whether or not an individual will participate in a particular series of diabetes classes, one would have to not only determine the individual's health locus of control (internal-external) and the person's valuing of health, but

also what other choices the person has at his disposal which may be valued as highly (such as reading about diabetes, watching televised instructions, or even going to work).

Finally, Rotter (1975) states that many investigators are too quick to assume that having an internal belief is good and having an external belief is bad. If anything, it is not yet clear whether internality is always relevant or a characteristic to be desired. Here again, Lowery and DuCette's (1976) study adds clarification. They found that in their 6-years after diagnosis group internally-oriented persons had significantly more problems with diabetes than the externally-oriented persons. They reasoned that when an internally-oriented person finds that the information at his/her disposal does not always lead to complete control of his disease, the individual seems to relinquish some control over the disease which results in more problems. The externally-oriented person, on the other hand, does not actively seek information about his/her disease nor is interested in control; instead, he/she simply complies with authority by keeping appointments more regularly and by following the prescribed regimen. Under these circumstances, it seems that the "external's" response is more adaptive than the "internal's". As interesting as these speculations may be, the cross-sectional nature of the study's design did not allow for the same person to be

studied over time. Consequently, although these questions arose, they remained unanswered.

Variables Influenced by Locus of Control. Research linking the concept of locus of control to different health behaviors is fairly extensive. The supposition is that if "internals" are indeed superior in cognitive and motivational aspects of the generalized "internal-external" dimension, they may be in a position to exert more power and control over many aspects of their lives including their own health maintenance, especially if they value health highly. Although not all studies have produced positive or conclusive results, several studies do indicate a link between locus of control (internal and/or external) and an individual's preventive health behavior, adherence to health prescription behavior, and information-seeking behavior.

A number of attempts have been made to link health locus of control to preventive health behaviors and/or precautionary measures such as going to the doctor and/or dentist for regular check-ups, using seat belts, practicing contraception, getting enough rest and exercise, and cessation of smoking in a relatively healthy population. Results of such research have yielded inconsistent results (see reviews by Strickland, 1978; Wallston and Wallston, 1981).

The research correlating a chronically ill person's

health LC orientation and adherence to a medical regimen is also inconclusive. Wallston and Wallston (1978, 1981) reviewed and reported several unpublished works in this area including studies by Weaver and Key. While Weaver found that internally-oriented kidney patients using dialysis machines were much more likely to adhere to diet regimens than externally-oriented patients, Key found that externally-oriented hypertensive patients (38, predominantly black, elderly, low socio-economic status females) had a higher compliance rate with diet prescription than internally-oriented patients. On the other hand, while Weaver's internally-oriented patients kept scheduled appointments more regularly, Key found no relationship between HLC and compliance with appointment-keeping, nor with report of medication-taking or clinic discontinuance. However, Key did find that externally-oriented patients had a higher compliance rate with medication taking, as measured by urinary drug excretion. Wallston and Wallston (1978) reasoned that failure to measure subjects' perceived value of health may account for some of the discrepancies in the results of these studies.

Along the same lines, studies have attempted to link control of diabetes to locus of control. In a recent study (Rabkin, Boyko, Wilson, & Streja, 1983) comparing the effects of different counseling modalities on blood sugar levels, no difference was found between internally and

externally-oriented persons (Rotter's I-E Scale). Also, Simonds et al. (1981) found no difference in the level of diabetes control in a group of 52 insulin dependent adolescents regardless of their locus of control orientation using a scale designed for children. See Table I in Appendix A for a comparison of the design of these studies.

Lowery and DuCette (1976) studied 90 lower class black adults with diabetes between the ages of 25-65 dividing them into three groups: 30 newly-diagnosed, 30 who had been diagnosed 3 years, and 30 who had been diagnosed 6 years. Subjects who were blind or could not read were excluded from the sample. The variables investigated included Rotter's (1966) I-E Scale to determine the individual's locus of control, the total number of problem incidences such as elevated fasting blood sugars, hypoglycemia, infection, weight gain and missed clinic appointments recorded in the chart to determine level of disease control for the 3-year and 6-year groups, and a diabetes and health information test. Once subjects were accepted into the study they were asked to complete first the I-E Scale and then the knowledge test. Results revealed that the number of problems per month decreased from the 3-year to the 6-year group. However, the results also showed that while subjects classified as internal in the 3-year group had fewer problems than the externals,

internal subjects in the 6-year group had significantly more problems than the subjects classified as external.

The relationship between health locus of control and health-related information seeking has been the focus of considerable research. Although some studies indicate a positive relationship, methodology varies a great deal among the studies and there is no consensus.

Seeman and Evans (1962) were among the first to study the relationship between LC and knowledge about disease. Using an earlier version of Rotter's (1966) I-E Scale they reported that hospitalized tubercular patients with an internal orientation knew more about their illness and were less satisfied when information was more difficult to obtain than patients with an external orientation. Stimulated by Seeman and Evan's (1962) success, Wallston, Wallston, Kaplan and Maides (1976) and Wallston, Maides, and Wallston (1976), as previously discussed, found that students classified as high health-value internals indicated willingness to read more pamphlets about hypertension than any of the other groups.

In a study by DeVito, Reznikoff, and Bogdanowitz (cited in Wallston and Wallston, 1981), student subjects were asked to indicate with a 'yes' or 'no' whether they were interested in finding out more about hypertension and then given an opportunity to ask questions after the pamphlet selection task. Although they did replicate Wallston,

Maides, and Wallston's (1976) results concerning willingness to read information about hypertension, they did not find any significant correlation between HLC and health value on expressed interest in obtaining more information or in actual information seeking. Sproles (cited in Wallston & Wallston, 1981) and Toner and Manuck (1979) studied patients with renal disease and individuals participating in a public hypertension screening respectively. They found that HLC internal subjects (Wallston, Wallston, Kaplan, & Maides' 1976 Scale) actually chose and took home more pamphlets and were more willing to attend classes than HLC external subjects. However, health value was not measured.

When Lowery and DuCette (1976) attempted to link LC to diabetes knowledge they found that individuals classified as internal in general had more disease-related information than individuals classified as external but this difference decreased to insignificance in the 6-year after diagnosis group. The reasons for these findings, which were presented by the investigators, have been previously discussed. Several other unpublished studies reported by Wallston and Wallston (1981) found no relationship between HLC and information seeking. Among them is the Wallston's 1978 attempt to replicate their results of the 1976 hypertension study using a combination of the MHLC scale and health value.

In sum, the LC construct has its roots in social learning theory and can be defined as the degree to which an individual perceives the outcome of his actions as the result of chance and powerful other (external control) or directly resulting from his own behavior (internal control). One's expectations in this regard are said to develop through prior experiences in similar situations. The bulk of the research in this area seems to indicate that HLC beliefs should predict health behaviors only among individuals who value health highly. LC expectancies have been studied in both healthy and chronically ill persons for over two decades. Although standardized instruments to measure it have been developed, how it functions is still not quite clear. It appears however, that a more health-specific multidimensional tool is more predictive of health-related behaviors in individuals who value health highly. The most recent such tool which needs to be tested in chronically ill individuals (such as in diabetes) is the Multidimensional Health-Specific Locus-of-Control Questionnaire developed by Lau and Ware (1981).

Diabetes Control

This section of the review of the literature will present a definition of diabetes and diabetes control, the operationalization of diabetes control, and the variables believed to affect it.

Definition. Diabetes is a chronic disorder in which the relative or absolute absence of insulin (normally produced by the B-cells of the pancreas) or the ineffectiveness of available insulin leads to disorders in the metabolism of carbohydrates, proteins and lipids (Kozak, 1982). Although it is recognized as an extraordinarily heterogeneous disease with differences in etiology, pathogenesis, and therapeutic response (Schnatz, 1982, p. 2), its exact cause is yet unknown.

Hyperglycemia is one of the first and enduring manifestations of diabetes. Depending on the type and extent of the diabetes and the degree of success of therapy, hyperglycemia can lead to dehydration with ketoacidosis or hyperosmolar coma, hyperlipidemia, and, over time, can contribute to complications.

Diabetes control is a term "used to refer to the degree of clinical and biochemical reversal of features which are characteristic of the diabetic syndrome" (Handelsman & Turtle, 1979, p. 607). Clinically, control implies absence of symptoms of hyperglycemia which can be achieved with relative ease. However, ideally, control means basal and postprandial normoglycemia - a much more difficult and less frequent achievement - which permits normal growth and development, promotes well being, and contributes to the postponement and/or prevention of long term complications such as micro/macroangiopathy and neuropathy (Pirart, 1978;

Tchobroutsky, 1978). Simply stated, control means plasma glucose values as close to the normal range (80 - 120 mg/dl) as possible (Schnatz, 1982).

Measuring control. Presently, the measures used as indices of diabetes control include clinical symptoms, urine glucose measurements, fasting or random blood glucose determinations, personal blood glucose measurements, and glycosylated hemoglobin A_1 (HbA_1) measurements.

The bulk of research in this area seems to indicate that clinical signs and symptoms of hyperglycemia, urine glucose measurements, and fasting and/or random blood glucose measurements contribute to the total picture of the diabetes state, but that by themselves can be misleading if depended upon as a gauge of glycemic control (Harrower & Gilmour, 1982; Hayford, Weydert, & Thompson, 1983; Ohlsen, Danowski, Rosemblum, Mreiden, Fisher, & Sunder, 1980; Pecararo, Chen, & Porte, 1982; Service, Molnar, & Taylor, 1972). With the recent advent of Dextrostix and the reflectance meter, personal blood glucose monitoring, if accurately done on a regular basis, has been found to be a more useful means of determining day-to-day and hour-to-hour level of diabetes control (Danowski, Ohlsen, Fisher, & Sunder, 1980; Schiffrin & Belmonte, 1982; Shapiro, Savage, Lomatch, Gniadek, Forbes, Mitchell, Hein, Starr, Nutter, & Scherdt, 1981; Sonksne, Judd, & Lowy, 1978). However, the averaging effect of Hemoglobin A_{1c}

estimations appear to be of particular value when frequent and/or accurate daily blood glucose values are not available.

Within the last decade the development of glycosylated hemoglobin estimation has added an objective and accurate index of average glycemic control over preceding weeks to months. Glycosylation is a process by which a glucose molecule binds to hemoglobin A forming a small percentage (3 - 6%) of Hemoglobin A_{1c} (HbA_{1c}). This process is relatively irreversible throughout the life span of the red cell (100-120 days); therefore, the increased levels of HbA_{1c} seen in persons who have diabetes (6-22%) reflect the mean of increased blood glucose that the red cells have been exposed to over the immediately preceding several weeks (Kozak, 1982, p. 49). It is important to note that normal HbA_{1c} values vary with different laboratory assays.

The two methods for assaying glycosylated hemoglobins presently in use are the Ion-exchange Chromatography and the Colorimetric Assay. After comparing the two methods Pecoraro, Graf, Halter, Beiter, and Porte (1979) found that although both methods correlate highly ($r = .94$, $p \leq .001$), the procedures estimate different glycosylated fractions. The major advantages of the colorimetric method are reported to be its yield of stable results from blood samples or hemolysates stored frozen before assay and its

ability to determine glycosylation of various hemoglobins, including fetal and sickle hemoglobins (p. 1120).

