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To whom it may concern:

This is to certify that on April 15, 2010, Erin M. Honcharuk submitted an Honors Thesis entitled "The Transition to College for Adolescents with Type 1 Diabetes" to the Psychology Department. This thesis has been judged to be acceptable for purposes of fulfilling the requirements to graduate with College Honors.

Sincerely,

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The Transition to College for Adolescents with Type 1 Diabetes

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Abstract

The transition to college leads to changes in relationships with family and friends, alters health behaviors, and may impact psychological well-being. Adolescents often move away from home, eat less nutritious meals, drink alcohol, and face stress from schoolwork and changes in relationships and living situations. These changes can be particularly problematic for adolescents with diabetes as they could affect how they take care of their disease and, subsequently, their metabolic control. The goals of this study were to determine if there are differences in relationships and health behaviors between freshman college students with and without diabetes; determine whether self-care behaviors and metabolic control change from senior year of high school to freshman year of college for those with diabetes; and examine whether we could predict changes in metabolic control and self-care behaviors with psychosocial variables. Participants were 29 adolescents with diabetes and 20 adolescents without diabetes. They completed an online survey and three 24-hour dietary and activity phone recall interviews during senior year of high school and freshman year of college. Adolescents with diabetes reported worse sleep, more alcohol abuse, and consumed fewer calories than those without diabetes. Adolescents with diabetes also reported being closer and having more contact with parents than those without diabetes. There were no group differences in psychological well-being. There were negative changes in metabolic control and self-care behaviors for those with diabetes. Better sleep quality, more binge drinking, more smoking, and worse self-care behaviors predicted the decline in metabolic control. Negative psychological well-being and greater parent support predicted more better self-care behaviors. These results suggest that the transition to college is very similar for adolescents with and

without diabetes, but that increased education about alcohol and smoking and the importance of continued parental support could improve diabetes outcomes for those entering college.

The Transition to College for Adolescents with Type 1 Diabetes

The transition from adolescence into adulthood is associated with a variety of changes. Adolescents experience many new things, whether it is living away from home, having a full-time job, or just being able to decide when and what to eat. For those with type 1 diabetes, the changes that occur during the transition may lead to a decrease in self-care. Although little research has examined how this transition affects self-care behaviors and metabolic control, a couple of studies that followed adolescents for about 20 years, noted that metabolic control deteriorated between 17 and 19 years of age (Bryden et al., 2001; 2003).

There are many reasons for negative changes in metabolic control and self-care behaviors during this period of time among those with type 1 diabetes. The change in parent relationships is one possibility. With age, adolescents assume more and parents assume less responsibility for diabetes care. Adolescents who move away from home may have less contact with family, causing a further decrease in family support for diabetes self-care. Without parental guidance and support, adolescents may decrease exercising, eat less nutritious meals, or drink alcohol, all of which can affect the adolescent's overall health, and also adversely affect metabolic control.

Another factor that may play a role in how the transition into adulthood affects diabetes self-care and metabolic control is whether adolescents with diabetes go to college. A large percentage of adolescents go to college, with one study noting that about 61.6% of high school graduates enter college immediately after high school graduation (The National Center for Higher Education Management Systems, 2006). The college environment may not be conducive to good self-care of diabetes for several reasons. First, as described above, parents are less able

to watch over an adolescent's self-care behaviors, making sure they make good choices. Second, college is associated with a deterioration in diet, an overall erratic schedule, not getting enough sleep, possibly binge drinking, and trying or using drugs—all of which could adversely affect diabetes. These behaviors can have negative effects on blood sugar levels and metabolic control. By comparing adolescents with diabetes before and after they enter college, we can examine whether changes in self-care occur with college entry. In addition, by comparing college students with and without diabetes we can determine if the transition into college is similarly related to psychological well-being, physical well-being, health care behaviors, and social support in the two groups. Because there is little research on college students with diabetes, this will be the focus of my study.

I have three goals for this study. The first is to examine how the transition from high school to college affects diabetes self-care behaviors and metabolic control. To address this goal, I will examine how self-care behaviors and metabolic control change from high school to college. To the extent that changes occur, my second goal is to determine whether we can explain these changes in terms of peer and parent relationship variables, psychological well-being, physical well-being, and general health behaviors, which include diet, smoking, alcohol consumption, amount of sleep and exercise regimen. A third goal is to determine whether the transition to college affects those with diabetes differently than those without diabetes. To address this goal, I will compare college students with diabetes to college students without diabetes in terms of relationships, psychological and physical well-being, and health behaviors. Because the consequences of poor health behaviors are more severe for those with rather than

those without diabetes, I predict that adolescents with diabetes may not participate in the same risk behaviors, such as drinking and poor eating habits, as their peers without diabetes.

Before presenting my study, I will briefly review the research on how the transition to college and the college environment affects health behaviors, diabetes management, metabolic control, psychological well-being and relationships. The vast majority of this research focuses on healthy college students; there are only a handful of studies that focus on those with diabetes.

Implications of College for General Health Behaviors

Entry into college may be accompanied by a decrease in good health behaviors. One domain is diet. A study of female college students (not specific to diabetes) showed that there was a decrease in total caloric intake over the first five months of college, including a decrease in consumption of vegetables, bread/pasta, milk, meat, grams of carbohydrates and protein, and milligrams of cholesterol (Butler et al., 2004). Although grams of fat consumed also decreased, the percentage of calories from fat increased. Another study of college students with diabetes also showed that diet may suffer upon entry into college. Wdowik et al.'s (2001) focus groups and interviews with college students with diabetes revealed that they were not following a healthful diet. Specifically, students reported finding it inconvenient to carry food and eat in class and did not frequently plan for meals or snacks. Another study found that students with diabetes reported not planning for snacks, but did find that students regularly ate breakfast, lunch and dinner (Wdowik et al., 2001). None of these studies compared the diets of students with diabetes to those without diabetes or compared the change in diet from high school to college among the two groups, so it is difficult to know whether diet deteriorated

similarly for both groups. Because the consequences of a poor diet are more hazardous for those with diabetes, their eating habits may not deteriorate to the extent of those without diabetes.

