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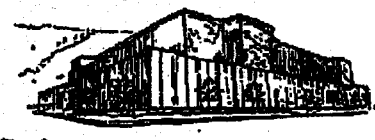

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WHY CHANGE NOW?
MOTIVATIONAL INTERVIEWING AS A BRIEF INTERVENTION FOR TYPE-2 DIABETES AMONG THE EASTERN SHOSHONE AND NORTHERN ARAPAHO

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Presented in Partial Fulfillment of the Requirements for the Degree of
Doctorate of Philosophy
The University of Montana
May 2005

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Darren Calhoun May, 2005 Psychology

Why Change Now? Motivational Interviewing as a brief intervention in Type-2 Diabetes Among the Eastern Shoshone and Northern Arapaho pp. 1-204

Chairpersons: Christine Fiore, Ph.D. and David Schuldberg, Ph.D.

Native Americans have the highest occurrence rates of Non-insulin dependant diabetes mellitus (NIDDM; Type-2 diabetes) of all races and ethnic groups in the United States. The Pima Indian Tribe (Tohono O'odham) of the United States has the highest incidence rate of Type-2 diabetes of any defined population in the world, with 1 in 3 people being diagnosed, with that rate climbing to 1 in 2 over the age of 45. Type-2 diabetes is a health problem of epidemic proportion in Native American communities of the United States. Secondary conditions resulting from Type-2 diabetes include kidney failure, blindness, early onset heart disease, nerve cell damage, and even death.

There is abundant research on the medical aspects of Type-2 diabetes in Native American populations. This research has limitations. The majority of the research has been done within the Indian Tribes of the southwestern U.S. It overlooks addressing the prevention of complications resulting from Type-2 diabetes. Specifically, research conducted on the psychological factors in diabetes management unique to Native Americans is lacking. Research on other populations suggests that lifestyle changes such as a healthy diet, weight management, and increased exercise levels increase insulin sensitivity, resulting in better glycemic control in Type-2 diabetes. These lifestyle changes are often difficult for individuals to initiate and maintain for those diagnosed with Type-2 diabetes. Motivational Interviewing has shown positive outcomes with regard to health related behaviors, including ones related to Type-2 diabetes.

This study was conducted within a population of Northern Plains Indian Tribes of the U.S., the Eastern Shoshone and Northern Arapaho tribes of the Wind River Reservation, located in west central Wyoming. Motivational Interviewing was studied as an intervention to initiate behavior change. Using the Transtheoretical Model of behavior change, readiness to adopt a healthy lifestyle was assessed. Data are lacking in the application of the Motivational Interviewing model in this population. In this study the Motivational Interviewing model and its effectiveness within this population was evaluated. Several factors were found to be predictive of change in DM patients' physiological measures and preliminary support for this intervention was demonstrated.

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Often there are so many people who play vital roles in these types of projects it seems impossible to know where to begin to issue acknowledgements. That is not the case here, as I would first like to thank the participants from the Wind River Indian Reservation who chose to participate in this research. These people placed their trust and faith in this project and I will be forever grateful. Without these individuals, this research would simply not have happened. I would also like to thank the Joint Business Council of the Eastern Shoshone and Northern Arapaho Tribes for their support in this endeavor. The financial and logistical support of many institutions made this project possible including the National Institutes of Health, the Indian Health Service, and the University of Montana.

I cannot overstate the importance of the faculty committee members who have gone beyond the call of duty to be helpful with everything from the data analyses and revisions, to actually scheduling a defense meeting. A special note of appreciation to David Schuldberg, my mentor beginning with the WICHE program and extending throughout my graduate school experience; to Rod Brod, as the statistics guru who was able to examine the data with me in a culturally understanding manner; to my good friend Dave Strobel, who gave me his word to help me in any way he could to ensure my success at UM (and kept his word - I appreciate that); and for the encouragement of Chris Fiore to pursue diabetes research using Motivational Interviewing.

I began this journey without fully realizing the trials and tribulations that I would face along the way. There have been several individuals and experiences which have made this journey interesting, fun, and possible. The people to whom I am grateful for their help along the way are too numerous to mention here but they are in my thoughts and they know who they are.

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Ha-Ho'

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TABLE OF CONTENTS

List of Tables vi

List of Figures vii

Chapter 1: Introduction 1
- Diabetes in Native Americans
- Etiology of Diabetes
- Quality of Life
- Locus of Control
- Role of Behavior in DM Management
- Depression in Diabetes
- The Transtheoretical Model of Change
- Motivational Interviewing
- Study Objectives & Hypotheses

Chapter 2: Methods 61
- Participants
- Procedures
- Physiological Measures
- Psychological Measures

Chapter 3: Results 72
- Imputation of Missing Data
- Factor Analyses of Selected Measures
- Intercorrelations Between Measures
- Means Comparisons
- Multiple Regression Models

Chapter 4: Discussion 97
- Physiological Measures
- Demographic Variables
- Health Related Behaviors
- Psychological Measures
- Participation in Intervention
- Limitations of Present Research
- Discussion of Issues Surrounding Research in Indian Country
- Clinical Implications & Future Research
- Concluding Comments

References 122

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Appendixes

A: Participant Consent Form 132
B: Treatment Manual 138
C: Psychological Measures/Questionnaires 170
D: Supplemental Tables & Graphs 187

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LIST OF TABLES

Table 1: Demographic characteristics of initial and final sample 62

Table 2: Reliability of the DC Fatalism Measure factors 75

Table 3: Reliability of the Diabetes LOC Measures factors 76

Table 4: Significant intercorrelations between psychological measures at baseline 77

Table 5: Significant mean differences from baseline to post-intervention 79

Table 6: Means (SD) of predictive variables for Regression Model 1 84

Table 7: Regression Model 1 coefficient table 85

Table 8: Means (SD) of predictive variables for Regression Model 2 89

Table 9: Regression Model 2 coefficient table 90

Table 10: Means (SD) of predictive variables for Regression Model 3 93

Table 11: Regression Model 3 coefficient table 94

Table 12: Factors loadings of DC Fatalism measure 187

Table 13: Factor loadings of Diabetes LOC measure 188

Table 14: Comparison of means (SD) at 6 months prior, baseline, & post-intervention 189

Table 15: Means (SD) for independent variables (demographic & change scores) entered into Regression Models 1-3 190

Table 16: Summary of Regression Model 1 192

Table 17: Summary of Regression Model 2 196

Table 18: Summary of Regression Model 3 200

Table 19: Correlation between Age, Total Blood Quantum, and Fear Distrust 202

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LIST OF FIGURES

Figures 1-7: Partial regression plots for Model 1 192

Figures 8-13: Partial regression plots for Model 2 196

Figures 14-17: Partial regression plots for Model 3 200

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INTRODUCTION

Non-insulin dependant diabetes mellitus (Type-2 diabetes; DM) is a disease that prevents the body from being able to break sugar down into usable energy. This disease is characterized by progressive stages of insulin resistance, impaired glucose tolerance, insulin secretory failure, worsening hyperglycemia, and finally overt diabetes (Knowler, Sadd, Pettitt, Nelson, & Bennett, 1993). An estimated 17 million Americans have Type-2 diabetes and prevalence rates are highest among ethnic minorities, particularly Native Americans/American Indians (NA/AIs). Occurrence rates of Type-2 diabetes among NA/AIs are the highest of all races and ethnic groups in the United States.

Diabetes is an expensive disease to treat and manage. The total cost estimate in 1993 for treating diabetes patients was in the range of $92-105 billion in the United States. It is estimated that one in every seven health care dollars in the US is spent on diabetes. Managed care and other health insurance companies are reluctant to take on clients with diagnosed diabetes due to these associated treatment costs. The question of what to do with the patients who already have Type-2 diabetes or how (if possible) to prevent new cases is only recently starting to be investigated (Ghodes, Kaufman & Valway, 1993). The costs and problems that are associated with the treatment of diabetes related problems lend worthiness and social value to studies which may lead to better prevention and/or treatment procedures in caring for the diabetic population.

Obesity is the leading risk factor for Type-2 diabetes and health related behaviors (e.g., diet, exercise, smoking, checking blood sugar) have been shown to delay the onset of the disease and to minimize it secondary complications. Psychological interventions such as Motivational Interviewing target behavior change such as improving individual's

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diet and increasing their level of exercise, but no research to date has examined the utility of this technique among American Indians with diabetes. The present research investigates the use of Motivational Interviewing as a brief intervention among a sample of Plains Indians with Type-2 diabetes.

This introductory chapter will first address the prevalence and possible etiological factors involved in Type-2 diabetes among NA/AIs. Next, the literature regarding the impact of behavior on the management of diabetes will be reviewed. This will be followed by a discussion of the Transtheoretical Model of Behavior Change and the therapeutic technique of Motivational Interviewing. Finally, the present study will be introduced.

Diabetes in NA/AIs

Although Type-2 diabetes was rarely reported among NA/AI and Alaska Native populations 50 years ago, it is currently a health problem of epidemic proportion in NA/AI communities (Ghodes et al., 1993; Newman, DeStafno, Valway, German, & Muneta, 1993) leading to health complications such as blindness, kidney failure, amputations, cardiovascular disease, and premature mortality. These health problems are a relatively recent occurrence and today are highly prevalent in NA/AI and Alaska Native populations (Burrows, Engelau, Geiss, & Acton, 2000; Ghodes et al., 1993). NA/AIs currently have a mortality rate from Type-2 diabetes that is approximately four times that of whites and two times that for African Americans (Ghodes et al., 1993).

There were no reports of either Type-2 diabetes or coronary heart disease among Indians prior to modern lifestyles (Bennet & Johnson, 1992; Jackson, 1986; Welty &

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Coulehan, 1993). The earliest documented cases of Type-2 diabetes in Indians were reported in the 1930s (Ghodes, 1991). By the 1940s, the prevalence of Type-2 in NA/AIs was similar to that of the general population of the U.S. (Knowler et al., 1993) with even greater rates among southwestern tribes by the 1950 (Knowler et al., 1993). The initial reaction of the medical community, however was that Type-2 diabetes was not causing the health problems in NA/AIs that it was known to cause in the general population. Type-2 diabetes was initially considered a "benign chemical abnormality" in the NA/AI population (Ghodes, 1991).

By late 1960s and early 1970s, health complications such as retinopathy, amputations, and renal failure were becoming evident in NA/AIs and it became well accepted that Type-2 diabetes had become a major health problem in the NA/AI population. In retrospect, it is now apparent that NA/AIs initially diagnosed with Type-2 in the 1940s and 1950s had not had the disease long enough to develop complications (Ghodes et al., 1993), thus accounting for the early (and erroneous) assumptions that the disease was benign in this population.

The increasing rate of occurrence of Type-2 diabetes among NA/AIs is astounding. Between 1990 and 1997, the number of NA/AIs and Alaska Natives of all ages with diagnosed diabetes experienced an alarming increase of 29% (Burrows et al., 2000). The increase in prevalence from 1990 to 1997 varied by region, with a 16% increase in the Northern Plains region and a 76% increase in the Alaska region (Burrows et al., 2000).

Diabetes in specific NA/AI populations.

While NA/AI populations have the highest rate of occurrence of Type-2 diabetes

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of all races in the U.S., prevalence rates vary by tribe and by region. The majority of research that has been done in the NA/AI groups has been done specifically in the southwestern U.S. with tribes such as the Pima, the Diné (Navajo), and the Salt River Apache (Acton, Valway, Helgerson, Huy, Smith, Chapman, & Ghodes, 1993; Stahn, Ghodes, & Valway, 1993). The members of the Pima tribe of southwestern Arizona have the highest rate of any defined population in the world, at the rate of 1 in 3 people being diagnosed with Type-2 diabetes (Knowler et al., 1993).

The northern plains tribes of the Wyoming/Montana area, although not as affected or as heavily researched as the southwestern tribes, have also been shown to have extremely high rates of diabetes when compared to the other ethnic groups in the U.S. Acton, Rogers, Campbell, Johnson, & Ghodes (1993) reported the rate of Type-2 diabetes to be 119 cases per 1,000 patients in members of the tribes of Wyoming and Montana who receive regular medical care from the Indian Health Service (IHS). Although these authors suggested that the rates of diagnosed diabetes were likely to be an underestimate due to the fact that no systematic screening process has been in place, the prevalence rate that they found was still 3.6 times that of the general population of the U.S. Ghodes (1993) estimated the prevalence rate of Type-2 diabetes at the Wind River Reservation of Wyoming to be 125 per 1,000 cases, slightly higher than the mean rate reported by Acton et al. (1993) for all tribes in the Billings, Montana area IHS.

Among other northern plains tribes, Stahn et al., (1993) reported the prevalence rates of Type-2 diabetes in the Winnebago and Omaha tribes of North Dakota and Nebraska to be 8.8 times the rates of the general population of the U.S. When examining the prevalence rates among the Sioux tribes of South Dakota, a prevalence rate was found

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that is 3.7 times higher than that of the U.S. general population.

Etiology of the disproportionate rates of Type-2 diabetes in Indian populations

Exactly how and why the incidence of diabetes has reached epidemic proportion among native populations is not fully understood. Several potential contributing factors have been proposed, including genetics, stress, and cultural issues.

Genetic theories.

The findings of Bogardus (1993) suggest that although Type-2 diabetes is characterized by obesity which may lead to abnormal insulin secretion, insulin resistance, and excess hepatic glucose output, genetic components also play a distinct part in the onset of Type-2 diabetes regardless of obesity.

The disproportionate rates of Type-2 diabetes found in Native populations has been hypothesized by some as being a result of a "thrifty gene" which may be present in NA/AIs. The "Thrifty Gene Hypothesis" states that NA/AIs have a gene which allows fat to be stored in a very efficient manner. Neel (1962) proposed that prior to Euro-American westward expansion, Indians acquired food via labor-intensive means such as hunting, gathering, and faming. Traditional foods were lower in fat and overall caloric value and the food supply was not as constant and effortless to obtain as it is today. Members of these groups experienced times of feast and famine and developed a quick-trigger response to insulin which was necessary to decrease urinary caloric loss. This "thrifty gene" may have historically allowed the NA/AI people to survive through times of little or no food supply. However as NA/AIs have become acculturated to European American eating habits, they have undergone a dramatic lifestyle and dietary change within the last

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century (within two generations) and their bodies have not genetically adjusted to this dramatic change (Neel, 1962). An increasingly steady diet with higher fat content is now readily available and the insulin response is no longer needed. What once had been adaptive, had became a liability resulting in increased rates of obesity and Type-2 diabetes (Neel, 1962).

Since 1962, there has been little evidence gathered to support Neel's original position regarding the pathophysiology or the existence of a thrifty gene. Neel (1982) has since proposed that three approaches are related to the thrifty genotype. First, some people may naturally produce more insulin due to the higher carbohydrate diet of the present day. The insulin trigger that maximized food storage in hunter-gatherer days is no longer needed so the beta cells become overworked, lose the capacity to respond to glucose cells, and the result is Type-2 diabetes. Neel's second approach proposes that some people may be genetically predisposed to have a lower level of insulin receptors or a greater insulin regulation response. Fewer properly functioning receptors may result from increased carbohydrate intake. In hunter-gatherer days, fewer cells would have led to a more efficient utilization of nutrients; today, it may lead to Type-2 diabetes. Third, some people may have a greater difference in insulin and lipid metabolism rates. This difference may cause the body to store lipids (fat) at a higher rate than needed leading to obesity, and overt diabetes.

In addition to the proposed gene that allows fat to be stored efficiently, there is a much higher fat content in the food eaten today by not only NA/Ais, but the entire U.S. population in general (Ravussin, 1993). A more consistent food supply that requires less physical effort to be obtained combined with the increased caloric and fat content of food

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in the diet has lead to an increase in obesity in many NA/AI populations (Knowler et al., 1993; Ravussin, 1993).

There are those who disagree with Neel's thrifty genotype theory. According to Joffe and Zimmet (1998), there are alternative explanations regarding the onset of Type-2 diabetes in indigenous populations. Citing research in developing communities in South Africa, they propose the "Thrifty Phenotype Hypothesis" where perinatal malnutrition causes beta cell dysfunction which leads to Type-2 diabetes. Hales and Barker (1991) also support the thrifty phenotype over the thrifty genotype hypothesis. They propose that mothers who had poor nutrition while pregnant are more likely to produce babies who will be predisposed to diabetes in later life. The malnutrition that the fetus experiences results in the vital organs like the brain receiving what nourishment is available. This potentially leaves organs like the pancreas short of full development. As a result, the beta cells which produce insulin are not able to continue to produce the necessary insulin in later life, particularly if over stressed by lifestyle (Hales & Barker, 1991).

Traditional tribal perspectives on diabetes etiology.

"*We don't know this diabetes*" -Burton Hutchinson, Northern Arapaho

According to the biomedical view, disease is recognized objectively; it is determined by physical signs, symptoms, lab tests and other specialized methods. The biomedical focus of disease is on abnormalities in the structure and function of bodily organs and systems. There are suggested causes of diabetes from the biomedical model; however the exact cause remains elusive. Indians have their own cultural ideas about and explanations of diabetes as an illness. In the tribal perspectives on diabetes etiology there is heavy emphasis on the relationship between the dramatic changes in diet and lifestyle

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that Indian people have experienced and the increasing rates of Type-2 diabetes in Indian populations. Diabetes is explained as a disease that results from a holistic way of life being altered or unbalanced by the dramatic lifestyle changes imposed upon Indians. Diabetes is considered a new disease among many Indian tribes of the United States, one which was introduced to them by the white man.

There is no oral history or recollection of diabetes among Indian populations prior to the establishments of reservations and the encroachment of the United States government. Diabetes is viewed by many Indians as a "white man's disease" much like diphtheria, tuberculosis, and smallpox (Garro & Lang, 1993; Garro, 1996). Interviews with Dakota Sioux tribal members from the Devil's Lake reservation found that the Dakota referred to diabetes affecting "the people" as opposed to an individual. This depicts diabetes as an experience by the tribe as a collective group rather than members as individuals (Lang, 1989). The stories of the Dakota inform us that the Dakota were once healthy prior to being forced onto reservations. However after the reservation era began, many Indians became ill with outside sicknesses that the white man brought to them (Lang, 1989). Among the Dakota, sugar is perceived as an illness that has altered the Dakota way of life, reporting that it has left them unbalanced (Lang 1989). Diabetes is seen as the most recent instance of white destruction of Indian culture and society according to some Dakota people. Furthermore diabetes is not considered treatable by traditional means (Lang, 1989). George, a traditional Dakota man, offers the following descriptions of diabetes:

> *"We once ate the right foods and lived the way as Wakantanka intended us to, people used to live to a very old age before we were put onto reservations... it is all the foods that we eat now, they make us sick, all the sugar, I think it is all the stress from living all bunched together in these*

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new housing projects that I think keeps my sugar up." (Lang, 1989)

Some tribal people attribute diabetes to not living the right way or to not carrying out traditional tribal responsibilities as they should. Examples of such causes are mourners not following the one-year period of mourning, or going against a vision. These are seen as having a negative impact on the tribal culture. Lang (1989) interviewed Carl, a traditional man who is well respected within his tribe. He explains:

> *"I wouldn't want to speak for others, but a lot of things are happening these days because people aren't acting like they are Indian anymore. Things aren't being done right around here on this reservation and we seem to have more and more of these problems like diabetes."* (Lang, 1989)

Carl also believes that the future will not be better for his people if traditional knowledge and practice continue to decline; he believes that illness will increase:

> *"This is a new disease for us Indian People, we didn't have this in the old days, and I think that it has to be treated by white man's medicine, I don't think traditional medicine will work for this condition. I have been considering something besides the clinic, I know about Yuwipi and I have been to ceremonies, but I don't think that diabetes can be cured in a Yuwipi ceremony."* (Lang, 1989)

Garro (1996, 1993) found that among the Anishinaabe, diabetes was consistently referred to as a new disease and that the Anishinaabe tended to group the causes of diabetes in four main groups: food eaten, weight, biomedicine (needles), and heredity. The message again was that the Indians had not experienced diabetes until contact was made with the European people:

> *"Most of the diseases came from the white man. I think our immune system long time ago was so powerful that up until they brought some certain germs from Europe or whatever it was, it practically wiped us off the face of this earth."* (Garro, 1996)

The tribal accounts for the etiology of diabetes make it clear that diabetes is a new

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disease to NA/AIs. However, similarities exist between Indian and biomedical explanations as to how the disease has manifested itself in this population, as the focus of both is on dramatic changes in lifestyle choices, levels of stress, and dietary habits.

"Those old guys told me; us guys we used to look like greyhounds all lean and hard, but these young kids, they don't look like that anymore, the food is too easy to get and its just not good for you, that's why we have so much diabetes these days, were gonna have to do something about it" – Northern Arapaho Tribal elder-

Chronic Stress as a diabetes risk or etiological factor among Indians.

Although stress was not measured in this study, it is an important facet of diabetes, perhaps related to the onset and a factor in the management of the disease like no other. Stress is known to be a risk factor in the onset of many psychological disorders, and is often a physical reality in NA/AI populations. The historical trauma experienced by many NA/AI populations is one of many factors thought to be related to increased levels of daily stress faced by groups who have experienced oppression and is also believed to be a component of fatalism. Dealing with chronic stress requires coping mechanisms to be adjusted to adequately manage daily affairs, prevent the onset of illness, and to promote health. However the result of the coping resources becoming overwhelmed leads to a negative impact on our health, which often becomes even more important to those with a chronic condition such as diabetes.

In addition to the explanations of the onset of Type-2 diabetes outlined above, the effects of the excessive level of chronic stress experienced by NA/AIs in the past 500 years must be considered. The treatment of Indian tribes by the United States appears to be the defining source of the chronic stress that this population has faced for the last five

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centuries and continues to face today.

Throughout history, there has been an attitude that Indians were less than human to the Euro-American invaders of what is now the United States. The first president of the United States, George Washington, when addressing his Indian policy stated, "The immediate objectives are the total destruction and devastation of their settlements, it will be essential to ruin their crops in the ground and prevent their planting more" (quoted in Diamond, 1992 p.74). Former president Theodore Roosevelt told his constituents, "The settler and pioneer have at bottom had justice on their side, this great continent could not have been kept as nothing but a game preserve for squalid savages" (quoted in Diamond, 1992 p.27). General Phillip Sheridan of the United States Cavalry stated, "The only good Indians I ever saw were dead" (Diamond, 1992, p. 66). More recently, Ronald Reagan has been quoted saying that Russia was the "evil empire". When asked by a group of Russian students whether or not NA/AIs were considered United States citizens, he looked quite puzzled, turned to one of his aides, and replied to the students that he was "unsure" about the citizenship status of NA/AIs (CBS News File, 1983).

During his term as president of the United States, Richard Nixon warned the citizens of the United States that Russia was bad. Nixon warned that Russia was bad because she had not kept any treaty or agreement signed with her. "You can trust the Communists, as the saying went, to be Communists" (Deloria, 1969). American Indians must be stuck with the irony of such statements; America has yet to keep one Indian treaty or agreement despite the fact that the United States Government has signed over 400 such agreements with Indian tribes. It would take Russia an entire century to make and then break a comparable number of treaties as the United States has done in its own

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back yard (Deloria, 1969).

The official white attitude toward Indians and their lands was that discovery gave the United States exclusive rights to extinguish Indian title of occupancy either by purchase or by conquest and forcible removal of Indians. However, the United States government acquired the land not through conquest or purchase, but rather through what is known as "trusteeship." Few tribes were ever defeated in war by the United States, and even fewer sold their land to the United States. Most sold some land and allowed the United States to hold the remainder in trust for them. From this humble beginning, the federal government stole some two billion acres of land and continues today to take what it can without raising any suspicion among the public that could create embarrassment and outcry. The position of many in the general public has been that the United States gave the Indians land (i.e., reservations) and that the Indians have not done anything with it; this is simply a reversal of the facts. "Truth be known that the only thing that the white men ever gave the Indian was disease, poverty and Christianity" (Deloria, 1969, 1992).

This type of blatant violation of the treaties that the United States signed with the Indian tribes of North America has caused much bitterness against the white government and mainstream American society. Many Indian tribes find themselves wondering what their rights are; for no matter where they turn, treaties are disregarded and laws are used to deprive them of what little land and other resources remain to them. When Indian people remember how weak and helpless the United States once was, how much it needed the good graces of the Indian tribes for its very own existence, how the Indians kept these people alive in the most difficult of winters and droughts, they burn with resentment at the treatment they have since received from the federal government. This

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incredibly sad and traumatic history has produced a high level of distress that Indian people of the United States live with on a daily basis. This distress level is real to Indian people, and only imaginable to those have not experienced it in their daily lives.

There is a commonly held belief among NA/AIs that a type of historical trauma exists which is often referred to as trans-generational trauma. This concept of trans-generational trauma posits that generations of NA/AIs continue to experience and suffer from post traumatic stress disorder type symptoms such as depression which are the result of their ancestors' exposure to previous highly traumatic events (Whitbeck et al., 2004). This historical trauma sensitizes NA/AIs to current mistreatment and compounds their level of stress. The unresolved psychological distress inherent in trans-generational or historical trauma is believed by many members of NA/AIs communities to be responsible for the high rates of challenging social issues such as domestic violence, substance abuse, and high rates of adolescent suicide.

The historical oppression of Indians by the United States government has produced a high level of distress in the Indian populations of the United States. It takes little effort to recognize the stress that Indian people live with; knowing that the very government which has promised so much and delivered so little in the past 500 years today has plenary power over them. It is an overwhelming stress on an individual as well as a community level to know that such government could deliver with the swiftness of a congressional vote and the signature of the President, a final blow terminating the existence of Indian tribes as they have known themselves for thousands of years.

Thus, this is a population which has lived under stressful conditions since the arrival of Euro-Americans in the late 1400s and westward European expansion began.

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Many of these conditions continue today. Indians have been forcefully relocated from their original homelands, subjected to genocidal attempts by the United States government and exposed to diseases that were unknown to them prior to Euro-American arrival on the North American continent.

Moreover, today while social and economic conditions on a few Indian reservations are bright, on most Indian reservations of the United States they are desperate. Select tribes such as the Mashantucket Pequot have incredibly successful gaming casinos and the White Mountain Apache tribe owns a successful multi-million dollar ski resort (Deloria, 1997; Utter 1993). But upon closer examination of Indian country in its entirety, it is much more common to see rates of chronic unemployment in the 50-80% range, increased rates of traumatic and accidental death, and poverty stricken living conditions often comparable to third world countries (Deloria, 1999; Utter, 1993). White (1990) reported that 25% of all NA/AIs live below the poverty line. In reservation communities, the rate of those living in poverty rises to 40% (O'Brien, 1990). This is a population which has undergone an extremely difficult lifestyle change in a very short time frame, and continues to experience a tremendous amount of stress due to the influence of a Euro-American way of life which was forced upon them. "The issues and problems that Indian people live with on a day-to-day basis are extremely complex, it takes a lifetime of education to even begin to understand them" (Giago, 1991; referenced from a speech given to high school commencement).

The tragedy of the past is that it sets precedent for land theft and other violations today, even when there is no longer any real need to steal such vast areas, nor violate such rights. However, the truth is that more damage is being done to Indian people

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currently than was done in the last century; water rights are being trampled on, promised health care is chronically under funded, and land is being condemned for irrigation tracts benefiting primarily non-Indians and reclamation projects. Simply put, Indian rights are being ground into the dirt (Deloria, 1969).

Stress and Type-2 diabetes.

As stated earlier in this paper, although we are not measuring stress the impact of stress on Type-2 diabetes is an area that continues to be researched as there is evidence that stress may be involved in the onset of diabetes, and increases the difficulty in managing the condition. There has long been speculation that stress is involved in the pathophysiology of Type-2 diabetes. Stress has long been suspected as having major effects on metabolic activity (Surwit & Schneider, 1993). The effects of stress on glucose metabolism are mediated by a variety of "counter-regulatory" hormones that are released in response to stress and which result in elevated blood sugar levels and decreased action of insulin. In diabetes, stress due to a lack of insulin or to the body's inability to use insulin (insulin resistance), results in increases in levels of blood glucose levels that cannot be properly metabolized. This indicates that stress has a contributory effect on hyperglycemia, although the exact role stress plays remains unclear (Surwit & Scheneider, 1993).

Stress also appears to have a role in the etiology of several long-term health problems. For example, air traffic controllers who work in busy airports where the danger of collision is highest show a greater incidence of high blood pressure and are at increased risk of developing both ulcers and diabetes (Cobb & Rose, 1973). Over the last 20+ years, there has been speculation that the autonomic branch of the sympathetic

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nervous system is involved in the pathophysiology of Type-2 diabetes (Feldberg, Pike & Stubbs, 1985; Surwit & Feinglos, 1988). Claude Bernard found that hyperglycemia could be produced in rabbits by lesioning the hypothalamus (Surwit & Schneider, 1993). The hypothalamus is the structure of the brain that controls the autonomic nervous system and the endocrine system via the hypothalamic-pituitary axis, which controls the release of the stress hormone cortisol. In addition, the hypothalamic-pituitary axis directly affects the functioning of the pancreas which is responsible for insulin production and secretion (Mcewen, 1994). Diabetes is considered an endocrinological disease.

The neurotransmitter norepinephrine also serves as a stress hormone in the human brain. Microdialysis studies have shown that stressful situations increase the release of norepinephrine in the hypothalamus, frontal cortex, and lateral basal forebrain. Cortisol, which is a steroid secreted by the adrenal cortex, also has shown in chronic stress to have deleterious effects on the hypothalamus. Cortisol is called a glucocorticoid, because it has profound effects on glucose metabolism (Carlson, 1998).

Recent research has shown that hyperglycemia can be produced by chemical stimulation of the brain with morphine and from a slow intravenous infusion of epinephrine, as well as from the type of stress that results in prolonged sympathetic discharge (Surwit & Schneider, 1993). Stressful stimuli can also result in increased blood glucose levels via several different hypothalamic-pituitary pathways. For example, cortisol, which is released in response to stress, results in enhanced glucose production by the liver and diminished cellular glucose uptake, which then results in increased blood glucose levels and decreased glycemic control. A hypothesis suggested by Bjornthorp (1991) is that this mechanism may lead to both obesity and a predisposition to diabetes if

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individuals are exposed to chronic stress. The adaptive benefits of the mechanism of stress-induced energy mobilization in healthy individuals appear to be detrimental in diabetic patients, where glucose metabolism is compromised and becomes problematic.

There is a great deal of scientific data to this point which gives a clear indication that stress plays a role in the pathophysiology of diabetes. As with many medical conditions stress appears to negatively impact the management of diabetes, and in some cases may exacerbate medical complications.

Fatalism.

A likely result of some of the same conditions described above related to long-term stress, is the existence of fatalistic thinking in this population. Fatalistic thinking is proposed as a similar construct to the notion of inevitability, that diabetes and its complications are inevitable. This may be a contributory factor in the onset of Type-2 diabetes, and in the resistance to implement behavior change which could actually prevent or delay complications. Previous research has shown support for the presence of a fatalistic thought pattern similar in this population (Calhoun, 1999). However, one must proceed with caution as some fatalistic thought may not necessarily be bad or at least may be adaptive. For instance a Shoshone man revealed that the idea of acceptance of one's time to go home to be with the Creator (to welcome death) is a culturally accepted concept and may be mistakenly interpreted as fatalism and therefore wrongly considered as unhealthy (Calhoun 1999). There is a common belief among many NA/AIs that it is one's duty to go on to the next life and become the earth for the next generation to walk on, this is important to remember in all of this.

Fatalistic attitudes influence health related behavior. The idea of inevitability has

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been shown to contribute to resistance of behavior management in heart disease (Davison, Frankel, & Smith, 1992). In the field of heart disease, the current orthodoxy of prevention is focused around the need to change daily habits, specifically those involving diet, exercise, and tobacco use (Davison, et al., 1992). However it is clear that knowledge of a behavioral cause of ill health does not automatically imply the abandoning of that behavior. Given that good health is nearly a universally desired goal, one somewhat crude response from professional health education has been to question the rationality of some sectors of the lay population and label them fatalistic. An important thing to note is that we are continuing to learn about the complexity of this concept of fatalism which may be interpreted differently by distinct cultural groups, and may be influenced by religious beliefs. Developing a working understanding of fatalism is an ongoing challenge to those working in fields such as health psychology.

Historical contributions to fatalism & stress among the Shoshone & Arapaho.

> *"When a kindness is shown a white man he feels it in his head and his tongue speaks; when a kindness is shown an Indian he feels it in his heart, and the heart has no tongue." (Washakie, 1878)*

Washakie, Chief of the Shoshones for nearly 60 years and friend to the white man and white government nearly all his life, eventually came to a point in the late 1800s where he no longer trusted the white government and its promises. This time in Shoshone history may well be associated with the onset of distrust and fatalistic thinking regarding the future for the Shoshone people. The betrayal that the Shoshone Tribe has endured at the hands of the U.S. government in the last century, like many other Indian tribes of the United States, is pervasive. However, one blatant example is that in 1878, ten years after

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Washakie was given the "Wind River Country" for his Shoshone people, the U.S. government placed the Northern Arapaho tribe (a historically bitter enemy of Washakie and the Eastern Shoshone) on what was known as the Shoshone Reservation at that time. Chief Washakie was told that this was only temporary and that the Northern Arapaho would be moved in the spring of 1879. This move of the Northern Arapaho Nation that was promised to Washakie never occurred.

In 1927, the Eastern Shoshone tribe sued the United States for giving the Northern Arapaho tribe a portion of their reservation without permission or compensation. After 12 long years of litigation, the Shoshone tribe won a 4.5 million dollar settlement (termed the Tunnison Award) from the U.S. government (Trenholm & Carley, 1964). In 1939, the Northern Arapaho tribe became permanent residents of the Shoshone reservation as part of this settlement. The name of the Shoshone Reservation was officially changed to the Wind River Indian Reservation. Ironically, the U.S. government deducted from that 4.5 million dollar settlement the incurred costs of operating the Shoshone Reservation from 1868 to 1939. Livestock and rations that had been part of the 1868 treaty, such as cattle, agricultural seed, and tools, were now being deducted from the settlement that was intended to right the wrong doing of the U.S. government to the Shoshone tribe. In addition, Washakie had previously been given a silver lined saddle by President Ulysses S. Grant. The saddle had been given to Washakie in honor of his willingness to cooperate with the U.S. government. Sadly, as part of the settlement of 1939, the Shoshone tribe was actually charged for the cost of that saddle, which was given to Washakie as a gift in honor of his service to the U.S. Government (Trenholm & Carley, 1964).