Several studies have confirmed the utility of the HbA_{1c} measurement as a monitor of glucose control in various settings and types of diabetes (Aleyassine, Gardiner, Tonks, & Koch, 1980; Jackson, Hess, & England, 1979; Pecoraro, Chen, & Porte, 1982). For example, Blanc, Barnett, Gleason, Dunn, and Soeldner (1981) studied the degree of diabetes control in 18 insulin dependent counselors during an 8-week camp program. A composite score derived from percent sugar-free urine tests, 24-hour glucose excretion, and mean preprandial blood glucose for the entire 8-week period was compared to a HbA_{1c} determination at the end of the 8-week period. The results showed a significant correlation between the HbA_{1c} and mean preprandial blood glucose ($r = .69$, $p \leq .01$) and between the composite score and the HbA_{1c} level ($r = .80$, $p \leq .001$). It was concluded that the HbA_{1c} level provides not only an overall view of the average blood glucose concentration for the past several weeks, but also may serve as a means for estimating diabetes control.

Caution is needed, however, in setting goals of normal HbA_{1c} levels for diabetes control. While a high HbA_{1c} clearly indicates poor control, a low HbA_{1c} could mean either a good or variable degree of glycemic control. Data presented by Goldstein, Parker, England, Wiedmeyer,

Rawlings, Hess, Little, Simonds, and Breyfogle (1982) suggests that "episodes of frequent or severe symptomatic hypoglycemia occurred almost exclusively in patients with well-controlled diabetes as reflected in their near-normal HbA_{1c} levels" (p. 74).

Variables Affecting Diabetes Control. It is a well accepted fact that diabetes control is a complex and often difficult achievement which is influenced by many pathophysiological, environmental, socio-psychological, and possibly demographic factors. An entire review of all these aspects is beyond the scope of this study.

Pathophysiological factors such as duration of diabetes (Dahlquist, Blom, Bolme, Hagenfeldt, Lindgren, Persson, Thalme, Theorell, & Westin 1982; Korhonen, Huttunen, Aro, Hentinen, Ihalainen, Majander, Sutonen, Uusitupa, & Pyorala, 1983; Stone, 1961; Watkins et al., 1967) and type of the disease such as Insulin Dependent Diabetes Mellitus (Type I) or Non-Insulin Dependent Diabetes Mellitus (Type II) (Gonen, Tochman, & Rubenstein, 1979; Stone, 1961) have not been shown to influence glycemic control. Among the socio-psychological factors suggested as influencing diabetes control is the individual's orientation to Locus of Control (Lowery & DuCette, 1976; Rabkin et al., 1983; Simonds et al., 1981). However, since this relationship has been extensively discussed in a previous section, it will not be repeated here.

The relationship between knowledge of diabetes self-care and control of diabetes is another debatable issue. Stone (1961) found that after instructing a group of 83 individuals who were considered ignorant about the diabetic regimen and who were in poor diabetes control that 43 achieved good control and 36 remained poorly controlled in spite of having adequate knowledge. Stone stated that on follow-up sessions the 36 subjects were identified and found to be unable to adhere to the prescribed diet. In another study (Korhonen et al., 1983), the investigators found that control of diabetes improved after initial intensive instruction (experimental group) and simple instruction (control group), but slowly returned to baseline over a 3-month period. Finally, studies by Watkins et al. (1967) and Williams, Martin, Hogan, Watkins, and Ellis (1967) suggested that knowledge about diabetes is inversely correlated with control; that is, those individuals who were in poor diabetes control actually knew more. The investigators suggested that possibly the individuals in poor control had more experience with problems and more attention paid their disease and thus had learned more; but despite this, other factors still kept their diabetes control poor. It appears that without knowledge of self-care, diabetes control is tenuous at best. However, the presence of knowledge is not sufficient to assure success.

Reports of studies dealing with the effects of demographic factors on diabetes control are few and have not been in agreement. The reports range from a non-significant to a significant relationship between demographic variables and diabetes control. Therefore, based on the research reviewed, demographic variables such as age (Dahlquist et al., 1982; Korhonen et al., 1983; Stone, 1961; Williams et al., 1967), sex (Stone, 1961; Simonds et al., 1981), ethnic background (Stone, 1961), marital status (Stone, 1961; Williams et al., 1967), length of schooling (Korhonen et al., 1983), and socio-economic status (Ludvigsson, 1977; Stone, 1961; Williams et al., 1967) cannot be said, with any degree of confidence, to affect diabetes control.

In sum, control of blood sugar (plasma glucose = 80-120 mg/dl) over a 24-hour period is generally believed to be important not only in order to eliminate symptoms but because it also contributes to the postponement and/or prevention of the long-term complications of diabetes. Although several methods to evaluate diabetes control are presently in use, the method which provides an objective index of average glycemic control over several weeks is the HbA_{1c} measurement. Finally, researchers have attempted to link type of diabetes, knowledge of diabetes, duration of diabetes, locus of control orientation, and demographic factors to diabetes control. Unfortunately, the few

available studies have yielded contradictory results.

Knowledge of Diabetes

This final section of the literature review will also present a definition of diabetes knowledge, how it is operationalized, and the variables believed to affect it which are relevant to the present study.

Definition. Knowledge of diabetes, is defined here as information about diabetes which was acquired, retained, and recalled when necessary. Knowledge can be divided into three components: Cognitive knowledge refers to ideas, facts, and principles related to diabetes and its management (i.e., verbalizes correct name of prescribed insulin), psychomotor knowledge refers to various skills and activities related to diabetes self-care such as injection of insulin and urine testing (Redman, 1976), and affective knowledge refers to what the person feels and values concerning diabetes (Espenshade, 1979).

The person who has diabetes mellitus must cope with a very complex, chronic, and potentially debilitating disease and assume responsibility for its day-to-day management. Therefore, the general consensus among health professionals is that knowledge about the basic nature of diabetes and the management procedures essential for self-care is a vitally important component of the clinical management of the disease.

Krall (1978) stated:

> It is almost impossible for those with diabetes to cope with modern life without comprehensive knowledge of their condition. Education is not an addition to treatment - it is treatment! ... Those long-term diabetics who have survived best are those who knew the most (p. 126).

The extent of essential knowledge for effectively managing a diabetes regimen depends in part on the type of diabetes. Although it is not actually known, health professionals believe that all individuals with diabetes need to know the basic nature of the disease, his/her type of diabetes, the signs and symptoms, common causes and appropriate actions to take in order to treat and prevent episodes of hyperglycemia, ketoacidosis, insulin reaction, and chronic complications (i.e. kidney disease, visual impairment, leg or foot ulcers). They also need to know the effects of emotional and illness-related stress, exercise, and excess weight on blood glucose levels, plus the dietary regimen and the management which best meets their particular needs. Persons who require exogenous insulin must acquire a much broader and complex knowledge base. These individuals need to know not only the facts, but also have the technical skills regarding insulin administration, urine testing for glucose and ketones, and blood glucose monitoring (Espenshade, 1979). In other words, to become independent the individual must have sufficient knowledge about diabetes in order to "think for

himself, to solve problems on his own, and to become more self-managing" (Dudley, 1980, p. 128).

Measurement of Diabetes Knowledge. One of the most common methods of assessing the degree and quality of present diabetes knowledge is via paper and pencil tests. There are many such evaluation instruments in existence. The questionnaire formats range from subjective open-ended to objective multiple-choice type items. Unfortunately, there is a paucity of instruments of established validity and reliability which are generalizable to various clinical settings. Only three such tools were found.

All three of these tools were found to be fairly comprehensive in their ability to assess the educational needs of the individual who has diabetes. However, two of them were found to have problems in the cognitive knowledge section which was the major area of interest in the present study. While the format and some of the items in the University of Michigan's Diabetes Educational Profile Project (Davis, Hull, & Boutaugh, 1981) were not appropriate for the sample of the present study, the Universtiy of Alabama's Diabetes Research and Education Hospital tool (Windsor, Roseman, Gautseff, & Kirk, 1981) was too limited in scope and lacked the ability to make fine discriminations of the patient's level of knowledge.

The third assessment tool was from the Test Item Bank of Diabetes Knowledge for Children and Adolescents under

development by Nowacek and Pichert (1983). Three different tests to assess children's knowledge of diabetes concepts and principles were developed and tested on a sample of 488 diabetic children and adolescents at summer camps in five states. Questions were chosen from nine standard diabetes content areas and were balanced on each test. This tool has several strengths. These strengths include clarity of item wording, inclusion of all aspects of diabetes management, and K-R 21 test reliabilities of .89, .88, and .88 for the three tests. In addition, it has an objective format and it tests not only for immediate recall of diabetes facts, but also the subject's ability to use these facts for problem solving. However, since the test was developed for children, the context of some of the items requires adaptation for adults.

Variables Which Influence Knowledge of Diabetes. The literature indicates that there are many environmental, socio-psychological (personal characteristics), pathophysiological, and possibly demographic factors which may influence the acquisition and retention of knowledge. However, due to the limited scope of this study, only selected factors will be reviewed.

In the diabetes area, environmental factors such as access to diabetes education programs, the constantly expanding and upgrading of the fund of knowledge, and the varying opinions of health professionals in the field can

influence how much accurate information the person has and how much he/she is willing to learn. Other environmental factors which have been suggested as being positively related to high scores in knowledge of diabetes are: receiving information from health professionals on an outpatient basis, reading more written material about diabetes (Dyer et al., 1979), and attending more than one clinic or seeing a private physician (Simon & Stewart, 1976).

Personal characteristics of the individual such as motivation (Watkins et al., 1967) and orientation to locus of control (Lowery & DuCette, 1976) are thought to influence how much knowledge of diabetes the person possesses. The concept of LC has been extensively discussed in a previous section and will not be further elaborated upon at this point.

The relationship between type of diabetes and knowledge of diabetes has been previously alluded to. It seems obvious that type of diabetes determines, to a certain degree, how much a person will know concerning the entire scope of diabetes. In other words, if one has Type II diabetes and has never required insulin, chances are one knows very little or nothing about insulin.

The relationship between duration of diabetes and cognitive knowledge of the disease has not been established. While Dyer, Cole, Franklin, Ishida, Nugent,

Chalfant, Donahue, Hickok, Kunishi, and Plaisted (1979) and Wysocki, Czyzyk, Slonska, Krolewski, and Janeczko (1978) reported that clients 18 years of age and older with high test scores had diabetes for a longer time, no significant relationship was found by Korhonen et al. (1983), and Watkins et al. (1967). On the other hand, Watkins et al. (1967) found that the longer a person had had diabetes, the more errors in insulin dose he/she made; but Lawrence and Cheely (1980) found no such relationship. Lawrence and Cheely reasoned that the difference in results were probably due to differences and weaknesses in the design of the studies.