One diet-related behavior that is especially relevant to those with diabetes is alcohol because drinking alcohol lowers blood sugar levels and could lead to hypoglycemia. Alcohol not only directly affects blood sugar, but may detract from other self-care behaviors such as testing and eating properly that could affect blood sugar. In addition, alcohol may impair a person's ability to notice low blood sugar levels. Alcohol consumption is more prevalent among college-age students than other age groups and is more prevalent among youth who attend college than those who do not (O'Malley & Johnston, 2002). One study of college students found an increase in alcohol consumption during the first 5 months of college (Butler et al., 2004). A study of male college students found that the average number of drinking days per month and number of binge-drinking episodes increased from a couple months before college to the first month of college (Labrie et al., 2008). When college students with diabetes were asked why their metabolic control decreased, they suggested that increased alcohol intake was a reason (Ramchandani et al., 2000). Because students with diabetes are aware of the increased risks that alcohol poses, they may drink less than their peers without diabetes. One study examined alcohol consumption among adolescents aged 17-22 with and without diabetes and found that those with diabetes were less likely to drink alcohol (Myers, 1992). However, this study did not examine college students exclusively.

Adolescents also may decrease the amount that they exercise when they enter college, which can have negative consequences for metabolic control among those with diabetes. One

study of college students, not specifically with diabetes, found a decrease in physical and sport activities and an increase in leisure activities over the first five months of college (Butler et al., 2004). Studies of students with diabetes have shown that students believe that exercise would improve their control (Ramchandani et al., 2001), but that students find studying conflicts with their ability to exercise (Wdowik et al., 1997). In addition, students report that feeling stressed, out of control, or unhappy is associated with less exercise (Wdowik et al., 2001). Because students with and without diabetes face similar challenges to exercise upon entry into college, we predict that exercise will decrease for those with and without diabetes when they enter college.

College may also lead to a decrease in the amount of sleep that students receive. First, the increase in schoolwork that occurs in college compared to high school could detract from sleep. Second, greater opportunities for social interaction and fewer parental constraints may lead to a decrease in overall sleep or more irregular sleep. Although it is reasonable to think that sleep decreases in college, research has not investigated differences in sleep behavior between high school and college students. The decrease in sleep is probably similar for college students with and without diabetes, but the decrease in sleep may have more hazardous health consequences for those with diabetes.

Implications of College for Diabetes Self-Care

While the entry into college has effects on general health behaviors, it may also have effects on health behaviors related to diabetes. For instance, entering college could lead to decreases in the frequency of blood glucose testing and injecting/ blousing insulin. One study found that students reported that it was inconvenient to test and carry diabetes supplies,

although the investigators did not examine whether testing was affected by entry into college (Wdowik et al., 1997). The only study that has examined how testing changed from high school to college showed that students tested more rather than less frequently (Ramchandani et al., 2000). Almost 60% of students reported testing more frequently in college than in high school and only 19.5% reported testing less frequently (Ramchandani et al., 2000). In addition, 88% either maintained or increased the number of insulin injections. However, the findings of this study are somewhat questionable because only 31% of those contacted agreed to participate in the study. Those whose self-care decreased upon entry into college may have been less likely to participate. The study also is limited by its cross-sectional nature; college students compared their current behavior to their recalled behavior from high school. In the present study, we will be able to examine how testing changes from high school to college in a more representative sample of those with type 1 diabetes with longitudinal data.

Implications of College for Relationships

The transition to college may be accompanied by changes in the amount or nature of social support received, which could have implications for health. Because students are constantly surrounded by peers and friends, they may experience an increase in peer social support compared to levels in high school. However, adolescents with diabetes may not experience the same increase in peer support as their healthy counterparts when they go to college. Those with diabetes meet new people who do not know they have diabetes and are faced with the decision as to whom they tell about diabetes and how much they tell them. Although students with diabetes seem to want to tell their friends about diabetes so that their friends know what to do in an emergency, some worry what people will think about their

diabetes and that others will treat them differently (Wdowik et al., 1997). Thus, students with diabetes may experience the same increase in the number of friends as students without diabetes but the quality of the new college relationships may be limited by the lack of self-disclosure. Thus, adolescents with diabetes may experience a decrease in diabetes-specific peer support as compared to high school.

One study of college students with diabetes tried to address this issue with an intervention where students met in groups to discuss diabetes-related topics. After this intervention, metabolic control significantly improved (Shalom, 1991). One reason for the improvement could be an increase in social support. During the sessions students reported that they felt comfortable expressing feelings that they had considered unacceptable to share with non-diabetic peers. This increased communication about one's feelings and the support received throughout the sessions may be why metabolic control improved.

The transition to college also may lead to decreases in family support because contact with family is diminished. This decrease in family support is most likely to occur among students who move further away to college. Those who live further from home are likely to have less family support, including diabetes-specific support, which may have implications for metabolic control. It is possible, though, that contact with family members rather than physical proximity is what actually predicts metabolic control, as those far from home may still maintain high contact with family through phone calls or e-mails.

There are a number of reasons why social support from family or friends could affect metabolic control. It may be that support directly affects metabolic control through a physiological mechanism. That is, the positive feelings that stem from social support may

directly affect the neuroendocrine system. It is also possible that social support indirectly affects metabolic control through diabetes self-care. Two studies showed that diabetes-specific family support was correlated with adherence to the diabetes self-care regimen (Gillibrand et al., 2006), and that those with higher diabetes-specific social support reported greater adherence (Wysocki et al., 1992). Thus, social support could affect adherence, which would then affect metabolic control.

College students with diabetes may not experience the same decrease in family support as college students without diabetes because they are more likely to live at home or live closer to home than students without diabetes. One study found that young adults with diabetes were more likely to remain at home while pursuing higher education and were more likely to attend community college than young adults without diabetes (Myers, 1992).

Whether students live at home or not may have different effects on parent social support. Interestingly, one study found that gender affected the relation between where the student was living and communication with mothers, according to parent self-report. Communication was better when daughters lived at home than at school, but communication was better when sons lived at school than at home (Anderson, 1990).