Chief Black Coal became the principal chief of the Arapaho in the spring of 1872

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(Flynn, 1991). Although not known as friendly to the U.S. government as was Washakie of the Shoshone, Black Coal, whom was a distinguished warrior at a young age, did serve as a military scout for the U.S. government. Black Coal assisted in the roundup of Sioux and Northern Cheyenne by General Crook and his forces in 1876. This service was to be in exchange for a reservation near the Tongue River in northern Wyoming promised to Black Coal by General Crook. This promise died with General Crook died, and the Tongue River Reservation was never granted to the Arapaho.

In 1878, Black Coal's people and many other Arapahos were placed on what was at that time the Shoshone Reservation. The Arapaho tribe, much like the Shoshone, consisted of several bands who would come together seasonally for hunting and ceremonies. This was to be a temporary placement until the Arapaho could be moved to a reservation that had been promised to them in southern Wyoming and northern Colorado extending eastward to Nebraska and south to Kansas. This move never occurred. This reservation, like the one in northern Wyoming that was promised to the Arapaho, was never granted. This reservation, however, had actually been part of an agreement that the Arapaho had signed in 1851 during the signing of the first Fort Bridger treaty, but had never been granted. After Black Coal died in 1892, Sharpnose became the principal chief of the Northern Arapaho.

Sharpnose was the last chief of the Northern Arapaho and was instrumental in keeping the Arapaho in Wyoming on what would eventually become the Wind River Indian Reservation. Sharpnose died in 1901, one year after the death of Washakie, the last chief of the Shoshone. Sharpnose's last spoken words were to Charles Little Ant:

> *"My friend I am dying of my battle wounds. Watch out for our children and yourselves, stay together as the Arapaho have always been together*

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since our beginning... beware of the stranger and his strange ways"
(Sharpnose, 1901)

Distrust in the white man was present in the last words of the Arapaho Chief. The Arapaho, like the Shoshone, eventually sued the federal government in 1955 for failing to pay them for the homelands lost to non-Indians in parts of Wyoming, Nebraska, Kansas, and Colorado. These lands consisted of the reservation that been promised them in the original Fort Laramie treaty of 1851. The Arapaho tribe won the claim in 1961. The U.S. government, however, claimed the award monies, stating that the award monies would serve as reimbursement for the 1940s settlement money paid to the Shoshone tribe to allow the Arapaho to stay at the Wind River Reservation. Thus the Arapaho ended up actually paying the U.S. government for half of the Wind River Reservation (Flynn, 1991).

The final result of all the broken promises and broken treaties was that two Indian tribes who were traditionally bitter enemies were being placed together to live on the same reservation apparently permanently. The history of the two Wind River Reservation Indian tribes is filled with many more examples of deceit and broken promises too numerous to mention here. The historical oppression and wrongdoing by the U.S. government leaves little to the imagination as to why the members of this population have a great amount of distrust toward the white culture, the U.S. government, and its representatives. Fatalistic thinking based on hopelessness seems likely to be present in this population. This may result from the members of this population feeling as though they are controlled by a government that they have no influence over. Hence, the feelings of not being in control over their own living conditions and or political situations would seem to be a likely result.

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Why quality of life is an important construct in DM care and why must we consider it here?.

Quality of life (QOL) is defined as a subjective perception of an individual's well-being as it is related to his or her health status when compared to most people in a particular society. Quality of life is typically contrasted with quantity of life. That is, quality of life examines whether there is happiness, self worth, and self-satisfaction as opposed to focusing merely only on survival and longevity. When considering QOL as a construct, it is often thought of as being multidimensional and consisting of factors such as emotional well-being, lack of physical pain, satisfaction with treatment, future worry or concern, and physical functioning (Jacobsen, De Groot, & Samson, 1994).

The subjective nature of QOL is an important consideration when working with a culturally unique population. For instance, cultural acceptance or interpretation of a variety of conditions affecting health, including views toward death, may be interpreted differently from one culture to the next. Factors such as fatalism, karma and cultural predeterminism may be viewed as an essential part of the natural life cycle (Schipper, Clinch & Olweny, 1996). Involvement of family in a treatment regimen for a health condition is likely to be an important factor for many NA/AI populations, whereas in the mainstream population this may be viewed quite differently. One's perception of one's own QOL may also depend on the QOL of one's peers in the population who face similar circumstances. This may be applied to factors such as socioeconomic status, or the occurrence rate of a particular condition such as diabetes. If diabetes is prevalent in the population and access to treatment is readily available, the impact of diabetes on the QOL may be less so than when access to treatment is less readily available. There are several

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conditions to which this may apply; thus how QOL is interpreted may vary in culturally unique, as well as demographically distinct populations.

There is an increasing view that QOL is an essential health care outcome which is as important (in some cases perhaps more important) than symptomatic status in evaluating the effectiveness of any healthcare intervention (Frisch, 1998). Critics of the QOL approach have deemed such measures as unnecessary when compared to more traditional measures of symptom reduction. However, QOL scales have been shown to significantly predict variables such as subsequent physical illness, psychological disorders, and related health care costs such as treatment costs (Anderson, Kiecolt-Glasser & Glasser, 1994; Barufflo, Gisle, & Corten 1995; Dworkin et al., 1992, Moreland et al., 1994; Stewart et al, 1992). Assessing the QOL of patients being treated for physical or psychological conditions may lead to the improvement of treatment effectiveness (Spilker, 1990). At the individual level, QOL measures may assess the impact of treatment on functioning and everyday life; and on a much larger level, QOL measures may have an effect on how the comparative efficacy or effectiveness of different treatments or service delivery systems in serving patient needs (Frisch 1998). Health care buying groups such as insurance companies, managed care companies, government funded programs, and others are more likely to pay for the use of treatments and interventions which show evidence of improved client QOL (Henderson, James & Spiker, 1990). QOL assessments are also becoming routine in the evaluation of new treatments for cancer, panic disorder, and major depression (Frisch, 1998).

Thus, with innovative approaches, we may broaden the criteria for physical and mental health functioning to include happiness and life satisfaction. This may be in

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contrast to focusing on the presence or absence of psychiatric or physical symptoms as the only indicators of health and well-being. Strupp (1996) states that contentment, satisfaction, or subjective well-being are the most important criteria of "mental health" and positive outcome in psychotherapeutic treatment when examining the patient's perspective. Strupp (1996) further states that above all else the individual wishes "to be happy and to feel content."

Direct assessment of QOL is needed in treatment outcome studies because measures of symptom intensity often fail to capture a client's subjective satisfaction. Emotional well-being can not be inferred from symptom freedom alone. Research in both medicine and psychology has supported the notion that positive and negative affect may in fact be independent, rather than the opposite of one another. George et al., (1995) utilizing brain scan studies found that sadness and happiness may affect different areas of the brain (e.g., limbic system vs. right frontal and temporal-parietal cortex respectively) in divergent directions, therefore are not mere "opposites". In similar findings, Zevon and Tellegen (1982) noted a consistent pattern of independence between measures of life satisfaction and positive affect, as well as finding negative affect being independent of psychiatric symptoms. Further support is evident in the findings of Stewart et al. (1992; Ware, 1986) who observed independence of positive and negative affect in that physical disease and its treatment may take the joy out of life with no measurable increase in negative affect or psychiatric symptoms. Outcomes such as reduced pleasure and satisfaction with and enjoyment of life often are only captured by QOL measures (Moreland et al, 1994; Schipper, Clinch & Powell, 1990; Ware 1986). Overall, we may then be making a mistake to infer that someone feels good, simply because they do not

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feel bad.

Quality of Life in DM patients.

All illnesses pose unique challenges to the adaptive capacity of patients and their families, however each illness presents specific challenges and differing demands (Jacobsen, de Groot, & Samson, 1995). In diabetes, there is a vast array of medical complications directly resulting from brittle or poor glycemic control. These conditions range from generalized microvascular damage which may lead to neuropathy, to peripheral nerve and autonomic damage leading to chronic pain, and major vessel disease. This may also result in stroke, myocardial infarction, and gangrenous infection which can (and often does) lead to loss of extremities due to amputations.

In essence, diabetes not only requires intensive behavior change in lifestyle patterns to manage the disease, there is the constant threat of subsequent physically damaging and life endangering complications. Diabetes patients and their families are often very aware of such dangerous conditions so much so that the illness is experienced like a ticking bomb which could explode at any moment (Jacobsen & Hauser, 1983). In addition to the risk of medical complications, there is evidence that diabetes may be responsible for an increased risk of depression in those patients with diabetes (Lustman et al., 1986, Rubin, 1994).

Stewart, Greenfield, and, Hays (1989) found that patients with diabetes experienced a decrease in quality of life when compared to non-diabetic individuals. However, the decreases were not as great as those found in comparing healthy individuals to those in other chronic illness groups such as coronary vascular disease. When examining rates of depression in diabetic patients, Wells et al. (1988) found a similar

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pattern as the rates of depression in diabetic patients were higher than in the general population, although lower than in those patients with other chronic illnesses such as chronic obstructive lung disease and coronary heart disease. Although patients with diabetes may report lower levels of depression and better QOL than individuals with other chronic ailments, having diabetes increases risk for developing other health conditions. In essence we may see a cycle in which a person develops diabetes, thus is at increased risk for the development of depression and cardiovascular disease, ultimately leading to a further decrease in quality of life.

Jacobsen, deGroot, and Samson (1994) examined the effects of, number, and severity of diabetes complications on QOL. Overall, patients with diabetes report experiencing a decreased QOL when compared to non-diabetic individuals. However the severity of complications appears to have a stronger effect on QOL than the number of complications. The authors found that diabetes patients who experienced an increase in the severity of complications report the greatest decrease in QOL, followed by those who experienced an increase in the number of complications, when compared to non-diabetic individuals. The findings with regards to complications support the intuitive notion that those individuals with fewer and/or less severe complications resulting from diabetes would experience a higher quality of life.

QOL in NA/AIs.

Quality of life research in NA/AI diabetic populations, similar to most behavioral health research among NA/AIs, is limited in both the number and scope of studies. While two published studies were found which address quality of life measurement in NA/AI populations, only one of the papers addressed quality of life as specifically related to

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diabetes. Gilliland et al. (1998) randomly surveyed self-reported health related QOL in a population of rural American Indians in New Mexico, and compared the results to both the general population of New Mexico and to that of the greater United States. Their results revealed that a smaller proportion of the Indian sample described their general health as "excellent" or "very good." Johnson et al. (1996) administered the MOS 36-item Short Form Health Survey (SF-36) to a group of Pima Indians diagnosed with diabetes in Arizona and found evidence of a significant impact of diabetes on this population's health related QOL. The Pima Indian tribe of Arizona has been well documented to have the highest occurrence rate of Type-2 diabetes of any defined population in the world (Knowler et al., 1993). Both the Gilliland (1998) and Johnson (1996) studies report QOL as useful constructs in assessing quality of life related issues NA/AI populations; however, neither of the publications examined the construct of diabetes-specific QOL as an outcome measure in diabetes research.

The potential damaging effects of diabetes appears to negatively impact an individual's QOL as well as have a negative impact on the family. However there is some positive news related to the abundance of bad news when examining low QOL. Wagner et al, (1990) found that low life satisfaction may actually predict a willingness to participate in prevention programs aimed at unhealthy behaviors such as smoking. Thus, it seems reasonable that examining diabetes specific QOL may allow an individual who is experiencing ambivalence regarding addressing diabetes treatment to shift his or her decisional balance in the direction of change. Overall it appears that QOL measures, and more specifically domain based life satisfaction measures, may help identify those at risk for health problems such as diabetes, allowing for improved treatment and possible

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prevention.

Impact of Type-2 diabetes on Indian's Quality of Life.

In this population of Shoshone and Arapaho, as with many other Plains Indian tribes, there is an importance placed on quality of life as it relates to the individual's life currently, not for the future. Helping one's family and community is emphasized above planning for the future on an individual basis. This may be interpreted by mainstream culture as "shortsighted" although in many tribal cultures the view of time on a linear scale is somewhat foreign. In contrast to the majority culture's view of time as linear, time is viewed as relative to the present moment, day or event. Among many Indians the emphasis of time is viewed much differently as importance is placed on living for the day and managing the task at hand. This is not to disregard the future, but rather to respect the present. Therefore when considering a concept such as quality of life it is easy to see how differences between members of certain groups of NA/AIs and those of the mainstream population of the United States may influence the management of diabetes.

Diabetes Locus of Control and why it is important here

The general idea of locus of control makes sense; there are elements in our lives, some of which we may control and some that we have no control over. When we think of problems specifically regarding our health then it stands to reason that we would improve what we could as to maintain or promote our health. Thus an internal locus of control would seemingly be helpful. Whereas, if we believe that we do not control any aspect of our health then we might be less likely to work to improve or maintain our health. So, an external locus of control regarding our health may be less helpful. As is often the case

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what appears intuitive often becomes more complicated and at times contradictory when we look at real world application.

Previous studies of the relationship between locus of control and health outcomes have been conducted for a variety of medical conditions with mixed results (Peyrot & Rubin 1994). Many of these reports used Rotter's original internal-external scale with some finding a positive relationship between high internal locus of control and desired behavioral outcomes and medical related outcomes; while others have found the opposite (Peyrot & Rubin, 1994). Several studies have found that high internal locus of control was related to better adjustment in diabetes patients, better glycemic control and better treatment regimen adherence (Burns et al., 1986; Brown et al., 1991; Lowery et al., 1976; Jacobson et al., 1986). However, there are also studies which have found the opposite, patients who report high internal locus of control and had poorer adjustment and worse control (Peyrot & Rubin 1994). Peyrot & McMurray (1985) found that internal locus of control was associated with improved glycemic control; however Schlenk and Hart (1984) found that internal and external locus of control were both associated with regimen compliance, and both studies used the same instrument, the Mental Health Locus of Control. Using a measure of diabetes specific locus of control, Bradley et al. (as cited in Peyrot & Rubin 1994) found that chance locus of control (external) was related to worse metabolic control and that personal (internal) locus of control was associated with better weight, improved glycemic control, and psychological well-being. The mixed results in these studies which examined the role of locus of control are interesting and perplexing.

In an attempt to explore the contradictory findings regarding the role of locus of

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control in diabetes, a measure looking specifically at diabetes locus of control (DLC) was developed and tested (Peyrot & Rubin, 1994). These researchers found that attitudes which reflect internality are sometimes associated with positive health outcomes, and sometimes they are associated with negative outcomes. Interestingly enough, this paradoxical finding is consistent with findings from previous studies. "The finding that internality subsumes at least two independent components, autonomy and self blame, which are oppositely correlated with measures of physical health and emotional well being, is consistent with findings from other studies and deserves closer consideration" (Peyrot & Rubin, 1994).

Upon closer examination of the findings, the authors discovered that when internal DLC was separated into autonomy and self-blame, autonomy was associated with positive outcomes and self-blame was associated with negative outcomes. So how could autonomy and self-blame both be part of the internality construct, yet show different outcomes? The authors surmise that a possible positive correlation between autonomy and self-blame could be the result of a set of basic beliefs where people perceive diabetes as under their control. This may allow for acceptance of responsibility for their diabetes control when things are good, however, they also take on excess blame when their glycemic control worsens. So the concept of internality may apply to both adherent and non-adherent patients though the concept has different behavioral referents for each type of person (Peyrot & Rubin 1994).

The authors also speculate that the causation between autonomy and health outcomes may be quite different from those between self-blame and health outcomes. Autonomy may lead to improved outcomes via better self-care and increased emotional

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well-being, thus improved self-care may then lead to additional autonomy. Where self-blame might be a consequence of decreased self-care and may lead to further deteriorating efforts to engage in their own care (Peyrot & Rubin 1994). The authors recommend that closer examination of diabetes locus of control be considered to better understand this relationship.

The other paradoxical finding from this study reveals that external locus of control is sometimes related to negative outcomes and sometimes it is related to positive outcomes. According to Peyrot and Rubin (1994) one component of external locus of control, "chance DLC" was related to negative outcomes such as frequent hyperglycemia, less regular exercise, poorer diabetes knowledge, and lower levels of emotional health reflected by low levels of self-esteem and increased levels of depression and anxiety. They report that the other component of external DLC, "powerful other" was more likely to be related with positive health outcomes.

The authors reveal that when external locus of control was examined closer, the powerful other component broke into two components, health professionals and non-medical others. They state that at this point the pattern of negative and positive relationships became increasingly clear.

The negative outcomes (infrequent insulin dosage and lower levels of diabetes knowledge) had a stronger association with high scores on the health professional component. In turn, the positive outcomes (infrequent late shots and infrequent binge eating) were associated with high scores on the non-medical other component.

The differences noted here reflect the fact that healthcare providers likely prescribe insulin doses and educate patients and the result should be a stronger effect on

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these factors, while other (primarily family members) are more likely to be involved in reinforcing patterns such as meals and timing of medication. The authors point out that for each measure of behavior or well being where results differed for the two components of powerful other DLC, the non-medical other component appears to have been more beneficial (Peyrot & Rubin, 1994).

They summarize the relationship between powerful others and outcomes: "While it may be to the patients benefit to depend on certain healthcare professionals and others, it may be a disadvantage to depend on specific others." They also state that regarding the support of others, "Certain support people appear to be part of the problem, while others are part of the solution" (Peyrot & Rubin, 1994). In response to these paradoxical findings, the authors conclude that this area of external locus of control and its effect on diabetes management is one of importance which should be addressed in future studies.

The Peyrot and Rubin (1994) study did not involve a population of NA subjects; however, it does suggest that locus of control may play a part in health related behaviors and outcomes. In a previous study examining locus of control in this same NA population Calhoun (1999) found support for a relationship between locus of control as defined by Peyrot and Rubin (1994) and fatalism as defined by Calhoun 1999 ($\underline{r}$ [139] = .453, $p<$ .01). This suggests that the notion of locus of control may be a useful construct in measuring health related behaviors and outcomes in a specific population of NA patients with diabetes.

The Role of Behavior in Type-2 Diabetes Prevention and Management

Given the profound impact of Type-2 diabetes among NA/AIs, identification of

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risk factors, as well as development of prevention strategies and management techniques are desperately needed. Despite the high prevalence of diabetes and feelings of fatalism, there are behaviors that can reduce an individual's likelihood of developing the disease, or at least delay the onset, and that can minimize the secondary complications associated with diabetes. For example, Sarol, Nicodemus, Tan, and Grava (2005) report that increased self-monitoring of blood glucose level (SMBG) is associated with improved glycemic control among Type-2 diabetes patients. Despite the importance of adhering to treatment recommendations to minimize DM related complications, patients often have difficulty making the necessary lifestyle changes and few interventions to increase adherence have demonstrated efficacy (Vermeire, Wens, Van Royen, Boit, Hearnshaw, & Lindemeyer, 2005).

Impact of diet & exercise in diabetes.

Lifestyle factors such as improved diet and increased exercise have been demonstrated to significantly decrease the incidence of Type-2 DM by as much as 58% compared to 31% with medication treatment (DPP Research Group, 2002). Obesity is currently considered the leading risk factor in the onset of Type-2 diabetes (Bennett & Johnson, 1992; Knowler et al., 1993). Upper body fat distribution and body mass index contribute independently to the probability of developing diabetes (Foreyt & Goodrick, 1995). Weight loss in obese individuals is associated with improved glycemic control. There are many possible explanations for this, however one that is well supported is that a loss of weight reduces insulin resistance thereby improving the body's ability to use insulin efficiently (Meyer, personal communication 2002).

Due to the exacerbating impact of obesity on diabetes, diet plays an important role

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in diabetes prevention and management. Insulin sensitivity can be increased with dietary changes that assist in weight management (Knowler et al., 1993). Weight loss in obese people is associated with better glycemic control. Decreased insulin secretion, increased hepatic glucose output, and peripheral insulin resistance are affected positively by moderately low or very low calorie diets (Foreyt & Goodrick, 1995).

Exercise has also been shown to be beneficial to diabetic management, glycemic control, and reduction of the risk of complications resulting from diabetes. The role of increased physical activity in preventing and controlling chronic diseases has been well documented. Control and prevention of coronary heart disease, hypertension, Type-2 diabetes, obesity and improvement in mental health have all been clearly associated with physical exercise (Patrick et al., 1994). In adults with Type-2 diabetes, regular aerobic exercise is associated with decreased blood pressure and improvements in glycemic control. Strength training has also shown to be beneficial to those diagnosed with Type-2 diabetes in improving insulin sensitivity and glucose tolerance (Foreyt & Goodrick, 1995).

Kaplan, Hartwell, Wilson, and Wallace (1987) compared the outcome of adults with Type-2 DM assigned to either diet, exercise, diet and exercise, or education. Their results suggested that the combined diet and exercise group demonstrated significantly greater reductions in HbA_{1c} and improvements on a measure of quality of life.

Prevention of secondary complications resulting from Type-2 diabetes.

Health problems associated with Type-2 diabetes include kidney failure, blindness, coronary problems, nerve cell damage and even death. Lifestyle adjustments such as increased rates of exercise and improved dietary habits, maintained consistently

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have been shown to assist in the prevention of long term medical health complications in Type-2 diabetes. The Diabetes Control and Complications Trial (DCCT) established that near normal glycemic control using "intensive" treatment delayed the onset and progression of diabetic retinopathy, nephropathy, and neuropathy (DCCT; Doherty et al., 2000). The United Kingdom Prospective Diabetes (UKPDS) Study also indicated that improved blood pressure management and glycemic control resulted in reduced complications of diabetes such as retinopathy, amputations, and renal failure (Doherty et al., 2000). Although there are many known biotechnical solutions available to manage diabetes, behavioral change is essential to this process (Doherty, 2000).

Given the importance of behavior in the prevention and management of diabetes, this introductory chapter will now turn to the psychological literature on how people change their behavior and the therapeutic techniques that have been developed to encourage such change.

Depression: A serious condition, often under-diagnosed, and under-treated

It is well documented that depression can have a negative impact on individuals' quality of life and increase the difficult task of managing diabetes. Depression is arguably one of the most prevalent and serious medical conditions health care providers face today. Symptoms of depression include: a persistent sad mood for at least two weeks; loss of interest in activities in which the individual previously found pleasure; significant change in body weight or in appetite; difficulty with sleeping; physical agitation or slowing; loss of energy; feelings of worthlessness; difficulty concentrating; and recurrent thoughts of death or suicide. A person experiencing depression is likely to suffer a

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decreased ability to function mentally and physically, or in some cases both. There is considerable debate as to whether depression should be considered a chronic condition as the symptoms may last for weeks, months, or in some cases for years with a waxing and waning pattern. Individual variation in experience of depressive symptoms, the duration and course of depressive episodes, along with differing responses to treatment point out the complex interaction between psychosocial, environmental, and physiological factors involved in this condition.

Persons diagnosed with depression have a significantly higher rate of emergency room visits, and have medical costs two times that of non-depressed individuals (Finkbonner, 2002). Of the top ten medications covered by managed care plans, in many states, seven are for the primary treatment of depressive disorders. The National Institute of Mental Health (NIMH) estimates that nearly 10 percent of adults in the United States (more than 19 million people) experience some form of depression every year (www.NIMH.nih.gov, 2005). The estimated occurrence rate of depression in the general population is from five to twenty five percent (DSM-IV). The specific etiology of depression is unknown at this time and appears to be quite complex. Research has shown support for several factors which may be related to the development and onset of depression, including a decrease in neurotransmitter levels along with interactions among environmental factors, genetic predisposition, stress, and difficult life events. Although there are several effective therapies for treating depression, as many as two out of three cases of depression are left untreated by primary care physicians encountering a person with the disorder (Anderson, Freedland, Clouse & Lustman, 2001).

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Depression & Diabetes: The chicken or the egg?

There is considerable debate today, as has there has been historically about the interaction and relationship between depression and diabetes. In 1684, a European physician by the name of Willis discussed the belief that depression and diabetes were related and perhaps that depression lead to diabetes (Anderson et al., 2001). Today we know that there is a complex interaction among a wide variety of physical, psychosocial, environmental, and genetic factors in the onset and course of diabetes. The relationship between diabetes and depression is well established and the understanding of this enigmatic relationship is increasing.

In a meta-analytic review of the literature on depression and diabetes, Anderson et al., (2001) concluded that clinicians can expect to see patients diagnosed with diabetes, twice as likely to be depressed as those without diabetes in similar settings. It was also estimated in this analysis that as many as one-third of patients with diabetes has depression at a level that impairs daily functioning and quality of life, adherence to medical treatment, glycemic control, and increases the risk of diabetes complications. The evidence also suggests that when Major Depressive Disorder (MDD) is present in patients with diabetes, the depression has a higher recurrence rate, and increased length of duration (Lustman, Griffith, & Clouse, 1988).

Depression is associated with difficulty in glycemic control, specifically hyperglycemia, which leads to increased risk of medical complications resulting from diabetes (Talbot & Nouwen, 2000). There is also evidence from 3 separate clinical controlled trials which support the notion that treatment which improves depression improves glycemic control (Lustman et al, 1997; Lustman et al., 1998; Lustman et al.,

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2000)

There is a common belief that depression may occur secondary to diabetes, resulting from the impact diabetes and its treatment is likely to have on daily functioning, though there is little evidence of this. For instance when comparing MDD findings such as positive family history and distribution among the sexes, there is little difference between MDD among those without diabetes in the general population and those with diabetes. Talbot and Nouwen (2000) further report that analysis using the American Psychiatric Association's DSM-IV criteria, does not support the notion of a mood disorder caused by diabetes.

However, there is considerable support for the inverse, as there is evidence that depression doubles the risk of incident Type-2 diabetes (Eaton et al., 1996; Kawakami; 1999). There is also evidence that the development of depression precedes the development of diabetes by many years (Lustman et al., 1988). Longitudinal studies have shown that Major Depressive Disorder increases the risk of developing Type-2 diabetes and resulting diabetic complications, whereas the opposite view is not supported (Talbot & Nouwen, 2000). It appears unlikely given the evidence available at this point that the initial onset of Major Depressive Disorder is secondary to or caused by Type-2 diabetes. Rather, evidence is building for the opposite case where the presence of MDD or depressive symptomatology increases the risk for the development of Type-2 diabetes and the resulting complications of diabetes.

Previous studies have shown that depressed mood is related to diabetic complications. So it becomes evident that when the complications increase, the probability of depression also increases. Rubin (1997) reports that "although many people

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may suffer psychological distress following a predictable crisis of diabetes, most accommodate over time, often quite rapidly and quite well." Although, the number of complications may have an effect as we see an increased risk for depression among those diabetes patients who have three or more complications (Anderson, et al., 2001).

Overall, it is apparent that the relationship between diabetes and depression is complex. And there is strong support that depression may interfere with efforts to achieve normoglycemia both physiologically and behaviorally. There is empirical evidence to support the notion that successful treatment of depression leads to improvements in glycemic control which may lead to prevention of long-term complications. Improved methods of recognizing and treating depression in medical settings is likely to benefit patients with diabetes.

Depression in Native Americans/American Indians.

There are unfortunately no large scale estimates or epidemiological studies detailing of the rates of depression or other psychological conditions among NA/AIs in the literature (Department of Health & Human Services - SAMHSA, 2001). There are several small limited studies regarding rates of depression in specific NA/AI populations; however these have questionable application within the population which participated in this study.

The reasons for this lack of sufficient data are numerous. Permission to conduct research in NA/AI populations is often restricted by tribal governments and such access is not easily gained in rural reservation settings. The reasons for such restrictions are with merit, and a detailed examination of these reasons is beyond the scope of this paper. However, it is suffice to say that historical abuse by previous research entities has lead to

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an immense distrust of research in this population in general.

In addition, the physical collection of research data is difficult due to a lack of centralized health centers or clinics which serve NA/AIs. The Indian Health Service (IHS) is the primary provider for many of the NA people who live on or near a reservation. Data on prevalence rates of depression is not tracked by IHS and therefore not readily available from IHS records. However, the IHS provides access to healthcare for approximately only 20 percent of the population. One third of AI do not have a steady source of health care such as a regular doctor or clinic that provides them with care. The logistical challenge of collecting reliable epidemiological data is significantly increased among this population.

The heterogeneity of this population also complicates accurate epidemiological estimates. There are at least 561 federally recognized distinct groups of Indians in the United States. In addition, there are other tribal groups which have lost their official federal recognition, but have preserved identifiable cultural features which are unique. Furthermore, the majority of people within the United States who identify themselves as NA/AI live in non-reservation urban settings; these are often groups of many different tribal affiliations. This results in data which may be less applicable to other tribal groups. In many of these tribal groups there are also distinct differences in the description of what a depressive episode may entail. Thus, the language of diagnostic criteria may not be easily transferable to an English context, increasing the difficulty of understanding and describing what "depression" is across the various groups and cultures. Manson (1990) and Ackerson (1990) report that several traditional measures of depressive symptoms (e.g., Center for Epidemiological Studies Depression Scale; CES-D) failed to

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differentiate between emotional distress in the form of somatic complaints among NA/AIs and may lead to inaccurate estimates of the rate of depression.

Even given the paucity of epidemiological data available, there is evidence of high rates of depression among NA/AIs. It is not difficult to imagine that depression is a major health concern in this population upon examination of the historical treatment of NA/AIs in the United States. When combining high rates of poverty and unemployment along with psychological problems such as substance abuse and post-traumatic stress disorder, it becomes apparent that depression is one of a host of potential co-morbid psychological conditions which may exacerbate diabetes or at the very least have a negative impact on diabetes treatment and outcomes.

Although there are no large studies detailing prevalence rates of depression, some smaller studies which have been published allowing a preliminary view of this condition among NA/AIs (Curyto, Chapleski, Lichtenberg, 1999). For example, Manson (1992) reports that over 30% of older Native American adults visiting an urban IHS outpatient medical facility reported significant depressive symptoms. This rate is higher than most published estimates of the prevalence of depression among older whites with chronic illness. Furthermore, an elevated rate of depression is often inferred from the high rates of suicide (particularly in adolescent males) observed in NA/AI communities (Department of Health & Human Services - SAMHSA, 2001).

In a study of the relationship between diabetes and depression among adult Pima Indians in Arizona, (age $\geq$18; n=541; 192 with DM, 449 without DM) Sing et al. (2004) found that the prevalence of depression was 16.3 % (18.7% in women and 12.6% among men). In both sexes, the rate of depression was higher in diabetic individuals (men 17.2%

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vs. 10.9%; women 20.2% vs. 17.6%) although the differences were not statistically significant. In those patients with diabetes who also were diagnosed with depression, there was a higher HbA_{1c} (9.3 vs. 8.1) for a difference of 1.2% and the difference remained significant when controlling for age, sex, duration of diabetes, and body mass index (BMI). The authors of this study acknowledge the scarcity of data on depression in NA populations; however, they conclude that this finding is consistent with previous suggestions that depression in NA populations is several times more prevalent in NA than in the general population of the US. The finding that the prevalence of depression is higher among diabetic patients is also consistent with findings of previous studies in the general US population. As outlined above, the negative impact of depression on diabetes is well documented.

Although the epidemiological data regarding depression are limited in this specific population it is apparent that improvement in recognition and treatment of the disorder could lead to improved medical outcomes for NA patients with diabetes.

Psychological Models of Behavior Change: The Transtheoretical Model

The Transtheoretical Model of Change (TMC) was developed by James Prochaska and his colleagues at the University of Rhode Island over the last fifteen years (Prochaska & DiClemente, 1992). The TMC conceptualizes change as progressing cyclically through a series of discrete stages reflecting degrees of motivation to change. Furthermore, it postulates that people use specific processes or strategies at each stage of change, and a mismatch between strategy and stage may result in an increased likelihood of failure to achieve change. There are distinct but interrelated levels at which change can

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be best addressed (DiClemente, 1991; Ockene, Ockene, & Kristellar, 1988; Prochaska, 1995; Prochaska, 1991; Prochaska, DiClemente, & Norcross, 1992).

Stages of change.

This model appears to be applicable in this study as behavior change is a considered to be very important in comprehensive diabetes management and care. The stage of change model was an integral part of the development of Motivational Interviewing. As we consider the research on the stage of change model, which reveals that individuals often go through stages prior to and as they are making behavior change, this project appears to be an exceptional opportunity to test a portion of the stage of change model in this population.

A unique contribution to understanding change has evolved out of TMC research. It was discovered that while moving toward changing a behavior, people progressed through a series of discrete stages reflecting degree of motivation. The initial stage of change is termed **Precontemplation** and is characterized by a lack of intention to change the behavior within the next six months. Individuals in this stage are often uninformed about the long-term consequences of their current behavior, avoid thinking about the problems associated with the behavior, feel demoralized about their ability to make changes, and may be defensive in response to social pressures to change (Grimley, Prochaska, Velicer, Blais, & DiClemente, 1994). Attempting to get a person in this stage to change his or her behavior is often unsuccessful. A lack of desire to change is characteristic of persons in this stage (Prochaska, DiClemente, & Norcross, 1992). A diabetic person in **Precontemplation** regarding dietary restrictions might say, "What's wrong with eating sweets every once in a while?" Prochaska and DiClemente (1992)

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reported that only 3% of smokers classified as precontemplators and who were still precontemplators one month later had made an attempt to quit smoking six months later. They also noted that those who moved from **Precontemplation** to the next stage, **Contemplation,** within the first month were twice as likely (7%) to have attempted change six months later.

The second stage, **Contemplation,** is characterized by an awareness of a problem with the current behavior and serious thought about changing it, but a lack of readiness to make the change. People tend to stay in the Contemplation stage for prolonged periods of time (Prochaska, 1995). Contemplators tend to struggle with weighing of the pros and cons of the current behavior and the solutions to the problem (Prochaska, DiClemente, & Norcross, 1992). For the diabetic in this stage, there may be a dilemma regarding the conflict between short-term positive consequences and potential long-term health problems. The diabetic may be torn between eating foods that taste good, foods that friends and family are enjoying, but also not wanting the result of high blood sugar and the risk of diabetic complications. Contemplators state that they intend to change their behaviors within the next six months (Prochaska, DiClemente, & Norcross, 1992). In a study by Prochaska and DiClemente (1992), 20% of the smokers in the **Contemplation** stage who remained in this stage one month later had attempted to quit smoking within six months. However of those who progressed to the next stage, **Preparation**, 41% had attempted change six months later.

The third stage, **Preparation,** is characterized by attempts to change within the previous year and intention to change within the next month. Individuals in this stage may be making attempts to change their behavior, but have not yet reached a specified

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criterion for change. The diabetic in **Preparation** to change diet for example may have cut down on the number of candy bars consumed each week, but is still occasionally eating them.