Reports of studies which examined the effects of demographic variables on diabetes knowledge are few and range from a non-significant to a significant relationship between demographic variables and diabetes knowledge. Most of the studies found in the literature seemed to focus on the relationship of age to amount of diabetes knowledge and reported that in individuals above the age of 12, the younger the subject the higher their scores in the knowledge test (Dyer et al., 1979; Karlander, Alinder, & Hellstrom, 1980; Miller et al., 1978; Simon & Stewart, 1976). The explanations offered by Simon and Stewart for the association of younger age with better scores on the knowledge test are that the younger age group may have been exposed to formal schooling and multiple-choice

examinations more recently while the poor knowledge test performance of their older subjects may have been reflecting their generally lower level of education. Investigators have found that better educated persons had higher scores in the knowledge test (Dyer et al., 1979; Korhonen et al., 1983; Simon & Stewart, 1976; Wysochi et al., 1978) and that some of the same explanations offered for age may apply here also.

No relationship was found between sex and knowledge of diabetes (Brook, 1977; Karlander et al., 1980; Korhonen et al., 1983) or between income level and knowledge of diabetes (Collier & Etzwiler, 1971). No studies were found dealing with marital status or occupation and diabetes knowledge. It seems obvious that considering the data presented, few conclusions can be made regarding the relationship between demographic variables and knowledge of diabetes.

In sum, health professionals agree that a fairly thorough knowledge of all the aspects of diabetes management is needed in order for the individual to manage his diabetes and be more independent. Although there are many tools to measure knowledge of diabetes, only few have established reliability and validity or test for both recall of information and problem solving ability. The tool developed by Nowacek and Pichert (1983) is such a tool and has yet to be tested in adults. Finally, some of the

variables suggested as affecting level of diabetes knowledge and which merit consideration in a research project are a person's orientation to LC, duration of the disease, type of diabetes, age of subject, level of education, and one's mode and source of diabetes information acquisition.

Summary

Diabetes is a chronic illness which requires the person who has it to acquire knowledge about the nature of the disease and the procedures essential for self-care in order to assume major responsibility for its management. Control of diabetes is believed to help increase life expectancy and to improve quality of life. However, it appears that too many individuals who have diabetes know little about its management and do not have the disease in good control. Therefore, health professionals are seeking to find and understand factors which may influence knowledge level and diabetes control.

There are many methods and tools which have been used to measure LC expectancies, diabetes control, and diabetes knowledge. It appears that a more health-specific multidimensional LC tool is more predictive of health-related behaviors in individuals who value health highly. Therefore, at present Lau and Ware's (1981) Multidimensional Health-Specific Locus-of-Control

Questionnaire seems to be the tool of choice even though it needs to be tested in chronically ill individuals. What diabetes control is and how to measure it is also a debated issue. It seems that all indices of diabetes control presently in use contribute to the total picture of the diabetes state with some indices being considered better than others. The HbA_1 measurement seems to provide a valid and objective index of average glycemic control over several weeks. Finally, a tool to measure diabetes knowledge needs to be reliable, valid, and measure all areas of diabetes care, including recall of diabetes information as well as the problem solving ability of the individual. Nowacek and Pichert's (1983) diabetes knowledge test is one such tool.

The literature reviewed suggested that selected demographic, pathophysiological, and socio-psychological variables, including one's orientation to LC, may affect diabetes knowledge and control. Although the concept of LC as it relates to generalized expectancies has been in existence for several decades, the Health-Specific Scales were only developed in the mid 70s. Consequently, to date the Health-Specific Locus of Control Concept has not been extensively studied in the chronically ill person and therefore, how it functions is still not clear.

Purpose of the Study

The purpose of this study was to extend the work of Lowery and DuCette (1976) in order to further explicate the theoretical components within the LC construct which could possibly affect knowledge and control of diabetes. Therefore, this study examined the relationship between health-specific locus of control beliefs and diabetes knowledge and control among individuals who valued health.

Assumptions

This study of the relationship between Health Specific Locus of Control and knowledge and control of diabetes is based on the following assumption:

The degree of diabetes control as measured by HbA_1 reflects to a significant extent the individual's behavior in managing his/her diabetes.

Hypotheses

The following hypotheses were tested:

1. Subjects who score higher on self control over health (SC) will have acceptable HbA_1 levels, while subjects who score lower on SC will have unacceptable HbA_1 levels.

2. Subjects who score higher on chance health outcomes (CH) will have unacceptable HbA_1 levels, while subjects

who score lower on CH will have acceptable HbA_1 levels.

3. Subjects who score higher on provider control over health (PC) will have acceptable HbA_1 levels, while subjects who score lower on PC will have unacceptable HbA_1 levels.

4. Subjects who score higher on general threat to health (GT) will have unacceptable HbA_1 levels, while subjects who score lower on GT will have acceptable HbA_1 levels.

5. Subjects who score higher on self control over health (SC) will significantly achieve higher scores on the diabetes self-care knowledge test than those subjects who score lower on SC.

6. Subjects who score higher on chance health outcomes (CH) will achieve significantly lower scores on the diabetes self-care knowledge test than those subjects who score lower on CH.

7. Subjects who score higher on provider control over health (PC) will have significantly higher scores on the diabetes self-care knowledge test than those subjects who score lower on PC.

8. Subjects who score higher on general threat to health (GT) will have significantly lower scores on the diabetes self-care knowledge test than those subjects who score lower on GT.

CHAPTER II

METHOD

Setting and Sample

The diabetes outpatient clinic of a large metropolitan university hospital in Oregon was used as the site for this study. Approximately 1000 patients visit this clinic per year. An average of 25 clients are seen in the clinic one morning per week by three nurse practitioners, two endocrinologists, one fellow, and two residents.

A convenience sample of patients attending the outpatient clinic for treatment of diabetes was selected to participate in this study over a 3-month period. Selection criteria included: males and females 18 years of age or older, on insulin therapy (regardless of diabetes type), with at least 1 year duration of diabetes, being seen at the clinic for at least 6 months, having at least one Hemoglobin A_1 measurement documented in the records, able to read English, currently caring for themselves, and who valued health (See Appendix B for patient criteria form). The 1 year minimum duration of diabetes was stipulated to ensure that all subjects had sufficient opportunity to become familiar with their diabetes regimen. Subjects were considered as caring for self if they answered affirmatively to a question regarding major responsibility for their diabetes management.

Data Collection Measures

Data collection instruments included the following: (1) a Health Value Scale to assist in subject selection, (2) a Background Data Form with two sections which provided demographic and illness-related information, (3) a Health Locus of Control Scale, (4) a Diabetes Knowledge Test, and (5) a Diabetes Control Data Form to record Hemoglobin A_1 Values.

Health Value Scale (Lau & Ware)

Locus of control expectancies predict health behaviors only in those people who value health highly (Rotter, 1975). Therefore, in the present study Lau and Ware's (Personal communication, April 27, 1982) Health Value Scale was used to select subjects who valued their health.

This scale consists of four opinion statements which are associated with a 7-choice Likert-type scale ranging from "strongly agree" (scored as 1) to "strongly disagree" (scored as 7). Items marked with ! are reversed in scoring (strongly agree = 7) so that a high score on all the items indicates the presence of value placed on health (See Appendix C). The scores may range from 4 to 28. Scores greater than 16 were considered to indicate that the person valued health.

A reliability coefficient of .67 (alpha) was achieved for the health value scale and construct validity was

established through factor analysis (Lau & Ware, Personal Communication, April 19, 1983). Hence, both reliability and validity appear to be acceptable for the health value scale.

Background Data Form

Section I of this form was used to record demographic and illness-related data regarding sex, age, ethnic background, duration of diabetes, type of diabetes, and presence of diabetes complications which were collected from clinic records (See Appendix D). Section II of this form was used to record data regarding marital status, level of education, employment status, occupation, annual income, insulin schedule, and mode and quantity of acquired information concerning disease management which were gathered through interview. Regarding quantity and source of acquired information about diabetes, subjects were asked to rate each of the listed sources (books, family/friends, nurse, doctor, dietician, other) on a scale ranging from "All I Know" to "None" (See Appendix D).

Health Locus of Control Scale (Lau & Ware, 1981)

The Health-Specific Locus-of-Control Scale by Lau and Ware (1981) measures health-related expectancies for control. It has the potential ability to be more predictive in specific health-related situations in which the individual has significant prior experience.

This scale has four dimensions. Three dimensions measure externality: (1) General Threat to Health (GT) = 5 items, (2) Chance Health Outcomes (CH) = 6 items, and (3) Provider Control Over Health (PC) = 8 items; and one dimension of internality called Self-Control Over Health (SC) = 8 items.

Subjects were asked to respond to these 27 randomly listed items which are worded as opinion statements. Each statement is associated with a 7-choice Likert-type scale ranging from "strongly agree" (scored as 1) to "strongly disagree" (scored as 7). Items marked with ! are reversed in scoring (strongly agree = 7) so that a high score on all the items indicates the presence of the dimension being considered (See Appendix E).

Scores may vary for each of the four dimensions in the following manner: GT may vary from 5 to 35, CH from 6 to 42, and PC and SC from 8 to 56. Higher scores in the dimensions measuring GT, PC, and CH indicate an external orientation, while higher scores in the dimension measuring SC indicates an internal orientation.

By using both test-retest and internal consistency methods, reliability coefficients ranging between .65 to .77 (median .71) were found by Lau and Ware (1981) for all four of the HLC subscales except for one test-retest coefficient for the GT subscale (.43). Inter-Scale Correlations indicated that SC was positively related with

PC and negatively related to CH, while GT and CH were positively related. All correlations ranged between .20 and .27. Construct validity was established through factor analysis.

Diabetes Knowledge Test (Nowacek & Pichert, 1983)

The knowledge test used in this study originated from an Item Bank of Diabetes Knowledge Questions for Children (Nowacek & Pichert, 1983) comprised of three parallel tests of 50 items each. Thirty items were chosen and adapted for adult subjects. These 30 items consisted of 29 that were multiple-choice items (2 to 4 alternatives per item) and 1 that was True/False. Recall of knowledge was tested by 18 items and problem solving ability for management of diabetes was tested by another 12 items. Content of these items included insulin, diet, urine testing, exercise, sick days, foot care and general information about diabetes (See Appendix F). K-R 21 reliabilities for the three forms of the test were reported to be .89, .88, and .88. Validity was not reported.

Hemoglobin A_1 Values

Data relating to diabetes control over the preceding 6 months were collected from clinic records of each subject. The data consisted of a mean value derived from all the available measurements of Hemoglobin A_1 (HbA_1) concentration for the 6-month period (See Appendix G).

In the setting studied, HbA_1 is determined by the colorimetric procedure (Pecoraro et al., 1979; Riddle & Hart, 1981) which yields a criterion-related validity correlation of r = .90. Their normal range for persons with proven normal glucose tolerance is 4-10% A_1 (mean ± SD, 7.0 ± 1.5).

For the purpose of this study HbA_1 laboratory values were converted into acceptable and nonacceptable categories based on the following criteria:

"Acceptable" if the mean HbA_1 concentration was between 8-10%.