Implications of College for Mental Health

College may be associated with an increase in stress and, subsequently, depressive symptoms. There are multiple sources of stress. Stress could arise from increased pressure from schoolwork, feelings of loneliness from leaving family and friends, and trying to fit in a new social environment. These sources of stress are similar for students with and without diabetes, so there is likely to be a similar increase in depressive symptoms for both groups. An

increase in stress and depressive symptoms during college is of particular concern for those with diabetes because psychological distress has been related to worsening metabolic control (Hood et al., 2006; McGrady et al., 2009).

Like social support, depression may affect metabolic control directly through some physiological mechanism or may affect metabolic control indirectly by altering self-care behavior. For example, one study showed that students think stress is associated with more sporadic eating habits, viewing exercise as less of a priority, and poor sleep habits (Wdowik et al., 1997). However, the relation of stress to metabolic control is not clear. One study showed a relation (Wysocki et al., 1992), and one study did not (Ramchandani et al., 2000). A study comprised partly of the same participants as the present study, though at mid-adolescence, showed that stressful life events predicted a worsening in metabolic control, and was partially mediated by meter readings, which is one aspect of self-care behavior (Helgeson et al., 2010). Thus, another reason that diabetes self-care may suffer during college among those with diabetes is that depressive symptoms increases and this interferes with self-care.

The Present Study

This study focuses on how adolescents with type 1 diabetes are affected by the transition to college. Because there is not much research addressing how metabolic control changes from high school to college, this study first seeks to determine if there is a change in metabolic control and, if so, the reasons for this change. We examine several explanatory factors, including changes in general health behaviors, diabetes self-care, relationships, and psychological well-being from high school to college. We also examined whether grades in college predict metabolic control. Those with poor grades may have good metabolic control

because these students spend the necessary time exercising, eating properly, and sleeping regularly at the expense of their schoolwork. Conversely, those with better grades may have better control because they lead a more organized life, which allows them to follow the correct treatment regimen while completing their schoolwork. Finally, we want to compare how the transition from high school to college differs for students with and without diabetes in terms of general health behaviors, relationships and psychological well-being.

Method

Participants and Design

A total of 29 adolescents with types 1 diabetes (average age 18.0 years) and 20 adolescents without type 1 diabetes (average age 17.8 years) who were in their senior year of high school participated in this study. Demographics for the two groups are shown in Table 1. About two-thirds of both groups were female, and the majority of both groups was Caucasian.

Procedure

Participants were recruited from an ongoing study of the transition from adolescence to emerging adulthood. They were invited during their senior year of high school to participate in this study. Each participant completed an on-line questionnaire during the spring semester of their senior year of high school (T1) and one year later (T2). In addition, participants completed three 24-hour dietary recall interviews by phone each year following their completion of the on-line questionnaire. Because the study focuses on the transition to college, only participants who were full-time students the second year of the study were included in this paper (which was 78% of the participants with diabetes, 71% of healthy participants).

Measures

Demographics. Information about each participant's gender, age, race, height, and weight was obtained at T1 and current living arrangements were obtained at both years. Participants also were asked with how many people they live, if they moved during the past year and, if they have moved, how far they live from their parents at T2.

Work/ school information. Each participant was asked what they were currently doing: "attending school", "working", "attending school and working", or "serving in the military." They were asked if they were a full-time student, how many hours they spend in class in a typical week and their GPA. If students worked, they were asked how many hours per week they work.

Those who worked completed a 10-item job satisfaction scale that tapped satisfaction with control over work, pay, and skills utilized (Hibbard & Pope, 1993; α=0.95). Responses to each item were made on a 7-point scale, ranging from "completely dissatisfied" to "completely satisfied."

Psychological well-being. We had four measures of psychological well-being. First, we measured depressive symptoms with the Center for Epidemiological Studies Depression (CES-D) Scale (Radloff, 1977; T1 α= 0.91; T2 α= 0.94). The scale consists of 20 items, which measures the occurrences of symptoms associated with depression over the past week. Each item is rated from 0 (none of the time) to 3 (most of the time). Items include "I did not feel like eating; my appetite was poor", "I thought my life had been a failure" and "I felt hopeful about the future" (reverse scored). Second, global life satisfaction was measured with the Satisfaction with Life scale, which contains 5 items used to measure global life satisfaction (Diener, Emmons, Larsen & Griffin et al., 1985; T1 α= 0.88; T2 α=0.90). Items are rated on a 7-point scale ranging from

"Strongly Disagree" to "Strongly Agree," and include "In most ways my life is close to my ideal" and "So far I have gotten the important things I want in life." Third, the UCLA Loneliness Scale (Russell, 1996) was administered. It contains eight items (T1 α=0.85; T2 α=0.83), each of which is rated from 1 (never) to 4 (often). Items include "There is no one I can turn to", "I feel alone", and "I can find companions when I want to" (reverse-scored). Fourth, perceived stress was measured with a 4-item scale, which assesses how often people feel anxiety and stress in the past month (Cohen, Kamarck, & Mermelstein, 1983; T1 α= 0.79; T2 α=0.80). Answers are rated on a 5-point scale, ranging from "never" to "very often." Items include "How often have you felt that you were unable to control the important things in life?" and "How often have you felt that things were going your way?" (reverse-scored).

Physical well-being. The Cohen Hoberman Inventory of Physical Symptoms (CHIPS; Cohen & Hoberman, 1983; T1 α= 0.91; T2 α=.94) measures the frequency of 33 physical ailments over the past two weeks. Participants rated each ailment from 0 (not at all) to 4 (a lot). Some symptoms are sleep problems, back pain, hands trembling, acne, nosebleeds, and cold or cough.

Exercise and physical activity. The Paffenbarger Physical Activity Questionnaire (Paffenarger, Wing & Hyde, 1978) measures the number of calories a person expends per week in sports, leisure and recreational activities. Items include how many stairs are climbed and city blocks walked on an average day. Participants listed up to five physical activities along with the number of times per week they perform each activity and the duration of performance. Scores are measured in terms of kilocalories expended per week.