The fourth stage, **Action,** is characterized by an actual change or modification in behavior, experiences, and/or environment in order to overcome the problem behavior. **Action** requires considerable time and effort and is often noticed by significant others. People are classified as being in the **Action** stage if they have successfully changed for a period of time from one day to six months. Because action includes overt behavior change, people often equate action with change. However the danger in conceptualizing change as an all or nothing process is that the necessary prerequisite changes in intention and the important efforts required to maintain the changes following action may be ignored (Prochaska, DiClemente, & Norcross, 1992).

The fifth stage, **Maintenance,** is characterized by the new behavior being performed consistently for more than six months. The individual in the **Maintenance** stage is working to maintain the new behavior and prevent relapse. During relapse, people regress to a previous stage. The majority of people who relapse (85% of smokers) relapse to Contemplation or Preparation and repeat the process of cycling through the stages of change (Prochaska & DiClemente, 1986).

Movement through the stages of the TMC is not necessarily a unidirectional process, individuals may move back and forth on their path to change (Ruggerio, 2000). Cycling through the stages is an important part in the change process (Ruggerio, 2000). Many people tend to recycle through the stages of change many times before changing for good. Prochaska and colleagues (1992) found that smokers who successfully stopped

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smoking averaged three cessation attempts over a 7 year period before succeeding at stopping smoking. Recycling is considered a natural part of the process of change, rather than a failure. A slip can be perceived as an important learning process, an opportunity to learn the barriers that exist in making lifelong changes (Ruggerio, 2000). As people cycle through the stages of change (including relapsing along the way) the more action taken, the better the prognosis for lasting change (Prochaska, 1995). That is, with each attempt to change (action), the individuals may learn from their mistakes, progress more quickly to another action attempt, and be increasingly resistant to future relapse (DiClemente et al., 1991).

Matching stage of change and intervention strategy.

The TMC is based on the premise that people are at different stages of motivational readiness for engaging in health behaviors, and that intervention approaches are likely to be most helpful when they are matched to the individual's current stage of change (Ruggerio, 2000). The TMC allows for individuals to receive a treatment intervention tailored to their specific situation, based on stage. This has been supported by research showing increased effectiveness in achieving change when interventions are tailored for the individual's stage of change as opposed to following a generic approach (Prochaska, 1997). Lifestyle changes that are prescribed to people who are diagnosed with Type-2 diabetes are often dramatically different from the lifestyles the individual is used to. Furthermore, it is not a given that people are ready to change how they live. Allowing for individual differences, especially in readiness to change may be a key factor in motivating people to adhere more precisely to lifestyle changes and treatment regimens for Type-2 diabetes.

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Research patterns suggest that change is best achieved by matching processes with the stage of change. In a behavioral weight-loss program, Prochaska et al., (1992) found support for the notion that interventions guided by matching processes with the individual's stage of change result in better patient outcomes. For a psychologist, helping people accurately identify their current stage of change is perhaps the most important step in moving toward changing behavior. Knowing a person's stage of change is not the end of the process, rather it is the beginning. The stage of change model offers us valuable insight into how an individual might be best assisted in moving forward through the process of change regardless of their current motivation to change their behavior (Ruggerio, 2000).

In order to use the stage of change model to its fullest, it is important to be familiar with the other specific components of the model: **Decisional balance**, **Situational self-efficacy/ temptations**, and the **Processes of change**. Knowledge and integration of these components can help health care providers tailor strategies for behavior changes for the person to maximize their interventions for increased success.

Decisional balance.

Decisional balance is a construct that refers to weighing the pros and cons of changing behavior. The cons of changing are perceived as outweighing the pros in the precontemplation and contemplation stages. Somewhere between contemplation and action, the pattern reverses and the pros of change are generally perceived as greater in the action and maintenance stages (Ruggerio, 2000). When matching intervention approaches with stage of change, reducing the cons in the early stages is important. For example, with diabetic patients it may be more helpful to ask them what is relevant to

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them regarding behavior change, as opposed to telling the patients what they may need to do. Thus, treating Precontemplators as if they are ready to contemplate deeply the causes of their current behavior may be a mistake. That is, Precontemplators are not likely to benefit from discussing solutions to the problem if they do not perceive that there is a problem, or if the cons of changing the behavior outweigh the pros.

Situational self efficacy/temptations.

These constructs are conceptualized as the situational temptations to engage in the previous, less desirable behavior, and as the confidence in one's own ability to engage in the new, healthier behavior in a variety of situations (Ruggerio, 2000). Research findings, indicate that people have less confidence and greater temptation in the early stages, with the pattern reversing itself in the later stages when individuals feel more confident and less tempted to return to previous behaviors. So when matching an intervention to a person's stage of change, it is likely to be helpful to know the person's level of confidence and temptations across important situations.

Among diabetic populations in Indian communities, there is likely to be additional culturally relevant factors involved. For example, in an Indian community reducing dietary fat intake is helpful to manage diabetes the same as in other communities. However, many Indian ceremonies and cultural activities involve food such as frybread which is of high caloric value and high fat content. Additional stress and development of new cons to behavior change are a likely result of feeling socially isolated if one were to not eat frybread in these situations. The ultimate goal is allowing the person to achieve behavior change which will result in movement through the stages. Thus it is important to help individuals identify situational temptations such as the temptations in the frybread

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example, and to build confidence in what may work best for them to manage these situations.

Processes of change.

The processes of change include the cognitive-affective and behavioral approaches useful in helping a person change behavior. There are two global categories in the processes of change, the experiential processes and the behavioral processes. The experiential processes include consciousness raising, dramatic relief, self-reevaluation, social liberation, and environmental reevaluation. The behavioral processes include self liberation, stimulus control, counterconditioning, helping relationships, and reinforcement management (Ruggerio, 2000).

Using consciousness-raising involves increasing awareness and information about the current behavior in question, such as its benefits and consequences to the individual (Ruggerio, 2000). Providing educational material about changing dietary patterns would be an example of the use of consciousness-raising with a diabetic patient.

The use of dramatic relief involves arousing emotional responding with a follow-up reduction in affect. An example of dramatic relief would be a media campaign which portrays individuals diagnosed with diabetes who have been able to delay or avoid complications by achieving tight glycemic control through increased self management.

Environmental-reevaluation involves having individuals reflect on how their behavior affects their environment (Ruggerio, 2000). For example, an elderly man with diabetes may realize with help that his grandchildren will worry less about him if he is able to increase his glycemic control with improved self-care.

Self-reevaluation involves having patients reflect on their self-image as it relates

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to management of diabetes (Ruggerio, 2000). If one were to help an obese woman see that she can be a positive role model for her obese son by increasing her level of exercise, this would be an example of self-reevaluation.

Using social liberation involves increasing societal changes or opportunities that help promote healthier behaviors (Ruggerio, 2000). The development of community exercise programs, walking paths, or nutrition courses designed to teach community members food label reading to improve their diet are examples of social liberation.

Self-liberation involves making a choice and being committed to change a behavior (Ruggerio, 2000). One may refer to this as turning over a new leaf. Using religious dates such as Lent for Roman Catholic individuals or New Year's resolutions to initiate health behavior change are examples of self-liberation.

Stimulus control is changing the environment to promote healthier behavior or avoid the unhealthy behavior (Ruggerio, 2000). Changing from drinking whole milk to 1% milk, or from Pepsi to diet-Pepsi as a soft drink choice would be an example of stimulus control.

Learning new healthier habits and substituting them for the less health habits is counter-conditioning (Ruggerio, 2000). Learning to chew gum rather than use chewing tobacco, or eat pretzels (low fat) rather than potato chips (high fat) as a snack are both examples of counter-conditioning.

Using helping relationships consists of developing and using a support system to help with positive behavior change (Ruggerio, 2000). Joining a diabetes walking group or weight loss support group would be examples of learning to develop and use helping relationships.

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Reinforcement management is precisely as it sounds, using reward systems for positive change (Ruggerio, 2000). Praise from a health care provider is often a powerful reward to a patient attempting to make lasting change.

Application of the TMC to diabetes in NA/AIs.

Although the TMC has been widely researched, its applicability in this specific NA/AI population has yet to be demonstrated. Findings by Daskavich (1997) provide a preliminary indication that the TMC may be successfully applied to measuring readiness to change in a NA/AI population diagnosed with Type-2 diabetes. Although this study did involve NA/AI participants, the participants were from an entirely different population of NA/AI than the current study, and therefore it is limited in its applicability to the current population. However in NA/AI populations there is often no existing data on specific techniques and approaches, therefore we mention it here as an indication of preliminary support for using the stage of change model to measure stage of readiness in a project studying diabetes in a population of NA/AI's.

Motivational Interviewing

Motivational Interviewing (MI) is a directive client centered counseling style for eliciting behavior change by helping clients explore their ambivalence (Rollnick & Miller, 1995). The concept of Motivational Interviewing evolved from experience in the treatment of problem drinkers and was first described by Miller (1983). Miller & Rollnick (1991) refined and elaborated on what Motivational Interviewing is and how it is applied in a more detailed description of clinical procedures. They describe that Motivational Interviewing is particularly useful for individuals who are reluctant to

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change and ambivalent about changing (Miller & Rollnick 1991). A goal of Motivational Interviewing is to help resolve such ambivalence and allow a person to move along the continuum of change proposed by Prochaska & DiClemente (1995). The application varies depending on the needs of the specific patient. For some people, a motivational boost is all that is required to initiate change. Once they become unstuck and are no longer immobilized by conflicting motivations they have the skills and resources necessary to make a lasting change (Miller & Rollnick, 1991). For others, this approach may actually be a prelude to even beginning treatment, as it creates an openness to change which paves the way for therapeutic change (Miller & Rollnick, 1991).

In Motivational Interviewing, the expert role traditionally played by the counselor is removed. This role of someone who tells the patient how to run his or her life is avoided in favor of seeing the patient as the expert who knows what is best for him or herself. Thus, responsibility for initiating and maintain change is left to the patient (Miller & Rollnick, 1991). The strategies of Motivational Interviewing are more persuasive and supportive than the coercive argumentative strategies involved in traditional treatments for people with problem behavior such as alcoholism (Rollnick & Miller, 1995). We also sometimes see a persuasive or coercive approach taken in health behavior change counseling. Whereas in Motivational Interviewing, the focus of the counselor is to create a positive environment which is conducive to change, rather than a confrontive one that tends to lead to defensive responding. The overall goal is to increase intrinsic motivation to change, resulting in change from within as opposed to change which is imposed from the outside. Other motivational approaches have relied on persuasion, coercion, and constructive confrontation. While these strategies may achieve

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change in some individuals, they are not focused on identifying intrinsic values and goals of the patient to stimulate behavior change as is Motivational Interviewing (Rollnick, & Miller, 1995).

Ambivalence within a client to change is not seen as the provider's task to resolve, but rather as the client's. In Motivational Interviewing, both the perceived benefits and costs associated with change are examined. Many clients have never been given the opportunity to express this conflict. For example a client might state, "If I stop smoking, then I will feel better about myself. However, most of my friends smoke so if I quit smoking I won't be able to go out or spend time with them." Using Motivational Interviewing, the provider's task is to facilitate change through expression of both sides of this ambivalence and guide the client toward an acceptable resolution which may trigger change (Rollnick & Miller, 1995). The therapist may be tempted to be helpful by persuading the client to the urgency of needed change; however persuasion on the part of the therapist at this stage generally increases client resistance and diminishes the probability of change (Miller & Rollnick, 1991).

Motivational interviewing appears to be a technique well suited to assist patient's with diabetes in changing the behaviors associated with increased risk of secondary complications. Its nondirective style also appears well suited for work with NA/AI populations who may be wary of more directive authoritarian approaches for cultural and historical reasons. However, there has been limited research examining its usefulness as an intervention in diabetes care and no published research regarding the use of this approach with NA/AIs. The limited literature available regarding its use with patients with diabetes has been shown to significantly enhance adherence to diabetes treatment

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program recommendations and improved glycemic control (Smith et al., 1997).

For a more detailed description of the MI technique, please refer to the Treatment Manual (Appendix B).

Using Motivational Interviewing as a brief intervention.

"Where there is true hospitality, not many words are needed" (Arapaho saying).

The words of this Arapaho saying are strikingly similar to one of the important aspects of using Motivational Interviewing as a brief intervention. In his description of the proper use of Motivational Interviewing in a brief setting Rollnick (1999) asks, "How do you know you have got it right?" He notes that some key signals are the patient is doing more of the talking than the counselor is, the counselor is carefully listening and directing the interview at appropriate moments, and the counselor is speaking slowly.

Using Motivational Interviewing as a brief intervention is based on the original work of Miller (1983) and Miller and Rollnick (1991; 2002), as well as the Transtheoretical Model of Change (Prochaska & DiClemente, 1992). In addition, the patient centered approach to the consultation has played a role as well (Stewart et al., 1995). As the method uses the innovations developed by the Transtheoretical Model and Motivational Interviewing, as well as a patient centered approach, we see it is not an original or new technique. Rather it is an attempt to redefine and adapt these ideas and techniques for use in a brief patient centered consultation (Rollnick, Mason, & Butler, 1999).

The use of Motivational Interviewing as a brief intervention was developed as a result of ideas and strategies that were tried in real as well as simulated consultations (Rollnick, Mason & Butler, 1999). The method of Motivational Interviewing as a brief

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intervention was developed initially from studies of health promotion among excessive drinkers in a general hospital setting (Rollnick et al., 1992). Other versions emerged with patients who were smokers and people with diabetes (Rollnick, Mason & Butler, 1999). This behavior change strategy forms an essential framework for understanding how one health behavior affects another. Thus, the technique is embedded in working with the whole person. The techniques are not magic bullets, but rather ways of structuring a conversation which maximizes the person's freedom to talk and think about change in an atmosphere which is non coercive (Rollnick, Mason, & Butler, 1999).

Consistent with the TMC, there is strong emphasis on choosing a task which suits the patient, as setting an agenda may be helpful to some patients while it will be irrelevant for others. There is no single way of carrying out a particular task, but rather a collection of strategies that are used. These strategies start out with development of rapport, and setting an initial focus on a task which is important to the patient. Once an issue is decided upon to discuss, understanding exactly how the patient feels about this issue should be the goal of the consultation.

In comparisons of the amount of Motivational Interviewing participants receive there is support for brief interventions utilizing Motivational Interviewing. There is evidence that a brief intervention utilizing Motivational Interviewing may be as effective as those designed to include more Motivational Interviewing. In a study of hypertension, patients who received a more intense does of Motivational Interviewing (six, forty five minute face to face sessions every four weeks) versus those who received much less (a single face to face 45 minute session along with five brief telephone sessions) showed both groups to have significantly improved outcomes (reduced weight and blood

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pressure, and reduced salt intake and alcohol consumption respectively) compared to a control group, but there were no significant differences on outcomes between "MI" groups (Wollard, Beilin, Lord, Puddey, Mac Adam, & Rouse, 1995). Miller (2000) reports that in several studies examining treatment intensity for problem drinkers that relatively brief interventions can trigger significant change. He further cites that in many cases it appears that an increased duration and intensity of treatment received does not equate with a consistent improvement in outcome for problem drinkers.

The research data on the application of Motivational Interviewing in brief settings with diabetes patients is limited. One study examined brief Motivational Interviewing in a population of patients with Type-2 diabetes by Marie and Sampson (2001) has yielded some preliminary but promising results. They found that assessment which allowed the development of a personalized program and manageable goals for lifestyle change helped to overcoming barriers to change in the diabetes patients who participated in their study.

The Present Research

Clearly, NA/AI Nations across the United States and Canada are facing a serious health problem that is having a significant impact on their current and future well being. Research is needed which will further our current understanding concerning prevention of Type-2 diabetes and its complications in NA/AI populations as well as the general United States population (Ghodes, 1993).

There are presently no research data on the two Wind River Reservation Indian Tribes that specifically examine intervention or prevention approaches to behavioral management of Type-2 diabetes. Examining the tribal history and cultural values of these

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groups may help to determine a direction in which to proceed with such research. This research will build on previous research (Calhoun, 1999) which examined the potential existence and role of fatalistic thinking with regard to behavioral management of diabetes in this population. The amount of research that has been done in NA/AI populations in the area of effects and rates of occurrence of Type-2 diabetes is substantial. However this study will be the initial step to study the applicability of a behavioral intervention in the management of Type-2 diabetes in this population.

Objectives.

The objectives of this study are to examine prevention methods which may be useful in preventing secondary complications from Type-2 diabetes. This present research is designed to study the effects of Brief Motivational Interviewing with regard to preventing health complications as a result of Type-2 diabetes in a specific Plains NA/AI population. The intervention in this study may help individuals diagnosed with Type-2 diabetes initiate lifestyle changes that could lead to the prevention or delay of medical complications resulting from the disease.

The use of Motivational Interviewing as a brief intervention was delivered by a trained interventionist to project participants in two, 30-minute sessions over the course of two to three weeks. Motivational Interviewing as a brief intervention has shown positive outcomes with regard to health related behaviors including Type-2 diabetes (Miller & Rollnick, 1991; Rollnick, Mason, & Butler, 1999). Lifestyle adjustments which are goals to be achieved include increased rates of exercise, improved dietary habits, and increased control of blood sugar levels as determined by a consistently decreased average blood sugar level.

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Blood sugar levels were measured, by testing participants fasting blood sugar levels and in addition using a glycosylated hemoglobin test (HbA_{1c}) to determine stable blood sugar levels over the past 30-90 days. As noted earlier, increased rates of exercise and improved dietary habits maintained consistently have been shown to assist in the prevention of long-term medical complications in Type-2 diabetes (Foreyt & Goodrick, 1995; Patrick et al., 1994). Given the high occurrence rates of Type-2 diabetes in this population, the potential importance of this research to affect the current, as well as future health and well being of NA/AIs is high.

The design included gathering psychological and physiological measures from subjects at pre- and post- intervention as well as at three month follow up.

Hypotheses.

1. Comparison of pre and post intervention data will reveal significant change in participants' physiological measures and health related behaviors. Specifically,

1.a. Participants' random blood glucose levels, HbA_{1c}, estimated average daily blood glucose will decrease from baseline to post-intervention.

1.b. Comparison of change in random blood glucose, estimated average daily blood glucose, and HbA_{1c} levels from 6 months prior to baseline with those from baseline to post-intervention will demonstrate a greater degree of improvement from baseline to post-intervention.

1.c. Participants will demonstrate increased exercise activity levels and improved dietary habits from Time 1 to Time 2.

2. Comparison of pre and post intervention data will reveal significant improvement on psychological measures. Specifically,

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2.a. Participants who identify themselves as being in the pre-contemplator, contemplator, or preparation, stage of the TMC will move beyond their current stage. Participants who identify with the action or maintenance level of the TMC will remain in their respective stage (not relapsed) or increase their level of lifestyle adjustment to further address their Type-2 diabetes.

2.b. Comparison of pre- and post-intervention measures will demonstrate a decrease in fatalistic thinking as measured by the DC Measure of Fatalism.

2.c. Participants will report an improved quality of life as measured by the Diabetes Quality of Life Inventory post intervention.

2.d. Participants' level of self-reported depressive symptoms as measured by the Beck Depression Inventory-II will demonstrate a decrease from pre-intervention to post-intervention.

2.e. Participants will increase their level of internal locus of control and a decrease in their external locus of control as related to diabetes management, as measured by the Diabetes Specific Locus of Control Measure.

3. As reviewed in this introduction, the literature suggests a relationship between health-related behaviors, psychological well-being, and patients' DM management. It was hypothesized that participants' change on measures of diet, exercise, depression, locus of control, fatalism, and quality of life would be predictive of their improvement on physiological measures (HbA_{1c}, estimated average daily blood glucose, and random blood glucose) from baseline to post-intervention. The predictive value of demographic variables was also examined in an exploratory fashion, without specific hypotheses regarding their impact on change in physiological measures.

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Additional analyses.

In addition to addressing the above hypotheses, the present study also conducted exploratory analyses on two psychological measures. Given that several of these measures had been used once previously in this population, factor analyses were used to explore whether the factor structure would look similar in the present sample. In addition, although some of the measures were used previously, they were not determined to be additive. In order to determine the additivity of certain measures, reliability analyses were conducted (only two of the specific scaled measures, DC Fatalism, Diabetes Specific Locus of Control were not additive, so were standardized).

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METHODS

Participants

This project involved individual tribal members from the Eastern Shoshone and Northern Arapaho Tribes of the Wind River Indian Reservation (N=26). Tribal members of various other Indian tribes who are living at the Wind River Reservation were also allowed to participate. The participants included adults 18 years of age and older, as the incidence rates of Type-2 diabetes among children and adolescents, although on the rise in Indian populations of the United States, is rare. The participants were selected based on having been medically diagnosed with Type-2 diabetes at the Indian Health Service. This was accomplished through chart review and via collaboration with the physicians and the diabetes coordinator employed at the Wind River Service Unit of the Indian Health Service.

Participants were tribal members recruited from those who regularly participate in the Diabetic Clinic that the Indian Health offers to those diagnosed with diabetes on a semi-monthly basis. The Diabetic Clinic is offered at local Indian Health Service Clinics in the communities of Arapaho and Ft. Washakie, on the Wind River Reservation. Participants were paid for their time in this research project, $10.00 for each time that they completed the measures, at the outset and at the three month follow up session. The total amount paid to participants was $20.00 if they completed the measures at baseline and follow up. Participants were not compensated for participation in the Motivational Interviewing sessions.

Approximately 96 individuals were invited to participate in this study and 83 (86%) expressed an interest and scheduled an initial appointment. Of those who

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expressed an interest, 26 (31%) attended the initial appointment for baseline assessment (those who did not show for their initial baseline appointment were rescheduled a minimum of 2 times and a maximum of 3 times). Twenty participants (77% of those who completed the baseline assessment) returned for the first intervention session, and all (100%) of those 20 returned for both the second intervention session and the post-intervention assessment. Please refer to Table 1 for a summary of the initial and final samples' demographic characteristics.

Table 1
Demographic characteristics of initial and final sample

	Initial sample	**Final Sample**
N	26	20
% Female	53.8	45.0
Age Mean (SD) yrs.	54.0 (10.9)	54.6 (9.2)
Length DM Hx yrs.	4.4 (1.0)	4.8 (0.4)
Blood quantum %	91 (17)	93 (11)
Tribal enrollment %	100	100
Baseline weight lb.	202.3 (40.4)	202.3 (41.7)
Body Mass Index (BMI)	31.8 (5.3)	32.8 (5.1)
Baseline HbA_{1c}	8.8 (1.8)	8.9 (1.7)

Among the final sample, most individuals had finished high school (35%) or some college (35%). Fifteen percent had not finished high school, although ten percent had achieved a GED. The remaining 15 percent had obtained at least a college degree, with five percent completing an advanced degree (at least a Master's degree). These numbers are comparable to 2000 Census estimates that 29.2% of American Indian/Alaska Natives completed high school or equivalency and 23.6% attended some college (US Census Bureau: Statistical Abstract of the US, 2004-2005).

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Procedures

This research project investigated the applicability of Motivational Interviewing as a treatment method to prevent health complications of Type-2 diabetes in this population. Specifically, the project investigated the utility of an intervention designed to assist a group of individual tribal members from the Wind River Reservation, diagnosed with Type-2 diabetes, in making lifestyle adjustments, N=26.

The interventionist attended bi-weekly scheduled diabetes clinics and met with individual patients informing them of this study and invited them to participate. In addition the diabetes educator, mental health staff and medical care providers were briefed on the study and also assisted in recruiting participants to take part in this study.

A plan was in place with the medical staff to refer participants found to have abnormally high random blood sugar levels (measured at the rate of 200+ mg/dl) and/or who were determined to be physically or psychologically vulnerable to appropriate medical health care personnel at the Indian Health Service clinics located on the Wind River Reservation. This did not happen to any participants in this study.

Tribal members who decided to take part in the study met with the interventionist for a total of four times. Upon agreeing to participate in this study, participants attended an initial appointment to complete both physiological measures (random glucose testing and HbA_{1c} testing) and psychological (DC Fatalism, Diabetes Locus of Control, Diabetes Quality of Life, Beck Depression Inventory-II, Stage of Change 5-item, Exercise & Dietary intake instruments) measures. The next two meetings consisted of 30-minute sessions of Motivational Interviewing and occurred within a three week period from the initial appointment where participants completed their initial measures (please see

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Training Manual; Appendix B).

Participants then returned to complete the last component of the study. They came to the clinic for their fourth and final meeting (within a three month period; means days to follow-up =110.5, SD = 7.6) for a follow up session in which they completed the physiological and psychological measures again. For a more descriptive outline of the appointments and a more detailed description of the intervention technique please refer to the Treatment Manual (Appendix B).

Physiological Measures

Blood was drawn for a random blood glucose testing and for a glycosylated hemoglobin test (HbA_{1c}) at the initial intake session and at three month post-intervention. The HbA_{1c} is a measure of stable blood glucose levels and constitutes a reliable integrated measure of the average blood glucose concentration over the life spans of circulating red blood cells for an estimated time frame of 2-3 months. This procedure has been widely available since the early 1980's allowing for objective measurement of stable and long term glycemic status (Krishnamurti & Steffes, 2001). The American Diabetes Association recommends HbA_{1c} testing at least twice a year in patients who show stable glycemic control and more frequently (quarterly assessment) for those patients whose treatment/therapy has undergone changes, and for those who experience difficulty achieving goals of stable glycemic control. HbA_{1c} serves as a reliable indicator of increased risk of complications due to diabetes. Awareness of HbA_{1c} levels appears to change the behavior of both providers and patients which in turn improves glycemic levels and lowers overall HbA_{1c} (Larsen, Hordes, & Magensen1990).

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Both the Diabetes Clinical Controlled Trial (DCCT) and the United Kingdom Prospective Diabetes Study (UKPDS) demonstrated clearly that improved glycemic control reduces the development and progression of several micro- and macro- vascular complications, including Retinopathy, and Nephropathy, of type-1 and Type-2 diabetes (Krishnamurti & Steffes, 2001). HbA_{1c} levels have also been found to be strong predictors of cardiovascular risk factors, cardiovascular events, and cerebral vascular accidents, as well as overall mortality in several studies (Bruno, Cavallo-Perin, Bargero, Borro, D'Errico, Pagano, 1998; DCCT Research Group, 1995, UKPDS, 1998; Kuusisto, Mykkanen, Pyroala, & Laakso, 1994; Laakso, 1999; Ravid, Brosh & Ravid-Safran, 1998).

Random blood glucose is a calculated measure of the level of blood sugar for an individual patient taken in a random fashion, where fasting is not required. Random blood glucose is often utilized in the diagnosis of diabetes and is also used to test for hyperglycemia (random blood glucose concentration > 200 mg/dL). While random blood glucose is not a measure of stable or long term glycemic control, it is useful for the purposes of monitoring for hypoglycemia (blood glucose concentration <80mg/dl) or hyperglycemia. This is precisely the reason it was utilized in this study. Uncontrolled hypoglycemia can be dangerous leading to severe acute complications leading to death; as well hyperglycemia can lead to long term complications in diabetes, although a more immediate worry of severe hyperglycemia is diabetic ketoacidosis, which can lead to death. Measures of random blood sugar and a HbA_{1c} was also be collected at the 3-month post-intervention session.

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Psychological Measures

The psychological measures used were the DC measure of Fatalism, Physical activity measure, Diabetes Quality of Life, Diabetes Locus of Control, Beck Depression Inventory-II, and Transtheoretical Model of Change measures.

DC Fatalism.

One of the questionnaires used in this study, the DC Fatalism measure, was developed by the researcher (see Appendix C). The measure is composed of 36 rationally derived items regarding cultural beliefs and fatalistic thought patterns specific to this population. The respondent rates his/her level of agreement on a 5-point Likert Scale from *1=strongly disagree* to *5=strongly agree*.

Previous use of this measure in another sample from this population has demonstrated support for the construct of fatalistic thought with regards to diabetes management (Calhoun, 1999). In the previous research, empirical principal component analysis suggested three distinct factors within the measure: Trust, Distrust, and Control. Each factor had an eigen value greater than 1 and accounted for at least six percent of the variance. The three factors accounted for a total of 34% of the variance with minimum loadings of .390. In the present study, a common factor analysis was performed on the DC Fatalism measure to further explore the psychometric properties of the measure within a similar population. The factor analysis findings including differences and similarities with the previously identified factors are reviewed in the Results and Discussion sections.

Diabetes Quality of Life.

The Diabetes Quality of Life measure (DQOL) was used to measure perceived

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quality of life in this population (see Appendix C). The Diabetes Quality Of Life Measure (DQOL; Diabetes Control Complications Trial Research Group, 1988) includes five scales: Satisfaction with Treatment, Treatment Impact, Worry about the Future Effects of Diabetes, Worry about Social and Vocational Issues, and Overall Well Being. A five point Likert scale system is used throughout the DQOL for measurement of satisfaction on the items ranging from "very satisfied" to "very dissatisfied." Five point Likert scales are also used to measure treatment impact ranging from "never" to "all the time" with respect to frequency of the experience. Worry scale items measuring both future effects of diabetes and social/vocational effects of diabetes were measured with a Likert scale with responses ranging from "never worry" to "always worry" including an "does not apply" option. There were two items added to this measure to increase the cultural specificity regarding travel for culturally relevant activities. The questions are listed as C7, and C8 in the DQOL. The questions ask specifically if participants feel as though their travel plans to other Reservations for cultural activities or ceremonies will be altered by their diabetes.

The responses to the DQOL were scored as specified by the Diabetes Control Complications Trial Research Group (1988; Jacobson, De Groot & Samson, 1994a; Ware & Sherbourne, 1992). A score of zero for the total or for a particular scale represents the lowest possible quality of life, and 100 represents the highest possible. Internal consistency of the scales range from .47 to.92 using Cronbach's *alpha* (Diabetes Control Complications Trial Research Group, 1988; Jacobson, de Groot & Samson, 1994a). Stability coefficients range from .78 to .92 over a one week period (Diabetes Control Complications Trial Research Group, 1988).

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With regard to construct validity, the total DQOL score shows "moderately strong, consistent correlations" with measures of "psychological symptoms, well being, and adjustment to illness" (Diabetes Control Complications Trial Research Group, 1988; Jacobson, de Groot, & Samson, 1994a; Jacobson, de Groot, & Samson 1995). The DQOL shows good internal consistency (with Cronbach's alphas ranging from 0.66 to 0.88 on independent scales; 0.92 for DQOL total), and good stability over one week ($r = 0.92$, DQOL total). Convergent validity of the DQOL has also been demonstrated with a variety of other instruments measuring psychiatric symptoms, perceived well being, and adjustment to treatment (Diabetes Control Complications Research Group, 1988). This measure was used previously in this population (Calhoun, 1999) and appears to be a useful instrument in data collection in this specific population.

Diabetes Locus of Control Measure

The Diabetes Locus of Control instrument (DLC; Peyrot & Rubin, 1994) is an 18-item measure designed to assess whether or not respondents perceive having any control over their diabetes (Appendix C). One additional item (#19) was added to strengthen its cultural appropriateness. The respondent rates his/her agreement with statements on a 6-item Likert scale ranging from *1=strongly disagree* to *6=strongly agree*. The DLC measure consists of six items in each of the three domains measuring diabetes specific internal locus of control, powerful other locus of control, and chance locus of control.

Based on factor analyses and face validity the authors created two subscales within the diabetes specific internal locus of control, "autonomy" (items 1, 5, 17) and "self blame" (items 2, 4, 16). The powerful other DLC factor also was separated into two subscales based on factor analyses and face validity, the two factors were termed "health

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professional" (items 4,7,10,12) with the other being "non-medical others" (items 13,18). Although the change domain generated two eigen values greater than one, there was no consistent pattern of loadings. Therefore, the authors retained their originally hypothesized single dimension of chance DLC (items 3, 6, 8, 9, 11, 15). Cronbach's *alpha* reliabilities ranging from 0.65 to 0.75 have been reported for various scales on this measure (Peyrote & Rubin, 1994).

In the present study, common factor analysis was performed on this instrument to assess the psychometric properties within this specific population of NA/AI; the results of the factor analysis are reviewed in the Results and Discussion.

Diet and exercise measures.

Participants completed a self-report measure on activities/exercise for the previous week (7 days). This measure included a wide variety of choices of activities including routine exercises such as house work and more intense cardiovascular activities such as running. This measure was used to estimate a total number of hours of physical activity. A basic self report measure was used to allow for a rating of dietary intake ranging from the previous 24 hour period up to one week. Neither of these measures has quantifiable reliability or validity. They were included primarily for descriptive purposes and a rough estimate of health-related behaviors. These instruments are included in the Appendix C.

Beck Depression Inventory-II.

The BDI-II is a 21item self-report measure for the assessment of depression severity in adults (Beck, Steer, & Brown; 1996). As a copyrighted instrument, it is not reproduced in the Appendix of this document. It is commercially available from The

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Psychological Corporation. The original BDI, a commonly used and widely researched measure, was updated to be consistent with the current DSM-IV (APA, 1994) criteria for depressive disorders. Items reflect common depressive symptoms such as depressed mood, self-critical thoughts, suicidal ideation, feelings of worthlessness, loss of interest, agitation, and sleep and appetite disturbance. The respondent rated each item on a 4-point scale ranging from 0 to 3 with larger values reflecting greater symptoms severity. These ratings are summed to yield a total score ranging from 0-63. Total scores are interpreted with the following classifications: 0-13 = minimal depression, 14-19 = mild depression, 20=28 = moderate depression, and 29-63 = severe depression.

The psychometric characteristics of the BDI-II were investigated on an outpatient sample of 500 patients with diagnoses of depression and a sample for 120 college student normal controls (Beck et al., 1996). With regards to internal consistency, the BDI-II's coefficient *alpha* was .92 for the depressed outpatients and .93 for the normal controls; and all 21 items of the measure significantly correlated with the total score. The BDI-II also demonstrated good test-retest reliability over a week's time among a sub-sample of depressed outpatients (r=.93, $p < .001$). The BDI-II's convergent validity is supported by its positive correlation with other measures of depression and related constructs such as the BDI-amended ($r = .93, p < .001$), the Hamilton Psychiatric Rating Scale for Depression ($r = .71, p < .001$), the Beck Hopelessness Scale ($r = .68, p < .001$), and the Scale for Suicide Ideation ($r = .37, p < .001$). Examination of the factorial validity of the BDI-II supported two highly correlated dimensions to depression – somatic symptoms and cognitive-affective symptoms. In regards to diagnostic discrimination, the patients with mood disordered obtained significantly higher BDI-II total scores on average than

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the normal controls, or patient with other diagnoses (e.g., anxiety, adjustment disorders).