"Nonacceptable" if the mean HbA_1 concentration was above 10% or below 8%.

Pilot Study

All of the data collection tools were pretested on a sample of four clients who met the established criteria. Only minor adjustments in the procedure and tools were necessary. These changes included: 1- allowing subjects to become more familiar with the format of the HLC scales through the use of four similar statements on a practice form; and 2- making slight adjustments in the format of the knowledge test so as to increase its capacity for individualization.

Design and Procedure

This descriptive study was correlational in design. Health locus of control was the independent variable; knowledge of diabetes and level of diabetes control were the dependent variables.

During a clinic appointment each potential subject received an explanation of the study and was invited to participate. Those who volunteered to participate were asked to read and sign a written consent form (See Appendix H). Subjects were then interviewed by the investigator to obtain background information and asked to complete the three questionnaires in the following order: (1) Health Value Scale, (2) Health Locus of Control Scale, and (3) a Diabetes Knowledge test. Each subject was allowed as much time as needed to complete the questionnaires in a quiet and comfortable environment. Only after the entire procedure had been completed was the criterion of value placed on health assessed and subject's exclusion or inclusion into the study determined. The available data relating to diabetes control (HbA_1) for the preceding 6 months was collected at this time, but results of HbA_1 levels drawn on day of data gathering were only available and retrieved 2 to 4 weeks later.

Analysis of Data

Both descriptive and inferential statistics were used to analyze the data obtained in this study.

The sample was described by the use of descriptive statistics and the degree of relationship between the independent and dependent variables of each hypotheses was measured and tested for significance by computing Pearson's r. An intercorrelation matrix was constructed and Pearsonian correlations were computed to determine the degree of relationships among the variables of the study.

CHAPTER III

RESULTS AND DISCUSSION

In this chapter, first the demographic and diabetes related characteristics of the sample will be described. Second, the findings in regard to the major variables, Health-Specific Locus of Control, Diabetes Control, and Diabetes Knowledge will be presented and analyzed. Third, evidence for and against the eight hypotheses will be presented and discussed. Fourth, the relationship between the demographic variables and the dependent variables will be presented. Finally, the relationship between the two dependent variables will be analyzed.

Sample Description

Fifty-five persons who were being treated for diabetes volunteered to participate in this study from a potential sample of 65 persons. This represents approximately an 80% response rate. Of those who volunteered, 11 failed to meet the criteria for participation in the study for the following reasons: 9 did not value health and 2 had missing valid HbA_1 measures within the previous 6 months. An additional six persons were dropped as subjects in the study as 4 required unusual assistance in completing the questionnaires and 2 did not complete the questionnaires due to lack of time.

This sample consisted of 39 mostly single white adult individuals with a high school education, below the median income as compared with the Public Health statistics of 1980 (U.S. Bureau of Census, 1982), and who were not working as can be noted in Table 2. The sample had almost equal numbers of males and females, and blue-collar and white-collar workers. In reference to Table 3, Type I and Type II diabetes were fairly equally represented and the majority of subjects had had diabetes for more than a decade. On the average, individuals were experiencing three different diabetes complications, two-thirds had to take insulin more than once a day, and the majority of subjects had attended a full week series of classes to learn about diabetes self-care. Finally, the majority of subjects indicated they learned a significant amount about diabetes from nurses (R.N.), books, dieticians (R.D.), and physicians (M.D.) in that order (See Table 4).

Descriptive Findings Regarding the Major Variables

Health-Specific Locus of Control

The HSLC Scale (Lau & Ware, 1981) used in this study is composed of four scales (Self Control, Provider Control, Chance Health, and General Threat). For this sample, the mean scores for the belief in Self Control and Provider Control were 40.85 and 43.28 respectively. These scores

Table 2

Selected Social and Demographic Characteristics of the Sample

Characteristics	(N = 39)	%
Sex		
Male	17	43.6
Female	22	56.4
Age (years)		
Range	19-71	
Mean	49.38	
SD	16.12	
Marital Status		
Married	15	38.5
Other	24	61.5
Education (years)		
Mean	13.08	
SD	3.69	
Ethnic Background		
White	35	89.7
Other	4	10.3
Annual Income		
Median	$10,555 (approx)	
Work Status		
Employed	13	33.3
Unemployed/Disabled	10	25.6
Retired	16	41.0
Occupation		
Professional	10	25.6
Manager	6	15.4
Clerical/Sales/Technical	4	10.3
Skilled Craftsperson	7	17.9
Semiskilled	6	15.4
Other	6	15.4

Table 3

Selected Diabetes-Related Characteristics of the Sample

Characteristics	(N = 39)	%
Type of Diabetes		
Type I	18	46.2
Type II	19	48.7
Secondary to other diseases	2	
Duration of diabetes (years)		
Range	2-38	
Mean	14.59	
SD	8.05	
Insulin Regimen		
1 Injection/day	12	30.8
2 Injections/day	8	20.5
3 of more Injections/day	19	48.7
Number of Diabetes Complications		
Range	0-10	
Mean	3.41	
SD	2.29	
Attend Diabetes Classes		
No	12	30.8
Yes	27	69.2
Years since attend Diabetes Classes		
Range (years)	1-17	
Mode	2.00	
Mean	5.40	
SD	4.42	

Table 4

Percentages of Other Sources of Diabetes Care Information

Quantity	Books %	Family/ Friends %	Nurse %	Physician %	Dietician %	Other %
All I Know (4)	2.6	____	10.3	5.1	____	____
A Lot (3)	33.3	12.8	64.1	46.2	25.6	10.3
Some (2)	53.8	17.9	23.1	20.5	61.5	23.1
Not Much (1)	5.1	20.5	2.6	10.3	7.7	10.3
None (0)	5.1	48.7	____	17.9	5.1	56.4

Note: The column totals do not always add up to 100% because of rounding

indicate that the subjects modestly believed in their ability to control their own health (internality) and that health care providers were in control of their health (externality). In addition, the subjects' belief in Chance Health had a mean score of 18.28 and their belief in General Threat had a mean score of 23.41. These scores indicate that the subjects neither subscribed nor negated these two external health beliefs (See Table 5).

Inter-scale Pearsonian correlations showed that, for this sample, there was a significant negative correlation between the scales of SC and CH ($r = -.50$, $p \leq .001$). Lau and Ware (1981) found the same relationship, although to a smaller magnitude.

Diabetes Knowledge

The instrument used to measure knowledge of diabetes self-care was adapted from Nowacek and Pichert's (1983) Item Bank of Diabetes Knowledge Questions for Children. Only 38 cases were used for analysis because one subject failed to complete the questionnaire. Out of a possible score of 30, scores ranged from 13 to 29 and the mean of 23.25 was obtained (See Table 5). Diabetes self care requires the presence of a substantial amount of knowledge regarding diabetes. Therefore, scores on a diabetes knowledge test which are skewed toward the higher end of the scale are desired - the more skewed the better. A

Table 5

Dependent and Independent Variables:

Means and Standard Deviations

Variables	(N = 39)
Health-Specific Locus of Control	
Self Control	
Mean	40.85
SD	6.75
Range	26-52
Possible Range	8-56
Provider Control	
Mean	43.28
SD	8.14
Range	16-55
Possible Range	8-56
Chance Health	
Mean	18.28
SD	6.79
Range	6-32
Possible Range	6-42
General Threat	
Mean	23.41
SD	4.52
Range	14-32
Possible Range	5-35
Diabetes Knowledge Test[a]	
Mean	23.25
SD	4.17
Range	13-29
Possible Range	0-30
Diabetes Control (HbA_1)	
Unacceptable	23
Acceptable	16
Health Value	
Mean	23.90
SD	3.50
Range	18-28
Possible Range	4-28

[a] $n = 38$

reliability coefficient Alpha of .76 was obtained for this test which is well within the acceptable range.

Diabetes Control

The physiological measure used to estimate control of diabetes was glycosylated hemoglobin (HbA_1) levels. The average of the available HbA_1 measures for each subject ranged from 8.7mg% to 12.4mg% and a mean of 10.32 mg% was obtained (See Table 5). The mean of 10.32 mg% signifies a HbA_1 value above the accepted normal range. When each subject's averaged HbA_1 value was categorized into acceptable or unacceptable levels, there were 23 values in the unacceptable category and 16 in the acceptable category.

Health Value

Although the sample was selected on the basis of subjects indicating at least some health value, it is of interest that subjects in this sample did not subscribe highly to valuing health (See Table 5).

Evidence for and Against the Hypotheses

Hypotheses I - IV

Hypotheses one through four stated that there was a relationship between one's HLC beliefs and level of diabetes control (HbA_1 concentration). The hypotheses were tested using Pearson's r correlation. The results

revealed that subjects' HLC beliefs, whether "internal" (SC) or "external" (PC, CH, GT), had no relationship to their HbA_1 concentrations (acceptable or unacceptable). Therefore, hypotheses one through four were rejected (See Table 6).

These findings were consistent with those of Rabkin et al. (1983), and Simonds et al. (1981). However, it was not possible to make comparisons with the Lowery and DuCette (1976) study because they controlled for duration of diabetes in relation to LC while the present study did not. Possible explanations for the lack of a significant relationship between HLC beliefs and diabetes control represented by these results may have resided with the conceptualization and operationalization of LC and/or with the conceptualization and operationalization of diabetes control.

Theoretically, the ability of the LC construct to predict behavior may be affected by the novelty or amount of experience in a given situation and the value of the reinforcement for a specific behavior (Rotter, 1975). Regarding the novelty of the situation, Rotter further suggested that situation-specific LC scales would enhance prediction of outcomes in areas of prior experience. In line with his suggestion, a Health-Specific Locus of Control Scale (Lau & Ware, 1981) was used in the present study. However, it may be questioned whether this newest

Table 6

Intercorrelation Matrix of the Independent and Dependent Variables

	SC	PC	CH	GT	DC	DK
Independent Variable (MHSLC)						
Self Care (SC)		-.11	-.50**	-.04	.17	.10
Provider Control (PC)			-.05	.02	.13	-.19
Chance Health (CH)				.13	.13	.07
General Threat (GT)					-.03	-.09
Dependent Variables						
Diabetes Control (DC)						.27*
Diabetes Knowledge (DK)						----

* $p \leq .05$
** $p \leq .001$

LC Scale is specific enough to make predictions in people who have chronic illnesses such as diabetes. Perhaps the items in the scale need to refer specifically to diabetes (i.e., instead of "Doctors can rarely do very much for people who are sick", the statement should read "Doctors can rarely do very much for people who have diabetes", etc.). Along the same lines, Lowery and DuCette's (1976) findings may have been due to their use of the general expectancy (I-E) scale. The I-E Scale may have been sensitive enough to detect the relationship between an internal belief and fewer problems with diabetes control in their newly diagnosed group in which the situation (the diagnosis of diabetes) was fairly new and ambiguous. However, since the relationship disappeared in the group of subjects who had had diabetes for a longer period of time, the I-E Scale may not have been sensitive enough to detect the relationship when there was considerable more experience with the situation.