Smoking and alcohol behaviors. Two questions were used to assess smoking habits, which were "What best describes your cigarette smoking in the last 12 months?" and "How much have you smoked cigarettes during the past 30 days?" The first question is rated on a 5-point scale from "have not smoked at all" to "smoke regularly now." The second question is rated a 7-point scale, ranging from "not at all" to "2 packs or more a day."

Alcohol usage is measured with six questions. The first question assesses how many occasions the person drank in the past 30 days, with a 7-point response scale ranging from "0 occasions" to "40 or more." The next five questions asked how many times in the last two weeks the person had one, two, three, four, or five or more drink(s) on one occasion on a 6-point scale from "none" to "10 or more times." Binge drinking was defined as the number of times the participant had more than five drinks on a single occasion for males and more than four drinks on a single occasion for females.

Among those who drank alcohol, the Rutgers Alcohol Problem Index (White & Labovie, 1989) was used to measure the negative consequences associated with alcohol. There are three subscales, each consisting of four items: alcohol abuse (T1 α= 0.68; T2 α=0.35), sample item: "Have you felt that you had a problem with alcohol?"), personal consequences (T1 α=0.35; T2 α=0.89, sample item: "Were you unable to do your work school or work?"), and social consequences (T1 α = 0.81; T2 α=0.83, sample item: "Did you get into fights, act bad or do mean things?"). All 12 items are rated on a 5-point scale, ranging from "never" to "very often."

Sleep behavior. Five items from the Pittsburgh Sleep Quality Index (Buysee et al., 1989; T1 α= .51; T2 α=0.51) were used to compute four variables to measure satisfaction with sleep. We asked about satisfaction with quality of sleep on a 4-point scale, ranging from very good to

very bad. We also asked participants to report the number of minutes it takes to fall asleep and the number of hours of sleep the person typically gets. We also computed a variable for actual sleep, which reflected the proportion of time in bed sleeping.

Self-care behavior. Adolescents with diabetes completed the Self-Care Inventory (La Greca, Swales, Klemp, & Madigan, 1988), which contains 22 items (T1 α= 0.69; T2 α=58). The measure asks about self-care behaviors in the domains of diet, testing, exercise, and insuling administration, such as how often the person tests glucose, administers the correct dose of insulin, sticks to the meal plan and exercises regularly. Responses were rated on a 6-point scale from "never do it" to "always do this." Two additional questions were added. The first asked how often adolescents test their blood sugar in an average day, and the second asks how often adolescents tested yesterday. Responses were rated on an 11-point scale from "0" to "10 or more."

Metabolic control. The most recent Hemoglobin A1c reading was collected from medical records. It is a measure of average blood glucose levels over the past 2-3 months.

Parent relationship. The 25-item Parental Bonding Inventory (Parker et al., 1979) measures three aspects of the parent-child relationship: parental care (12 items, α = 0.92), sample item: "Could make me feel better when I was upset"), parental autonomy (6 items, α = 0.74, sample item: "Gave me as much freedom as I wanted"), and parental overprotection (7 items, α = 0.82, "Felt I could not look after myself unless they were around"; Parker et al., 1979). Respondents are asked to rate items with respect to the first 16 years of their lives. Items are rated on a 5-point scale from "never" to "very often."

We also asked how often adolescents are in contact with their parents (7-point scale ranging from “more than once a day” to “less than once a month”), how often they visit home (6-point scale ranging from “every day” to “less than once a month”), how close they are to their parents (5-point scale ranging from “not at all” to “very”), and how often they confide in their parents (5-point scale ranging from “never” to “very often”).

Adolescents also rated parental monitoring, child disclosure of feelings, child disclosure of daily activities and parental control (Stattin and Kerr, 2000). All items were rated in terms of frequency, ranging from 1=never to 5=always. Parental monitoring (T1 α=0.83; T2 α=0.89=0) included items such as “do your parents know what you do with your free time” and “do your parents know when you are having problems.” Child disclosure of feelings (T1 α=0.86; T2 α=0.87) included items such as “do you tell your parents how you really feel about things” and “do you talk to your parents as freely as you talk to your friends.” Child disclosure of daily activities (T1 α=0.61; T2 α=0.75) included items such as “do you keep secrets from your parents about what you do during your free time” and “do you talk to your parents about school or work.” Parental control (T1 α=0.88; T2 α=0.87) included items such as “do you think your parents interfere too much in your free time activities” and “do you feel as though your parents control everything in your life.”

Peer relationships. Friend support was measured with the Berndt and Keefe scale (1995). The 18-item scale contains four subscales: friend companionship (6 items, T1 α=0.87; T2 α=0.87, sample item: “How often do you talk to friends on the phone or by computer?”), friend emotional support (4 items, α = 0.89; T2 α=0.83, sample item: “When you do a good job on something, how often do your friends praise or congratulate you?”), friend instrumental

support (4 items, α = 0.84; T2 α=0.83, sample item: “If you needed help with something, how often could you count on your friends to help you ?”), and friend intimacy (4 items, α = 0.86; T2 α=0.85, sample item: “How often do you tell your friends something important that you want them to keep secret?”). Items were rated on a 5-point scale ranging from “never” to “very often.”

We administered the TENSE scale to assess friend conflict (Ruehlman & Karoly, 1991). The 16-item scale asks how often in the past month friends have behaved in four different negative ways: friend insensitivity (T1 α=0.79; T2 α=0.76, sample item: “Took my feelings lightly”), impatience (T1 α=0.75; T2 α=0.72, sample item: “Wouldn’t let me finish talking”), interference (T1 α=0.61; T2 α=0.69, sample item: “Tried to manipulate or influence me for their own benefits”), and rejection (T1 α=0.67; T2 α=0.76, sample item: “Seemed bored with me”). Each subscale consisted of four items, each of which was rated from 0 (not at all) to 4 (about every day).