The BDI-II is commonly used to screen for depression in Indian Health Service (IHS) clinics and hospitals. This measure has demonstrated good reliability (.93) among a sample of adult Northern Plains Indians with Type-2 diabetes (Leonardson, Daniels, Ness, Kemper, Mihura, Koplin, Foreyt, 2003).

TMC Questionnaires.

In this study we used three simple 5-item forced choice questionnaires to allow individual participants to estimate their stage of readiness to make changes in their DM management, level of exercise/activity, and diet/eating (see Appendix C). These questionnaires were developed for this study based on the TMC stages of change, as well as descriptions of sample statements for each stage and a series of questions described by Prochaska, Norcross & DiClemente (1994) as "stage of change self assessment." The respondent reads each of the 5 items reflecting different stages of change regarding each behavior and rates their readiness. The statements are arranged in ascending order, with later options reflecting a stage of change higher on the TMC spiral model. A choice of option 1 suggests the respondent is in the Precontemplation stage. Choosing the second items reflects a level of Contemplation. Option 3 suggests a Preparation stage of change and Option 4 suggests Action. Respondents in the Maintenance stage are expected to rate themselves as option 5. Similar questionnaires have been employed in this population by Calhoun, 1999.

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RESULTS

The following analyses were conducted using SPSS 12.0 for Windows. An *alpha* level of .05 was used for all statistical tests of significance. Statistical techniques included: Correlation, Multiple Stepwise Regression, Imputation through the use of Regression, Factor Analyses, Univariate Analyses of Co-Variance, and *T*-Tests. The tables are numbered; the main tables are included in the text while other tables less central to the discussion are located in Appendix D.

Imputation of missing data

Examination of the dataset revealed the following missing data: three participants were missing their 6 months prior random blood glucose from their medical chart; two participants were missing random blood sugar at baseline due to lab error; and six participants completed the baseline assessments, but were lost to attrition and had no post-intervention data. Regression imputation as described by Hair, Anderson, Tatham, and Black (1998) and Tabachnick and Fidell (2001) was utilized to estimate the missing values based on valid values of the complete data set and the participants' values on other variables, thereby increasing the effective N of the study to 26. This method is an accepted technique for replacing missing data in data sets with a moderate level of scattered missing data and an established relationship between variables (Hair et al., 1998).

First, the baseline data of the 20 participants who completed the study was compared to that of the 6 participants who did not complete the entire study. These

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analyses revealed no significant differences in demographic variables (i.e., age, gender, education, tribal enrollment, length of diabetes history), baseline physiological measurements (i.e., HbA_{1C}, random glucose, estimated daily blood glucose, BMI), or baseline scores on any of the psychological measures. The appropriateness of using regression to impute the missing data was reinforced by the lack of significant differences between the completers and noncompleters at baseline.

Next, the correlations between the variables with missing data and the variables to be used to calculate the regression equations were examined. Theses analyses yielded significant correlations between the variables in question. Regression analyses were then used to delineate the relationship between the missing values and the variables to be used for imputation. The three missing 6-month prior random blood glucose values were imputed using a regression equation based on the participants' average estimated daily blood glucose 6 months prior and their HbA_{1C} 6 months prior. The two missing baseline random blood sugars were imputed from the participants' baseline average estimated daily blood glucose and baseline HbA_{1C}. Finally, the post-intervention values for the 6 participants who did not complete the study were imputed based on their baseline measurements and the relationship between baseline and post-intervention data observed in the complete dataset. All following statistics include the full 26 cases (with imputed data), unless otherwise indicated. The imputation procedure was performed only on the dependent variable therefore there is no negative compound effect on the use of stepwise regression.

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Factor analyses of psychological measures

Common factor analysis using varimax rotation was utilized to delineate the structure of selected psychological measures employed in the study and make determinations regarding the amount of variance accounted for by the separate variables. Factor analysis is a multivariate statistical method whose primary purpose is to define the underlying structure in a data matrix, it addresses the problem of analyzing the structure of the interrelationships among a large number of variables (e.g., those in questionnaires, test items) by defining a set of common underlying dimensions known as factors (Hair et al., 1998). The purposes of utilizing factor analyses are summarization and data reduction (Hair et al., 1998). The decision to use common factor analysis over principal components analysis was based on the desire to identify latent dimensions and constructs represented in the original variables. Furthermore, we knew little about the amount of specific and error variance in these measures and we hoped to eliminate this variance by using common factor analysis.

DC Fatalism Measure.

Factor analysis was performed on the DC Fatalism measure to assess the utility and structure of this measure empirically and to derive factor loadings. This process led to an eight factor structure in which 20 of the original 36 items loaded unidimensionally at both baseline and post-intervention. All factors had eigen values greater than 1. The scales were developed from the factors within this measure and were then used in determining a difference score from baseline (T1) to post-intervention (T2). These difference scores were used in determining improvement vs. non-improvement.

The overall variance explained in each of the factor analyses, along with the

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factors that had eigen values greater than 1, and the items in each factor are listed below. However for a greater description of individual items and loadings please refer to Appendix D, Table 12. The eight factors explained 85.96% of the variance. Please see Table 2 below for a listing of the factors, their items, and their Cronbach's *alpha* at baseline and post-intervention. All *alpha* levels were acceptable and all scales with multiple items were determined to be additive at both baseline and post-intervention.

Table 2
Reliability of DC Fatalism Measure Factors

Factors	Cronbach's α at Baseline	Cronbach's α at Post-intervention
Personal Health Responsibility (items 24, 26, 32, 36)	.876	.811
Genetic Racial Fatalism (items 4, 13, 14, 16, 18)	.827	.879
Provider trust (items 7, 11, 12)	.866	.745
Treatment Acceptance (items 21, 22)	.760	.708
Fear Distrust (item 10)	--	--
Traditional diet (item 8)	--	--
Prevention Beliefs (items 19, 23)	.836	.603
Creator Respect (items 28, 29)	.508	.617

Note: No reliability reported for factors composed of a single item

Diabetes Locus of Control.

Factor analysis was performed on the DLC measure to assess the utility and structure of this measure empirically and derive stable factors. This process led to a four factor structure in which 10 of the original 19 items loaded. All factors had eigen values greater than 1 and they explained 52.63% of the total variance. The scales were constructed from the factors within this measure and were then used in determining a difference score from baseline (T1) to post-intervention (T2). These difference scores

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were used in determining the extent of improvement in Diabetes Specific Locus of Control from baseline (T1) to follow up (T2). The factors and their respective items which loaded are listed below in Table 3. For a more detailed description of individual items please refer to Appendix D, Table 13.

Table 3
Reliability of Diabetes Locus of Control Measure Factors

Factors	Cronbach's α at Baseline	Cronbach's α at Post-intervention
Chance (items 3, 8, 11, 15, 18)	.819	.776
Self-Blame (items 2, 14)	.593	.705
Health Responsibility (items 4, 17)	.686	.564
Family Support (item 13)	--	--

Note: No reliability *alpha* reported for factors composed of a single item

Intercorrelations between psychological measures

Pearson correlations were calculated between the participants' baseline scores on the psychological measures. In the interest of making the correlation matrix more readable, only significant ($p < .05$) correlations are reported in Table 4.

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Table 4

Significant intercorrelations between psychological measures at baseline

	BDI-II	TMC-DM	TMC-DE	TMC-AE	DCF-PHR	DCF-GRF	DCF-PT	DCF-FD	DQOL-A	DQOL-B	DQOL-C
TMC-DE	--	.782	--	--	--	--	--	--	--	--	--
TMC-AE	--	.680	.812	--	--	--	--	--	--	--	--
DCF-PHR	-.695	--	--	--	--	--	--	--	--	--	--
DCF-CR	--	--	-.540	-.547	--	--	.554	--	--	--	--
DCF-PB	--	--	--	--	--	--	.527	--	--	--	--
DLC-C	--	--	--	--	--	.529	--	--	--	--	--
DLC-HR	--	--	--	--	.620	--	--	--	--	--	--
DQOL-A	.655	--	-.504	-.563	--	--	--	--	--	--	--
DQOL-B	--	--	--	--	--	--	--	.525	.500	--	--
DQOL-C	--	--	--	--	--	--	--	.511	--	.657	--
DQOL-D	--	--	--	--	--	--	--	--	--	.769	.699
DQOL-E	.500	--	--	--	--	--	--	--	--	.498	--

Note: BDI- II = Beck Depression Inventory-II.

TMC-DM = Transtheoretical Model Change Questionnaire Diabetes Management; TMC-DE = Transtheoretical Model Change Questionnaire Diet / Eating; TMC-AE = Transtheoretical Model Change Questionnaire Activity / Exercise.

DCF-PHR = Personal Health Responsibility Factor of DC Fatalism; DCF-GRF = Genetic Racial Fatalism Factor of DC Fatalism; DCF-PT = Provider Trust Factor of DC Fatalism; DCF-FD = Fear Distrust Factor of DC Fatalism; DCF-CR = Creator Respect Factor of DC Fatalism; DCF-PB = Prevention Belief Factor of DC Fatalism;

DLC-HR = Diabetes Locus of Control Health Responsibility Factor; DLC-C = Diabetes Locus of Control Chance Factor

DQOL-A = Diabetes Quality of Life Section A Total; DQOL-B = Diabetes Quality of Life Section B Total; DQOL-C = Diabetes Quality of Life Section C Total; DQOL-D = Diabetes Quality of Life Section D Total; DQOL-E = Diabetes Quality of Life Section E Total;

-- cells with non-significant correlations (p>.05)

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Comparisons of means at 6 months prior, baseline, and post-intervention

Paired-samples *t*-tests revealed multiple significant changes from baseline to post-intervention, as well as several trends approaching statistical significance. Significant differences and trends are presented below in Table 5. Please see Table 14 in Appendix D for a full table including nonsignificant comparisons.

In contrast to the predictions of Hypotheses 1a-1b, no significant changes were observed among the three physiological measures utilizing paired-samples *t*-tests. However, these simple means comparisons did not control for the effects of other variables and the changes in HbA_{1c}, random blood glucose, and daily estimated blood glucose were further explored with multiple stepwise regression in the section to follow.

Among the measures of health related behaviors (Hypothesis 1c), a trend towards decreased levels of self-reported consumption of unhealthy foods was observed from baseline to post-intervention, $t(25)=1.829$, $p = .079$.

Significant changes were also noted on multiple psychological measures (Hypotheses 2a-2e). The only psychological measures that did not demonstrate at least a trend towards improvement were the TMC questionnaires (Hypothesis 2a). Participants' level of self-reported depressive symptoms decreased from baseline to post-intervention, $t(25)=2.922$, $p<.01$ (Hypothesis 2d). The clinical significance of this finding is important due to the well documented positive relationship between glycemic control and depression and has been described elsewhere in this paper. This finding is increasingly informative when considering that we are looking at a decrease in self-reported symptoms of depression and is predictive after other variables are controlled for in the regression model. Also it is important to note that the effect size calculated here utilizing

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the pooled standard deviation is considered a medium effect size (.485) when measured on a continuum of small (.10-.35), medium (.36-.65) and large effect sizes (>.65) (Cohen, 1988). This medium effect size supports the notion of an appreciable or clinically relevant difference between a patient who scores a 7 on the BDI-II and someone who scores a 12. Among the factors of the DC Fatalism measure, a significant decrease was observed in Genetic Racial Fatalism, $t(25)=2.126$, $p<.05$ (Hypothesis 2b). Analyses yielded two trends among the factors of the DLC: improved Family Support, $t(25)=-2.026$, $p=.054$; and decreased Self Blame, $t(25)=2.032$, $p=.053$ (Hypothesis 2e). Examination of the DQOL subscales, revealed multiple significant improvements and one trend: Section A, $t(25)=4.865$), $p<.01$; Section C, $t(25)=2.044$, $p=.052$; and Section D, $t(25)=3.300$, $p<.01$ (Hypothesis 2c).

Table 5
Significant mean differences from baseline to post-intervention ($N=26$)

	Baseline	Post-intervention
Health Related Behaviors		
Unhealthy dietary choices [a]	7.92 (2.73)*	7.18 (1.87)*
Psychological Measures		
Beck Depression Inventory-II[a]	11.65 (11.04)***	7.18 (7.68)***
DC Fatalism		
Genetic Racial Fatalism [a]	2.47 (0.87)**	2.28 (0.87)**
DM Locus of Control		
Self-blame [a]	4.50 (0.95)*	4.17 (1.19)*
Family Support[b]	4.35 (0.89)*	4.77 (0.91)*
DM QOL		
Scale A-Tx satisfaction [a]	37.77 (12.74)***	29.64 (9.68)***
Scale C-Worry about future [a]	17.62 (7.47)*	15.77 (6.75)*
Scale D-Worry Social/Voc. Issues [a]	9.27 (4.00)***	8.23 (3.60)***

Note: [a] Lower scores on these measures reflect improvement
[b] Higher scores on this measure reflect improvement
* Means differ at $p<.08$
** Means differ at $p<.05$
*** Means differ at $p<.01$

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Multiple Regression Models

In this study, we employed stepwise multiple regression analysis to further explore the relationships among variables (Hypothesis 3) and the role of other predictors of blood glucose change. The basis for using regression analyses was to predict a single dependent, or criterion variable, from the knowledge of one or more independent variables. In stepwise regression, variables are entered into the model if they meet statistical criteria and can be removed if they not longer contribute significantly. This approach is an exploratory model-building procedure that is useful for eliminating superfluous independent variables from the dataset and identifying predictive relationships for future research to explore (Tabachnick & Fidell, 2001). Of the sequential regression methods (forward addition, backwards elimination, or stepwise estimation), stepwise estimate is arguably the most popular due to its ability to examine the contribution of each independent variable and maximize prediction with the smallest number of variables (Hair et al., 1998). Although stepwise regression can be influenced by characteristics of the sample from which the equation is drawn, such an exploratory approach was appropriate in this preliminary study with a small sample. In addition attention was paid to the issue of multicolinearity between measures to ensure it remained within acceptable limits and did not influence the final equation. Given that no such previous research had been conducted in this population, we wanted to consider the potential contribution of each variable and identify relationships between variables that warrant future research. Cross validation of these findings should be addressed in future research and it is likely that the variance accounted for would decrease and stabilize upon a cross validation of the findings described here due to the exploratory nature of these

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analyses.

Specifically, we regressed the single dependent variable, change in Glycosylated Hemoglobin A1c (HbA_{1c}) from baseline to post-intervention, on multiple independent or predictor variables. The idea behind using the multiple regression analysis is to use the independent variables which have known values to predict the single dependent value selected by the investigator (Hair et al., 1998; Tabachnick & Fidell, 2001). In this case, we entered the change scores from a pool of independent variables in a stepwise mode to obtain the best predictors of change in HbA_{1c} level from the baseline (T1) to post-intervention (T2).

Initially there was a rather large pool of theoretical and some research-based scalar potential predictors. However, there were some factors that emerged that were "new" and/or certainly different than previous research had indicated (e.g., some of the factors of the DC Fatalism and DLC items). The original scales and these newly-discovered factors were also included in the pool of predictors that generally were thought to be possibly/likely predictive of participant glucose changes as a result of the intervention. Having identified this pool of potential predictors, change scores on the three glucose dependent variables were then regressed on the entire pool in stepwise manner to determine which ones were in fact the most predictive of changes. While we feel that the results found in these analyses provide support for the Motivational Interviewing intervention, we also must mention that there could be an effect here resulting from regression to the mean with regard to oscillating blood glucose values.

In short, the literature/research based-hypotheses guided the initial selection and later inclusion of the general predictor dimensions, some of which were subjected to

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further confirmatory and initial factor analyses as theoretical-empirical bases for including the indexes for the final predictor pool. The final stage (the three stepwise regressions) was employed to determine which of the potential independent variables were actually predictive, once other powerful predictors were held constant (included) in the final model(s). Indeed, the stepwise regression procedure nicely summarizes that empirical world of Type-2 diabetes in this special population. That is, theory and prior research guided the initial selection of the pools of scaled items, but confirmatory and inductive factor analyses, followed by stepwise regression, permitted determining which of those possible predictors were in fact most powerfully operating within this particular population and intervention program. The pool of 31 predictor variables is listed in Appendix D, table 15, this group of independent variables was chosen based on theoretical grounds and was not prescreened; as described earlier, attention was paid to the issue of multicolinearity which was within acceptable limits. Certain measures used in this study contain subscales which were utilized to calculate change scores. The list of predictors and the change scores that were calculated are listed in Appendix D, table 15. As mentioned earlier in this paper data imputation was utilized to replace missing values, the use of imputed values does not interfere with interpretation of regression analyses.

Change scores were computed so that positive values represent an improvement and negative values reflect a decline in the variable in question. Historically, the reliability and validity of difference scores described as measures of gain, growth, or change, has been challenged. However, Williams and Zimmerman (1996) reveal that this criticism is based on misleading assumptions regarding the values of parameters in familiar classical test theory equations. They further demonstrate that modified equations

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based on applied testing situations which are more realistic can lead to simple gain scores that can be more useful in research than commonly believed with respect to both reliability and validity (Williams & Zimmerman 1996).

Below are three models which are summarized, with partial regression plots in Appendix D. Univariate analysis of covariance also determined the average dependent change attributable to the effects of the completer vs. non-completer (in two models of actual blood glucose measures) and gender (in one model of estimated average daily blood glucose) groups, while statistically controlling for the effects of other predictors.

Regression model #1: Predicting HbA_{1c} Improvement (addresses hypotheses 1a, 1b, 1c, 2b, 2d, 3).

In this regression model, the dependent variable, change in HbA_{1c} from baseline to post-intervention, was regressed on the pool of multiple independent variables. In our model summary we had a total of 7 predictors which entered the model: 1) change in HbA_{1c} from 6 months pre-baseline to baseline, 2) change in provider trust from baseline to post-intervention, 3) total blood quantum (this is defined as % total Indian blood collected in demographic data), 4) completion of the study, 5) change in depression from baseline to post-intervention, 6) change in hours of exercise from baseline to post-intervention, and 7) change in treatment acceptance from baseline to post-intervention. The final model had an *R* squared value of .896, accounting for 89.6% of the variance. The mean and standard deviations of predictive variables are presented in Table 6 and the final regression (Model 1) is summarized in Table 7. Each of the seven predictors and their independent effects on HbA_{1c} are described below in the order of their partial r^2 values. The partial regression plots (Figures 1-7) are in Appendix D.

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Table 6
Mean (SD) of Predictive Variables for Regression Model 1

	Mean	SD
Demographic Variables		
Group (completer vs. noncompleter)	--	--
Total Blood Quantum	.9050	(.16801)
Physiological Measures		
HbA_{1c} change from 6 mo prior to T1	-.169	(1.693)
Health Related Behaviors		
Exercise (hours in previous week)[a]	1.395	(11.303)
Psychological Measures		
Beck Depression Inventory-II[a]	4.4735	(7.806)
DC Fatalism		
Provider Trust[a]	.1101	(.690)
Treatment Acceptance[a]	.0498	(1.00)

Note: -- No means offered for categorical variables
[a] Change from baseline to post-intervention
All change scores are calculated so that positive values reflect improvement

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Table 7
Regression Model 1 Coefficient Table

	Unstandard. Coefficients		Stand. Coeffs.	*T*	Sig.	Correlations			Other Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Toler-ance	R^2
(Constant)	1.959	.663		2.956	.008					
HbA1C change 6 mo prior-T1	-.703	.077	-.828	-9.153	.000	-.609	-.907	-.697	.709	.504
Provider Trust Change	.966	.179	.465	5.404	.000	.425	.787	.412	.784	.197
Total Blood Quantum	-3.342	.756	-.391	-4.420	.000	-.242	-.721	-.337	.742	.095
Group	.881	.282	.264	3.130	.006	.045	.594	.238	.818	.012
BDI Change	.079	.017	.430	4.599	.000	.028	.735	.350	.664	.012
Change in Exercise	.030	.010	.240	2.901	.010	.210	.564	.221	.850	.050
Tx Accept. Change	-.263	.115	-.183	-2.284	.035	-.137	-.474	-.174	.900	.025

Note: Dependent Variable is HbA_{1c} change from baseline to post-intervention
R^2 = Proportion of total variance accounted for

Is earlier HbA_{1c} (from 6 months prior to baseline) predictive of change from baseline to post-intervention? (addressing hypotheses 1a-b, 3). Using all 26 study participants and controlling for other variable effects, the regression results (Model 1) showed that participants' HbA_{1c} change in the 6 months prior to the study was a significant (partial $r^2 = .823$; $R^2 = .504$; $p<.05$) predictor of HbA_{1c} change from baseline to post-intervention. That is, persons who showed decreased glycemic control during the six months prior to the study, tended to make a significant improvement in their glycemic control by at post-intervention. Conversely, the participants who improved their glycemic

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control in the 6 months preceding the outset of our study, failed to demonstrate improvement from baseline to post-intervention.

Change in Provider Trust & Glycemic control (addressing hypotheses 2b, 3). Change in Provider Trust (a three item factor from the DC Fatalism measure) was a significant (partial r^2= .619; R^2= .197, p<.05) predictor of improvement in HbA_{1c} from baseline to post-intervention. Participants who reported improved provider trust had improved HbA_{1c} levels by post-intervention assessment.

Depression & Glycemic Control (addressing hypotheses 2d, 3). A decrease in depression as measured by the Beck Depression Inventory-II emerged as a significant (partial r^2 = .54; R^2= .012, p<.05) predictor of improvement in HbA_{1c} levels in this study. As a person's level of depression subsided, or improved, so did their measure of stable glycemic control.

Blood Quantum & Glycemic Control (no hypotheses addressed here). Examination of the relationship between total blood quantum and patients' HbA_{1c} change revealed that those with increased level of blood quantum tended to exhibit HbA_{1c} levels that worsened or did not improve. Thus, it appears that levels of NA/AI blood quantum was a significant (partial r^2 = .52; R^2= .095, p<.05) predictor of non-improvement on a change score measurement of HbA_{1c}.

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Completion of Intervention (no hypotheses addressed here). Recall that we had a total of 20 participants complete the intervention (20c) and six participants who did not complete the intervention (6nc). When comparing the HbA_{1c} level of these two groups, remember that since all twenty-six participants completed all required measurements at T1, those data were used to impute estimates at T2 for the 6nc cases by predicting from a simple regression equation estimated using data from the 20c cases. Model 1 revealed that controlling for other predictors, the group that completed the study showed significant (partial r^2= .352; R^2= .012, p<.05) improvement in their individual HbA_{1c} level; i.e., the 20c showed more improvement on HbA_{1c} difference score than did the 6 non-completers.

Exercise and Glycemic Control (addressing hypotheses 1c, 3). In the relationship between exercise and HbA_{1c} we found that hours of reported exercise was a significant (partial r^2 = .319; R^2= .050, p<.05) predictor of improvement in HbA_{1c}. There was a positive relationship between increased levels of exercise and improvement on HbA_{1c}; i.e., those who reported exercise increased, tended to exhibit improved HbA_{1c}.

Treatment Acceptance & Glycemic Control (addressing hypotheses 2b, 3). This finding showed that Treatment Acceptance (a factor of the DC Fatalism measure) was predictive (partial r^2 = .225; R^2= .025, p<.05) of improvement on HbA_{1c} once other predictors were controlled. Those who were less likely to endorse belief that diabetes can be cured by medicine (either Traditional or Western) showed greater improvement on HbA_{1c} at follow up.

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Univariate Analysis of Covariance for Model 1. ANCOVA utilizing the predictors identified in Model 1 as covariates yielded a significant difference between those who completed the intervention and those who did not, in HbA_{1c} from baseline to post-intervention (F [1,18] = 9.795, $p < .01$). Comparison of the mean changes of those who did not complete the intervention (-.458) and those who did complete the intervention (.424) revealed a significant effect size of .881 ($p<.05$). Since one HbA_{1c} unit equals an average of 35(mg/dl), this effect size translates to a three-month overall estimation plasma glucose (mg/dl) difference of 30.8, or an estimated 16.0 point blood glucose increase for non-completers compared to a 14.8 blood glucose drop among study completers.

Regression Model #2: Predicting Average Estimated Daily Blood Glucose Improvement (addressing hypothesis 2c, 2e, 3).

In this regression model, we expected the patterns to be similar to those in the main model because average daily estimated blood glucose, the dependent variable, was derived from the HbA_{1c} (the dependent variable in Model 1). Although the findings were similar, there were some differences. For instance, the group variable did not enter this model, but gender, which did not show up in our main model was a predictor. The level of variance accounted for in the second model was 80.9% which indicates a strongly significant prediction model. The first seven steps of the regression added variables; one variable (change in health dietary choices from baseline to post-intervention) dropped out of the model in the eighth step due to losing statistical significance, resulting in a final

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model with six variables. The mean and standard deviations of predictive variables are presented in Table 8 and the final regression (Model 2) is summarized in Table 9. The six variables that entered stepwise and remained in this model are described below in descending order of partial r^2 values. The partial regression plots (Figures 8-13) are in Appendix D.

Table 8
Mean (SD) of Predictive Variables for Regression Model 2

	Mean	SD
Demographic Variables		
Gender	--	--
Total Blood Quantum	.9050	(.16801)
Physiological Measures		
Average est. daily change from 6 mo prior to T1	-5.077	(53.308)
Health Related Behaviors		
Exercise (hours in previous week)[a]	1.395	(11.303)
Psychological Measures		
Diabetes LOC		
Self Blame [a]	.333	(.820)
Diabetes QOL		
Section B – Treatment Impact [a]	.2223	(4.590)

Note: -- No means offered for categorical variables
[a] Change from baseline to post-intervention
All change scores are calculated so that positive values reflect improvement

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Table 9
Regression Model 2 Coefficient Table

	Unstandardized Coefficients		Standard. Coeff.	*T*	Sig.	Correlations			Other Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Toler-ance	R^2
(Constant)	116.21	33.5		3.464	.003					
Av. Bld. Gl. change 6 mo prior-T1	-.563	.114	-.549	-4.95	.000	-.686	-.751	-.49	.818	.37638
Exercise Change	1.033	.494	.213	2.090	.050	.160	.432	-.21	.962	.03415
Tx Impact Change	3.843	1.224	.322	3.140	.005	.209	.584	.315	.952	.06739
Blood Quantum	-105.4	34.045	-.324	-3.10	.006	-.298	-.579	-.31	.918	.09662
Gender	-47.42	12.778	-.441	-3.71	.001	-.303	-.648	-.37	.712	.13362
Self-Blame Change	23.074	7.790	.346	-2.96	.008	.292	.562	.297	.736	.10109

Note: Dependent Variable is average estimated blood glucose change from baseline to post-intervention
R^2 = proportion of total variance accounted for

Change in Average Estimated Daily Blood Glucose 6 Months Prior to Baseline (addressing hypotheses 1a-b, 3). Again, examination of the relationship between the change in average estimated daily blood glucose from baseline to post-intervention and the change in average estimated daily blood glucose from 6-months prior to baseline revealed a statistically significant difference (partial $r^2 = .564$; $R^2 = .376$, $p<.05$) after other variables entered the equation. That is, those who were worsening in their glycemic control as measured by the average daily glucose estimate, from 6-months prior to

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baseline showed greater improvement from baseline to post-intervention.

Gender (no hypotheses addressed here). Gender was a significant independent predictor (partial r^2= .42; R^2= .134, p<.05) of change in average estimated daily blood glucose from baseline to post-intervention. In this relationship, females did not fare as well as males. Being male was a significant predictor of improved average estimated daily blood glucose from baseline to post-intervention, while this was not observed in female participants.

Treatment Impact (addressing hypotheses 2c, 3). Model 2 exhibited the relationship between average daily estimated blood glucose and the impact of treatment reported by the individual. This specific treatment impact scale was one of 5 separate subscales from the Diabetes Quality of Life measure that examined the self-reported impact of diabetes treatment on individual patients. Specifically, a reported improvement in treatment impact (i.e., the individual reported less negative treatment impact) was a significant predictor (partial r^2= .342; R^2= .067, p<.05) of improved average estimated daily blood glucose at post-intervention.

Blood Quantum (no hypotheses addressed here). The next predictor variable, total blood quantum, appeared as a significant predictor (r^2 = .336; R^2= .097, p<.05) of worsening or non-improving average estimated daily blood sugar at post-intervention.

Self Blame (addressing hypotheses 2e, 3). The relationship between a factor from the

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Diabetes Locus of Control Scale, Self Blame, and the individual average estimated daily blood glucose change scores showed that the Self Blame Factor (items 2 and 14) was a significant predictor (partial $r^2 = .316$; $R^2 = 101$, $p<.05$) of improvement in average estimated daily blood glucose at post-intervention. As self blame decreases, the individual patient improved on the average estimated daily blood glucose measurement.

Exercise (addressing hypotheses 1c, 3). Similar to Model 1 above, increased levels of self-reported exercise from baseline to post-intervention was a significant predictor (partial $r^2 = .187$; $R^2 = .034$, $p<.05$) of improved average estimated daily blood sugar, once other variables were statistically controlled; i.e., when exercise increased, average estimated daily blood glucose decreased/improved.

Univariate Analysis of Covariance for Model 2. ANCOVA utilizing the predictors identified in Model 2 as covariates yielded a significant difference between males and females in level of change in average estimated blood glucose from baseline to post-intervention (mean change of 33.47 and -13.96 respectively; effect size = 47.4; F [1,19] = 13.78, $p < .01$). As average estimated daily blood glucose is a function of HbA1c, we see similar findings here. As stated previously one HbA_{1c} unit equals an average of 35(mg/dl), so this effect size translates to a three-month overall estimated daily blood glucose level difference of improvement at the rate of 33.47 (mg/dl) for men, which is nearly one full (96%) HbA1c unit. And for women the decrease of 13.96 (mg/dl) in daily estimated average blood glucose is over 1/3 (39%) of an HbA1c unit.

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Regression Model # 3: Predicting Random Blood Glucose Improvement

(addressing hypotheses 2b, 2e, 3).

In our final regression model, the dependent variable change in Random Blood Glucose from baseline to post-intervention was regressed on the pool of independent variables. A total of four predictors entered Model 3 and attained an r^2 value of .559, accounting for 55.9% of the variance in random blood glucose change. The mean and standard deviations of the four predictive variables are presented in Table 10 and the final regression (Model 3) is summarized in Table 11. The four variables that entered stepwise and remained in this model are described below in descending order of partial r^2 values. The partial regression plots (Figures 14-17) are in Appendix D.

Table 10
Mean (SD) of Predictive Variables for Regression Model 3

	Mean	SD
Demographic Variables		
Group (completer vs. noncompleter)	--	--
Physiological Measures		
Random gluocose change from 6 mo prior to T1	3.500	(84.593)
Psychological Measures		
DC Fatalism		
Traditional Diet [a]	-.0620	(1.133)
Diabetes LOC		
Family Support [a]	.4231	(1.065)

Note: -- No means offered for categorical variables
[a] Change from baseline to post-intervention
All change scores are calculated so that positive values reflect improvement

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Table 11
Regression Model 3 Coefficient Table

	Unstandardized Coefficients		Std. Coeff.	*t*	Sig.	Correlations			Other Statistics	
	B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	R^2
(Constant)	-61.599	25.775		-2.39	.026					
Random Glucose Change 6mo prior-T1	-.875	.183	-.903	-4.79	.000	-.500	-.722	-.69	.590	.451
Family Support Change	34.867	12.562	.453	2.776	.011	.084	.518	.402	.788	.038
Traditional Diet Change	32.329	12.689	.447	2.548	.019	-.032	.486	.369	.682	.014
Group	63.330	28.609	.332	2.214	.038	.253	.435	.321	.933	.084

Note: Dependent Variable is random blood glucose change from baseline to post-intervention
R^2 = proportion of total variance accounted for

Change in Random Glucose from 6 months prior to baseline (addressing hypotheses 1a-b, 3). The first variable to enter the model demonstrated that having random glucose which was worsening 6 months prior to the baseline measurement was a significant predictor (partial r^2= .522; R^2= .451 , p<.05) of random glucose improving at post study post-intervention.

Family support (addressing hypotheses 2e, 3). Model 3 demonstrates that increased reported family support was a significant predictor (partial r^2= .268; R^2= .038, p<.05) of improvement in random glucose change from baseline to post-intervention. A higher degree of family support (a factor of the DLC) was positively related to improvement in

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level of random glucose.

Traditional Diet (addressing hypotheses 2b, 3). A significant (partial $r^2 = .236$; $R^2 = .014$, $p<.05$) relationship was found between participants' perceptions of a traditional diet as a method to manage diabetes and improvement in random glucose from baseline to post-intervention. Controlling for other predictors, those who endorsed the notion that a traditional diet was better for diabetes management showed an improvement in their level of random glucose.

Completion of Intervention (no hypotheses addressed here). Controlling for other predictors, completion of the study exhibited a positive relationship with random glucose change. Relative to the six non-completers, the 20 individual participants who completed the intervention showed significant (partial $r^2 = .189$; $R^2 = .084$, $p<.05$) improvement on random glucose from baseline to post-intervention.

Univariate Analysis of Covariance for Model 3. ANCOVA utilizing the predictors identified in Model 3 as covariates yielded a significant difference between study completers and non-completers in change in random glucose from baseline to post-intervention (mean change of 11.41 vs. -51.91 respectively; effect size = 63.32; F [1,21] = 4.9, $p < .05$). As mentioned in the both of the previous models, one HbA_{1c} unit equals an average of 35(mg/dl). Although random blood glucose is not a reliable measure of long-term glycemic control this finding suggests that for the study completers an improvement of 11.41 (mg/dl) if it were maintained in a regular fashion represents nearly

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one-third (32.6%) of an HbA1c unit, whereas those did not complete if they maintained the decrease in glycemic control, would potentially decrease there HbA1c by over one full HbA1c unit (1.43).

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DISCUSSION

This study was undertaken to assess the utility of Motivational Interviewing as an intervention to improve behavioral management of Type-2 diabetes among residents of the Wind River Indian Reservation (N=26). Data regarding demographic variables, physiological measures, health-related behaviors, and psychological self-report instruments were collected at 6-month prior (for available variables), baseline, and a three month post-intervention follow-up. The results regarding each of these areas and the support for our hypotheses are reviewed below.

As listed in the Introduction, the following results were hypothesized:

1. Comparison of pre and post intervention data will reveal significant change in participants' physiological measures and health related behaviors. Specifically,

1.a. Participants' random blood glucose levels, HbA_{1c}, estimated average daily blood glucose will decrease from baseline to post-intervention.