Another factor which could explain the lack of a significant relationship between HLC beliefs and diabetes control is the inability of LC scales to reflect the subjects' actual behavior in a particular situation. For instance, in the present study subjects commented that even though they might strongly agree with the statement "In the long run, people who take very good care of themselves stay healthy and get well quick", they did not always act on that

belief. Another possible explanation may be that the reactions of individuals who have a chronic illness such as diabetes are quite different from those who are using preventive health measures or have a curable disease. It is important to note here that Lau and Ware's (1981) HSLC Scale had not been tested with chronically ill individuals prior to this study, and that no other studies using this scale have been reported in the literature.

The reinforcement value, health, was measured and controlled in the present study. Only subjects who indicated that they valued health were included in the study. However, health value of subjects ranged from 18 to 28 (16 = undecided) whereas the theoretical injunction stipulates that in general, HLC beliefs should predict health behavior only under high-health-value conditions. Perhaps if only subjects scoring 25-28 had been studied, the results might have differed. On the other hand, in a chronic disease such as diabetes where many people feel they have already lost their health, other aspects of life such as family relationships, their jobs, or even the pleasure of eating may become of greater value or give them more gratification than their health. However, these speculations cannot be substantiated through the literature as none of the cited studies dealing with diabetes control (Lowery & DuCette, 1976; Rabkin et al., 1983; Simonds et al., 1981) measured health value.

In the present study, glycosylated hemoglobin (HbA_1) measures were used as the index of diabetes control. All the available HbA_1 measures over a 6-month period for each subject were noted. The average of the available HbA_1 values for each subject was then used to classify the subject as being in acceptable or unacceptable diabetes control. Perhaps the fact that the subjects had varying numbers of HbA_1 (1-9) values within the 6-month period introduced a certain amount of error into the measurement. The subjects who had more HbA_1 measurements may have provided a more accurate picture of their overall diabetes control state than those with only one HbA_1 measurement. It is important to note that the measure of diabetes control used in this study varied from those reported in some of the literature. For instance, Lowery and DuCette (1976) used a number of different problems such as episodes of hypoglycemia, infections, etc., to define level of diabetes control in their subjects.

Interpretation of HbA_1 values is another problematic issue. The state of the art is such that one cannot assume that lower HbA_1 values indicate better control and as the values go up control worsens. One reason for this dilemma is that individuals who have lower HbA_1 levels, especially below 8mg.% or 7mg.%, seem to have more frequent insulin reactions (England et al., 1982). Therefore, the present study dichotomized the HbA_1 data into acceptable and

unacceptable categories and much information may have been lost in the statistical analyses. The present study fairly well exemplifies this issue in that the dichotomous data revealed no relationship to HLC; however, when the averaged HbA_1 raw scores were analyzed as continuous data the results suggested the presence of a small negative relationship between HbA_1 levels and Chance Health (external) beliefs ($r = -.27$, $p \leq .05$).

Finally, there are several differences in sample characteristics and design between the studies reviewed (Lowery & DuCette, 1976; Rabkin et al., 1983; Simonds et al., 1981) and the present study which may have contributed to the similarities and differences in the results. These differences may be seen in Table 1 (See Appendix A).

Hypotheses V - VIII

Hypotheses five through eight stated that there was a relationship between one's HLC beliefs and amount of diabetes self-care knowledge. These hypotheses were also tested using Pearson's r correlations. The results revealed that subjects' HLC beliefs, whether "internal" (SC) or "external" (PC, CH, GT) had no relationship to the amount of diabetes self-care knowledge they possessed. Therefore, hypotheses five through eight were rejected (See Table 6).

These findings differed from those of Seeman and Evans (1962) which indicated that individuals with an "internal" belief knew more about their illness than individuals with an "external" belief. However, the present findings were in agreement with those of Lowery and DuCette's (1976) subjects who had had diabetes for a longer period of time (6 years).

There are several possible explanations for the lack of significance between HLC beliefs and diabetes self-care knowledge found in the present study. The lack of relationship could have been due to either of the variables of LC and/or diabetes knowledge. However, since problems relating to the LC construct have been previously discussed, only issues relating to the knowledge variable will be considered here.

The first issue for consideration is the diabetes test itself. The knowledge test used in the present study was comprised of multiple-choice questions which tested recall of knowledge and problem-solving ability for management of diabetes. The problem-solving questions presented a hypothetical situation for the subject to choose the correct course of action. Lowery and DuCette (1976), on the other hand, used a different diabetes knowledge assessment instrument which was not available for comparison with the test used in the present study. The diversity of knowledge assessment instruments used in

different studies and the nearly total lack of valid and reliable instruments to assess the education of diabetic individuals contribute to the difficulty in interpreting these research findings.

The second issue for consideration is whether chronicity of illness influences knowledge of disease and how it relates to LC. It is possible that the reactions of individuals who have a curable (tuberculosis) versus an incurable chronic illness (diabetes) are quite different. Perhaps individuals who have tuberculosis (Seeman & Evans, 1962) and are internally-oriented see that eventually they will be cured and believe that if they learn all they can about their illness they can possibly help themselves be cured faster.

On the other hand, diabetes is a life-long illness which demands daily awareness and certain changes in one's life-style. Lowery and DuCette (1976) reasoned that when internally-oriented persons learn that they have diabetes, the initial response is to learn about the disease so as to feel that they have some control over the situation. However, as time passes, the novelty wears off and, especially with Type I diabetes, such persons may find that control efforts do not always lead to the expected results. As a consequence, the internally-oriented person may stop reading about diabetes or not attend as many refresher classes and forget some of what was learned. The

externally-oriented person, on the other hand, may follow a different course. He may not actively seek information about his illness and may be content to follow the prescribed regimen. This person is not interested in exerting control over the situation. However, as time passes and the disease continues the externally-oriented person eventually does learn a considerable amount about his/her illness. Consequently, with increased duration of diabetes the differences in amount of disease knowledge between internally and externally-oriented persons are practically nonexistent. Although the above reasoning seems to support both the present study's findings and Lowery and DuCette's (1976) findings in their 6-year diabetes duration group, the possibility still remains that knowledge of a chronic illness may not be at all related to LC.

Finally, alternative behaviors available to the individual may also have affected this study's outcome (Rotter, 1975). For example, in the present study, outpatient subjects had a number of activities competing for their time and attention, whereas Seeman and Evans' (1962) hospitalized subjects had a considerably narrower choice of activities. Therefore, it could be reasoned that Seeman and Evans' internals, who were generally thought to seek more information, may have found themselves with

little else to do except read and learn about their illness.

Interaction of the Demographic Variables With the Dependent Variables

Although the demographic variables were not the primary focus of this study, they do offer the oportunity for consideration of factors which may have influenced the dependent variables.

Correlations Between Diabetes Control and Demographic Variables

A correlation matrix composed of Pearson's r correlations between the diabetes control measure (HbA_1) and the demographic variables was constructed. The data presented in Table 7 shows that while to a significant extent female subjects were in unacceptable diabetes control, male subjects were in acceptable diabetes control ($r = -.32$, $p \leq .05$).

These results were not consistent with those of Stone (1961) who found no significant relationship between sex and diabetes control in an adult population. However, the present study's results were consistent with those of Simonds et al's. (1981) study of an adolescent group. It is of interest to note that in Simonds' study the HbA_1 levels were dichotomized into low (acceptable diabetes

Table 7

Correlations Between Dependent Variables

and Selected Demographic Variables

Demographic Variables	Dependent Variables: Diabetes Control	Dependent Variables: Diabetes Knowledge
Sex	-.32*	.20
Age	-.06	-.48***
Education	.09	.26
Income	.08	.45**
Employment	.07	.47***
Yrs. Since last attended diabetes class	.13	.43**
Type Diabetes	-.19	-.52***
Duration Diabetes	.01	.47***
Insulin Schedule	-.05	.37**
Learning from Books	.02	.33*
Learning from physician	-.07	.38**

*$p \leq .05$
**$p \leq .01$
***$p \leq .001$

control) and high (unacceptable diabetes control) as they were in the present study.

No significant correlations were found between any of the other demographic variables investigated (age, marital status, education, ethnic background, income, employment, occupation, diabetes classes, type and duration of diabetes, insulin regimen, number of diabetes complications, and receiving information about diabetes from family/ friends, books, nurse, physician, and dietician) and diabetes control.

Correlations Between Diabetes Knowledge and Demographic Variables

A correlation matrix composed of Pearson's r correlations between the diabetes knowledge measure and the demographic variables was constructed. Several demographic variables were significantly related to diabetes knowledge. These data are presented in Table 7 and will be discussed individually.

Age of subjects showed that the younger persons knew more about diabetes than the older persons ($r = -.48$, $p \leq .001$). The present finding regarding the relationship between age and diabetes knowledge is consistent with several other studies reviewed (Dyer et al., 1979; Miller et al., 1978; Karlander et al., 1980; Simon & Stewart, 1976). Simon and Stewart suggested that the poor knowledge test performance of their older persons may have been

reflecting their generally lower level of education, while the younger persons may have been exposed to more formal schooling and were more familiar with multiple-choice examinations and thus were able to perform better on the knowledge test.

Unlike the studies by Dyer et al. (1979), Korhonen et al. (1983), Simon and Stewart (1976), and Wysochi et al. (1978), the relationship between diabetes knowledge and level of formal education did not quite reach significance ($r = .26$, $p = .058$) in the present study. Also, like the studies by Brook (1977), Karlander et al. (1980), and Korhonen et al. (1983), the present study found no significant relationhsip between sex and diabetes knowledge.

The present study also revealed that subjects who were employed ($r = .47$, $p \leq .001$) and who had higher levels of income ($r = .45$, $p \leq .01$) knew more about diabetes than subjects who were unemployed (including retired) and who had lower levels of income. Subjects who had Type I (insulin-dependent) diabetes knew more about diabetes than subjects who had Type II (non-insulin dependent) diabetes ($r = .52$, $p \leq .001$). Since all subjects were taking insulin, one might have expected type of diabetes not to make a difference in amount of diabetes knowledge. However, subjects who had Type I diabetes also tended to be on a more complex insulin regimen ($r = -.61$, $p \leq .001$).

Therefore the present findings regarding the relationship between type of diabetes and knowledge of diabetes are not surprising.

Two variables related to the passage of time, duration of diabetes and years since subjects last attended diabetes classes, were found to be related to knowledge of diabetes. The Pearsonian correlation showed that the longer it had been since subjects attended a full week series of diabetes classes the more they knew about diabetes care ($r = .43$, $p \leq .01$). No other studies were found which dealt directly with this issue. Perhaps with passage of time the experience of using the knowledge learned in class reinforced learning while those with more recent class did not have the benefit of experience and consequently did not do as well in the diabetes knowledge test.