24-hour Dietary and Activity Recall Interview

Participants were contacted by phone and asked to review their day from the time that they woke up to the time that they went to sleep by giving a detailed description of the food eaten and activities performed. Participants with diabetes also reported when they tested, the results of testing, and if they injected or bolused. The interviewer probed for more detail on food eaten and activity performed to obtain the most accurate representation of the previous day possible. Participants recalled two weekdays and one weekend day. The information about food and activities were entered into the ESHA Research, Professional Nutrition Analysis Software and Databases to determine nutritional information and activity level.

Results

Overview of the Analyses

First, I examined whether there were group (diabetes vs. healthy) differences in demographic and background variables. Second, I examined whether diabetes outcomes (e.g., self-care behavior, metabolic control) changed over time. Then, I examined whether psychosocial variables predicted changes in those same diabetes outcomes. Next, I examined group and time differences in psychosocial variables and outcomes. Finally, on an exploratory basis, I compared participants with diabetes using a pump verses injections on psychosocial variables and outcomes.

Preliminary Analyses

Before conducting the primary analyses, we examined whether there were group differences on demographic and background variables. There were no group differences on age, sex, or race as shown in Table 1. However, healthy participants had a higher socioeconomic status (SES) than diabetes participants, t (47) = 2.02, $p < .05$. Thus, we controlled for SES in all analyses. We also note in Table 1 that healthy adolescents reported more parental bonding autonomy than adolescents with diabetes, t (48) = 2.97, $p < .10$.

For background variables that were measured at both T1 and T2, we conducted two way (group by time) analyses of variance. There were a few time differences as shown in Table 2. Body Mass Index (BMI) increased from T1 to T2 for both groups, F (1, 47) = 5.41, $p < .05$. There were no group or time differences in work status, with about half of participants working in each group at each time. Among those who worked, there was no difference in hours worked

at T1, but a significant difference at T2, F (1,19) = 3.59, $p < .10$. As shown in Table 2, diabetes participants worked more hours at T2.

For questions asked only at T2, we conducted an independent samples t-test. As shown in Table 3, there were no group differences in job satisfaction, whether participants moved in the past year, where participants were living, distance moved, number of people living with, or number of hours in class per week. Approximately 2/3 of each group lived on a college campus. On average, respondents moved 90 miles from home, lived with between 2 and 3 people, and attended classes about 18 hours per week. There was a trend toward a group difference on GPA, t (43) = 3.40, $p = .14$, such that healthy adolescents had a higher GPA than adolescents with diabetes.

Changes in Diabetes Outcomes Over Time

As shown in Table 2, for adolescents with diabetes, there was an increase in hemoglobin A1c (HbA1c) between T1 and T2, t (24) = -1.93, $p < .07$ and a decrease in average number of blood glucose readings taken per day between T1 and T2, $t(27) = 1.76$, $p < .10$. There was a trend toward a decrease in number of blood glucose tests taken yesterday, $t(27) = 1.62$, $p < .12$. Scores on the self-care behavior index remained relatively stable from T1 to T2.

Predicting Changes in A1c, Self-Care, and Number of Readings per Day

Next, we wanted to predict changes in diabetes outcomes over time. To reduce the number of psychosocial predictor variables, we created composite indices of several variables. Parent support (α=0.88), friend support (α=0.85), and friend conflict (α=0.81) indices were created by averaging the individual variables comprising the scales. We created a psychological well-being index (α=0.83) by taking the average of the standardized scores on depressive

symptoms, loneliness, perceived stress, and life satisfaction (reverse scored). Higher scores reflected poorer psychological well-being

A1c. We used regression analysis to examine changes in HbA1c by entering T1 HbA1c on the first step and entering each of the T2 psychosocial variables individually on the second step of the equation. Recall that an increase in A1c reflects a worsening of metabolic control. The results for the regression analysis are shown in Table 4. Binge drinking significantly predicted increases in A1c, such that more binge drinking was associated with a greater increase. Poor self-care behavior predicted an increase in A1c and smoking marginally predicted an increase in A1c. Surprisingly, better sleep quality also predicted an increase in A1c.

Self-Care. We used regression analysis to examine changes in self-care by entering T1 self-care on the first step and entering each of the T2 psychosocial variables individually on the second step of the equation. As shown in the second column of Table 4, none of the variables predicted changes in self-care. There was a weak trend (p=0.15) for the friend support index to be related to an increase in self-care.

Average number of readings per day. I used regression analysis to examine changes in average number of blood glucose meter readings taken per day by entering T1 number of readings on the first step and entering each of the T2 psychosocial variables individually on the second step of the equation (see third column of Table 4). None of the variables predicted significant changes in meter readings. More parent support (p=0.11) marginally predicted an increase in the average number of readings taken. Surprisingly, there was a trend for poor psychological well-being (p=0.11) to predict an increase in the number of meter readings taken.

Group and Time Effects on Outcomes

We examined whether there were group and time differences on all the dependent variables with group and time analyses of covariance (controlling for SES). The means for diabetes and healthy groups at T1 and T2 on all the dependent variables are shown in Tables 5, 6, 7, 8.

Psychological outcomes. As shown in Table 5, there were no group, time, or group by time interactions on any of the four psychological outcomes.

Parent relationship. Four questions were only asked at T2. There were main effects of group on the frequency of visiting home, F (1, 40) = 3.50, p = .07, closeness with parents, F (1, 43) = 5.21, p = .03, and confiding in parents, F (1, 42) = 3.24, p = .08. Adolescents with diabetes were more likely to visit home, were closer to their parents, and reported confiding more in parents than healthy adolescents. There were no group differences for contact with parents. Four questionnaires concerning parent-child relationships were administered at both T1 and T2. There was a main effect of time on parental monitoring. Parental monitoring decreased with time for both groups, F (1, 46) = 3.05, p = .09. There were no group or time differences for child disclosure of feelings, but there was a marginal group by time interaction on child disclosure of daily activities, F (1, 46) = 3.00, p = .09, such that disclosure increased between T1 and T2 for adolescents with diabetes but slightly decreased between T1 and T2 for healthy adolescents. There were no group or time differences for parental control.

Peer relationships. The group and time means for peer relationships are shown in Table 7. There were no significant main effects of group or time on any of the peer relationships variables. There was a single marginal group by time interaction, F (1, 46) = 2.99, p < .10. Friend

rejection decreased for diabetes participants from T1 to T2, but increased for healthy participants.