1.b. Comparison of change in random blood glucose, estimated average daily blood glucose, and HbA_{1c} levels from 6 months prior to baseline with those from baseline to post-intervention will demonstrate a greater degree of improvement from baseline to post-intervention.

1.c. Participants will demonstrate increased exercise activity levels and improved dietary habits from Time 1 to Time 2.

2. Comparison of pre and post intervention data will reveal significant improvement on psychological measures. Specifically,

2.a. Participants who identify themselves as being in the pre-contemplator, contemplator, or preparation, stage of the TMC will move beyond their current stage.

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Participants who identify with the action or maintenance level of the TMC will remain in their respective stage (not relapsed) or increase their level of lifestyle adjustment to further address their Type-2 diabetes.

2.b. Comparison of pre- and post-intervention measures will demonstrate a decrease in fatalistic thinking as measured by the DC Measure of Fatalism.

2.c. Participants will report an improved quality of life as measured by the Diabetes Quality of Life Inventory post intervention.

2.d. Participants' level of self-reported depressive symptoms as measured by the Beck Depression Inventory-II will demonstrate a decrease from pre-intervention to post-intervention.

2.e. Participants will increase their level of internal locus of control and a decrease in their external locus of control as related to diabetes management, as measured by the Diabetes Specific Locus of Control Measure.

3. As reviewed in this introduction, the literature suggests a relationship between health-related behaviors, psychological well-being, and patients' DM management. It was hypothesized that participants' change on measures of diet, exercise, depression, locus of control, fatalism, and quality of life would be predictive of their improvement on physiological measures (HbA_{1c}, estimated average daily blood glucose, and random blood glucose) from baseline to post-intervention. The predictive value of demographic variables was also examined in an exploratory fashion, without specific hypotheses regarding their impact on change in physiological measures.

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Physiological Measures

The three physiological measures included in this study were HbA_{1c}, random blood glucose levels, and average estimated daily blood glucose. Means comparisons between participants' measurements at 6-month prior, baseline, and post-intervention did not reveal any significant change over time, failing to support Hypothesis 1a-b. However, further examination of the change scores between 6-months prior to baseline and baseline to post-intervention revealed several interesting findings.

Worsening physiological measurements (i.e., increasing HbA_{1c}, random glucose, and average estimated daily blood glucose) in the 6 months prior to the study were predictive of improved physiological measurements from baseline to post-intervention. This finding is interesting, but should be interpreted with caution. Perhaps the glycemic level of those who demonstrated improvement prior to the study reached a ceiling and had stabilized, leaving no further room for improvement after the intervention. This possibility is supported by a report from the American Diabetes Association that although an HbA_{1c} of less than 7 is recommended, only 56% of DM patients are able to attain an $HbA_{1c} < 8$. Thus, many DM patients may only improve their $HbA1_c$ to a certain level and have little more room to change in a given window of time. As we know from the research on the various stages of change in the Transtheoretical Model of Change, individuals may cycle through different stages of change at different points in time. This may then allow those individuals to address further change at different points in time depending on their needs. Therefore, if this were to occur in a time span beyond three months, a study such as the present one would not capture the additional individual change.

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Approximately half of the participants who completed the study (11/20) demonstrated improved HbA_{1c} from baseline to post-intervention, with two remaining the same and 8 decreasing their glycemic control. As outlined below, a number of the variables included in the present study demonstrated significant value in predicting who would demonstrate such change. The clinical significance of improved HbA_{1c} must be emphasized. Even small change in HbA_{1c} can lead to significant reductions in complications of DM. For example, a 1.5% decrease in HbA_{1c} has been estimated to lead to a 24-33% decrease in the 10-year incidence of proliferate retinopathy (as reviewed in Krishnamurti & Steffes, 2001).

Demographic Variables

Although no specific hypotheses were postulated regarding the impact of demographic variables on participants' response to the intervention, several demographic factors have been shown to be related to diabetes and were included in the regression equations. Two demographic variables emerged as significant predictors of change (via the stepwise regression model) in physiological measurements from baseline to post-intervention.

Gender was found to be a predictor of improved average estimated daily blood glucose from baseline to post-intervention in regression Model 2. Being male was a significant predictor of participants' improvement on this physiological measure over the course of the study. This finding is likely the result of several factors; some which are discussed here, while others are beyond the scope of this project. This gender difference could be in part due to differences in body mass index. Women are more likely to have a

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higher body mass index and a higher concentration of body fat than men. As a result, men have an advantage in the ability to lose weight. Also, males are generally more likely to be employed in physically demanding manual labor positions and may get more exercise as a result. Although it seems reasonable to conclude that men may have an advantage in glycemic control due to the known relationship of increased exercise and overall improved diabetes management, this difference should be explored in a more detailed fashion in future research.

Total blood quantum was the other demographic variable that emerged as a significant predictor of improvement in HbA_{1c} or average estimated daily blood glucose from baseline to post-intervention. The negative relationship that was observed may be attributable to several factors. First, there is a well documented positive association between increased blood quantum (Native American Ancestry) and rates of Type-2 diabetes (Lee et al., 1995). Ghodes (1994) reports that diabetes rates are highest in full-blooded Native Americans; this was observed initially in Choctaw Indians and subsequently in other tribes. Knowler, Pettitt, Saad, and Bennett (1990) also found that increased rates of Indian heritage are associated with higher rates of diabetes – rates of diabetes in full blooded Indians of the Gila River Indian Community were twice that of non-Indians community members, and those of mixed ancestry were in an intermediate position. They conclude that the positive relationship between blood quantum and diabetes rate is consistent with the hypothesis that the high incidence rate of diabetes in this population is in large part due to a high frequency of the gene or genes that are believed to increase susceptibility to diabetes. As reviewed in the Introduction, genetic factors are thought to play a significant role in the elevated prevalence of diabetes among

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Indians. In this study population, the range of blood degree is truncated (minimum blood degree 63%, maximum blood degree 100%) which indicates a sample with a high degree of Indian ancestry. In addition to the truncated range, the findings in each of the regression models where blood quantum entered as a predictor the amount of variance accounted for was less than 10% (Model 1 = 9.4%, Table 7; Model 2 = 9.6%, Table 9). The positive relationship between blood quantum and diabetes risk warrants further research and highlights the need to identify prevention and intervention techniques with demonstrated efficacy in this population with increased susceptibility to developing Type-2 DM.

The predictive power of blood quantum that emerged in this study may also be attributable to the significant positive correlations between blood quantum, age, and the Fear Distrust factor of the DC Fatalism measure (see Appendix D, Table 19). Elderly tribal members are more likely to have a high blood quantum due to less marriage outside the tribe in previous generations and to have potentially experienced historical racism, cultural oppression, and negative interactions with the US Government as described by Brave Heart and DeBruyn, 1998. Among those with a high degree of Indian ancestry, this historical intergenerational trauma could be contributing to a greater degree of distrust toward the Indian Health Service as a branch of the US government (Belcourt-Dittloff & Stewart, 2000). It is important to recognize that although the interventions for this study were performed by a tribal member from this reservation, all sessions took place at the IHS clinic. The relationship between blood quantum and age alone may also contribute to this finding. An elderly person with DM may not change at the same rate as a younger person due to less concern about long-term complications.

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Additionally, the findings regarding blood quantum are difficult to interpret definitively because it is potentially a proxy variable for a wide range of other social and cultural variables such as degree of genetic risk for DM, degree of traditionalism, level of education, degree of discrimination experienced, acculturation stress, exposure to historical trauma, age, fear, and distrust. For example, acculturation issues have been shown to affect glycemic control in other minority populations (Jaber, Zhu, Brown, Herman, & Hammad, 2003). These findings highlight the need to consider cultural issues when developing behavioral interventions for improved management of diabetes. Future research should explore the role of acculturation in the management of diabetes among Native Americans.

Therefore, the present results regarding blood quantum warrant further research to replicate and perhaps clarify this finding; however the degree to which these factors are interrelated will make it very difficult to tease them apart. These factors could be an amalgam which becomes non-significant and non-informative when considered separately. It is important to explore these findings with extreme caution and care due to the sensitivity of the issue and potential for misrepresentation and misuse.

Health Related Behaviors

An increased level of exercise from baseline to post-intervention emerged as a significant predictor of improved HbA_{1c} and average estimated daily blood glucose over the same time period. This finding is consistent with previous reports of the importance of exercise in DM prevention and management (Diabetes Prevention Program Research Group, 2002; Kaplan, Hartwell, Wilson, & Wallace, 1987; Smith, Kratt, Heckemeyer, &

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Mason, 1997).

In regards to diet, participants' demonstrated a trend towards lower levels of unhealthy food consumption from baseline to post-intervention. However, dietary change did not emerge as a predictor of change in physiological measures. This may have been due in part to the lack of sensitivity of the dietary measure used in this study. Future research should consider collaboration with a dietician to identify a reliable and valid dietary measure to more accurately reflect impact of Motivational Interviewing on dietary changes.

Psychological Measures

Means tests revealed evidence of change from baseline to post-intervention on several of the self-report psychological instruments including the BDI-II, factors of the DC Fatalism, factors of the DLOC, and subscales of the DQOL. These findings were in support of hypotheses 2b-e. Contrary to our hypothesis 2a, the TMC questionnaires did not demonstrate any significant change from baseline to post-intervention or enter into any of the regression models as significant predictors. Participants rated themselves as midway between the Preparation and Action stages both at baseline and post-intervention. The limited range of scores on these instruments may have contributed to their lack of significant findings; each questionnaire (stage of DM management, diet/eating, activity/exercise) is composed of one set of five statements. The respondent chooses the one that best matches their level of readiness for change, yielding scores from 1-5. Other studies have found more detailed TMC stage questionnaires with a greater range of scores to yield predictive value (Prochaska et al., 1992; Prochaska et al.,

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1994).

BDI-II. On the BDI-II, a significant improvement in self-reported level of depressive symptoms was observed from baseline to post-intervention. Participants' mean level of depression at baseline was in the upper end of the minimally depressed range. By post-intervention, their mean level of self-reported depressive symptoms had declined to a nondepressed level. Utilizing the categorical interpretive guidelines outlined by Beck et al. (1996), eight of the participants were at least mildly depressed at baseline. Four were in the mildly depressed category, two were moderately depressed, and two endorsed a severe level of depressive symptoms. Of the eight participants reporting at least mild depression at baseline, all but one had improved enough to change at least one category in the predicted direction (e.g., from mildly depressed to minimal depressive symptoms), suggesting clinically significant improvement (Jacobson, Follette, & Revenstrorf, 1984).

This finding has important clinical implications not only for patients' emotional well-being, but also for their DM management. As reviewed in the Introduction, the relationship between diabetes and depression is complex and increased levels of depression are associated with poorer glycemic control. In fact, a decrease in depression was found to be a significant predictor of improved HbA_{1c} in the present sample. This finding also speaks to the need for interdisciplinary teams including mental health professionals to care for patients with diabetes.

DC Fatalism. Factor analysis of the DC Fatalism measure identified 8 factors: Personal Health Responsibility, Genetic Racial Fatalism, Provider Trust, Treatment Acceptance, Fear Distrust, Traditional Diet, Prevention Beliefs, and Creator Respect.

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Previous principal components analyses supported three factors: Trust, Distrust, and Control (Calhoun, 1999). Although the present eight factors included fewer items from the measure, they accounted for a substantially greater degree of variance (34% vs. 85.96% respectively). This improved amount of variance explained is likely due to the differences in statistical techniques employed and the elimination of error variance achieved via common factor analysis. The differences in the factor structure of the measure that emerged in these two studies are likely the results of differences in technique (including statistical approaches, scoring, minimum allowed factor loadings). The present findings are believed to be the more reliable of the two, although replication with another sample is necessary to validity these factors.

Of the present factors, simple means comparisons revealed a significantly decreased Genetic Racial Fatalism from baseline to post-intervention. This finding suggests a decrease over the course of the study in the belief that DM was brought to Indians maliciously by Whites and that now all Indians will eventually develop diabetes. A decrease in the belief that diabetes is inevitable and that a malevolent outside force is responsible for DM can have an important impact on patients' self-efficacy and their efforts to manage their health. However, with more powerful factors in the regression models, this difference did not emerge as a significant predictor of improved glycemic control with this small study sample. Larger samples should be examined to further test this notion.

Several of the identified factors also emerged as significant predictors of improved physiological measures. An increased endorsement of Provider Trust was predictive of improved HbA_{1c} in Model 1. The items of Provider Trust reflect a belief

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that health care providers are trustworthy sources of information regarding the prevention of DM and potential complications, as well as an openness to follow their suggestions regarding DM management. This finding is consistent with previous research regarding the importance of a good working alliance between patients and health care providers in adherence to diabetes treatment and obtaining good glycemic control (Ciechanoswki, Hirsch, & Katon, 2002; Ciechanowski, Katon, Russo, & Walker, 2001). Provider trust is a particularly important issue within NA/AI communities. The primary source of healthcare in this population is provided by the Indian Health Service which is a United States government program; and as established in the introduction, there is sufficient reason for a high level of distrust among this population toward the US government. The importance of a trusting relationship between health care providers and DM patients also highlights the necessity for providers working in an IHS facility to be culturally informed and preferably have a background in the community themselves. Further efforts to recruit NA/AIs into healthcare professions are obviously needed.

A decreased rate of Treatment Acceptance was also predictive of improved HbA_{1c} in Model 1. The items composing the Treatment Acceptance factor reflect a belief in a cure for diabetes. Perhaps as participants grew more aware of the fact that DM is not cured but requires ongoing management, they took greater responsibility for managing the DM and experienced improved HbA_{1c}.

Finally, an increased endorsement of the DC fatalism factor Traditional Diet from baseline to post-intervention was predictive of improved random blood glucose. This item is not a measure of actual diet, but rather belief that a traditional diet can improve DM control. Even coming to hold a stronger belief in a more traditional diet was a

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significant predictor of improvement in participants' actual random glucose levels.

DLC. Factor analyses of the DLC demonstrated 4 factors: Chance, Self-Blame, Health Responsibility, and Family Support. Previous common factor analysis of this measure among a sample of adults with diabetes has demonstrated three factors: Diabetes Specific Internal Locus of Control (including subscales Autonomy and Self-Blame), Powerful Other Locus of Control (including subscales Health Professionals and Nonmedical Others), and Chance (Peyrot & Rubin, 1994). The two Chance Factors identified in the two studies shared many of the same items. The Self-Blame factor in the present study was very similar to Peyrot and Rubin's (1994) subscale of Self-Blame, sharing two of three items. Peyrot and Rubin's (1994) Autonomy subscale shared one item with Health Responsibility factor identified in the current study. In addition, the Family Support factor that emerged in the present study shared one of two items with Peyrot and Rubin's (1994) Nonmedical Others subscale. The fact that family support emerged as a unique factor in the present study may reflect cultural emphasis on the extended family among Indian Communities. Peyrot and Rubin (1994) provide limited description of the demographics of their sample, but given that it was conducted in Baltimore, it likely did not include a substantial number of Plains Indians. Despite the differences in sample demographics, the present findings provide preliminary support the factor structure of this measure and its utility for assessing locus of control with diabetes patients' of NA/AI populations.

Among the DLC factors observed in this study, means comparisons yielded a trend towards increased Family Support and decreased Self-Blame from baseline to post-intervention. Change in the Family Support factor of the DC Fatalism measure also

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entered Model 3 as a significant predictor of random blood glucose. As participants perceived greater support of their family in managing the DM, they demonstrated improved random blood glucose. Patients have a great deal of difficulty making health choices if their loved ones and household members are not supportive of their efforts to quit smoking, remove junk food from the house, and get more exercise. Family support is an essential component of DM management, and is highly valued in many NA/AI communities.

Change in the DLC factor of Self-Blame entered regression Model 2 as a significant predictor of change in average estimated daily blood glucose. As participants' ratings of Self-Blame decreased, their glycemic control improved. Items composing the Self-Blame factor reflect a self-critical view that one must be perfect to manage their DM well. During the course of the intervention sessions, several participants indicated that allowing themselves to make occasional mistakes lessened their overall stress level and improved their confidence in their ability to manage DM.

DQOL. This measure generated 5 subscales: A-Treatment Satisfaction, B-Treatment Impact, C-Worry about Future Effects of DM, D-Worry about Social/Vocational Issues, and E-Overall Health. Means comparisons yielded significant improvement in participant ratings of Treatment Satisfaction and Worry about Social/Vocational Issues, as well as a trend towards decreased Worry about the Future from baseline to post-intervention.

Change in the Treatment Impact subscale of the DQOL from baseline to post-intervention entered Model 2 as a significant predictor of change in average estimated daily blood glucose. The items of this subscale address negative aspects of DM

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management (e.g., pain, embarrassment, physical illness). Participants' reports of decreasing levels of these negative experiences associated with DM were predictive of improved average daily estimated blood glucose.

Participation in the Intervention

Completion of the intervention and follow-up assessment was a significant predictor of whether participants demonstrated improved HbA_{1c} and random blood glucose from baseline to post-intervention. In conjunction with the lack of differences between study completers and noncompleters at baseline, this finding suggests that participation in the intervention was beneficial for participants' DM management. However, these results must be viewed as tentative due to the use of imputation to calculate the post-intervention data for the noncompleters and the lack of a formal control group. Additionally, cross validation of the regression model is needed in future research with this and other similar populations.

Limitations of the Present Research

As mentioned above, the lack of a formal control group is a limitation of the present research. No control group was used due to the limited availability of participants. As described in the Methods section, it took considerable effort to recruit and maintain the 20 participants who did complete the study. If they had been randomly assigned to either a treatment or control group, the cell size would have been too small for statistical comparisons.

The small sample size also limited the power of the present study and precluded

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holding out a subsample to cross-validate the results of the regression models. Inclusion of a larger sample may have yielded greater differences and/or more model predictors between the baseline and post-intervention time points. Although collecting a larger sample would be challenging, ideally future research will replicate this study with a greater number of participants and assess the generalizability of the regression models.

The findings of the present study are also limited due to the collection of data on only one reservation. The sample was collected from the Wind River Indian Reservation that consisted primarily of tribal members from the Northern Arapaho Tribe, the Eastern Shoshone Tribe, members of both the Eastern Shoshone and Northern Arapaho combined or mixed bloods, and a small number of participants from other Indian tribes such as the Oglala Sioux, and the Choctaw. Different tribes have unique cultures and background and the results of this project may not generalize to other populations. Replications with other NA/AI groups are needed, and cross validation as mentioned previously should be a priority in future research in this area.

Discussion of the Issues Surrounding Research in Indian Country

The difficulty recruiting a larger N for this study highlights the challenges to conducting research in NA/IA populations. These individuals are limited in numbers, often reside in rural areas with underdeveloped communities, and have good reason to be wary of researchers.

The difficulties that researchers encounter while conducting research in NA/AI communities are numerous, complicated, and can be quite difficult to navigate. Several studies have been discontinued, have failed, or have been severely limited due to the

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inability of the investigators to consider and/or address the pitfalls inherent in attempting to do research in NA/AI communities. Following are some examples of the difficulties of implementing and completing research in NA/AI communities and on reservations.

Permission to do such studies is often an issue. There is often additional permission and Internal Review Board approvals (or their equivalent) that must be obtained prior to collecting data in many NA/AI communities, such as those required by IHS. Most reservations have a governing body that will require some form of prior approval. This may be in the form of a resolution or letter of permission from an elected body such as a tribal council, or in the form of an approval from a government official such as the Agency Superintendent of the Bureau of Indian Affairs. Obtaining such permission is often the first hurdle a researcher will face. Securing this type of permission(s) can be challenging and very time consuming due to many interacting factors.

A lack of resources in many of these impoverished communities can lead to priorities that do not include an emphasis on research. The importance of research may appear to be an academic exercise in comparison with the immediate needs of the population. For instance, when potential participants cannot make regularly scheduled appointments to participate in research due to the need for each day's earned wages to support their family, the importance of research to that individual is negligible at best. These are the kinds of things that must be considered when frustrated researchers wonder why their recruitment and post-intervention rates are not what they would like to see, or why no one appears interested in their project.

The financial costs of doing research in Indian country may be greater than

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anticipated due to such things as the long distances between communities that one must travel and the lack of supportive facilities in NA/AI communities. When conducting healthcare research there is often a lack of centralized locations at which research data/trials can be conducted. Many of these communities are quite small and this leads to concerns with privacy and confidentiality issues that are not easily overcome and may lead to individuals refusing to participate. Basic infrastructure for tribal government and other official business are often inadequate or nonexistent; therefore office space for research is frequently a very low priority. The availability of telecommunications for both providers and participants is also often limited; many tribal members who live on rural reservations do not have phones.

There is a cultural component of conducting research in NA/AI communities that must be also addressed. In the mainstream academic community of the United States, there appears to be a desire to understand many things for an academic purpose or to "share" the knowledge that can be ascertained from conducting research with NA/AI populations. And while in this society we owe many thanks to such research in areas such as medicine, physics, psychology, pharmaceuticals, and a variety of other fields, it can also be considered a disrespectful and/or harmful approach. Often in NA/AI communities there is a reluctance to allow sensitive information to be collected and shared. As the value placed on why something happens in a particular way or how certain procedures take place may be a specific tradition that is thousands of years old. The sharing of this information must be contemplated and considered carefully with much respect. For instance, many Plains Tribes hold ceremonies such as a Sun-Dance. The level of cultural and traditional respect paid to such ceremonies is often very high. Without describing the

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ceremony here, it is suffice to say that allowing photography and/or written description of the ceremony by outside individuals is not allowed. However, there have been accounts where outside persons have managed to take photos, conceal them, and later publish articles, various descriptions, and even books on the traditional practices of many indigenous people and their spiritual and religious ceremonies.

There is a basic tenet of human subject research that the study must benefit the population who participates, rather than satisfy another group's curiosity or needs. In the non-Indian world, there at times appears to be a fascination with how Indian cultures do things or why Indians may do things differently than non-Indians. Thus, there is a desire to study it in an academic way, and to write about it or want to understand it so that it may be shared with others outside the NA/AI community. Many Indian people resent this as they feel like it can be an invasion of their cultural privacy and furthermore they may encounter non-Indians who want to write books or "share" their cultural practices and in some cases benefit financially or professionally without regard for the population, which is offensive. As established earlier in this paper, there is a history of mistreatment that has lead to distrust. This is an additional way in which distrust finds its way into many Indian communities. These kinds of practices are not necessarily common nor are they frequently the goal of researchers. Although when one of these cases occurs the repercussions are felt throughout the Indian community, as well as the research community. When researchers from a large state university in the southwest are supposedly conducting diabetes research with a data set collected from a group of Southwestern NA/AI people and the data were also used in a study which examined schizophrenia risk factors (without permission from the individuals or the tribe), it should

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come as no surprise why NA/AI tribes and communities do not trust outside research entities!

There is a common saying among many Plains NA/AI elders, that the "whites have to have it written down to believe it or trust it." As well, there are several instances where rather than accepting that a particular approach that an indigenous group utilizes to address a problem with an individual or a community, the non-Indian wants to study it and determine why a specific approach or technique works rather than merely accepting that the approach or technique is helpful to a community or to an individual. The lack of respect in the non-Indian academic community for the oral tradition is an excellent example of how knowledge of NA/AI is considered insufficient and conclusions drawn from such information is thought to be in need of further study. Vine DeLoria Jr. has written about how modern scientists are amazed to learn that certain plant species have shown in research trials to respond positively to music, resulting in increased growth and vitality. He goes on to explain that this is considered an amazing scientific discovery. Yet when indigenous groups such as the Hopi or the Anasazi discuss and tell stories about their belief (s) (many of which they have held for thousands of years) that holding ceremonies such as corn dances and singing songs (a specific ceremony) will enhance their crops, their beliefs are dismissed as "mystic" or "shamanism." Again, rather than accept that a particular group believes a particular way, there is a push to "get some data" and this is often considered the only acceptable way to justify a certain belief. Many people in the NA/AI communities are offended by this approach.

The goal here is to point out that there are several reasons to consider why accomplishing research in NA/AI communities can be difficult, many of which are not

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apparent and may require a deeper level of understanding of specific cultures. The level of disrespect may be difficult to see initially and even more difficult to understand, yet it may be present and affecting the ability to do research among these communities. These are areas which persons interested in doing research in Indian communities should be well versed in and considering on a regular basis. When we think of the concepts of necessary and sufficient in our academic training in epidemiology and occurrence rates of particular disorders, we must remind ourselves that many things with regards to doing research in Indian country are necessary and we must never forget that while something may be necessary it may not necessarily be sufficient.

Research as a whole is a good thing. I firmly believe that Indian communities can and do benefit from research studies that are done in a respectful manner and which work to improve the lives of Indian peoples and the lives of others. Many people in NA/AI communities understand the advances that can be made through conducting quality research and implementing helpful findings and techniques. However when ethical violations occur, atrocities are committed, and/or people are disrespected for an approach to knowledge which is different than the mainstream "scientific method", it serves as yet another example of mistreatment for NA/AI communities. Thus, members of NA/AI communities have even more reason to feel distrustful of the mainstream society.

Diabetes Specific Research in Indian Country.

There is a large body of literature documenting the astounding rates of diabetes, and resulting medical complications among NA/AI populations in the United States. The sheer magnitude of negative impact to NA/AI communities resulting from diabetes related medical complications will continue to be felt by these communities and their

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members well into the future. Research which is conducted in an ethical manner that holds the benefit of tribal communities and their members above all else is called for immediately. In this small study we have found preliminary support for an approach which is focused on empowering individuals who have the knowledge and expertise about their own bodies and minds including experience based on the course of their condition, to consider change from their perspective. This is a very encouraging sign and is only the beginning of interventions that could be tailored to benefit such individuals and communitied.

With the challenges NA/AI communities face regarding diabetes, the need for ongoing research and intervention is multi-faceted. Although there is research that has been associated with prevention of the onset of Type-2 diabetes replication of such studies in NA/AI communities such as the one in this project need to take place. Inclusion of traditional perspectives in the development of intervention programs need to be given equal respect and opportunity in the area of preventing diabetes and its harmful complications. In Mexico south of the Arizona border, a group of Pima Indians (Tohono O'odham) has a very low rate of Type-2 diabetes, yet they are biologically related to the Tohono O'odham of southern Arizona. The diet of the southern group of Tohono O'odham is a very traditional diet with low fat and carbohydrate intake and regular work and exercise as daily activities. So when the elders of plains tribes describe diabetes as a disease which could be reduced or eliminated by a change in diet, or we see a reduction in HbA_{1c} in those who acknowledge such a belief we must follow up by allowing approaches in this vein to be implemented. This is where an approach like Motivational Interviewing is so valuable, to encourage individuals to consider unique approaches to

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managing their own health and preventing complications as well as promoting their health and well-being.

Clinical Implications & Future Research

Overall, the findings of the present research support the relationship between health-related behaviors, psychological well-being, and diabetes management (specifically glycemic control). Several significant changes were found in each of these domains from baseline to post-intervention and multiple significant predictors of improved glycemic control were identified. Theses findings replicate previously identified relations in this area of health care. However, no previous research had demonstrated all of these findings in a NA/AI population.

Moreover, all areas of change from baseline to post-intervention were in the direction of improvement, lending support to the effectiveness of this brief intervention in impacting patient's diabetes management. Three psychological variables both emerged from regression models as significant predictors of improved glycemic control and demonstrated at least a trend towards significant improvement from baseline to post-intervention follow-up: Depression, Self-Blame, and Family Support. The potential clinical implications of these three constructs warrant further discussion.

One of the most significant improvements was observed in self-reported levels of depressive symptomatology. Decreasing levels of depression also emerged as a significant predictor of improved glycemic control when other variables were controlled. As reviewed in the introduction, the relationship between depression and diabetes is well documented. In fact, IHS has a mandate to screen for and address depression as part of a

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comprehensive approach to diabetes care (IHS Standard of Care for Patients with Type 2 Diabetes, 2003). Inclusion of mental health professionals in diabetes programs is recommended by the American Diabetes Association. The findings of the present study suggest that Motivational Interviewing holds great promise as a brief intervention in Type-2 DM management.

The Self-Blame factor of the DLC also demonstrated a trend towards improvement from baseline to post-intervention and was a significant predictor of improved glycemic control. Self-Blame reflects a tendency to both take credit for good DM management and be unnecessarily critical of one's self during times of poorer glycemic control. Motivational Interviewing lends itself particularly well to addressing this issue. This is accomplished by allowing the patient to view themselves as the expert on how to manage their health and implement change behaviors. Patients are less likely to feel criticized or the need to live up to other peoples' standards if they are not told directly what to do by their health care provider. A collaborative approach allows people the freedom to choose what behavior is most important for them to focus on regarding DM management and to accept that they do not have to maintain perfection to improve their glycemic control and overall health. This finding is consistent with the substance abuse literature which suggests patients viewing a relapse as a failure rather than a set-back or learning opportunity are more likely to continue to abusing substances (Marlatt & Gordon, 1980; Marlatt & Gordon, 1985).

The other variable that emerged as both a significant predictor of change in glycemic control and demonstrated a trend toward improvement from baseline to post-intervention was Family Support. Family support is an essential component of DM

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management, and is highly valued in many NA/AI communities. During their sessions of Motivational Intervention, several participants expressed an interest in including their family members in their efforts to make exercise and dietary changes. After initial efforts, many indicated that this was improving not only their glycemic control, but also benefiting their family members. Perhaps participants reported a higher level of family support post-intervention because they were more openly discussing their DM management with family members for the first time during the course of this study. Participants who successfully involved family in their efforts to change likely benefited from this social support and demonstrated greater improvement in their glycemic control.

Although depression, self-blame, and family support were the only variables that demonstrated at least a trend towards improvement and significant predictive value for improved glycemic control, multiple other variables demonstrated improvement or predictive value. Obviously, future research is needed to replicate these findings and further investigate theses relationships. All of the present regression models utilized physiological measures as dependent variables. Additional analyses examining what is predictive of improvement in the health-related behaviors and psychological measures are needed.

Concluding Comments

As discussed throughout this paper, we are describing a population of people who have been faced with cultural oppression, forced assimilation, genocide, racism, economic adversity, and elevated rates of negative health conditions over the last 500+ years; however, it is important to remember that this strong group of people has

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persevered in times of difficulty and today is one of the fastest growing demographic groups in the US. Chief Washakie, the leader of the Eastern Shoshone, and Sharpnose, the last Chief of the Northern Arapaho, both wanted their people to be strong and maintain their identity… which they are doing – "in a good way."

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APPENDIX A: Participant Consent Forms

Subject Information and Consent Form

Title: Why Change Now? Motivational Interviewing as a Brief Intervention to Type-2 diabetes in Plains Indian Tribes

Investigators/Study Directors: Darren Calhoun, ABD-PhD
David Schuldberg, Ph.D., Christine Fiore, Ph.D.
Department of Psychology, University of Montana. (406) 243-4522/4183/2081

Purpose:
1. I understand that this study hopes to discover if there are ways to help prevent health complications of type-2 diabetes in American Indians. Type-2 diabetes is a disease where the body can not handle blood sugars well, which can lead to eye, foot, circulation, and heart problems.

Procedures:
1. I understand that if I choose to participate that I will have 4 meetings with the interviewer. These meetings will take place over a time period of approximately 3 months at my choice of either the Arapaho or Ft. Washakie Indian Health Service Clinic.

2. The first meeting will be an informational session where I will learn about the study and have opportunity to ask questions regarding the study. At this time I may choose to sign consent forms and participate or I may choose to decline to participate. I understand that my participation is voluntary and that I may choose to stop participating at any time without consequence. If I choose to participate I will fill out forms at this time and again in approximately 3 months at a follow up meeting, these forms will ask questions about my history with diabetes, my thoughts about diabetes, my mood, and lifestyle choices including exercise and nutrition. I will agree to have my height and weight checked, and to have blood drawn for an HBA1c (average blood sugar) test, as well my random blood sugar level will be checked at this time. This meeting is expected to take approximately 1 hour of my time.

3. In the second meeting I will discuss my story with diabetes and discuss strategies with the interviewer such as healthy lifestyle choices which may help improve my behavioral management of diabetes. This meeting will be scheduled within one week of the first meeting and is expected to take approximately 30 minutes.

4. In the third meeting I will again discuss methods such as healthy lifestyle choices with the interviewer which I may find helpful in improving my behavioral diabetes management. This meeting will be scheduled within one week of the previous meeting is expected to take approximately 30 minutes.

5. Approximately 3 months after the third meeting I will meet with the interviewer for a fourth and final meeting. This meeting is to follow up and again fill out the forms

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regarding diabetes management which were filled out at the beginning of the study and to have blood drawn for the HBA1c (average blood sugar) and random blood sugar test. This meeting will take approximately one hour of my time. This will be the last meeting of this study.

6. All data from this study will be kept in a locked file cabinet and will be held confidential with only research staff having access to this information. The data will be coded so as not to contain names and other identifying information. A key which contains names and other identifying information will be created and will be stored separately from the data in locked file cabinets with only the investigator and research staff having access to this key. This key will be destroyed upon completion of the study to ensure participant confidentiality.

Payment for Participation

1. I will receive $10 for my time each time I complete the forms, get measured for weight and height and have my blood drawn for the HBA1c (average blood sugar) and random blood sugar test. I understand that I will be asked to fill out the forms and have blood drawn on two occasions separate occasions, before the study and at the conclusion of the study. I understand that I am being paid for my time not for my participation in the intervention.

Risks and Discomforts:

1. I understand that blood will be drawn form a vein in my arm for this study. The blood will be drawn by Indian health service lab technicians or health care providers who are trained in phlebotomy. The phlebotomist will draw approximately 4 table spoons of blood from my arm on two separate occasions. This will occur at the beginning of the study, and at the completion of the study. The blood is being drawn for two reasons: the first is to measure random blood glucose level which is also known as blood sugar: the second reason blood will be drawn is to measure my average or stable blood sugar over time for the past 30-90 days (HBA1c, glycosated hemoglobin test). There are possible risks that I am aware of with having my blood drawn and they include pain, bruising, bleeding and infection. I am aware that the trained personnel performing the blood draw will do what is necessary to reduce the chances of these risks. I also understand that they Indian Health Service Diabetes Coordinator will look at my random blood sugar levels and my HBA1c results in my medical chart for the 6 months previous to this study. This is to gain an idea of the levels of my blood sugar and HBA1c test results for the six months prior to this study. I will be revealing personal information about my health related to type2 diabetes. I am aware that your research staff will keep my personal information strictly confidential and that if I need to speak with a medical or mental health professional regarding my health or participation in this study I will receive an appropriate referral to do so.