As for duration of diabetes, those subjects with longer diabetes duration were better informed about their disease than subjects with shorter diabetes duration ($r = .47$, $p \leq .001$). These findings were consistent with those of Dyer et al. (1979) and Wysocki et al. (1978). On the other hand, Korhonen et al. (1983), and Watkins et al. (1967) found no significant relationship between duration of diabetes and knowledge of diabetes. It seems logical nonetheless, that the longer a person has to deal with diabetes, he/she cannot help but learn from the day-to-day experiences with it, and therefore may know more than

someone else who has not had as long an exposure to it. Watkins et al. also investigated the relationship between duration of diabetes and motor ability or knowledge (performing procedure correctly) and found that the longer a subject had had diabetes, the more errors were made in insulin dose. Lawrence and Cheely (1980), however, found no such relationship. The relationship between cognitive and psychomotor knowledge (knowing and doing) is not yet settled. It is commonly acknowledged that knowing (cognitive) does not ensure doing (motor); however, health educators would like to see such a relationship. Although the present study did not measure motor skill, it did measure an outcome that is thought to be closely related to behavior (diabetes control) which will be more fully discussed in a later section.

Subjects who had a more complex insulin regimen were also found to know more about diabetes than subjects who had a simpler regimen ($r = .37$, $p \leq .01$). In as much as a more complex regimen requires a person to know more, this finding is not surprising.

Those subjects who indicated learning significantly more from books ($r = .33$, $p \leq .05$) and from physicians ($r = .38$, $p \leq .01$) than from other health professionals or family, did score higher on the diabetes knowledge test. These findings were consistent with Dyer et al's. (1979) findings which also showed that learning from health

professionals (M.D., R.N., R.D.) and from books related to higher diabetes knowledge when learning occurred on an outpatient basis.

Finally, the variables of marital status, number of diabetes complications, ethnic background, occupation, and learning from family/friends, nurse, or dietician were not found to be significantly related to diabetes knowledge.

Interaction Between the Dependent Variables

Diabetes knowledge and diabetes control were the major dependent variables of the present study and their intercorrelation was not its primary focus. Nonetheless, a Pearsonian correlation showed that subjects who knew more about diabetes were assessed as having their diabetes in acceptable control ($r = .27$, $p \leq .05$) while those who knew less were assessed as having their diabetes in unacceptable control. Since none of the subjects in the present study had averaged HbA_1 levels below 8 mg.%, a Pearson's correlation treating HbA_1 as a continuous variable was computed and revealed an even stronger relationship between diabetes knowledge and diabetes control ($r = -.43$, $p \leq .01$).

These findings are in contrast to those of Williams et al. (1967) in that subjects who on the average knew more about diabetes were in poorer control. In an attempt to explain their findings, Williams et al. suggested that

possibly the individuals in poor control had more experience with problems and more attention paid their disease and thus had learned more. However, other factors still kept their diabetes control poor. Direct comparisons between the present study's findings and those of Korhonen et al. (1983) and Stone (1961) cannot be made because they studied the immediate and over time effects of intensive diabetes instruction on diabetes control.

The present study implied that subjects who knew more were more successful in managing and/or adhering to their prescribed regimen, and that managing better or doing was related to control. Health educators, in general, would like to see such a relationship (knowing ---> doing); however, in general, it seems that: 1) knowing does not always result in doing; and 2) although doing usually results in control it may not be an over-riding factor. Stone's findings well exemplify this issue in that out of 83 subjects who knew more, 36 did not have their diabetes in control because they did not seem to be able to follow the prescribed diet. Watkins et al. (1967), on the other hand, found that those who knew in general about diabetes also managed better than those who did not; but they also found no significant correlation between degree of management/doing and diabetes control. These different findings could be a reflection of the differences in the design of the studies and/or the fact that there is still

much that is not known about the biological characteristics of diabetes and how it affects different individuals.

The foregoing discussion has pointed out that in the present study more male subjects had their diabetes in acceptable control than females. Also, this study showed that younger, employed, Type I diabetic subjects who had a higher income level, had had diabetes for a longer time, for whom more time had elapsed since they last attended diabetes classes, had a more complex insulin regimen, had indicated learning more about diabetes from books and physicians, were also the ones who knew more about diabetes. In addition, those who knew more also had their diabetes in acceptable control.

CHAPTER IV

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The present study was conducted in order to describe and explore the relationships between Health-Specific Locus of Control orientation of persons who have diabetes and the amount of diabetes knowledge and degree of control. Hypotheses were proposed which predicted that persons who were oriented towards Self-Control and believed in Provider Control would have more knowledge and control of their diabetes than those who were oriented towards Chance Health and General Threat to Health.

Over a 3-month period a convenience sample of adult patients who were attending the outpatient clinic for insulin treatment of diabetes were invited to participate in this study. Those who met the criteria for inclusion in the study were administered the following three instruments: 1) a Multidimensional Health Locus of Control Scale (Lau & Ware, 1981) comprised of the four subscales of "Self Control", "Provider Control", "Chance Health", and General Threat to Health"; 2) a Diabetes Knowledge Test for Children and Adolescents (Nowacek & Pichert, 1983) which was adapted for adults; and 3) Section II of the Background Data Form (demographics & illness-related information). In

addition, data to complete Section I of the Background Form and data relating to diabetes control (HbA_1) for the previous 6 months were gathered from each patient's records. HbA_1 levels were dichotomized into acceptable diabetes control (HbA_1 between 8-10mg%) and unacceptable diabetes control (HbA_1 < 8 or > 10mg%). Of the 55 persons who volunteered to participate in the study, 39 were accepted for data analysis.

A Pearsonian intercorrelation matrix was constructed to determine the degree of relationship among the variables of the study. The results revealed no significant relationship between subjects' HLC beliefs and diabetes control (acceptable/unacceptable HbA_1 levels) nor between subjects' HLC beliefs and diabetes knowledge. Therefore, the hypotheses were rejected. Significant interactions were found between selected demographic variables and the dependent variables. While acceptable diabetes control was found more frequently in males than in females ($r = -.32$, $p \leq .05$), sex was not significantly related to knowledge of diabetes. Higher scores on the diabetes knowledge test were also significantly related to subjects who were younger ($r = -.48$, $p \leq .001$), were employed ($r = .47$, $p \leq .001$), had higher levels of income ($r = .45$, $p \leq .01$), had Type I diabetes ($r = .52$, $p \leq .001$), more time had passed since they last attended diabetes classes ($r =$ .43, $p \leq$

.01), had had diabetes for a longer time (r = .47, $p \leq$ .001), had a more complex insulin regimen (r = .37, $p \leq$ .01), and indicated learning more from books (r = .33, $p \leq$ .05) and from physicians (r = .38, $p \leq .01$). Finally, increased levels of knowledge were significantly related to acceptable diabetes control (r = .27, $p \leq .05$) and the lower the HbA_1 level (not below 8 mg%) the more knowledge of diabetes was present (r = -.43, $p \leq .004$).

Possible explanations for the findings were discussed in terms of the operationalization and conceptualization of Health Locus of Control, especially as it relates to chronic illness. Problems related to the operationalization of diabetes control and knowledge were also discussed.

Conclusions and Recommendations

In conclusion, the findings of the present study do not support the contention that a person's Locus of Control orientation is significantly related to their degree of diabetes control or their level of diabetes knowledge. At present the reasons for this apparent lack of relationship between LC and the outcome measures are not clear. One could question the utility of present instruments, such as the HSLC Scales, to make predictions in chronic illness. In addition, selected demographic variables seem to play an inconsistent role in both knowledge and control of diabetes. The variables which affect control of diabetes

seem to remain elusive. Finally, although knowledge of diabetes was found to be related to control of diabetes, it only accounted for a small part of the variance in diabetes control.

Based on these findings, the following suggestions for further study are offered:

1- Study the person who has a chronic illness in an attempt to discover the relevance of the issue of Locus of control in the management of their therapeutic regimen over time. Perhaps the actual major factors which operate in the concept of LC have not yet been identified in the chronically ill.

2- Construct a more disease-specific LC instrument and test it on selected subpopulations of persons who have diabetes. Such populations may be characterized according to length of illness and/or type of diabetes, etc.

3- Devise ways to test whether an internally-oriented person's behavior and verbal statement of their beliefs in specific health-related situations correspond with each other.

4- Study individuals who score on the very high end of the health value scale (i.e., scoring 24-28) in order to provide a more definitive test of the theory that HLC is predictive only in subjects who value health highly.

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APPENDIX A

SUMMARY TABLE OF STUDIES COMPARING THE EFFECT OF LOCUS OF CONTROL BELIEFS ON DIABETES CONTROL AND KNOWLEDGE

Table 1

Summary of Studies Comparing the Effect of Locus of Control Beliefs on Diabetes Control and Knowledge

Characteristics	Authors: Lowery & DuCette (1976)	Rabkin et al. (1983)	Simonds et al. (1981)	Present Study (1984)
Sample	90 lower class out/inpatient adults	40 middle-class outpatient adults	52 middle-class adolescents	39 low-middle class outpatient adults
Setting	3 hospitals	Hospital clinics & doctor's offices	University Clinic	University Clinic
Diabetes Type	Not known if Type I or II or if both	Type II	Type I	Type I & II - on Insulin therapy
Instruments				
Diabetes Control	Problems with diabetes control	Fasting Serum Glucose	HbA_{1c}	HbA_1
Locus of Control	Rotter's I-E Scale	Rotter's I-E Scale	Scale for Children	Lau & Ware's MHSLC Scale
Knowledge of Diabetes	True/False test Developed by authors	———	———	Nowacek & Pichert's Multiple-Choice - Rote Memory & Decision-Making
Underlying Variable				
Duration Diabetes	30-newly diagnosed 30-3 years 30-6 years	———	———	———
Counseling Method	———	Compared Individual Counseling with Behavior Modification	———	———
Health Value	Not measured	Asked subjects how much they worried about their health	Not measured	Only subjects who valued health
Findings				
Disease Control	Internals in 3-year group had less problems than externals; but internals in 6-year group had more problems than externals	No significant effect of LC on diabetes control	No significant effect of LC on diabetes control	No significant effect of LC on diabetes control
Disease Knowledge	In newly diagnosed group internals knew more; however, internals & externals in 6-year group had same amount of knowledge	———	———	No significant effect of LC on diabetes knowledge

APPENDIX B

SAMPLE SELECTION CRITERIA

CODE NO. _____

Sample Selection Criteria Form

_____ 18 years of age or older

_____ On insulin therapy

_____ One year duration of diabetes or more

_____ Clinic patient $\geq$ 6 months

_____ Able to read English

_____ Caring for self: Assumes major responsibility for diabetes care

_____ Presence of at least one HbA_1 measurement

_____ Value Health Score > 16

APPENDIX C

HEALTH VALUE SCALE
(LAU & WARE)

CODE NO. _____

Health Value Scale

The following statements describe what some people believe about health.

After reading each of the following statements, circle the number that best expresses your beliefs. There are no right or wrong answers. Circle 1 if you strongly agree, 2 if you moderately agree, 3 if you slightly agree, 4 if you are undecided, 5 if you slightly disagree, 6 if you moderately disagree, and 7 if you strongly disagree.