Health behaviors. As shown in Table 8, there were no effects for group or time on physical symptoms. There was a group main effect for sleep quality, F (1, 46) = 3.40, $p < .10$, such that adolescents with diabetes reported worse sleep than healthy adolescents at both T1 and T2. There was a marginally time effect for binge drinking, such that it increased for both groups from T1 to T2, F (1,47) = 7.77, $p < .10$. Among those who drank, there was a marginal group by time interaction for alcohol abuse, F (1, 15) = 3.55, $p < .10$. Alcohol abuse increased for adolescents with diabetes, but modestly decreased for adolescents without diabetes. Among those who drank, there were no group or time differences in personal or social consequences from drinking. There were no group or time differences in smoking the past year with between 25% and 41% reporting smoking at each time. There were also no group or time differences for smoking in the past month with between 67% and 80% reporting smoking at each time.

Physical activity data are also shown in Table 7. There were no group or time differences for total activity per week as determined by the Paffenberger questionnaire, but there was a time main effect for total energy expended as determined from 24-hour recall, F (1, 40) = 2.72, $p = .11$. From T1 to T2 total energy expended decreased for both groups. There were no group or time differences in active energy expended as determined from 24-hour recall.

There was a group difference in total calories consumed determined by 24-hour recall, F (1, 43) = 5.28, such that adolescents with diabetes consumed fewer calories than healthy adolescents at both T1 and T2. When specific nutritional components were examined, there was a group by time interaction for grams cholesterol consumed. Adolescents with diabetes

were stable in their consumption of cholesterol from T1 to T2, while adolescents without diabetes decreased their cholesterol consumption, F (1, 43) = 8.53, $p < .05$. There was a group difference in consumption of grams of sugar, F (1, 43) = 7.40, $p < .10$, such that sugar consumption was lower among adolescents with diabetes than healthy adolescents at both times. There was also a group by time interaction for percent protein consumption, F (1, 43) = 3.66, $p < .10$. Adolescents with diabetes decreased their percent protein, while healthy adolescents increased. There were no group or time differences for percent carbohydrates, percent fat, or percent saturated fat consumption.

Comparison of Participants on Insulin Pump or Insulin Injections.

Although it was not an explicit purpose of our study, we recognized that adolescents with diabetes may be using two very different treatment methods that could affect their psychological well-being and self-care. Two-thirds (19 of 27) of adolescents used an insulin pump. We compared adolescents with diabetes who were on an insulin pump to those who were on insulin injections in terms of psychological well-being and self-care (see Table 9). There were no differences in SES between the two groups, so SES was not statistically controlled in these analyses. There were no group or time differences in depressive symptoms or loneliness. There was a slight trend towards pump users having lower perceived stress than injection users, F (1, 25) = 1.90 = .19, $p < .19$. There was a marginal group main effect and group by time interaction for life satisfaction, F (1, 25) = 11.81, $p < .05$, and F (1, 25) = 3.06, $p < .10$, respectively. Life-satisfaction was higher among pump users than injection users at both times of assessment, but increased from T1 to T2 among pump users and decreased from T1 to T2 for those using injections. There were group main effects for self-care, F (1, 25) = 6.10, $p < .05$,

average number of blood glucose readings taken per day, $F(1, 24) = 3.18$, $p < .10$, and number of blood glucose readings taken yesterday, $F(1, 24) = 3.01$, $p < .10$. All three indices of self-care were higher for adolescents using pumps than injections.

Discussion

Differences in the Transition to College between Adolescents with and without Diabetes

One goal of this study was to determine what changes occurred upon the entrance to college and if these changes were similar for adolescents with and without diabetes. In general, relationships with parents stayed relatively stable from high school to college. In fact, the only aspect that changed from high school to college was that adolescents with diabetes increased the amount they told parents about their daily activities, while healthy adolescents decreased in this aspect of their relationship. We do not know if the disclosure on the part of adolescent with diabetes results from adolescent behavior or parent behavior. Parents of adolescents with diabetes may inquire more about diabetes-related behaviors, which would explain why disclosure of daily activities increases for adolescents with diabetes. During high school, parents are able to monitor their child's behavior and do not need to ask about it. Alternatively, adolescents might disclose more on their own. They reported being closer to their parents than healthy adolescents during college. Therefore, adolescents with diabetes might feel more comfortable disclosing information to their parents.

There was other evidence from this study that adolescents with diabetes are more strongly connected to their parents than adolescents without diabetes. When at college, adolescents with diabetes visited home more often and confided more in parents. Even at baseline, adolescents with diabetes reported having less autonomy while growing up compared

to healthy adolescents. Therefore, it seems that parents of children with diabetes have always been more involved in their child's life and continue to be more involved when adolescents enter college.

Support from friends was similar between adolescents with and without diabetes and remained stable upon the entrance to college. In terms of problems with friends, the only difference that appeared focused on friend rejection, which reflected friends not wanting to spend time with the adolescent. Contrary to prediction, this rejection decreased for adolescents with diabetes, but increased for healthy adolescents. It may be that those with diabetes felt that high school peers were more rejecting of them than college peers. Perhaps, peers in college do not notice, know, or care about the adolescent's diabetes as much as peers in high school did. One problem we faced when creating this survey was what group of friends the adolescent would reference, either friends from high school or college, when responding. If adolescents are thinking about different groups of friends when answering these questions, this could have altered the consistency of our results.

Overall, psychological outcomes were very similar for both groups and were stable over time. In fact, there were no group differences for any of the psychological variables at either time of assessment. This may be because entering college does not have dramatic effects on psychological well-being and having diabetes does not affect the transition in terms of psychological outcomes. However, a closer examination of the data shown in Table 5 suggests another possibility. For three of the four measures, it appears that adolescents with diabetes start out psychologically worse than healthy adolescents, but that healthy adolescents deteriorate to the same level of those with diabetes once they enter college. It appears that

college does not worsen psychological well-being for adolescents with diabetes, potentially because they already know how to deal with additional stress. Healthy adolescents are initially psychologically better because they do not have these additional stressors from diabetes. However, upon entering college, their psychological well-being deteriorates to the same level as adolescents with diabetes due to the stressors associated with college. Only for life satisfaction is this trend not continued. The life satisfaction scale is more general and respondents may take a more overall approach to rating their happiness with their life than the other scales, which may reflect more specific aspects of daily life. While adolescents feels stressed, potentially from the college workload, they may be happy with how their life is going and know that the additional stress is worthwhile.