Benefits:

1. This project aims to study ways to assist in helping people prevent health complications as a result of type-2 diabetes. I understand that I may not directly benefit from being in the study but that I may increase what we know to help trial members on

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the Wind River Indian Reservation reduce the number of people who have health complications from diabetes.

Confidentiality:
1. All information from this study will be private and will not become a part of my file at either Ft. Washakie or Arapaho Indian Health Service clinic. My name will not appear on any of the materials. In order to schedule the meetings over the 3-month study period the interviewer will keep my name and information as well as how to best contact me so that I can continue in the study. I understand that if I receive a medical referral it is my option to follow up on that procedure and that my name or any other identifying information will not be passed on to medical or other health care personnel. I understand that the interviewer will be collecting information regarding my mood. I also understand that should I endorse items on this measure, or verbally indicating suicidal ideation or self harm the confidentiality of information which I have shared may be breached, this will occur only in the event that my personal health and safety is compromised. I understand that any self identifying information will be destroyed upon completion of this study. Although staff members at either Indian Health Service may be aware of my participation in the study all data from the study will remain confidential. If I wish to receive the results of the study when it is completed I understand that I can call Kelly Moore, M.D. at the Billings Area Indian Health Service Office (406) 247-7111, Catherine Keene at the Wind River Service Unit (307) 332-7300 for further information. I also may contact David Schuldberg, Ph.D. or Christine Fiore, Ph.D. at the University of Montana (406) 243-4521/4183/2081.

Compensation for Injury:
1. Although we believe the risk of taking part in this study is minimal, the following liability statement is required in all University of Montana consent forms, therefore the following liability information is provided:
"In the event that you are injured as a result of this research you should individually seek appropriate medical treatment. If the injury is caused by the negligence of the University or any of its employees, you may be entitled to reimbursement of compensation pursuant to the Comprehensive State Insurance Plan established by the Department of Administration under the authority of M.C.A., Title 2, Chapter, 9. In the event of a claim for such injury, further information may be obtained from the University's Claims Representative or University Legal Counsel (David Aronofsky 243-432)".

Voluntary Participation/Withdrawal:
1. I understand that my participation is voluntary and that I may stop participating at any time in the study without consequence. At any time during the study I may withdraw for any reason and still receive any compensation that is allowed for me for my participation up to the point at which I withdraw from the study.

Subject's Statement of Consent:
I have read and understand the above description of this research study. I have been informed of the risks and benefits involved and all my questions have been answered to my satisfaction. Furthermore, I have been assured that any future questions I may have

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will also be answered by a member of the research team. I voluntarily agree to take part in this study. I understand I will receive a copy of this consent form.

_____
Printed or typed name of participant

_____ _____
Signature of Participant Date

_____ _____
Signature of Witness Date

Optional:
I am aware that to ensure that the study is conducted in the matter it was designed that some of the study participants will be asked to have audio tape recording of the two meetings in which strategies to discuss improving behavioral management will occur.

_____I am willing to be audio taped.
_____I am NOT willing to be audio taped.

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Authorization for Use and disclosure of Health Information for Research Purposes

Why Change Now? Brief Motivational Interviewing as an Intervention in Type-2 Diabetes in Plains Indian Tribes

You have been asked to be part of a research study being done by Darren Calhoun and his research team here at the Wind River Service Unit of Indian Health Service. The purpose of the study is to attempt to discover if there are ways to help prevent health complications of type-2 diabetes in American Indians. Type-2 diabetes is a disease where the body cannot handle blood sugars well, which can lead to eye, foot, circulation, and heart problems.

The federal Health Insurance Portability and Accountability Act (HIPAA) requires you to give your permission to use health information about you that we either create or use as part of the research. This permission is called a HIPAA Authorization. **We will use or disclose (release) information collected in this study regarding your length of time diagnosed with diabetes, tribal affiliation, height and weight, random blood sugar levels, stable blood sugar levels (HBA1c), levels of depression, quality of life related to diabetes, thoughts about diabetes management, information regarding your levels of exercise and dietary intake, and information regarding your safety or others if there is reason to believe that you are a danger to yourself or others. The information related directly to your health records at Indian Health Service that is part of routine care for patients with diabetes, such as blood sugar measurements, may become a part of your health record.**

As part of the study, your health information may be used by and/or disclosed (released) to: The research team which includes the principle investigator Darren Calhoun, clinical supervisor Dr. Rector, diabetes staff Dianna Richter, Marion Ute, and your primary medical care provider which may include one or more of the following: Dr. Klinkenborg, Dr. Calder, Dr. Nelson, Dr. Cardinal, Mr. Berry RN, FNP, Ms King RN FNP, Ms Scofield RN, FNP. It is important to note that medical care providers are not part of the research team and will be allowed access to the study information only if a determination is made that it is medically necessary to share the information. On call medical or mental health care staff may be contacted and information may be shared with that person if a determination is made that a participant's safety and well being are at risk. Dr. Fiore and Dr. Schuldberg are faculty members of the University of Montana and are the research supervisors of Darren Calhoun, however they will not have access to the personal health information that you disclose in this study.

Those persons who receive your health information may not be required by Federal privacy laws (such as the Privacy Rule) to protect it and may share your information with others without your permission, if permitted by laws governing them.

We will use your health information to conduct the study, **and other uses of the information, e.g., to determine research results, to monitor your health status, to**

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measure effects of drugs/devices/procedures, and possibly to develop new tests, procedures or commercial products. It is important to remember this study and information collected from this study will be used to help us learn more about how to address preventing the complications of diabetes and improving the health and well being of those with diabetes. Health information is used to report results of research to sponsors and federal regulators. It may be audited to make sure we are following regulations, policies and study plans.

By signing this form, you authorize the use for research purposes the information listed above. If you do not sign this authorization, you will not be a part of the study. Taking part in the study is voluntary. You may refuse to take part, without any penalty or loss of care or services by IHS or others. If you decide to take part, your Authorization for this study will not end unless you cancel (revoke) it. The information collected during the study will be kept until the completion of the study. Upon completion of the study the study data, which will become a series of numbers and codes and will contain no information that could identify individual participants will be kept indefinitely. **However, it is noted that the master list, which may contain identifiable information will be destroyed upon completion of this study. This means that there will be no record of those individuals who participated in the study in the study materials or data beyond the anonymous numbers and codes.** At any time you can cancel this Authorization by writing to the study principal investigator Darren Calhoun, P.O. Box 592 Crowheart, WY. 82512. If you cancel your Authorization, you will also be removed from the study, without penalty or loss of care or services for which you are qualified. Canceling your Authorization only affects uses and sharing of information after the study investigator gets your written request. Darren Calhoun and his or her research team can continue to use information about you that has already been collected. No information will be collected about you after you cancel the Authorization.

By signing this Authorization form you agree that you have read this Authorization form and have been given the opportunity to ask questions. If you have any questions later, about this study or any information in this form you may contact Darren Calhoun, P.O. Box 592 Crowheart, WY. You will be given a signed copy of this authorization for your records.

This authorization does not have an expiration date.

_____ _____

Signature of participant or participant's personal representative Date

_____

Printed name of participant or participant's personal representative

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APPENDIX B: Treatment Manual

Why Change Now?
Motivational Interviewing as a Brief Intervention for Type-2 Diabetes on the Wind River Reservation

The Eastern Shoshone and Northern Arapaho Tribes, The National Institute of Health, The University of Montana, and The Indian Health Service.

Darren Calhoun, M.A.; Christine Fiore, Ph.D.; David Schuldberg, Ph.D.

Forward:
This serves as a training manual and will provide a brief overview of what Motivational Interviewing is, and how it was used as an intervention in this project. Participants in this project will attended 2 Motivational Interviewing sessions to discuss their individual approach to behavioral management of diabetes. Each session followed the spirit of Motivational Interviewing and the guidelines that are derived from the Motivational Interviewing literature (Miller & Rollnick. 2002). This manual is an adaptation of descriptions of Motivational Interviewing found in "Motivational Interviewing: Preparing People to Change" by Miller & Rollnick 2002, "Health Behavior Change: A Guide for Practitioners" by Rollnick, Mason, & Butler 1999, and "Motivational Interviewing: Professional Training Videotape Series" (Miller, Rollnick, & Moyers, 1998). In addition, personal experiences and quotes to the primary author are added into the descriptions of the manual to allow for an increasingly experience driven training manual.

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Review of Theory:

What is Motivational Interviewing?

Motivational Interviewing is directive client centered counseling style for eliciting behavior change by helping clients explore their ambivalence (Rollnick & Miller, 1995). This approach is a particular way to help people change their present or potential problems (Miller & Rollnick, 1991). The concept of Motivational Interviewing evolved from experience in the treatment of problem drinkers and was first described by Miller (1983). Miller & Rollnick (1991) refined and elaborated on what Motivational Interviewing is and how it is applied in a more detailed description of clinical procedures. They describe that Motivational Interviewing is particularly useful for individuals who are reluctant to change and ambivalent about changing (Miller & Rollnick 1991, Miller & Rollnick 2002). A goal of Motivational Interviewing is to help resolve such ambivalence and allow a person to move along the continuum of change proposed by Prochaska & DiClemente (1995). The application varies depending on the needs of the specific patient. For some people a motivational boost is all that is required to initiate change. Once they become unstuck and are no longer immobilized by conflicting motivations they have the skills and resources necessary to make a lasting change (Miller & Rollnick, 1991). For others this approach may actually be a prelude to even beginning treatment, as it creates an openness or willingness to approach change that paves the way for therapeutic change (Miller & Rollnick, 1991).

In Motivational Interviewing the expert role traditionally played by the counselor is removed. This role of someone who tells the patient how to run his or her life is

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avoided in favor of seeing patients as the expert and knowing what is best for him or her. Thus responsibility for initiating and maintain change is left to the patient (Miller & Rollnick, 1991, Miller & Rollnick, 2002). This does not mean that the therapist becomes a powerless or helpless bystander; rather some Motivational Interviewing research seems to support that therapists exert a surprising amount of influence over whether or not their clients change (Miller & Rollnick, 1991).

The strategies of Motivational Interviewing are more persuasive than coercive, more supportive than argumentative (Rollnick & Miller, 1995). The focus of the counselor is to create a positive environment that is conducive to change, rather than a confrontive one, which tends to lead to defensive responding. The overall goal is to increase intrinsic motivation to change, resulting in change from within as opposed to change that is imposed from the outside. Other motivational approaches have relied on persuasion, coercion, and constructive confrontation. While these strategies may achieve change in some individuals, they are not focused on identifying intrinsic values and goals of the patient to stimulate behavior change as is Motivational Interviewing (Rollnick, & Miller, 1995; Miller & Rollnick, 2002).

Ambivalence within a client to change is not seen as the counselor's task to resolve, but rather as the client's. Often the conflict regarding the decision to make changes creates additional difficulty for initiating change, as the client begins to realize that change is not only difficult but also complex. In Motivational Interviewing, both the perceived benefits and costs associated with change are examined. Many clients have never been given the opportunity to express this conflict. Imagine this aspect of a conversation coming from a client: "If I were to stop smoking then I will feel better about

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myself; however most of my friends smoke so if I quit smoking I won't be able to go out or spend time with them." This is a small but often cited description into the complexities of changing behavior. Using Motivational Interviewing the counselor's task is to facilitate change through expression of both sides of the ambivalence and guide the client toward an acceptable resolution, which may trigger change (Rollnick & Miller, 1995). One may be tempted to be helpful by persuading the client to the urgency of needed change. It appears quite clear however that these tactics generally increase client resistance and diminish the probability of change (Miller & Rollnick, 1991).

To a counselor who is accustomed to a confrontational, aggressive, and persuasive method, Motivational Interviewing may appear to be a hopelessly slow and passive process. However the proof of what this process really entails is in the outcome. More aggressive styles and strategies lead to pushing clients into changes that they are not ready for (Rollnick & Miller, 1995). In contrast to more aggressive styles, the counselor utilizing Motivational Interviewing may appear primarily inactive in the therapeutic process. However, when using Motivational Interviewing one proceeds with a strong sense of purpose, along with clear strategies and skills for pursuing a sense of timing to intervene in particular ways at incisive moments (Miller & Rollnick, 1991). The motivational literature reveals that in alcohol use research increased confrontational styles by counselors may actually lead to an increase in drinking (Miller & Rollnick, 2001).

Motivational Interviewing as a Brief Intervention

This method uses the innovations developed by the Transtheoretical Model and

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Motivational Interviewing, as well as a patient centered approach, so we see it is not an original or new technique. Rather it is an attempt to redefine and adapt these ideas and techniques for use in a brief patient centered consultation (Rollnick, Mason, & Butler, 1999). In his description of the proper use of Motivational Interviewing as a brief intervention Rollnick, Mason, & Butler (1999) posed the question: How do you know you have got it right? Some key signals are, the patient is doing more of the talking than the counselor is, the counselor is carefully listening and directing the interview at appropriate moments, and the counselor is speaking slowly (Rollnick, Mason, & Butler, 1999).

In comparisons of the amount of Motivational Interviewing participants receive there is support for brief interventions utilizing Motivational Interviewing. There is evidence that a brief intervention utilizing Motivational Interviewing may be as effective as those designed to include more Motivational Interviewing. In a study of hypertension, patients who received a more intense does of Motivational Interviewing (six, forty five minute face to face sessions every four weeks) versus those who received much less (a single face to face 45 minute session along with five brief telephone sessions) showed both groups to have significantly improved outcomes (reduced weight and blood pressure, and reduced salt intake and alcohol consumption respectively) compared to a control group, but there were no significant differences on outcomes between "MI" groups (Wollard, Beilin, Lord, Puddey, Mac Adam, & Rouse, 1995). Miller (2000) reports that in several studies examining treatment intensity for problem drinkers that relatively brief interventions can trigger significant change. He further cites that in many cases it appears that an increased duration and intensity of treatment received does not

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equate with a consistent improvement in outcome for problem drinkers.

The method comes from the two broad sources, Motivational Interviewing (Miller 1983, Miller & Rollnick 1991, Miller & Rollnick, 2002) and the Transtheoretical Model of Change (Prochaska, DiClemente, & Norcross 1992). This method was developed over a ten-year period in which ideas and strategies were tried in real as well as simulated consultations (Rollnick, Mason & Butler, 1999). Using Motivational Interviewing as brief intervention was developed initially from studies of health promotion among excessive drinkers in a general hospital setting (Rollnick et. al, 1992). Others emerged with patients who were smokers and people with diabetes (Rollnick, Mason & Butler, 1999). In addition, the patient centered approach to the consultation has played a role as well (Stewart et. al 1995). This behavior change strategy forms an essential framework for understanding how one health behavior affects another. Thus, it is embedded in working with the whole person. The techniques are not magic bullets, but rather ways of structuring a conversation that maximizes the person's freedom to talk and think about change in an atmosphere that is non-coercive (Rollnick, Mason, & Butler, 1999).

Consistent with the Transtheoretical stage of change model (Prochaska, Norcross & DiClemente, 1994), there is strong emphasis on choosing a task which matches the patient's level of readiness to address change. There is no single way of carrying out a particular task, but rather a collection of strategies that are used. These strategies start out with development of rapport, and to focus on a task that is important to the patient, which may or may not involve setting an agenda. Once an issue is decided upon to discuss, understanding exactly how the patient feels about this issue should be the goal of the consultation.

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In Type-2 diabetes mellitus (DM), behavioral management plays an important part in the treatment process. Some areas of lifestyle that affect DM management are diet, exercise, self-monitored blood glucose levels (SMBG), routine doctor's visits, and adherence to prescribed oral medication (s) or use of insulin injections as part of a comprehensive treatment regimen. These may appear to be easily followed. However, most patients develop Type-2 diabetes in adulthood. The result is behavior patterns which have been developed over many years or even decades are suddenly called into question and appear to be in need of immediate and often drastic change. Where does this leave the patient with recently diagnosed Type-2 diabetes? A common response is a feeling of overwhelming fear and anxiety, often leading to feelings of depression. Estimated prevalence rates of depression in recent diagnosed cases of diabetes <2 yrs, is approximately 50% (Rubin et. al 1995) which is much higher than the general population prevalence rate which is estimated at 25% (DSM-IV-TR 2002). As the individual begins to realize the complexities of behavior change required to assist in their management of diabetes, they often view such changes in a negative fashion.

Quote's from two separate patients diagnosed with diabetes, *"You know I would like to see what it feels like to live without diabetes for one day, I mean I was diagnosed with diabetes when I was 25 years old, which was 10 years ago, and I don't even remember what it was like to live without diabetes, not have to check my sugar, eat what ever I wanted to, ...and now I just feel cursed."*

"It is hard to remember all this stuff like carb counting, checking my blood sugar and keeping track, I was very active before this and now I am always worried about my blood sugar dropping too low or being too high, so I just stay home, it is frustrating."

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The changes people face are often difficult and result in feelings of frustration. Making lifestyle changes is not only difficult, but appears to be a complex process which is not easily understood or accomplished. This notion is supported by the large body of research literature on the Transtheoretical stage of change model which shows that individuals may fall at differing levels along a continuum ranging from not considering change, to exploring ways to prevent relapse once change has occurred. Preparing people for change may be the most important step in accomplishing measurable behavior change (Prochaska, Norcross & DiClemente, 1994).

Motivational Interviewing has gained support in significantly enhancing adherence to diabetes treatment program recommendations, and in leading to improved glycemic control (Smith et al., 1997). A study of the application of Motivational Interviewing utilized as a brief intervention specifically within a population of patients with Type-2 diabetes by Marie and Sampson (2001) has yielded some preliminary but promising results. The authors found that using Motivational Interviewing as a brief intervention was an effective approach to overcome barriers to change in patients with diabetes.

By allowing individuals to focus on the aspect of behavioral management that is most relevant or applicable to their situation, Motivational Interviewing places the power to initiate and accomplish change where it has always been, with the patient. The expert role of the health professional is removed and a collaborative relationship between the patient and provider is formed to approach behavior change from a new direction.

Motivational Interviewing is highly adaptable intervention which lends itself well to brief settings and places the patient in the role of the expert with regard to their

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respective situation. This patient empowerment model results in patients eliciting intrinsic motivation for change as opposed to the provider trying to convince the patient why change is a good idea. In this specific Native American population, this intervention was utilized to create a less directive and more collaborative relationship between patients and care providers. We believe that it will allow for an improved method for discussing how each individual may wish to increase behavioral management of diabetes, and allow those individuals to tailor changes to their circumstances. This was accomplished by assessing importance, readiness and confidence, of the person in regard to the health behavior they choose.

Key Signals to knowing that you are proceeding with the intervention correctly *(Rollnick, Mason, & Butler, 1999 p. 34):*

- The person's story with regards to diabetes has been elicited
- You are speaking slowly.
- The patient is doing much more of the talking that you are.
- The patient is actively talking about behavior change and you are listening and reflecting.
- While listening very carefully you are gently directing the interview at appropriate moments.
- The patient is "realizing things" for the first time.
- The patient is actively suggesting ideas for change or asking for information and advice without you "offering", or "lecturing".

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Description of Techniques used in Motivational Interviewing:

*These examples and descriptions of techniques are adapted from "Motivational Interviewing: Preparing People for Change" (Miller & Rollnick 2002), "Health Behavior Change: A Guide For Practitioners" (Rollnick, Mason & Butler, 1999), "Motivational Interviewing: Professional Training Videotape Series" (Miller, Rollnick, & Moyers, 1998) and are combined with personal experiences of the primary author of this manual.

Starting out, some things to avoid:

Premature Focus Trap:

This happens when we assume that we know what the person wants to talk about and we begin a discussion that doesn't fit. We want to avoid this mistake by collaborating and asking them to talk about what they see as important therefore it is time for us to listen.

Confrontation-Denial Trap:

This is a mistake easily made. It happens when we present the argument of how important it is for the person to change, inevitably placing the client in the role of opposition. That is, the patient is left to argue against change.

Labeling Trap:

Here we need to avoid any emphasis that attempts to push or force the person to admit that they have a problem. The old adage of having to "admit a problem first" does not appear to be an effective method of accomplishing change. There is one likely outcome if we continue to force or push and that is increased resistance by the patient. To avoid this situation, it is helpful to emphasize to the patient that labels are merely words, and that

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focusing on how to address improving behavior change that is helpful to them as an individual is the goal.

Blaming Trap:

Trying to figure out whose fault it is that the patient has a problem. This is a trap to avoid, as blame will help no one and will often increase negative feelings, making change more difficult. The point here should be to remain focused on how the individual can approach improving their DM management without assigning blame or finding fault.

Question-Answer Trap:

This happens when the interventionist falls into a pattern of asking a question and the participant answers with a one word response. The use of open ended questions here will encourage the participant to engage more, and allow for more collaboration in the discussion. A rule described by Miller & Rollnick (2002) is to avoid asking three questions in a row. One way to avoid this is to follow the person's lead allowing the conversation to flow more easily.

The Expert Trap:

If the interventionist acts or speaks as if they are the lone expert with all the answers. When this happens the patient will unlikely see the efforts of the provider as collaborative. The interventionist must work to acknowledge the expertise of the participant this allows and encourages a more collaborative approach between patient and provider. If the participant says:

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"I don't know, you tell me you're the expert."

The provider might reflect:

"Actually I was hoping you would share with me as you are the expert on you, you know much more about yourself than any doctor or other provider. So I would like to hear, what are your thoughts about how changes could occur to allow you to have more control over your diabetes?"

This approach is likely to lead to more conversation than lecturing or appearing to be the expert would lead to.

How to elicit self-motivating statements:

Ask open ended questions:

"What are your concerns about diabetes?" "What concerns do you have about how diabetes may affect your life or your family?"

Explore pros and cons:

By asking about the positives of the current choices, the interviewer both joins with the participant and gain permission to ask about the other side – the cons. *"What are some good reasons to continue smoking?" "Tell me some reasons to stop smoking."*

Asking for elaboration:

When the participant shares a concern or makes any self-motivating statement, the interventionist can further the statement simply by asking for more information.

Pr: *"You said, you could start walking, tell me what that would be like for you?"*

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Imagining and discussing the extremes:

The interventionist can use hypothetical to remove the perceived threat that a person may feel if the conversation seems too personal.

Pr: *"What are the worst things you can imagine happening if someone continued without checking their blood sugar levels regularly?"*

Also it can be very helpful to discuss positive aspects:

"What do you suppose the best possible outcome could be if you made changes in your diet and exercise levels to improve your DM management?"

Looking forward:

This often allows people to think about how they may initiate and accomplish change.

Provider: *"Where do you see yourself with regard to your diabetes management in say the next 5 years?"*

Handling Resistance:

"Resistance" implies the participant is doing something to impede the interventionist. This may lead to feelings of frustration on behalf of the interventionist. What many of us do not realize is that resistance requires two people and that each have a different point of view. There is an old Lakota saying; *"Force, no matter how well concealed, begets resistance."* This is an area to pay particular attention to, if resistance appears it is time for the interventionist to consider their approach and change strategies. What does

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resistance look like? The patient will begin to position him/herself in a defensive posture and the therapist will notice obvious arguing, bickering or the patient may dismiss the provider completely. This appears to happen frequently if the counselor takes on a lecturing/teaching format. When we hear *"I don't want to change the way I eat" or "I don't need to change, there is not a problem with the way I do things now."* Then it is time to change our strategy and roll with the resistance. Resistance is not necessarily bad. This is the key to using Motivational Interviewing correctly. Resistance is often simply one side of the person's ambivalence regarding change. The challenge is to see this "resistance" as ambivalence and to remember it is energy that can be useful in guiding the provider's behavior, and allowing the patient to think about change on their terms not those of the provider. The first sign of resistance is a signal to change strategy and do something different. If the provider notices resistance beginning to decrease it is a sign the person may be thinking about change.

Responding to resistance with reflective strategies:

Simple reflection:

Acknowledging what the person has just said.

Pt: *"I like to eat out and I like to eat what I want, when I want and how much I want."*

Pr: *"It sounds like maintaining your current diet and schedule is very important to you right now."*

Amplified reflection:

This is an area where it is important to emphasize that the provider has clearly

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heard the person.

Pt: *"I don't want to do all this, I mean if I had the time for all this it would be different, do you know how hard it is to count carbohydrates every time I have something to eat?"*

Pr: *"This is really difficult, I mean it is never ending and you are very frustrated by all of it and it is something that you could never do!"*

By emphasizing the resisting statement the person when hearing it back will often respond by backing off the resistance. *"Well I wouldn't say it is impossible, I mean I could do..."*

Double-sided reflection:

Reflecting the ambivalence the person is expressing,

Pt: *"I want to set a good example for my kids, but it is hard to pay attention to all this stuff checking blood sugar, not eating certain things, sometimes I just want to let it all go, you know? I don't like having so much to worry about."*

Pr: *"So on the one hand you value your health, you want to set a good example for your kids and you would like to make changes, but on the other hand you often feel the stress of having to make changes and it never goes away."*

Strategic responses: Shifting focus

This is a strategy to prevent focusing on a negative item and promote discussion on the patient's terms.

Pt: *"I can't do all this walking the dietician wants me to do and the doctor said I need to quit smoking, and quit drinking all this other stuff, I mean..."*

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Pr: *"Wow it sounds like there are lots of things to think about, but let's not get caught up in all that just yet, I would like to hear about what you would like to do at this point..."*

Reframing:

This is a reflection of a different kind, for example the provider can change the meaning of the statement so that a perceived weakness, is reframed as a statement of strength.

Weakness: *"I can't quit smoking my family would give me a hard time."*

Reframe: *"It would be hard for you to quit, you like to hang out with your family and they all smoke. At the same time, because you want to set a good example for the younger family members it is hard to continue to smoke knowing that they see it and knowing how it affects your diabetes..."*

Agreement with a twist:

This is acknowledging with reflection and then changing the meaning slightly with a reframe. The idea is to use the reflection then use the momentum to change the meaning of the statement.

Pt: *"I don't want to quit drinking I mean it is the one thing I really enjoy and my other doctor tells me that I have to... but it is the only thing I really enjoy, why should I give up something I enjoy so much?"*

Pr: *"Well you and I both know that it is your choice, and this may be one of those behaviors where it is just too dear for you to give it up, even if it is hurting your health some, it may be worth it to you."*

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This must be done very carefully, the goal is not to give an impression of sarcasm, rather the goal is to show real concern and acknowledge the fact that the person may never actually change the behavior. It is also important to let the patient know that you are not endorsing their continued problem behavior. I know of a patient who said to their provider *"well everything is ok then... I mean I can just eat what ever I want right?"* Remember, the emphasis here being that it is the person's choice ultimately. *"You're right, it's really up to you"* in response to *"I don't want to change."* Interestingly, when a provider skillfully chooses to take the side of not changing by acknowledging the strength of the choice to not change, a common response from the patient is often something resembling," *Well you know I could..."*

Giving feedback and advice:

Most effective, brief interventions include giving the participant personally relevant feedback about his or her current behaviors. So, here the person is receiving information with no direct or implied judgment about the person. A good time to offer advice is when a patient asks the provider for information or has a question that is searching for advice. Consider this example:

Pt: *"You know I have heard that even a little exercise can help, but I just don't know how to get started, and how much exercise is enough anyway?"*

Pr: *"That is a good question and let me share something with you that I just read in a recently published article. Small amounts of exercise like 10 or 15 minutes at a time 2-3 times per day can decrease your insulin resistance for as long as 3 days! So exercising 3-*

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4 times per week can have a large impact on your overall DM management.

Pt: *"Well I am not sure if I could do that, I mean I leave for work very early in the morning and when I get home and do my chores around the house, play with the kids and visit with my wife I have no time left for exercise."*

Pr: *"We have discussed working together to help you improve your DM management and since you asked about exercise I wanted to share this information with you. Remember as we discussed what you do is completely up to you. We can explore what you would like to do, and discuss strategies that may work better at some points in time than others."*

Pt: *"I would like to get started, but I am unsure where to start..."*

One strategy to follow is to allow the person to see where he or she is at right now in terms of their overall behavioral management of DM. In order for a person to make an informed decision about where they are going, they have to know where they are at right now. Allowing the individual to see where they are and where they may want to go is the main purpose of giving feedback. The focus of the provider is to continue to work collaboratively with the participant.

Pr: *"If we were to discuss the three most important things to you right now to improve your DM management what would those be?"*

The person may not necessarily tell us what we think is important, and that is ok, we must remember we want to know where the person is, not where we want them to be. Something to remember is that this may be the first time they have thought about changes and we know how complicated and difficult it can be. Showing accurate empathy and

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sharing their concern is likely to be helpful at this point. Allowing the individual to ask questions to assure their understanding is important.

Working with ambivalence:

Developing a discrepancy:

After hearing the person's story with diabetes, it is often helpful to reflect and ask questions. This many times may lead to a discrepancy to discuss.

Pt: *"... and so that is where I am with diabetes, I mean I have had it 15 years, and I would like to take better care of myself. I mean I know I need to take better care but I have a family to raise. I work hard and I just don't have time to exercise... and I don't like not eating what I want... it is all so hard."*

Pr: *"Taking care of your family and working hard are important to you. And at the same time it sometimes feels like taking care of your diabetes is restrictive and gets in the way of spending time with your family. It sounds like there are two different issues here – it is hard to want to do one thing and at the same time feel like you really should do another. That sounds difficult."*

Explore the pros and cons of change, but be careful to **not** assume that participants will view a given cost or benefit in the same way that you do. What is a high cost or highly weighted pro for change for some may be of little value or importance to others. Discovering and understanding these individually unique elements of ambivalence is an important part of working with the individual to foster change.

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Changing the focus to "But I am not sure how to change?" question:

A good time to make this transition is when the person makes increasing self-motivating statements and decreases in "resistance behaviors." This is a good time as the shift in the patient's readiness to explore change may be near. The person may begin to ask questions about how to change or what have others done to make changes. This is a good time to collaborate with the individual on how ready they are to consider change, how important it is to them and how confident they are to initiate change. These three components of change are key to helping individuals consider the complexity of change.

The interventionist can start by saying;

"For all we know about behavior change we know there are components that help us understand how we view change as individuals. So I would like to ask you to think about the following areas of change:" "If we were to have a big ruler, lets call it the readiness to change ruler, and it was numbered from 1 to 10, with 1 being not ready at all, and 10 being extremely ready, where would you fall right now with regard to changing your dietary habits to improve DM control? Followed by asking: *"Now if we used that same scale from 1 to 10 measuring confidence instead of readiness; how confident are you that if you made changes in your diet that you would be able to stick to it?"* The last question I want to ask you is *"if we were to measure importance with that same ruler how important is it to you to attempt change at this point, remember 1 is not ready at all and 10 is I am so ready that I want to start right this second!"*

The first questions attempts to examine the individual's level of readiness, the second looks at whether the person has any confidence in their ability at this point to consider

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change, and of course the third helps us look at importance levels. When a patient provides answers to these questions it is helpful to follow up with statements, which will often elicit additional discussion. *"I noticed that you were right in the middle, you said 5 to the readiness question - you're ready. You rated yourself a 2 in confidence to change - Lack of confidence is getting in your way."*

How to make this shift?

Summarize the ambivalence:

"So, if I hear you right, on the one hand you feel like you would like to make changes because... but on the other hand you do not want to because of..." Reflect back all of the self-motivating statement you can remember about why it is personally meaningful for the person to make changes when you present the "hand" of the ambivalence. You can now follow-up with a "Key question" *"What do you want to do? What is next for you? Where do you go from here?"*

The Intervention in the "Why Change Now?" Project

This project involved individuals who have been diagnosed with Type-2 diabetes participating in the study on four separate occasions. It is important to note that the theory with regard to techniques and strategies is listed above. The framework of how this intervention was intended to proceed is listed below; the quotes interwoven are summaries from actual clinical experiences of the interventionist, although the quotes are not from any of the participants who took part in this study. This is followed by an overview/outline of how the two sessions actually proceeded.

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So to start off, we want to open the intervention by gently directing the interview and getting the interview off on the right foot.

Opening and gently directing the interview:

Remember here that there are many important things to consider when beginning the interview, such as allowing the person to describe their experience or to tell their story about diabetes (e.g., when they were diagnosed, difficulties that they encounter, etc...). We are directing here as we are looking to gain information that will be helpful in our collaborative effort. As the person shares information, we can gently guide the individual to share their experience with us.

When we elicit the person's story with regards to diabetes:

This is the time to approach the person respectfully and ask for their unique perspective. For the following sample dialogues, *Pr* refers to Provider and *Pt* is the patient.

Pr: "*You know I was wondering if you might be willing to share with me your story with regards to diabetes, I mean what has it been like for you since you were diagnosed with diabetes?*"

Pt: "*It was 6 years ago, and... well after it happened I was sort of stunned, then I was so mad, I mean I didn't want to have to deal with this, I watched my mom go through all this crap... I am still mad and worried too I guess...I mean I don't want to have to be worried.*"

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Pr: *"It sounds like you are mad about all this and wondering what you might be able to do?"*

Pt: *"Well I don't really think there is anything I can do."*

Pr: *"You feel like maybe there is nothing you can do, sort of hopeless."*

Pt: *"I do sometimes... I mean why wouldn't I? But at the same time I can't just give up."*

An agenda (if it seems to be appropriate) can be established after hearing the person's story and collaborating with the patient based on what the individual tells the provider is important to them and their diabetes management. This may be one or more of many things, and it often may be something that does not on the surface appear to be part of diabetes care. For example a patient once shared that they did not exercise because they did not feel safe when walking along the road near their home due to traffic. This is time for the interventionist to listen.

Open-ended questions:

Open ended questions allow the individual a chance to express their concern or point of view. This can also be used early in opening the interview, or to gently guide and elicit more information from the individual *"What would you like to talk about today?" "What concerns you most about your health?"*

It is important after we get the interview started to know where to go next. This will be done following the lead of the participant. Some things that will be helpful in continuing on after we begin are:

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Listening & Reflecting :

Listen closely and repeat back to the individual what you hear them say to you. Careful not to simply sound like a recorder, or it may be perceived as mimicking. When done carefully this allows the individual to quickly pick up on the fact that you are carefully listening to their concerns. It is also helpful to ask for clarification to make sure you have heard correctly, and taken in the proper context what the person has said. This approach encourages the participant to talk and engage in the session more actively.

Summarizing:

This involves bringing together what you have heard, and highlighting what you emphasize. For example;

Pr: "*So it sounds like there are a number of good things you do now to manage your diabetes, you exercise when you can, you have stopped drinking soda and you have tried to increase your intake of fruits and vegetables. At the same time you would like to get more exercise, and check your blood sugar more often. Does this sound right?*"

Pt: *"Yea, I think that's pretty much accurate"*

Affirming:

Demonstrating to the person that you hear both the good and not so good, or successes and areas which the individual would like to improve. Acknowledging that this person is doing the best he or she can currently. Improving skills to address areas will allow them to move toward additional change and improved DM management. This is to be done throughout the intervention and will often increase the patient's confidence.