	Strongly Agree	Moderately Agree	Slightly Agree	Undecided	Slightly Disagree	Moderately Disagree	Strongly Disagree
1. If you don't have your health, you don't have anything. !	1	2	3	4	5	6	7
2. There are many things I care about more than my health.	1	2	3	4	5	6	7
3. Good health is of only minor importance in a happy life.	1	2	3	4	5	6	7
4. There is nothing more important than good health. !	1	2	3	4	5	6	7

APPENDIX D

BACKGROUND DATA FORM

CODE NO._____

Background Data Form

Section I

Medical Record Information

1. Sex

   1 Male
   2 Female

2. Age _____

3. Ethnic Background

   1 White
   2 Black
   3 Mexican American
   4 Chinese
   5 Other _____

4. Duration of Diabetes _____
   Years

5. Type of Diabetes

   1 Type I
   2 Type II
   3 Secondary to other diseases

6. Complications of Diabetes

   Large Blood Vessel Disease
   1 CAD 2 Angina 3 MI 4 Stroke
   5 Occlusion of other large vessels
   Small Blood Vessel Disease
   6 Retinopathy
   7 Nephropathy
   Neuropathy
   8 Peripheral
   9 GU 10 GI
   11 Autonomic
   Other
   12 Amputations 13 Cataracts
   14 Yeast Infections 15 Hypertension

CODE NO._____

Section II

The Interview Questionnaire

7. What is your present marital status?

   1 Married: living with spouse
   2 Married: not living with spouse
   3 Divorced or legally separated
   4 Widowed
   5 Never married

8. What is the highest level of education that you have completed?

   1 2 3 4 5 6 7 8 9 10 11 12
   College: 13 14 15 16
   Post Graduate: 17+ Highest degree attained: _____

9. Are you presently:

   1 Employed
   2 Unemployed
   3 Retired

10. How would you classify your usual occupation?

    1 Professional
    2 Manager or owner of business
    3 Farmer (owner or manager of at least 100 acres)
    4 Clerical, sales, technician
    5 Skilled Craftsman, foreman
    6 Operative, semi-skilled
    7 Service worker
    8 Unskilled
    9 Farmer (owner or manager of less than 100 acres)
    10 Housewife

11. In what range was your gross annual income last year?

    1 Under $5,000
    2 $5,001 to $9,999
    3 $10,000 to $14,999
    4 $15,000 to $19,999
    5 $20,000 and over

CODE NO._____

12. If you have ever attended a complete series (full week) of classes to learn about diabetes care, list each:

When: _____ Where: _____

_____ _____

_____ _____

13. Other than classes, how much information about diabetes have you received from:

	All I Know	A lot	Some	Not Much	None
Books					
Family/Friends					
Nurse					
Doctor					
Dietician					
Other					

14. How many times per day do you take Insulin? _____

APPENDIX E

HEALTH-SPECIFIC LOCUS-OF-CONTROL QUESTIONNAIRE (LAU & WARE, 1981)

CODE NO. _____

Health Locus-Of-Control Scale

The following statements describe what some people believe about health.

After reading each of the following statements, circle the number that best expresses your beliefs. There are no right or wrong answers. Circle 1 if you strongly agree, 2 if you moderately agree, 3 if you slightly agree, 4 if you are undecided, 5 if you slightly disagree, 6 if you moderately disagree, and 7 if you strongly disagree.

	Strongly Agree	Moderately Agree	Slightly Agree	Undecided	Slightly Disagree	Moderately Disagree	Strongly Disagree
	1	2	3	4	5	6	7
1. Staying well has little or nothing to do with chance.							
2. Seeing a doctor for regular check-ups is a key factor in staying healthy. !							
3. Doctors can rarely do very much for people who are sick.							
4. Anyone can learn a few basic health principles that can go a long way in preventing illness. !							
5. People's ill health results from their own carelessness. !							
6. Doctors relieve or cure only a few of the medical problems their patients have.							
7. There is little one can do to prevent illness.							

CODE NO. _____

	Strongly Agree	Moderately Agree	Slightly Agree	Undecided	Slightly Disagree	Moderately Disagree	Strongly Disagree
8. No matter what anybody does, there are many diseases that can just wipe you out. !	1	2	3	4	5	6	7
9. I have a lot of confidence in my ability to cure myself once I get sick. !	1	2	3	4	5	6	7
10. Whether or not people get well is often a matter of chance. !	1	2	3	4	5	6	7
11. People who never get sick are just plain lucky. !	1	2	3	4	5	6	7
12. Doctors can almost always help their patients feel better. !	1	2	3	4	5	6	7
13. The seriousness of many diseases is overstated.	1	2	3	4	5	6	7
14. When it comes to health, there is no such thing as "bad luck".	1	2	3	4	5	6	7
15. In the long run, people who take very good care of themselves stay healthy and get well quick. !	1	2	3	4	5	6	7
16. Recovery from illness requires good medical care more than anything else. !	1	2	3	4	5	6	7
17. In today's world, few diseases are totally debilitating (crippling).	1	2	3	4	5	6	7
18. Recovery from illness has nothing to do with luck.	1	2	3	4	5	6	7

CODE NO. _____

		Strongly Agree	Moderately Agree	Slightly Agree	Undecided	Slightly Disagree	Moderately Disagree	Strongly Disagree
19.	Most people are helped a great deal when they go to a doctor. !	1	2	3	4	5	6	7
20.	There are a lot of medical problems that can be very serious or even fatal (can kill you). !	1	2	3	4	5	6	7
21.	Healthwise, there isn't much you can do for yourself when you get sick.	1	2	3	4	5	6	7
22.	Doctors can do very little to prevent illness.	1	2	3	4	5	6	7
23.	"Taking care of yourself" has little or no relation to whether you get sick.	1	2	3	4	5	6	7
24.	Some kinds of illness are so bad that nothing can be done about them. !	1	2	3	4	5	6	7
25.	If I get sick, it's my own fault. !	1	2	3	4	5	6	7
26.	Many times doctors do not help their patients to get well.	1	2	3	4	5	6	7
27.	Good health is largely a matter of fortune. !	1	2	3	4	5	6	7

APPENDIX F

DIABETES KNOWLEDGE TEST
(NOWACEK & PICHERT, 1983)

CODE NO. _____

DIABETES KNOWLEDGE TEST

Directions

1. Please read the directions before you start answering the questions.
2. Answer each question to the best of your knowledge.
3. Take the time you need to answer all questions.

TEST

Please answer each of the following questions by circling the letter next to the best answer.

1. If you take _____ insulin at 7 a.m., when will it have the greatest effect?

   a. about 9 a.m.
   b. about 12 noon (about lunch time)
   c. about 5 p.m. (about dinner time)
   d. about 10 p.m.

2. In which exchange group is corn found?

   a. Vegetable
   b. Meat
   c. Bread
   d. Milk
   e. Fat

3. You have taken 22 ____ before breakfast. You have been having frequent insulin reactions (low bood sugar) in late afternoon and before your supper. What could be done to your insulin dose?

   a. increase the dose to 24 _____
   b. decrease the dose to 20 _____
   c. skip the insulin for one day
   d. nothing

4. _____ insulin usually lasts in the body

   a. 3 - 4 hours
   b. 8 - 12 hours
   c. 18 - 24 hours
   d. 36 hours

CODE NO. _____

5. Read the urine record below and then choose the insulin dose the person should take on January 5.

Date	Insulin Dose	Urine Tests Breakfast	Lunch	Dinner	Bed	Remarks
Jan. 2	40 ____	5%	3%	0	1%	Urinated 3 times last night, tired
Jan. 3	40 ____	5%	3%	0	0	Tired, reaction at 3 PM
Jan. 4	40 ____	5%	5%	0	1%	Tired
Jan. 5	?					

a. 40 _____
b. 44 _____
c. 30 _____ morning and 10 _____ before dinner

6. You and a friend go to McDonald's for lunch. What could you order along with a diet Seven-Up?

a. an apple turnover
b. a Big Mac
c. a small hamburger
d. a small hamburger without the bun
e. you shouldn't eat anything

7. I will probably always have diabetes.

a. True
b. False

8. As a general rule, convenience foods (e. g. snack cakes) should be avoided because they:

a. have little or no nutritional value.
b. are high in fat content.
c. are too low in carbohydrates.
d. cannot be calculated into exchange values.

9. On a weight reduction diet, a person should lose _____ pounds each week.

a. less than ½
b. ½ to 2
c. at least 3
d. 5 or more (if they stick to the diet)

CODE NO. _____

10. A person would have to under-eat _____ calories per day in order to lose one pound of body fat in a week.

    a. 500
    b. 1000
    c. 3500
    d. 7000

11. You awaken at 6 AM with nausea, stomach ache, fever and vomiting. Usually you take 40 units of _____ at 7 a.m. Your blood sugar is 400 and your urine shows positive ketones. Of the following, which is the one best choice?

    a. Take 40 units of Regular insulin now
    b. Take 44 units of _____ insulin now
    c. Take 40 units of _____ and 10 units of Regular now

12. Tim has poor circulation in his feet caused by his diabetes. A good way for Tim to take care of himself is to

    a. wear stretch socks or socks with elastic tops.
    b. avoid walking whenever possible.
    c. exercise his ankles and feet every day.

13. Who is responsible for managing your diabetes?

    a. Your doctor
    b. Your family
    c. Yourself
    d. The nurse who taught you about diabetes

14. Your blood sugar readings have been between 240 and 400 at lunchtime for the last two weeks. Would you change anything?

    a. No, that shows pretty good control
    b. No, I'd just keep watching it
    c. Yes, I might eat less for breakfast
    d. Yes, I'd add 10% more Regular insulin to my evening shot

15. You woke up late and are rushed for work. You give yourself your insulin but only have 5 minutes to catch your ride. You should

    a. skip breakfast
    b. have a piece of toast and orange juice on your way out the door
    c. don't go to work that day

CODE NO. _____

16. One goal of treatment in diabetes is to

    a. cure the disease
    b. control the complications of diabetes
    c. produce no sugar in the blood
    d. restore insulin production in the pancreas

17. You go to the refrigerator because you are thirsty. There is a coke, a Tab, and unsweetened orange juice. To keep your blood sugar from going up you choose the

    a. coke
    b. tab
    c. unsweetened orange juice

18. Dan, who has insulin-dependent diabetes, skipped lunch in order to exercise. He now feels very tired and light-headed. The best thing for Dan to do is to

    a. take two candy bars
    b. take a small dose of oral hypoglycemics
    c. take an extra insulin injection
    d. drink a soda that contains a good deal of sugar

19. Betty has diabetes and must lose weight, but she is having a hard time doing so. An appropriate way for Betty to take care of herself is to

    a. eat fast-acting sugar snacks at regular intervals each day
    b. follow a nutritionally balanced diet but eat smaller portions than she is now
    c. eat more of her calories in the morning and fewer at night
    d. none of the above

20. When should urine be tested for ketones?

    a. after eating acidic foods
    b. after eating foods high in fat
    c. every time you check for sugar
    d. when urine tests show high sugar

	Hyperglycemia (high glucose)	Hypoglycemia (low glucose)
21. Dry skin and mouth occur with	a. high	b. low
22. Too much insulin causes	a. high	b. low
23. Too much food causes	a. high	b. low

CODE NO. _____

	Hyperglycemia (high glucose)	Hypoglycemia (low glucose)
24. Taking insulin prevents or reduces	a. high	b. low

25. John, who takes insulin, is sick with the flu. One good thing for John to do is to:

a. take oral hypoglycemics instead of insulin
b. decrease the amount of insulin he is taking
c. consume additional fast-acting sugars, such as orange juice
d. test more frequently for sugar levels and ketones

26. During the summer you were walking two to three miles every afternoon. The rainy season has started and you now spend your time watching T.V. You notice that you are now going to the bathroom more often and drinking more. You should:

a. raise your morning insulin and/or do more exercise in the afternoon
b. eat more for lunch
c. lower your morning insulin
d. I don't know

27. If you begin to get a blister on your foot after wearing a new pair of shoes you should:

a. put iodine on the blister and stop wearing the shoes
b. put iodine on the blister and tell the doctor
c. stop wearing the shoes, cleanse the wound, and watch for infection

28. Denise has newly-diagnosed diabetes and is learning about foot care. An appropriate way for Denise to take care of herself is to:

a. inspect her feet daily for any irritation or infection
b. use iodine or peroxide on any cuts or blisters
c. soak her feet daily in hot water
d. none of the above.