Health behaviors were the domain that seemed to be most strongly affected by the transition to college and by whether the participant had diabetes or not. Adolescents with diabetes had worse sleep quality than healthy adolescents during high school and college. One explanation for this finding is that adolescents with diabetes have to test their blood glucose in the middle of the night, which would interfere with sleep quality. Adolescents with diabetes also might become low or are worried they will become low while sleeping, both of which could lead to decreased sleep quality.

Although there were no group differences in the frequency of binge drinking, there was a group difference in feeling dependent on alcohol. Among those who drank, alcohol dependence increased in college for adolescents with diabetes, but decreased for healthy adolescents. This is opposite of what we predicted. The increase in alcohol abuse among those with diabetes may have occurred in reaction to stricter parental constraints throughout high

school compared to the parental constraints of healthy adolescents. In college, adolescents have more freedom and more opportunities to drink. Perhaps adolescents with diabetes take advantage of these opportunities more so than healthy adolescents because they had greater parent regulation during high school. These results suggest that there needs to be more education about the consequences of alcohol for glucose levels and metabolic control among adolescents with diabetes prior to leaving home. It also suggests that future research should investigate whether parents' overprotective behavior contributes to the increase in binge drinking among those with diabetes.

Not surprisingly, both groups decreased their physical activity upon entering college. This most likely occurs because time spent studying and time spent with friends engaging in sedentary activities replaces physical activity. In addition, there may be fewer opportunities for college students to participate in sports compared to high school.

Diet is a health behavior that showed no change from high school to college. It was not surprising that adolescents with diabetes consumed less sugar than healthy adolescents. Adolescents with diabetes know they should eat healthily and limit sugar intake in order to maintain good diabetes health. It seems that these adolescents do follow these guidelines even when entering college. It is somewhat surprising, however, that adolescents with diabetes consume fewer calories overall than healthy adolescents.

Effects of the College Transition on Diabetes Outcomes

We also examined how the transition to college impacted diabetes-related outcomes. Little previous research has examined changes in metabolic control and self-care behaviors upon entering college. Our results showed a decrease in metabolic control and a decrease in

self-care, as measured by the frequency of blood glucose testing, upon entering college. The decrease in testing frequency may have contributed to the decline in metabolic control. Metabolic control is used to measure overall diabetes health, thus showing that diabetes health decreases. Poor diabetes health can lead to health complications from diabetes.

To better understand why metabolic control deteriorated upon entrance into college, we examined whether the psychosocial variables we measured would explain this change. Not surprisingly, binge drinking predicted worse metabolic control. Drinking alcohol may disrupt blood glucose control. It is a bit counterintuitive that drinking alcohol *lowers* blood glucose because alcohol contains carbohydrates. To make matters worse, adolescents may think that they should take insulin when drinking alcohol because they are ingesting a beverage high in carbohydrates. This behavior would only further decrease their blood glucose. In addition, adolescents may pay less attention to general self-care behaviors when drinking alcohol. In fact, the self-care behavior index overall predicted a decline in metabolic control.

Smoking also predicted a decline in metabolic control. This could be because those who smoke may not be as concerned with their general or diabetes health. In other words, smoking is really a proxy for poor self-care. To test this hypothesis, we examined the correlation between smoking and self-care. This correlation was not significant, $r = -.17$, $p = .37$. Perhaps smoking is related to a set of other risk behaviors that affect metabolic control. In this study, smoking was marginally correlated with binge drinking ($r = .23$, $p = .11$) and significantly correlated to alcohol abuse ($r = .32$, $p < .05$). Therefore, it seems that increased smoking predicts a decrease in metabolic control because those who smoke are more likely to engage in other risky behaviors, such as drinking alcohol.

Sleep quality predicted metabolic control, but in the direction opposite of predictions. Good sleep quality was associated with a *decline* in metabolic control. There are a couple of reasons why this may have occurred. First, those who take better care of their diabetes may be more likely to be concerned about dropping low at night and may be more likely to wake up to test, both of which would lead to poor sleep quality. To test this hypothesis, we correlated sleep quality with self-care behaviors. Although the relation was positive, it was not significant, r=0.22, p=0.25. Second, conscientiousness might underlie both good metabolic control and poor sleep quality. That is, conscientious people may be concerned about taking care of their diabetes, but also concerned about maintaining good grades and spending adequate time studying- both of which would interfere with sleep. To test this possibility, we examined the correlation between sleep quality and GPA, but again it was not significant, r=0.25, p=0.24. However, GPA may not be the best way to measure conscientiousness about school. Perhaps hours spent studying would better reflect conscientiousness and be linked to poor sleep quality.

We also examined whether we could predict changes in self-care behaviors. Unfortunately, none of the psychosocial variables significantly predicted changes in overall self-care or changes in testing frequency. There was a very weak trend for friend support to be associated with improved self-care. In terms of meter readings, there was a weak trend for parent support to be associated with more frequent meter readings. Thus, support from parents and friends may play a role in the self-care of college students. Perhaps parents continue to remind adolescents to test even when they are at college. Friends may also remind

adolescents to follow good diabetes behaviors, or friend support could instill in adolescents a sense of self-efficacy to follow the necessary behaviors.

There also was a weak trend for poorer psychological well-being to be associated with more frequent blood glucose testing. Similar to our explanation for the association of poor sleep with improved metabolic control, one cost of being concerned about taking better care of diabetes is psychological distress. Therefore, taking care of one's diabetes can lead to additional stress and increased depressive symptoms. This suggests that additional support, especially psychological, should be provided to adolescents with diabetes so that they are able to maintain both good diabetes health and good psychological well-being.