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Pr: *"So you have stopped smoking, which is quite an accomplishment, and you would really like to stop eating fast food, but you have had less success, often due to your busy schedule in your attempts to do that?"*

Pt: *"You know that's true, and it is crazy I mean look at all the people who can't quit smoking, and I just made up my mind that I was going to quit, and I did! I am not sure why I don't just do the same thing with eating out all the time?"*

Eliciting self-motivating statements:

In this situation the person is making the argument for change. This may be initiated by an open question from the provider to elicit change talk.

Pr: *"How do you feel about your A1c level staying at this level?"*

Pt: *"I wish I could lower my A1c. It's so hard though you know? Maybe if I decrease my carbohydrate intake that might be a good start?"*

Problem recognition:

The individual actually begins to recognize that their current choices could change allowing improved DM management. *"I know I need to do something, my blood sugar has been dropping way too low."*

Concern:

A person may show concern for their condition or long-term complications of the condition if change is not made. *"If I don't do something I will eventually end up on dialysis and I don't want that... but the changes are hard."*

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Intention to change:

The patient may begin to talk about change, maybe even for the first time ever! *"You know I guess I never thought about it like this. I mean I didn't realize that everyone I know smokes... stopping is something that I hadn't even considered before this and now I see one of the reasons why... Wow, that is pretty crazy."*

Optimism for change:

This may be seen as expression of the person's belief in their ability to make changes, or increased confidence in the possibility of making change. *"You know it isn't so much that I don't know what to do - I just need to start doing it. I mean even a little at a time will probably help."*

Appointment #1 Measures:

In the first appointment, participants were offered information about the study, and afforded the opportunity to ask questions. Those who agreed to participate then filled out and sign the informed consent documents (Appendix A). They completed psychological measures and demographic information sheets. In addition, they had blood drawn for their physiological measures. The first session took the participants (including filling out the measures and the blood draw) between thirty (30) and ninety (90) minutes. Participants were paid $10.00 for their time in filling out measures and having their blood drawn. This session concluded with a scheduling of the next appointment for Motivational Interviewing and a brief discussion of the importance of committing to the

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remaining appointments.

Appointment #2- First session of Motivational Interviewing:

Participants returned within two weeks for a second appointment to complete their first 30-minute session of Motivational Interviewing. This first intervention session emphasized development of rapport and collaboration with the patient. The focus was on eliciting the participant's personal experience or story with diabetes. This session was important for allowing the interventionist to understand each patient's story and to allow the participant to understand that the power or "expertise" that they possess regarding their own health is the most powerful tool with which they may accomplish change.

Establishment of what was most important to the individual patient occurred in this session as well (e.g., "I want to quit smoking so I can be healthier!"). This was often followed by a discussion of how that may or may not be something the patient would choose to proceed with. With this approach, the interventionist was able to follow the lead of the patient, gently guide the interview, and focus on what the individual considered the most important aspect of DM management to them as an individual.

In some instances during or at the end of the first session of Motivational Interviewing, participants requested that the interventionist assist them in securing an appointment to meet with the Wind River Service Unit diabetes educator or the nutrition specialist. In addition, there were some individuals who wanted appointments with both the nutritionist and the diabetes educator. Appointments were made by the interventionist in the cases where a referral was requested.

Scheduling of the next session of Motivational Interviewing and the importance

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of committing to the remaining appointments ended this session.

The Goals of Session 1:

- Introduce philosophy
- Establish rapport
- Elicit participant's story of experience with diabetes
- Acknowledge the participant's expertise
- Collaborate with the participant to discuss behavioral management of diabetes
- Set agenda, decide what behavior is important to discuss following the lead of the participant
- Set appointment for person to come to next session

Appointment #3- Second session of Motivational Interviewing:

All participants returned within a period of two weeks of the previous session for a second 30-minute session of Motivational Interviewing. The session focused on the individual's experience with change and what about that change they found important (e.g., "I would like to get in shape but it's hard and I don't have time!") or not important (e.g., "I'm not too worried about it for now, I mean I am young and healthy and I feel fine so I don't worry too much about my diabetes control").

The second session built on the first. The interventionist inquired with the participant what the discussion should focus on, then followed the participant's direction gently guiding the intervention. Individuals tended to focus on specific aspects of change, including consideration of making no change at the present time. There were no instances

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where participants informed the interventionist that they had made a firm decision to not make any changes to improve their DM management. Several individuals reported that the present intervention approach was in contrast of previous approaches where they felt as though they were being told "what to do".

Similar to the first session, there were instances where participants requested that the interventionist assist them in securing an appointment to meet with the diabetes educator or the nutrition specialist, or in some cases both. In one specific case during the second session of Motivational Interviewing, the patient informed the interventionist that s/he now wanted to see an endocrinologist to increase his/her efforts to increase glycemic control. The patient was referred to discuss such a referral with his/her primary care physician. In addition, there were several individuals who inquired about the benefit of increased exercise. Upon advising the individuals to first check with their physician before initiating a new exercise program, information regarding the benefits of exercise for DM management including decreased insulin insensitivity was shared. Appointments to professional personnel within the service unit were made by the interventionist at the request of the participant.

The session ended with focus on the importance of individual choice to change or not to change and to make such choice based on an internal perspective regarding what might work best for the individual. A follow up appointment in three months was scheduled.

The Goals of Session 2:

- Continue to discuss the patient's experience with diabetes. Explore importance,

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readiness and confidence of differing aspects of DM management and strengthen each area as it applies to the individual.

- Support self-efficacy, reinforce efforts for change since last session
- Exchange information
- Discuss long-term behavior change goals
- Set appointment to return for follow up data collection

Appointment #4- Three month post-intervention follow-up:

This was a follow-up appointment and the final meeting between the interventionist and the individuals who took part in the study. Participants returned in approximately 3-months to complete the psychological (DC Fatalism, Diabetes Locus of Control, Diabetes Quality of Life, Beck Depression Inventory-II, Transtheoretical Model of change 5-item questionnaire, Dietary intake and Exercise activity) and the physiological measurements (HbA1c, Random Glucose). Participants were paid $10 for their time to complete these measures. Time spent on this task for participants varied from thirty minutes to ninety minutes.

This intervention appeared to be well received by those who participated as there was 100% completion of participants who completed the initial session of Motivational Interviewing completed the entire treatment protocol. In addition there was very consistent and quite positive feedback response from participants. In future approaches using this treatment manual as a guide may be helpful in developing additional interventions appropriately tailored to the needs of individual participants.

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APPENDIX C: Psychological Measures/Questionnaires

DC Fatalism Measure

Please read each question below carefully and rate how much you agree with each statement, on the following scale:

I strongly disagree	I disagree	I am not sure If I agree or disagree	I agree	I strongly agree
1	2	3	4	5

1. I think Indians get diabetes more than other ethnic groups such as Whites, Blacks, Asians, etc.

   1 2 3 4 5

2. I think I got diabetes because others in my family have diabetes.

   1 2 3 4 5

3. I think I could have prevented getting diabetes.

   1 2 3 4 5

4. I think if anyone in a family has diabetes their whole family will have diabetes.

   1 2 3 4 5

5. If the doctor/health educator or other health care provider told me that type-II diabetes might be preventable I would not trust them.

   1 2 3 4 5

6. I trust what my doctor or health care provider recommends for treating my diabetes.

   1 2 3 4 5

7. If the doctor/health educator or other health care personnel told me that type-II diabetes might be preventable and I believed them, I would try suggested lifestyle changes such as a new diet and increased exercise, as a way to control my weight.

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1 2 3 4 5

8. I think a traditional diet like dried meat, berries, fish, and other natural foods would be better for me to manage my diabetes.

1 2 3 4 5

9. I think that dietary changes suggested by doctors or other health care personnel are ways to try to get Indians to eat like white people.

1 2 3 4 5

10. I think that suggested lifestyle changes like trying to get more exercise are ways for doctors to try to get Indians to act like white people.

1 2 3 4 5

11. If the doctor/health educator or other health care personnel told me that type-II diabetes complications such as kidney trouble, foot problems, vision problems, and other health problems associated with diabetes might be preventable I would believe them.

1 2 3 4 5

12. If the doctor/health educator or other health care personnel told me that type-II diabetes complications such as kidney trouble, foot problems, vision problems, and other health problems associated with diabetes might be preventable, and I believed them I would try suggested lifestyle choices such as a new diet, or increased exercise, as a way to control my weight.

1 2 3 4 5

13. I think I got diabetes because I am an Indian.

1 2 3 4 5

14. I think all Indians eventually get diabetes.

1 2 3 4 5

15. I think I have control over anything in my life that happens to me.

1 2 3 4 5

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16. I think that diabetes was brought to Indian people by white people.

1 2 3 4 5

17. I think the Commodities that are given to Indians by the United States Government, cause diabetes.

1 2 3 4 5

18. I think that diabetes was brought to Indian people by white people to try to harm Indian people.

1 2 3 4 5

19. I think diabetes can be prevented.

1 2 3 4 5

20. I think it will help me to manage my diabetes to listen to the doctor or other health care provider and follow his/her instructions.

1 2 3 4 5

21. I think diabetes can be cured with medicine.

1 2 3 4 5

22. I think diabetes can be cured using traditional medicine.

1 2 3 4 5

23. I think complications from diabetes can be prevented.

1 2 3 4 5

24. I follow recommendations from my doctor or other health care provider about diet and exercise to prolong my life.

1 2 3 4 5

25. I think traditional healing/medicine is better for my diabetes than going to the clinic/doctor for healing/medicine.

1 2 3 4 5

26. I think I can control my physical health.

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1 2 3 4 5

27. I think I can control my mental health

1 2 3 4 5

28. I think that the creator controls what happens to me in my life.

1 2 3 4 5

29. I am being disrespectful to my body if I don't take care of it.

1 2 3 4 5

30. I am fearful of death.

1 2 3 4 5

31. I think it is more important to live every day and enjoy life than it is to take steps to lengthen my life.

1 2 3 4 5

32. I am willing to make sacrifices to prolong my life.

1 2 3 4 5

33. I think I have no control over anything in my life that happens to me.

1 2 3 4 5

34. I would do what is within reason to lengthen my life rather than let myself die.

1 2 3 4 5

35. I think that when the creator calls me home it is my time to go, regardless of diabetes.

1 2 3 4 5

36. I think my body is sacred and I do the best I can to take care of it.

1 2 3 4 5

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Diabetes Quality of Life Measure

Please read each statement carefully. Please indicate how satisfied or dissatisfied you are with the aspect of your life described in the statement. Circle the statement that best describes how you feel. There are no right or wrong answers to these questions. We are interested in your opinion.

Use the following scale to rate your response:

very satisfied	moderately satisfied	neither satisfied or dissatisfied	moderately dissatisfied	very dissatisfied
1	2	3	4	5

A1. How satisfied are you with the amount of time it takes to manage your diabetes?

1 2 3 4 5

A2. How satisfied are you with the amount of time you spend getting checkups?

1 2 3 4 5

A3. How satisfied are you with your current treatment?

1 2 3 4 5

A4. How satisfied are you with the flexibility you have in your diet?

1 2 3 4 5

A5. How satisfied are you with the burden your diabetes is placing on your family?

1 2 3 4 5

A6. How satisfied are you with your knowledge about diabetes?

1 2 3 4 5

A7. How satisfied are you with your sleep?

1 2 3 4 5

A8. How satisfied are you with your social relationships and friendships?

1 2 3 4 5

A9. How satisfied are you with your sex life?

1 2 3 4 5

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A10. How satisfied are with you with your work, school and household activities?

1 2 3 4 5

A11. How satisfied are you with the appearance of your body?

1 2 3 4 5

A12. How satisfied are you with the amount of time you spend exercising?

1 2 3 4 5

A13. How satisfied are you with your leisure time?

1 2 3 4 5

A14. How satisfied are you with your life in general?

1 2 3 4 5

In the next group of questions please indicate how often the following events happen to you. Use this scale to rate your response:

Never	**Very Seldom**	**Sometimes**	**Often**	**All the time**
1	**2**	**3**	**4**	**5**

B1. How often do you feel pain associated with the treatment for your diabetes?

1 2 3 4 5

B2. How often are you embarrassed by having to deal with your diabetes in public?

1 2 3 4 5

B3. How often do you have low blood sugar?

1 2 3 4 5

B4. How often do you feel physically ill?

1 2 3 4 5

B5. How often does your diabetes interfere with your family life?

1 2 3 4 5

B6. How often do you have a bad night's sleep?

1 2 3 4 5

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B7. How often do you find your diabetes limiting your social relationships and friendships?

1 2 3 4 5

B8. How often do you feel good about yourself ?

1 2 3 4 5

B9. How often do you feel restricted by your diet?

1 2 3 4 5

B10. How often does your diabetes interfere with your sex life?

1 2 3 4 5

B11. How often does your diabetes keep you from driving a car or using a machine (e.g.., a typewriter)

1 2 3 4 5

B12. How often does your diabetes interfere with your exercising?

1 2 3 4 5

B13. How often do you miss work, school, or household duties because of your diabetes?

1 2 3 4 5

B14. How often do you find yourself explaining what it means to have diabetes ?

1 2 3 4 5

B15. How often do you find that your diabetes interrupts your leisure time activities?

1 2 3 4 5

B16. How often do you tell others about your diabetes?

1 2 3 4 5

B17. How often are you teased because you have diabetes?

1 2 3 4 5

B18. How often do you feel that because of your diabetes you go to the bathroom more

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than others?

1 2 3 4 5

B19. How often do you find that you eat something you shouldn't rather than tell someone you have diabetes?

1 2 3 4 5

B20. How often do you hide from others the fact that you are having an insulin reaction?

1 2 3 4 5

In this next set of questions please indicate how often the following events happen to you. Please circle the number that best describes your feelings.

Use this scale to rate your response:

Never	Very Seldom	Sometimes	Often	All the time
1	2	3	4	5

C1. How often do you worry about whether you will get married?

1 2 3 4 5

C2. How often do you worry about whether you will have children?

1 2 3 4 5

C3. How often do you worry about whether you will not get a job you want ?

1 2 3 4 5

C4. How often do you worry about whether you will be denied insurance?

1 2 3 4 5

C5. How often do you worry about whether you will be able to complete your education?

1 2 3 4 5

C6. How often do you worry about whether you will miss work?

1 2 3 4 5

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C7. How often do you worry about whether you will be able to take a vacation?

1 2 3 4 5

C8. How often do you worry about whether you will be able to travel to other reservations for pow-wows, rodeos or other activities over the summer?

1 2 3 4 5

C9. How often do you worry about whether you will be able to travel to other reservations for sundances or other ceremonies?

1 2 3 4 5

D1. How often do you worry about whether you will pass out?

1 2 3 4 5

D2. How often do you worry that your body looks differently because you have diabetes?

1 2 3 4 5

D3. How often do you worry that you will get complications from diabetes?

1 2 3 4 5

D4. How often do you worry that someone will not go out with you because you have diabetes?

1 2 3 4 5

E1. Compared to other people your age would you say that your health is :

1. Excellent 2. Good 3. Fair 4. Poor

(Please circle the one that you feel applies to you)

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Diabetes Locus of Control Measure

***Note: this form has 6 numbers to choose from.** Please read each of the following items carefully and select the number that best describes how you feel about diabetes. Please mark only one number to indicate how much you agree with each statement.

I strongly Disagree	I disagree	I mildly Disagree	I mildly Agree	I Agree	I Strongly Agree
1	2	3	4	5	6

1. I can avoid complications from diabetes.
1 2 3 4 5 6

2. When my sugar is high it's because of something I've done
1 2 3 4 5 6

3. Good health is a matter of good fortune.
1 2 3 4 5 6

4. Regular doctor's visits avoid problems.
1 2 3 4 5 6

5. What I do is the main influence on my health.
1 2 3 4 5 6

6. If it's meant to be I will avoid complications from diabetes.
1 2 3 4 5 6

7. I should call my doctor when ever I feel bad.
1 2 3 4 5 6

8. My blood sugars will be what they will be.
1 2 3 4 5 6

9. Blood sugars are controlled by accident.
1 2 3 4 5 6

10. I can only do what my doctor tells me.
1 2 3 4 5 6

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I strongly Disagree	I disagree	I mildly Disagree	I mildly Agree	I Agree	I Strongly Agree
1	2	3	4	5	6

11. I never know why I'm out of control.
1 2 3 4 5 6

12. Health professionals keep me healthy.
1 2 3 4 5 6

13. My family is a big help in controlling my diabetes.
1 2 3 4 5 6

14. When my blood sugar is high it's because I have made a mistake.
1 2 3 4 5 6

15. Good control is a matter of luck.
1 2 3 4 5 6

16. Complications from diabetes are the result of carelessness.
1 2 3 4 5 6

17. I am responsible for my health.
1 2 3 4 5 6

18. Other people have a big responsibility for my diabetes.
1 2 3 4 5 6

19. The creator is responsible for my diabetes.
1 2 3 4 5 6

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Diet Questionnaire

The following questions refer to foods that you may have eaten yesterday. Think about all the foods you have eaten since you got up yesterday morning until you went to bed last night. Be sure to include foods you ate at home at school at work, at restaurants or anywhere else. ** **Please mark or circle the answer for each question.**

1. Yesterday how many times did you eat fruit?

   0 1 2 3 more than 3 times

2. Yesterday how many times did you eat green salad or vegetables?

   0 1 2 3 more than 3 times

3. Yesterday how many times did you eat hamburgers, hot dogs, or fried chicken?

   0 1 2 3 more than 3 times

4. Yesterday how many times did you eat french fries or potato chips?

   0 1 2 3 more than 3 times

5. Yesterday how many times did you eat cookies, doughnuts, pie or cake?

   0 1 2 3 more than 3 times

6. Yesterday how many cans of **regular pop** did you drink?

   0 1 2 3 more than 3 **if you don't drink pop circle here*

7. Yesterday how many cans or bottles of **diet pop** did you drink?

   0 1 2 3 more than 3

8. Yesterday how many drinks containing alcohol did you drink? (1 drink=12 oz of beer, 5 oz of wine, or 1 shot of liquor)?

   0 1 2 3 more than 3

9. How often do you normally eat in the morning?

   Never 1-2 times per week 3-4 times per week 5 or more times per week

10. During a normal breakfast, what types of food do you usually eat? Please circle all that apply also please list number of servings.

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Bacon or sausage eggs cereal or oatmeal toast fruit fruit juice

pop (soda) any other foods_____

11. During a normal week, how often do you eat at a fast food restaurant, e.g. McDonalds, Burger King, Gas station deli, Wendys, etc…

Never 1-2 times per week 3-4 times per week 5 or more times per week

12. Yesterday how many hours of television did you watch?

None-I don't watch TV 1-3 hours 4-7 hours 8 hours or more

13. Yesterday how many hours did you spend sitting at your desk while at work or in a chair or couch at home?

None 1-3 hours 4-7 hours 8 hours or more

14. Yesterday how many hours did you spend in your vehicle while driving or sitting?

None 1-3 hours 4-7 hours 8 hours or more

Measure of self-reported exercise

Please STOP HERE and ask the coordinator for instructions on this form.

Physical Activity/Exercise

We are going to ask you some questions about your physical activities/exercise during the **past 7 days**. If you did an activity/exercise, please check the space in front of it. Then, in the spaces provided for each activity you check, circle the amount of total hours you did that activity in the **past 7 days**. write how many total hours and/or minutes you did the activity in the **past 7 days**. If you did physical activities during the **past 7 days** that are not listed, please write them down in the spaces provided below. If you have any questions, please ask. We will be happy to help you.

Example:

_____Dancing	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+

I. Chores/Work	**Hours During the Past 7 days**												
____digging	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____raking	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____mowing the lawn	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____hand watering	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+

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____harvesting or planting	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____carpentry/construction	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____digging or choping	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____carrying heavy loads	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____delivering mail, waiting tables or patrolling on foot	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____house painting	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____making deliveries	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____working horses or livestock	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____logging	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
ranch or farm work	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+

please describe in space below

_____

_____

II. Housework	**Hours During the Past 7 days**												
____sweeping or mopping	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____scrubbing floors	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____vacuuming	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____washing windows	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____dusting	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____hanging/folding laundry	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____hand-washing laundry	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____ironing	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
_other housework/cleaning	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+

(please describe in the space below)

_____

_____

III. Cooking	**Hours During the Past 7 days**												
____kneading bread	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____hand-mixing	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____butchering	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____making dry meat	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+

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___other food preparation (describe in spaces below)	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+

_____

_____

IV. Sport/Recreation	**Hours During the Past 7 days**												
____slow walk or treadmill	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____walking quickly/hiking (include treadmill)	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____jogging or running	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____aerobics or calisthenics (e.g., jumping jacks)	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____stretching or yoga	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____soccer or football	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____tennis or racquetball	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____basketball	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____volleyball	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____softball or baseball	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____golf (walking & carrying or pulling clubs)	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____golf (riding in golf cart)	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____martial arts	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____dancing of any kind	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____swimming	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____hunting	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____fishing	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____paddling a boat or raft	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____bowling	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____archery	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____weight lifting	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+
____biking (include stationary bike)	0	½	1	1½	2	2½	3	3½	4	4½	5	5½	6+

V. In the spaces below, please describe <u>any</u> other physical activities you did in the past 7 days that we did not ask about.

_____

_____

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Transtheoretical Model of Change Questionnaires

Please read the following statements, and circle the one that best describes your current approach to managing diabetes:

- I have diabetes and I am not thinking about making any changes in my lifestyle choices such as healthier eating, exercise or other areas at this time to address diabetes
- I have diabetes and I know I need to make some changes in my lifestyle choices such as healthier eating, exercise and others, however I have not started those changes yet.
- I have diabetes and I am preparing to make some lifestyle changes such as healthier eating, exercise and others, I plan to begin those changes within the next month.
- I have diabetes and I have started to make lifestyle choices in areas such as healthier eating, exercise and other areas, and I have been sticking to these changes for less than 6 months.
- I have diabetes and I have started to make lifestyle choices in areas such as healthier eating, exercise and other areas, and I have been sticking to these changes for more than one year.

Please read the items below regarding diet/eating and circle one item that best describes you.

- I am not thinking about changing my eating or ways of cooking to improve my health.
- I am thinking about changing my eating and/or learning to cook in ways to improve my health, but I haven't done anything yet.
- I have been thinking about changing my eating and/or cooking in ways to improve my health and I will do that within the next month.
- I have changed by eating and/or cooking in more health ways to improve my health in the past 6 months.
- I have made changes in my eating and/or cooking habits over 6 months ago and I am sticking to my changes.

Please read the items below describing exercise and being active and circle one item that

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best describes you.

- I am not thinking about becoming more active or doing more exercise to improve my health.
- I am thinking about being more active or getting more exercise to improve my health but I haven't made any changes yet.
- I have been thinking about being more active and getting more exercise to improve my health and I will begin within the next month.
- I have become more active and/or have been getting more exercise to improve my health in the past 6 months.
- I have made changes in my exercise and activity level over 6 months ago and I am sticking to my changes.

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APPENDIX D: Supplemental Tables & Graphs

Table 12
Factor Loadings of DC Fatalism Measure

Item #	Factor I	Factor II	Factor III	Factor IV	Factor V	Factor VI	Factor VII	Factor VIII
DC 1	--	--	--	--	--	--	--	--
DC 2	--	--	--	--	--	--	--	--
DC 3	--	--	--	--	--	--	--	--
DC 4	--	.639	--	--	--	--	--	--
DC 5	--	--	--	--	--	--	--	--
DC 6	--	--	--	--	--	--	--	--
DC 7	--	--	.700	--	--	--	--	--
DC 8	--	--	--	--	--	.868	--	--
DC 9	--	--	--	--	--	--	--	--
DC 10	--	--	--	--	.596	--	--	--
DC 11	--	--	.872	--	--	--	--	--
DC 12	--	--	.881	--	--	--	--	--
DC 13	--	.863	--	--	--	--	--	--
DC 14	--	.872	--	--	--	--	--	--
DC 15	--	--	--	--	--	--	--	--
DC 16	--	.665	--	--	--	--	--	--
DC 17	--	--	--	--	--	--	--	--
DC 18	--	.625	--	--	--	--	--	--
DC 19	--	--	--	--	--	--	.604	--
DC 20	--	--	--	--	--	--	--	--
DC 21	--	--	--	.803	--	--	--	--
DC 22	--	--	--	.736	--	--	--	--
DC 23	--	--	--	--	--	--	.749	--
DC 24	.886	--	--	--	--	--	--	--
DC 25	--	--	--	--	--	--	--	--
DC 26	.680	--	--	--	--	--	--	--
DC 27	--	--	--	--	--	--	--	--
DC 28	--	--	--	--	--	--	--	.629
DC 29	--	--	--	--	--	--	--	.529
DC 30	--	--	--	--	--	--	--	--
DC 31	--	--	--	--	--	--	--	--
DC 32	.781	--	--	--	--	--	--	--
DC 33	--	--	--	--	--	--	--	--
DC 34	--	--	--	--	--	--	--	--
DC 35	--	--	--	--	--	--	--	--
DC 36	.921	--	--	--	--	--	--	--

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Table 13
Factor Loadings of Diabetes Locus of Control (DLC)

Item #	Factor I	Factor II	Factor III	Factor IV
DLC 1	--	--	--	--
DLC 2	--	.664	--	--
DLC 3	.623	--	--	--
DLC 4	--	--	.632	--
DLC 5	--	--	--	--
DLC 6	--	--	--	--
DLC 7	--	--	--	--
DLC 8	.625	--	--	--
DLC 9	--	--	--	--
DLC 10	--	--	--	--
DLC 11	.709	--	--	--
DLC 12	--	--	--	--
DLC 13	--	--	--	.527
DLC 14	--	.617	--	--
DLC 15	.780	--	--	--
DLC 16	--	--	--	--
DLC 17	--	--	.705	--
DLC 18	.865	--	--	--
DLC 19	--	--	--	--

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Table 14
Comparison of Means (SD) at 6 months prior, baseline, and post-intervention (N=26)

	6 months prior	Baseline	Post-intervention
Physiological Measures			
HbA_{1c} [a]	8.65 (1.94)	8.82 (1.78)	8.6 (1.49)
Avg. Est. Daily Glucose [a]	209.26 (58.78)	214.35 (56.37)	206.42 (53.02)
Random Glucose [a]	207.23 (70.08)	203.73 (70.85)	206.93 (69.43)
BMI [a]	--	31.75 (5.29)	31.05 (5.67)
Weight (lbs.) [a]	--	198.42 (39.15)	196.52 (41.11)
Health Related Behaviors			
Health dietary choices [b]	--	7.92 (2.73)	7.18 (1.87)
Unhealthy dietary choices [a]	--	7.92 (2.73)*	7.18 (1.87)*
Exercise (hours in previous week) [b]	--	13.92 (11.46)	15.31 (10.04)
Psychological Measures			
Beck Depression Inventory-2 [a]	--	11.65 (11.04)***	7.18 (7.68)***
TMC			
Stage [b]	--	3.42 (1.39)	3.59 (1.29)
Diet [b]	--	3.19 (1.35)	3.55 (1.26)
Exercise [b]	--	3.27 (1.19)	3.56 (1.12)
DC Fatalism			
Personal Health Responsibility [b]	--	3.88 (0.68)	4.02 (0.54)
Genetic Racial Fatalism [a]	--	2.47 (0.87)**	2.28 (0.87)**
Provider Trust [b]	--	4.06 (0.65)	4.17 (0.55)
Treatment Acceptance [b]	--	3.08 (0.82)	3.13 (0.83)
Fear Distrust [a]	--	2.00 (0.85)	2.05 (1.13)
Traditional Diet [b]	--	3.85 (0.83)	3.78 (0.88)
Prevention Beliefs [b]	--	3.87 (0.78)	4.01 (0.63)
Creator Respect [b]	--	4.12 (0.61)	4.19 (0.60)
DM Locus of Control			
Chance [a]	--	2.72 (1.00)	2.92 (0.98)
Self-blame [a]	--	4.50 (0.95)*	4.17 (1.19)*
Health Responsibility [b]	--	5.02 (0.52)	5.04 (0.53)
Family Support [b]	--	4.35 (0.89)*	4.77 (0.91)*
DM QOL			
Scale A-Tx satisfaction [b]	--	37.77 (12.74)***	29.64 (9.68)***
Scale B-Tx impact [a]	--	48.73 (14.27)	48.51 (14.24)
Scale C-Worry about future [a]	--	17.62 (7.47) *	15.77 (6.75) *
Scale D-Worry Social/Voc. Issues [a]	--	9.27 (4.00)***	8.23 (3.60)***
Scale E-Overall Well-Being [b]	--	2.54 (0.91)	2.57 (0.90)

Note: [a] Lower scores on these measures reflect improvement
[b] Higher scores on these measures reflect improvement
* Means differ at $p<.08$
** Means differ at $p<.05$
*** Means differ at $p<.01$

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Table 15

Means (SD) for Independent Variables (Demographic & Change Scores) Entered into Regression Models 1-3

	Demographic Variables	
	Mean	**Standard Deviation**
Group (completer vs. noncompleter) [1, 3]	--	--
Gender[2]	--	--
Total Blood Quantum	.9050[1, 2]	.16801

	Change Scores	
	6 mo. Prior to Baseline	**Baseline to Post-intervention**
Physiological Measures		
HbA_{1c} [a]	-.1692 (1.693)[1]	.220 (1.437)
Avg. Est. Daily Glucose [b]	-5.077 (53.308)[2]	7.93 (54.707)
Random Glucose [c]	3.500 (84.593)[3]	-3.20 (81.965)
Weight (lbs.)	--	1.903 (5.887)
Health Related Behaviors		
Health dietary choices	--	2.850 (3.881)
Unhealthy dietary choices	--	.8112 (2.263)
Exercise (hours in previous week)	--	1.395 (11.303)[1, 2]
Psychological Measures		
Beck Depression Inventory-II	--	4.474 (7.806)[1]
TMC Total		.2734 (.966)
Stage	--	.171 (1.114)
Diet	--	.360 (1.157)
Exercise	--	.290 (1.155)
DC Fatalism		
Personal Health Responsibility	--	.149 (.616)
Genetic Racial Fatalism	--	.192 (.460)
Provider Trust	--	.110 (.691)[1]
Treatment Acceptance	--	.050 (1.001)[1]
Fear Distrust	--	-.051 (1.330)
Traditional Diet	--	-.062 (1.133)[3]
Prevention Beliefs	--	.149 (.693)
Creator Respect	--	.073 (.585)
DM Locus of Control		
Chance	--	-.20 (.662)
Self-blame	--	.33 (.820)[2]
Health Responsibility	--	.019 (.608)
Family Support	--	.423 (1.065)[3]
DM QOL (as % of total for each subscale)		
Scale A-Tx satisfaction	--	11.606 (12.164)
Scale B-Tx impact	--	.222 (4.590)[2]
Scale C-Worry about future	--	4.108 (10.248)
Scale D-Worry Social/Voc. Issues	--	5.188 (8.017)
Scale E-Overall Well-Being	--	.000 (22.361)

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Note: All change scores are calculated so that positive values reflect improvement and negative values reflect decline

[a] Independent variable in Model 1 only

[b] Independent variable in Model 2 only

[c] Independent variable in Model 3 only

[1] Entered Regression Model 1 as a significant predictor of change in HbA_{1c} from baseline to post-intervention

[2] Entered Regression Model 2 as a significant predictor of change in average estimated daily glucose from baseline to post-intervention

[3] Entered Regression Model 3 as a significant predictor of change in random blood glucose level from baseline to post-intervention

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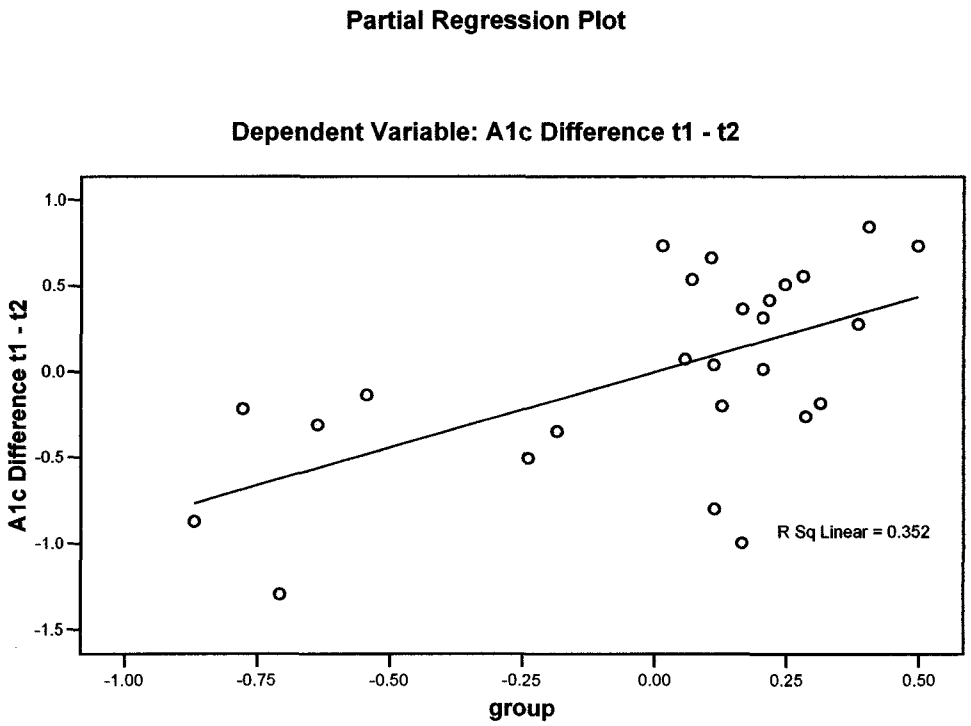
Table 16
Summary of Regression Model 1

	R	*R* Square	Adjusted *R* Square	Std. Error of Estimate	Durbin-Watson
Model 1	.946	.896	.855	.54702	2.434