CODE NO. _____

29. A good way to avoid or prevent emotionally stressful situations from bothering your blood sugar is to:

    a. worry about all the terrible things that could happen
    b. keep all your feelings in and don't let anyone know how your're feeling
    c. always say "yes" when people ask you to do something so they don't get angry at you
    d. remember that tomorrow is another day to try again

30. What advice would you give a person about what to say to close friends about his/her diabetes?

    a. tell them about diabetes and what to do in emergencies for them
    b. don't go out of your way to tell them, and then only as little as possible if they find out
    c. do everything you can not to let them find out

Diabetes Knowledge Test

Answer Key

1.	c	16.	b
2.	c	17.	b
3.	b	18.	d
4.	c	19.	b
5.	c	20.	d
6.	c	21.	a
7.	a	22.	b
8.	b	23.	a
9.	b	24.	a
10.	a	25.	d
11.	c	26.	a
12.	c	27.	c
13.	c	28.	a
14.	c	29.	d
15.	b	30.	a

APPENDIX G

DIABETES CONTROL DATA

CODE NO._____

Diabetes Control Data Form

Date						
HbA_1						

Mean: _____

Level of Control

Acceptable = 8-10% _____

Nonacceptable = > 10% or < 8% _____

APPENDIX H

CONSENT FORM FOR HUMAN SUBJECTS

UNIVERSITY OF OREGON HEALTH SCIENCES CENTER
SCHOOL OF NURSING

Consent for Human Research Project

Title: RELATIONSHIP BETWEEN LOCUS OF CONTROL EXPECTANCIES AND DISEASE-RELATED LEARNING AND DISEASE CONTROL IN PERSONS WHO HAVE DIABETES

I, _____,
(First Name) (Middle Initial) (Last Name)

herewith agree to serve as a subject in the investigation named, "Relationship between Locus of Control Expectancies and Disease-Related Learning and Disease Control in Persons who have Diabetes", conducted by Sonia L. Giles, R.N., B.S.N., under the supervision of May Rawlinson, Ph.D.

The aim of this study is to explore diabetic patients' understanding and attitudes concerning their disease. I understand that I will be asked to complete three written questionnaires requiring approximately 45 minutes. I understand that the only risk to me may be the inconvenience of completing the questionnaires. My participation in this study will help nurses to better understand persons who have diabetes (including myself) and perhaps find ways to better teach them and myself at various stages of their/my illness.

I understand that the Oregon Health Sciences Center, as an agency of the State, is covered by the State Liability Fund. If I suffer any injury from the research project, compensation would be available only if I establish that the injury occurred through the fault of the Center, its officers or employees. I further understand that if I have further questions I am to call Dr. Michael Baird, M.D., at (503) 225-8014.

The information obtained by the investigator will be kept confidential. My name will not appear on the records and code numbers will be used to protect my privacy. The results of the study will be reported in ways that do not identify me with my specific answers. Sonia Giles, R.N., has offered to answer any questions that I might have about

my participation in this study. I understand I may refuse to participate or withdraw from this study at any time without affecting my relationship with, or treatment at the Oregon Health Sciences University.

I have read the foregoing and agree to participate in this study.

_____ (Date)

_____ (Subject's Signature)

_____ (Witness's Signature)

APPENDIX I

PERSONAL COMMUNICATION

THE OREGON HEALTH SCIENCES UNIVERSITY

School of Medicine
Department of Medicine
Section of Metabolism

3181 S.W. Sam Jackson Park Road Portland, Oregon 97201 (503) 225-8488

August 1, 1983

Sonia L. Giles, R.N.
14381 S.E. Charjan
Clackamas, Oregon 97015

I, Matthew Riddle, M.D., Associate Professor Department of Medicine and Director of the Diabetes Clinic at the OHSU, hereby give permission for Sonia L. Giles, R.N., B.S.N. to collect data on patients at this Diabetes Clinic for the purpose of conducting her research study.

8/1/83
(Date)

(Signature)

Matthew Riddle, M.D.

Carnegie-Mellon University

Department of Social Science
College of Humanities
and Social Sciences
Schenley Park
Pittsburgh, Pennsylvania 15213
(412) 578-2833

April 27, 1982

Sonia L. Giles, R.N.
14381 S.E. Charjan
Clackamas, Oregon 97015

Dear Colleague:

Enclosed is the reprint you have requested. If you use any of the Lau-Ware HLC scales in your research, I would greatly appreciate your sharing your results with me. In particular, please let me know the characteristics of the population studied, the mean values of the HLC scales in that population, the reliability of the scales in the population, and the consequences or predictors of the four scales, depending on the criteria of your particular study.

Let me remind you that HLC should predict health behavior only among individuals with high health value. Below is a 4 item health value scale which Ware and I also developed (which we will publish if he ever gets off his duff, stops working on his trivial and inconsequential research at Rand, and puts some time into the article).

1. If you don't have your health, you don't have anything.

2. There are many things I care about more than my health.

3. Good health is of only minor importance in a happy life.

4. There is nothing more important than good health.

We have used 7-point "Strongly Agree" to "Strongly Disagree" response scales for the HLC items and the health value items.

Sincerely,

[redacted]

Social Science

RRL/dm
encl.

Carnegie-Mellon University

Department of Social Sciences
College of Humanities
and Social Sciences
Schenley Park
Pittsburgh, Pennsylvania 15213
[412] 578-2833

April 19, 1983

Sonia L. Giles, R.N.B.S.
Graduate Nursing Student
14381 S.E. Charjan Street
Clackamas, Oregon 97015

Dear Ms. Giles:

The article you request is enclosed. A manuscript in preparation establishes factor validity for the health value scale (i.e., it correlates reasonably with other scales). Its reliability is .67 (alpha).

Sincerely,

[redacted]

Richard R. Lau
Assistant Professor
of Social Sciences

RL/jlm

Enclosure

VANDERBILT UNIVERSITY
NASHVILLE, TENNESSEE 37232 TELEPHONE (615) 322-7311
Diabetes Research and Training Center • School of Medicine • Direct phone 322-2197

June 27, 1983

Dear Ms. Giles,

This letter is in response to your request for information about the Item Bank of Diabetes Knowledge Questions for Children. Enclosed are our cover letter, project description, camp profile, and samples of the 1983 tests which are now being studied. You must understand that many items are being tried for the first time and we can not vouch for their quality until our studies have been conducted. To that end, we request the following:

1. If you use the tests, or any of the items, please send us copies of your results;
2. If you add new items, that's great! Please send them, and the results on them, back to us. We'll use them on subsequent versions of the test, and they'll add to the quality of the item bank;
3. Let us know if you need a lot of copies of the test. We'll send them free so long as you'll agree to send back the results;
4. Please follow the suggestions for administration so we know that the conditions under which everyone took the tests were similar.

Thank you for your interest in this project. We are pleased to have you as a member of the research team. Your contributions will be appropriately acknowledged.

Sincerely,

[redacted]

James W. Pichert, Ph.D.

GN;JWP:ndw

ABSTRACT

AN ABSTRACT OF THE THESIS OF

SONIA L. GILES

For the MASTER OF NURSING

Date of Receiving this Degree: June 8, 1984

Title: RELATIONSHIP BETWEEN LOCUS OF CONTROL EXPECTANCIES AND DISEASE-RELATED LEARNING AND DISEASE CONTROL IN PERSONS WHO HAVE DIABETES

Approved: _____
May Rawlinson, Ph.D., Thesis Advisor

Because the major responsibility for the management of diabetes lies with the patient, he/she must have knowledge about the nature of the disease and the procedures essential for self-care. Also, control of diabetes is essential for normal growth and development, promotion of well-being, and possible postponement and/or prevention of the long-term complications usually associated with the disease.

An individual's orientation to "Locus of Control" (LC) has been suggested as influencing one's knowledge of diabetes and the degree to which the disease is controlled. However, a number of factors which have been identified as potentially affecting the ability of LC to predict behavior need to be considered. These factors are: novelty of the situation, the value of the reinforcement for a specific behavior, the alternative

behaviors available to the individual, and the multidimensionality of the LC construct (Rotter, 1975).

Although based on the study by Lowery and DuCette (1976), this study expands their work both conceptually and operationally as it explores the relationship between an individual's Locus of Control orientation and knowledge and control of diabetes. Hypotheses were proposed which predicted that persons who were oriented towards Self-Control and believed in Provider Control would have more knowledge and control of their diabetes than those who were oriented towards Chance Health and General Threat to Health. Subject's LC orientation was measured by a multidimensional health-specific scale instead of a generalized unidimensional scale. The four LC dimensions include one measure of internality, Self-Control, and three measures of externality labeled: Provider Control, Chance Health, and General Threat to Health (Lau & Ware, 1981). In addition, the subject's health value was measured and controlled, degree of diabetes control was measured through Hemoglobin A_1 values, and knowledge of diabetes was measured by a test which included not only recall knowledge but also problem solving ability in six major areas of diabetes management.

The sample consisted of 39 volunteer individuals from the diabetes outpatient clinic of a large metropolitan

university hospital. Selection criteria included: males and females 18 years of age or older, on insulin therapy (regardless of diabetes type), with at least 1 year duration of diabetes, being seen at the clinic for at least 6 months, having at least one hemoglobin A_1 measurement documented in the records, able to read English, currently caring for themselves, and who valued health.

The results of testing the hypotheses by Pearson's correlations revealed no significant relationship between subjects' HLC beliefs and diabetes control nor between subjects' HLC beliefs and diabetes knowledge. However, higher scores on the diabetes knowledge test were significantly related ($r = .27$, $p \leq .05$) to acceptable diabetes control. In addition, a number of demographic variables were significantly related to diabetes knowledge but not to diabetes control. Conclusions were drawn and recommendations made for further work.