Figures 1-7. Partial Regression Plots for Model 1



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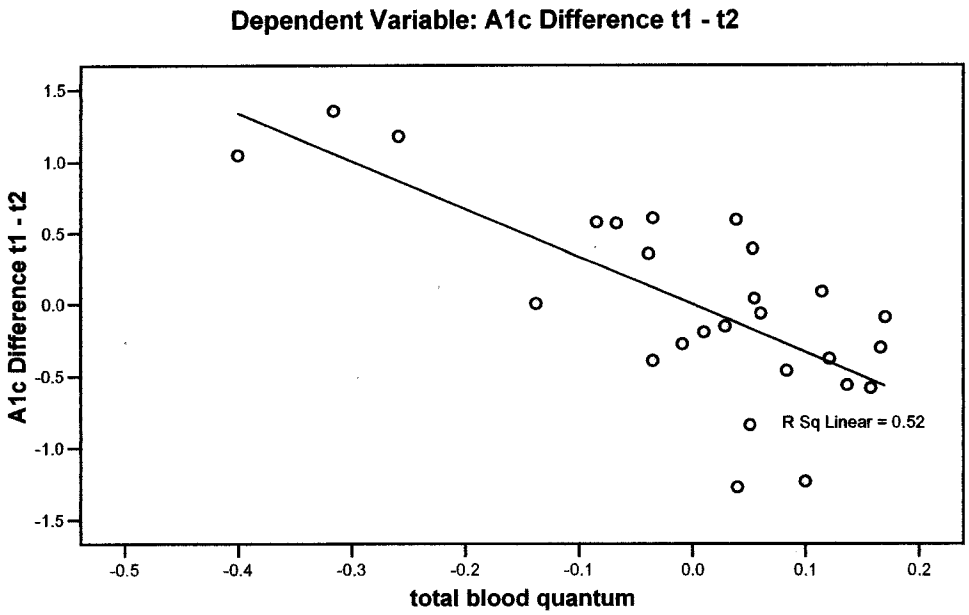
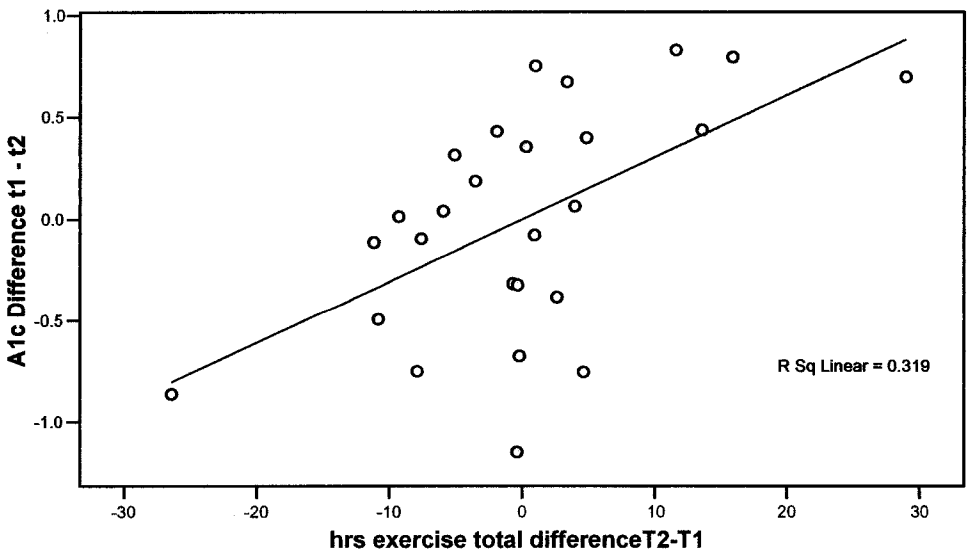
Partial Regression Plot



Partial Regression Plot



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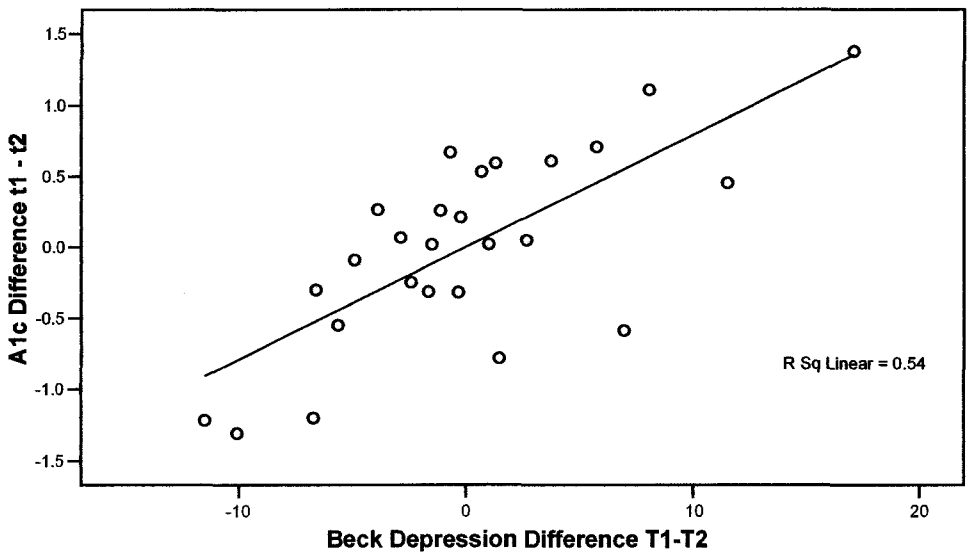
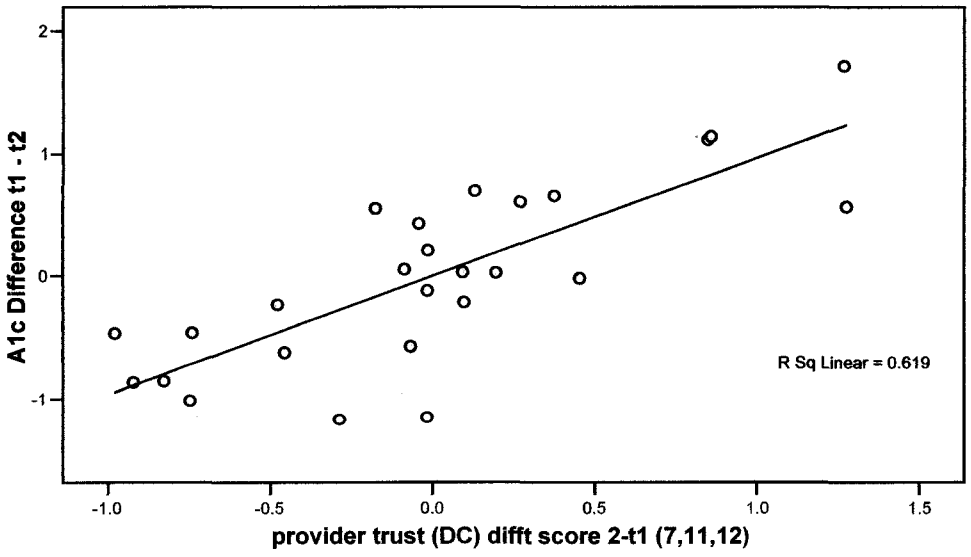
Partial Regression Plot

Dependent Variable: A1c Difference t1 - t2



Partial Regression Plot

Dependent Variable: A1c Difference t1 - t2



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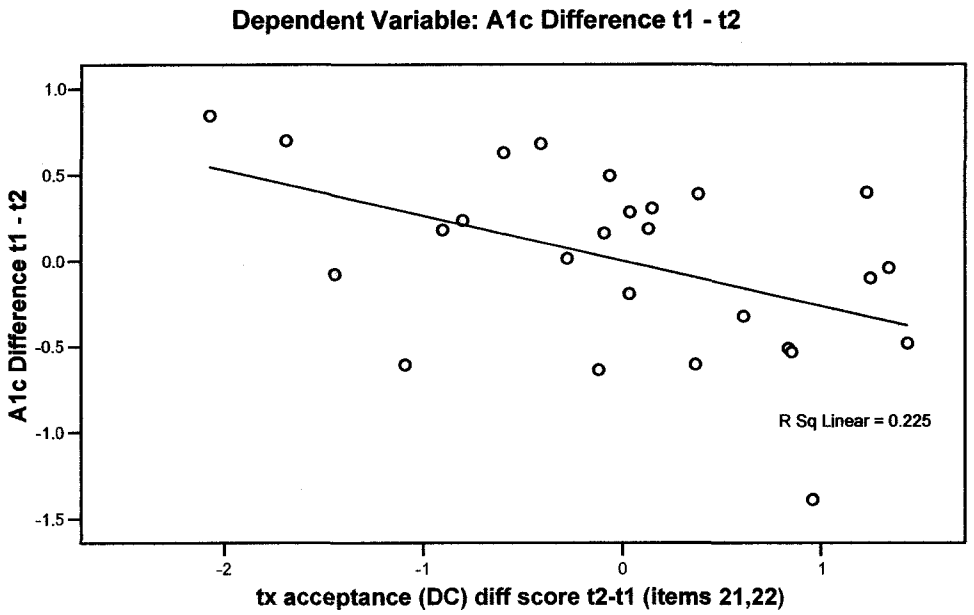
Partial Regression Plot



Partial Regression Plot

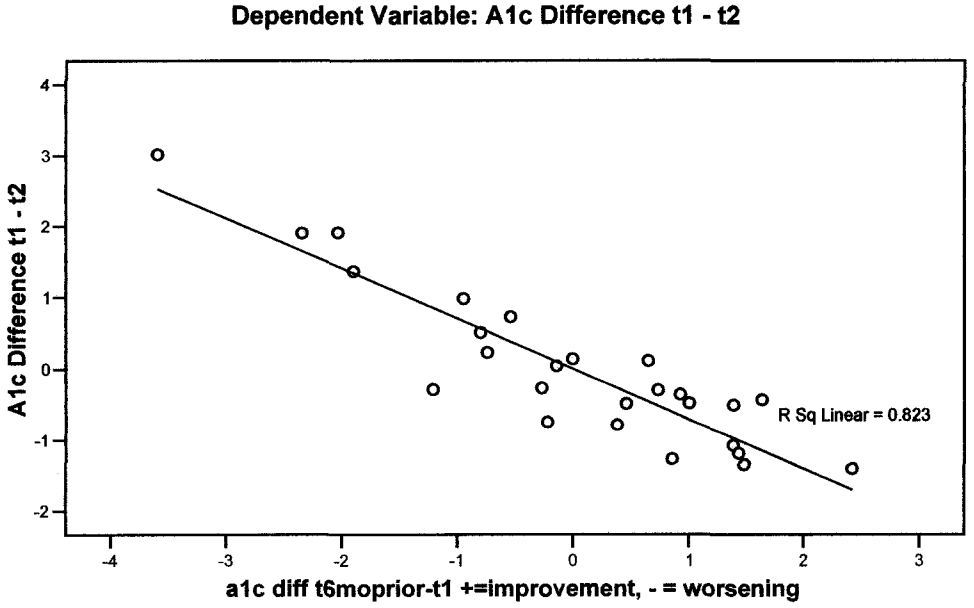


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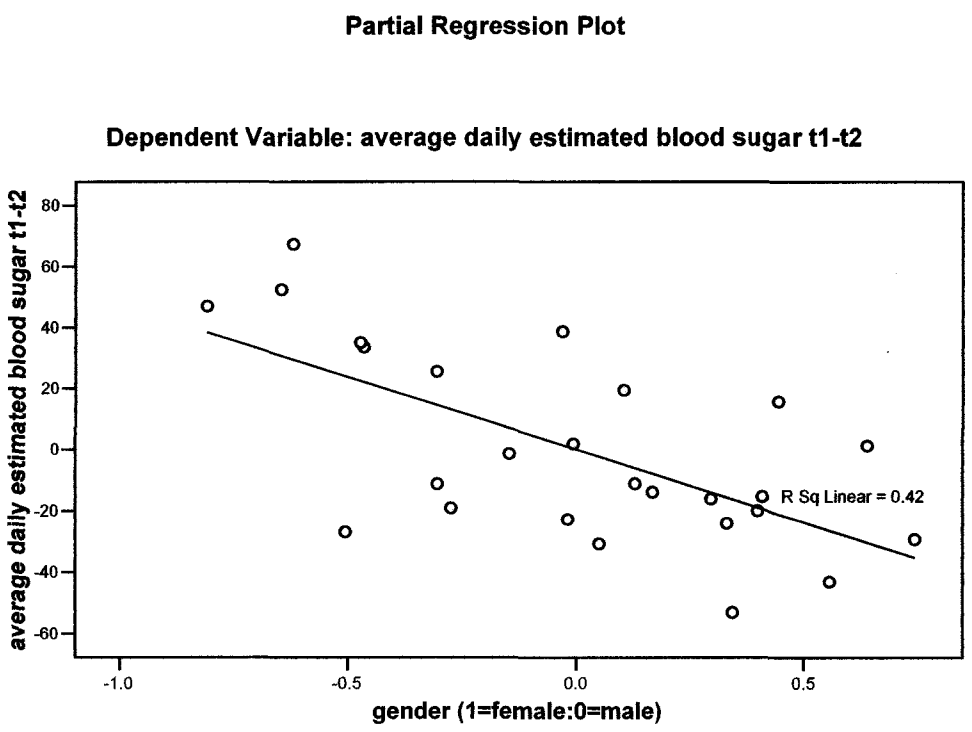
Table 17
Summary of Regression Model 2

	R	*R* Square	Adjusted *R* Square	Std. Error of Estimate	Durbin-Watson
Model 2	.900	.809	.749	27.405	1.806

Figures 8-13. Partial Regression Plots for Model 2



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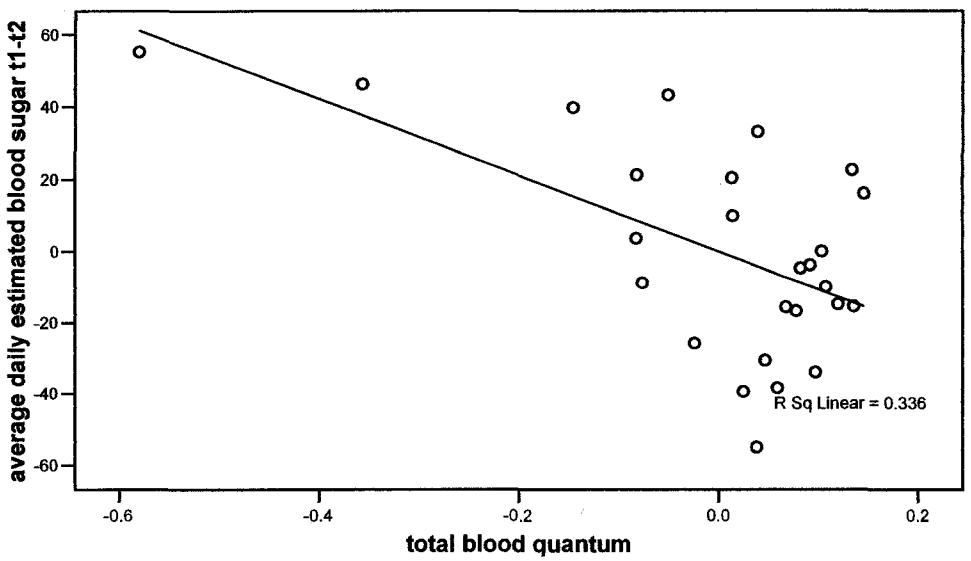
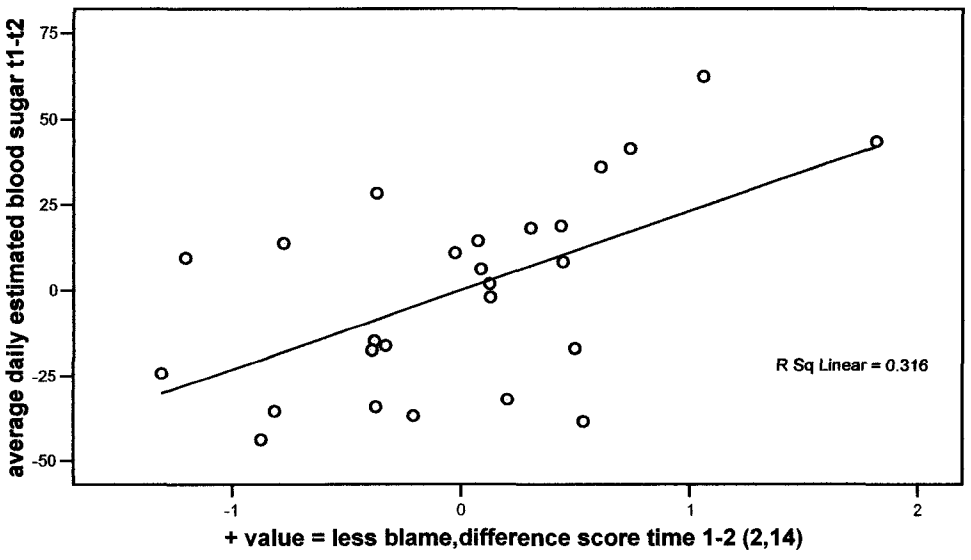
Partial Regression Plot

Dependent Variable: average daily estimated blood sugar t1-t2



Partial Regression Plot

Dependent Variable: average daily estimated blood sugar t1-t2



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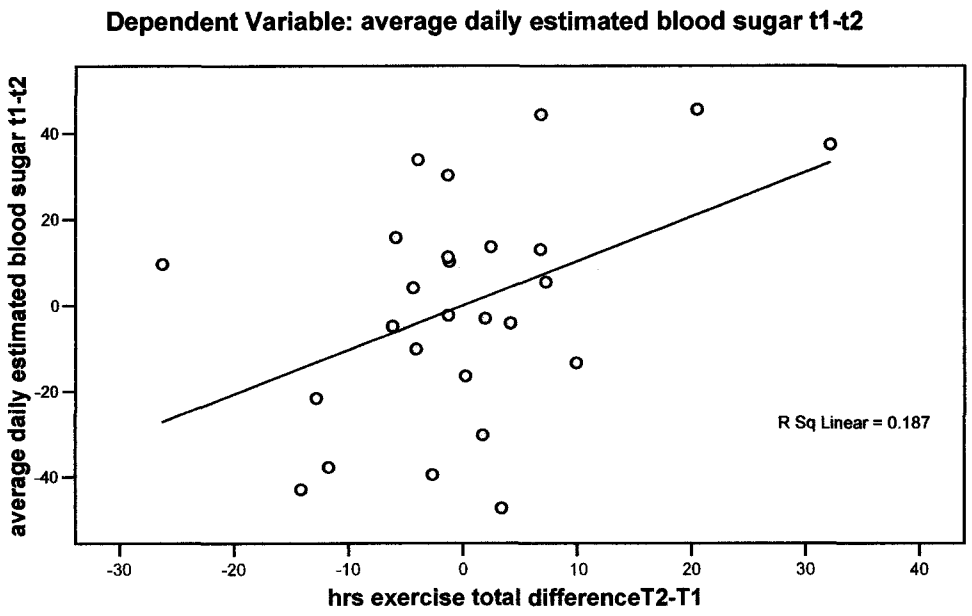
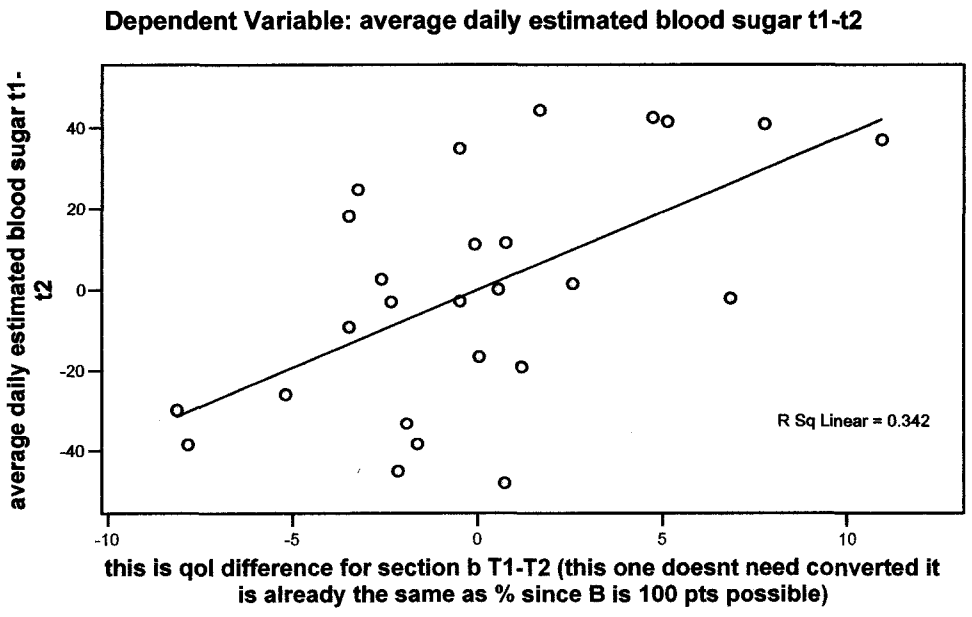
Partial Regression Plot



Partial Regression Plot



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Partial Regression Plot

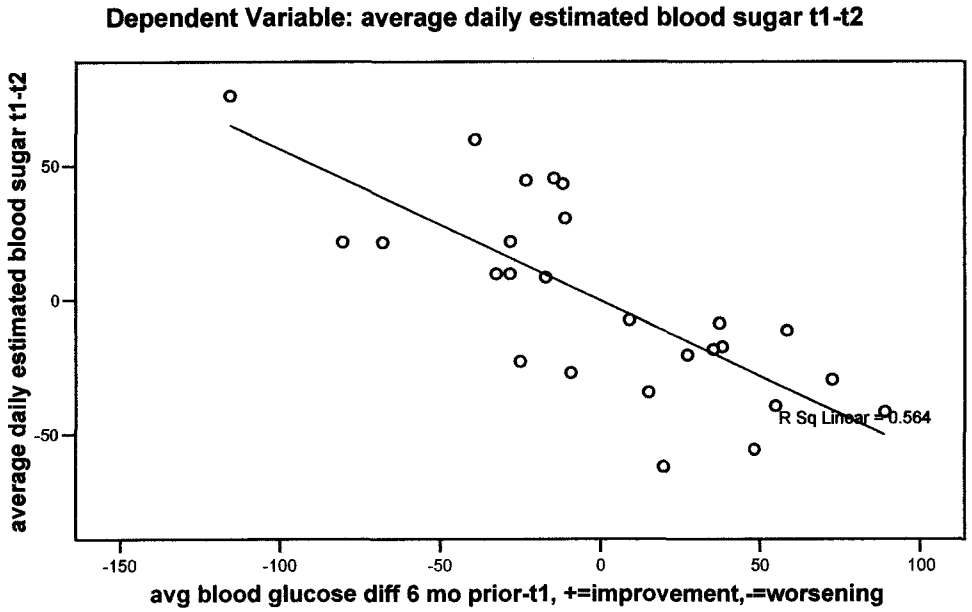

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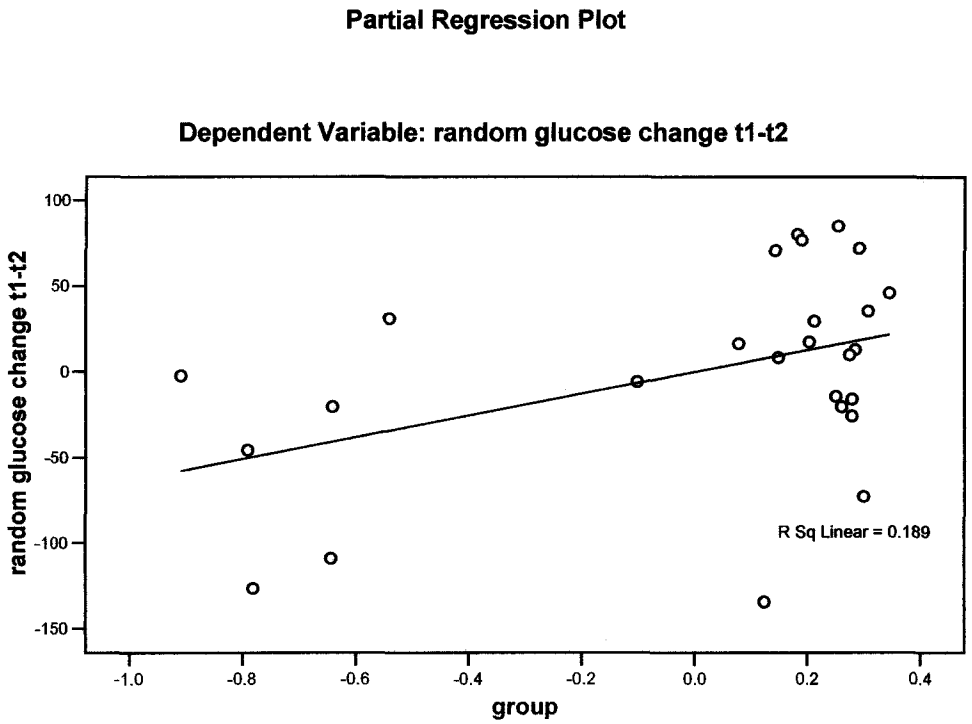
Table 18
Summary of Regression Model 3

	R	*R* Square	Adjusted *R* Square	Std. Error of Estimate	Durbin-Watson
Model 3	.748	.559	.475	59.370	1.917

Figures 14-17. Partial Regression Plots for Model 3



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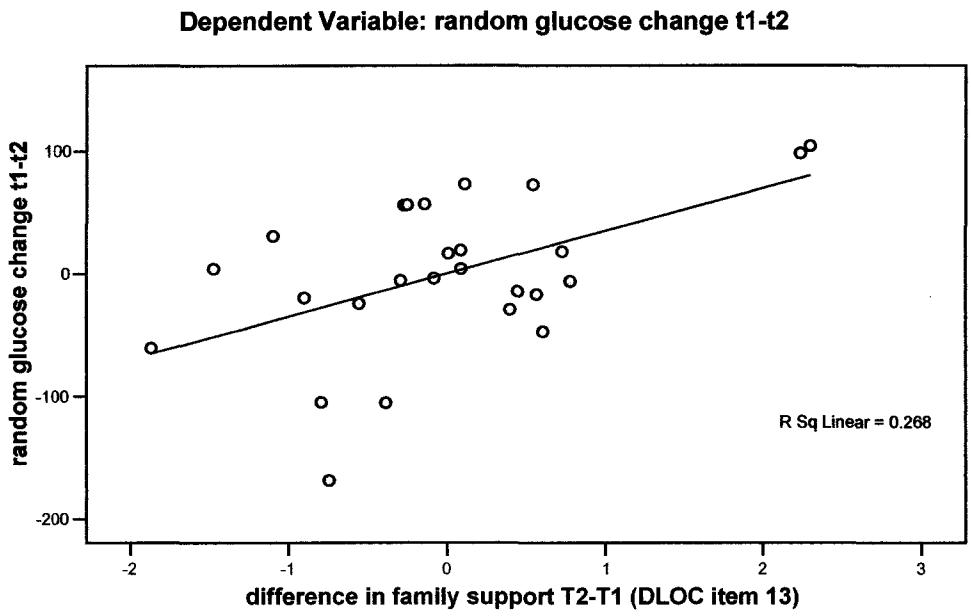
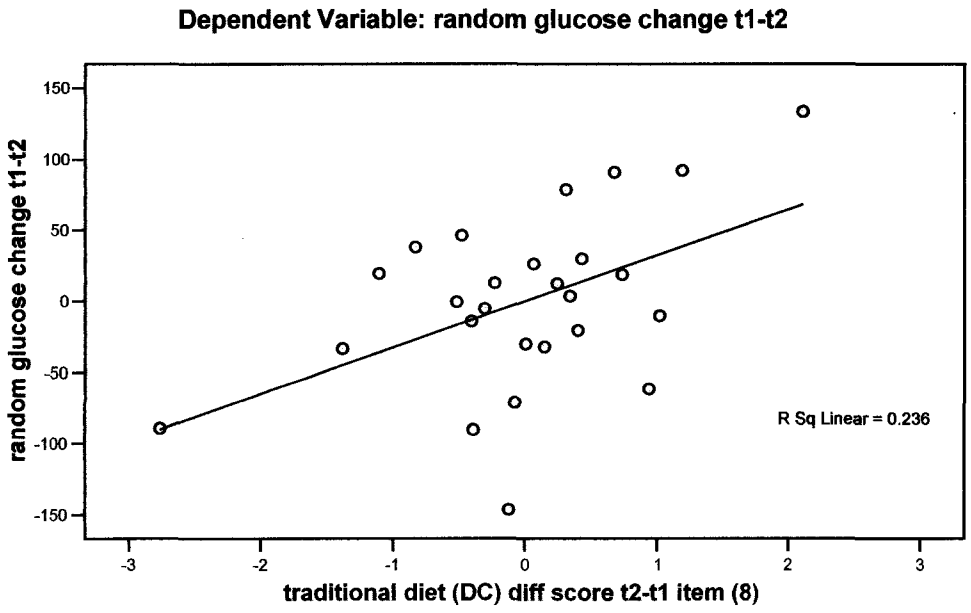
Partial Regression Plot



Partial Regression Plot



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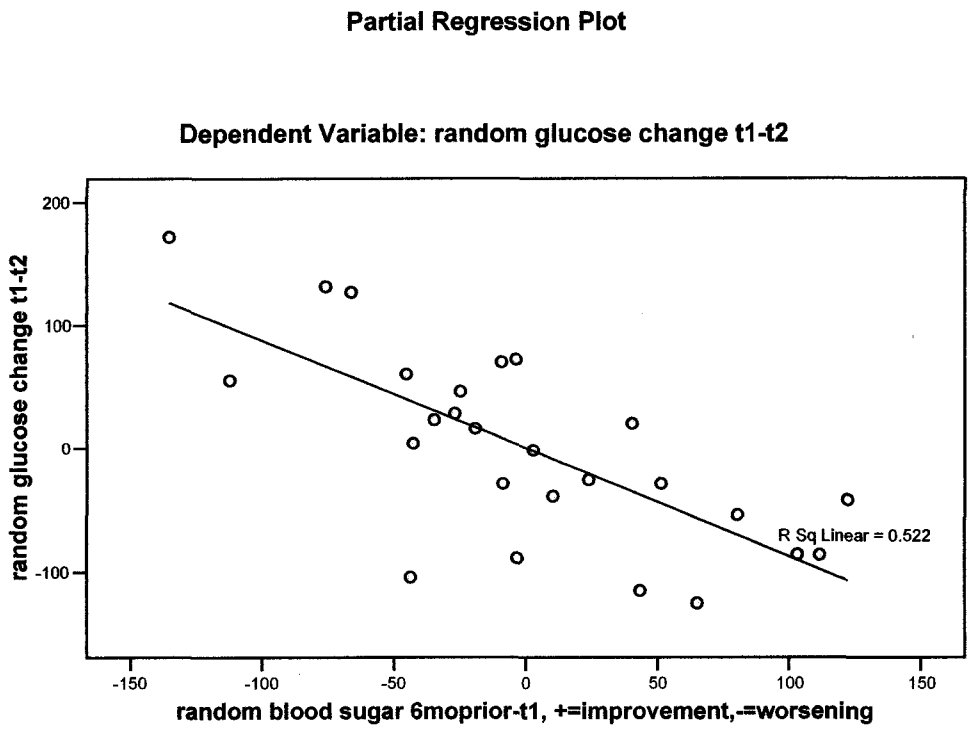

Table 19

Correlation between Age, Total Blood Quantum, and Fear Distrust

		Participant Age	Total Blood Quantum	Fear Distrust Change Score
Participant Age	Pearson Correlation Sig. (1- tailed) *N*			
Total Blood Quantum	Pearson Correlation Sig. (1- tailed) *N*	.343* .043 26		
Fear Distrust Change Score	Pearson Correlation Sig. (1- tailed) *N*	.160 .217 26	.330* .050 26	

Note: * Correlation is significant at the 0.05 level (1-tailed)

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Demographics Questionnaire

ID#_____

Please circle your responses, or fill in the blanks. If you come to a question that doesn't seem clear to you or if you have questions please ask at any time. Thank you for your time and help in this research project.

1. Age_____ Gender: Male/Female
   Height: Ft._____in._____ Approximate Weight_____lbs.
2. Tribal Affiliation:_____
3. Enrolled Tribal member? YES/NO
4. Non-enrolled descendant? YES/NO
5. Degree of Indian Blood from tribe where you are enrolled_____
6. Total Indian blood degree_____.
7. Do you prefer to speak your Native language rather than English? YES/NO
   (e.g., Eastern Shoshone, Northern Arapaho or other Indian language)
8. How traditional do you consider yourself to be? (Circle your response)
   1=not traditional at all
   2=traditional but less so than most others
   3=as traditional as most people on the reservation
   4=more traditional than most people on the reservation
   5=very traditional
9. Have you had traditional education from an elder? YES/NO

10. Please place a check next to the highest level of schooling you have completed
    Highest grade completed (if not high school)_____
    GED_____
    High School_____
    Some College_____
    College Degree_____
    Advanced Degree (e.g., Master's degree, PhD, MD)_____

11. What type of diabetes have you been diagnosed with? (Circle your response)
    Type-1 Diabetes (insulin-dependent)
    OR
    Type-2 (non-insulin dependent)
    Do you take pills or get shots of insulin? (Circle your response)

12. How long ago were you diagnosed with diabetes? (Circle your response)

    6 months or less more than 6 months, but less than 1 year

    1 or 2 years 2 to 5 years More than 5 years

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13. Do you think you can prevent complications like, problems with vision, circulation, problems with kidneys or others that are a result of diabetes? (Circle your response)
    1=no
    2=probably not
    3=maybe
    4=probably can
    5=yes

14. Has anyone in your immediate blood related family (only include immediate blood related family here, like grandparents, mother, father, children, brothers, sisters, aunts or uncles) been diagnosed with diabetes?
    YES/NO
        If yes, how many? (Circle your response)
        1-5 6-10 11-15 16-20 More than 20

15. Have any of your **traditional relatives who are not related to you by blood** such as adopted grandpas, grandmas, brothers, sisters, aunts, uncles, mother-in-law, father-in-law, or others been diagnosed with diabetes?
    YES/NO
        If yes, how many? (Circle your response)
        1-5 6-10 11-15 16-20 More than 20

16. Do any of your friends have diabetes?
    YES/NO
        If YES, how many? (Circle your response)
        1-5 6-10 11-15 16-20 More than 20

17. What type of treatment have you had for diabetes? (Please circle all that apply to you)
    Pills, Shots of insulin, Foot check-ups, Regular doctor visits,
    Attend diabetic clinic, Regular visits with the dietician, Changes in my diet,
    Increased exercise, Dialysis, Amputation, Glasses, Traditional Medicine,
    Dental check-ups, Eye exams, or Other (please list)_____
    _____

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