Effects of Insulin Injections or Insulin Pump on the College Transition

One variable that may affect how adolescents with diabetes transition to college is whether they are on an insulin pump or not. We examined differences in psychosocial outcomes between adolescents who used injections or insulin pumps. Those who used pumps reported less stress, more life satisfaction, and better self-care behaviors at both times of assessment. However, we do not know the directionality of these relations. It may be that those who are happier and have better self-care are the ones who are placed on insulin pumps. In one case, there was a difference between pump and injection users in the transition from high school to college. Life satisfaction increased for those using a pump upon entering college, while it decreased for those using injections. Thus, it may be that using an insulin pump aids in the adjustment to the changes that occur at college. Pump use allows for increased freedom and is less intrusive than injections. For instance, students using insulin pumps have flexibility in meal times, which can be quite variable in college because of varying schedules. Students can

then focus on work or spend time with friends and not have to leave these activities to eat at a specified time. Students might also feel more comfortable interacting with new peers if they do not have to inject in front of them or leave these interactions to inject. Doctors might, therefore, want to consider placing adolescents entering college on the pump as it seems to improve some aspects of psychological well-being.

Study Limitations and Strengths

Before concluding, it is important to note the limitations of this study. First, we had a small sample size. This is problematic because it might be that there are small differences between adolescents with and without diabetes that we were unable to detect. Overall, we did not find many group differences between high school and college on psychological well-being. Although there were only a few studies that examined the transition from high school to college, we predicted that there would be changes from high school to college and that having diabetes or not would affect the size of those changes. If these differences were there, but small, we cannot detect them with small sample sizes. A larger sample would enable us to identify those differences. Second, there was a group differences in SES. While we statistically controlled for this difference, there may have been other ways that SES affected the differences between the two groups. Finally, all outcomes were based on self-report. Adolescents may be susceptible to demand characteristics.

There were also several strengths of this study. First, most studies do not examine college students with diabetes and, therefore, this research contributes to research on adolescents with diabetes by providing results not only on college students with diabetes, but also on the transition to college for these students. Second, whereas most previous research

has compared college students to high school students using cross-sectional designs, we employed a longitudinal design to examine the changes that occurred from high school to college. Third, the participants were from a long-standing longitudinal study. Therefore, having participated in this study for 5-7 years, they may feel comfortable enough with the study staff to give honest answers.

Conclusions

This study showed that adolescents with and without diabetes are, overall, very similar in terms of psychosocial variables, such as peer relationships and mental and general health, during both high school and college. The largest group difference appeared in the domain of parent relationships, such that adolescents with diabetes had stronger ties to parents than healthy adolescents. A troubling group difference involved drinking alcohol. While binge drinking levels were similar between adolescents with and without diabetes and similarly increased in both groups upon entering college, alcohol dependence increased for adolescents with diabetes from high school to college but not healthy adolescents. As researchers have speculated, we showed that adolescents with diabetes experienced a decline in metabolic control and decreased their self-care upon entry to college. Health behaviors, such as drinking and smoking, appeared to be risk factors for these adverse changes in diabetes outcomes, whereas support from friends and parents were protective factors. These findings suggest a need for increased education about risky health behaviors while encouraging continued parental involvement as adolescents with diabetes enter college to ensure that metabolic control is maintained.

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Table 1

Baseline Data for Year 1: Percentages and Means (SE)

	Diabetes	Healthy
Sex		
Female	65%	65.5 %
Male	35%	34.5%
Age	18.0	17.8
Race		
Caucasian	93.1%	90.0%
Other	6.9%	10.0%
SES[B]	43.5 (9.6)	49.1 (9.39)
Parent bonding overprotection	2.36 (.15)	2.20 (.18)
Parent bonding autonomy[b]	3.43 (.11)	3.72 (.13)
Parent bonding concern	4.07 (.13)	4.08 (.16)

Notes: B=group effect $p < 0.05$; b=group effect $p < 0.10$

Table 2

Baseline Data for Year 1 and 2: Percentages and Means (SE)

	Diabetes (SE)		Healthy (SE)	
	Year 1	Year 2	Year 1	Year 2
BMI[A]	25.38 (0.90)	25.81 (0.93)	24.04 (0.11)	24.77 (1.12)
Currently Working	55.2%	41.4%	55%	45%
Hours Worked per week[bC]	16.75 (1.81)	19.82 (4.03)	16.41 (1.95)	11.05 (1.95)
HbA1c[A]	8.51 (1.70)	9.00 (1.98)		
Average blood glucose tests per day[a]	5.71 (1.46)	5.29 (2.00)		
BG tests yesterday	5.50 (2.10)	5.07 (2.00)		
Self-care behavior	3.66 (0.56)	3.59 (0.58)		

Notes: A= time effect $p < 0.05$; a= time effect $p < 0.10$; B=group effect $p < 0.05$; b=group effect $p < 0.10$; C= time*group effect $p < 0.05$; c=time*group effect $p < 0.10$

Table 3

Baseline Data for Year 2: Percentages and Means (SE)

	Diabetes	Healthy
Job Satisfaction	49.00 (3.63)	47.80 (6.00)
Moved in past year	Y: 72.4%	Y: 60%
Where living		
Home	27.6%	35%
College Campus	69%	60%
Apt/house	3.4%	5%
Distance moved (miles)	91.25 (91.07)	90.38 (93.71)
Number of people living with	2.76 (1.12)	2.75 (1.07)
Class hours per week	18.22 (2.95)	18.36 (3.58)
GPA	3.10 (0.11)	3.36 (0.12)

Table 4

Regression: Predicting changes in HbA1c, Self-Care and Number of Readings

	A1c	Self-Care	Average Number of Readings
Sleep quality	0.29*	0.01	-.06
Negative Psychological Well-being	0.04	-0.12	0.68
Parent Index	0.33	0.02	0.79
Friend Support Index	0.12	0.15	0.23
Friend Conflict Index	0.12	-0.06	-0.35
Binge Drinking	0.31*	0.03	-0.24
Smoked in past year	0.81+	-0.11	0.17
Total Calories Expended	0.00	0.00	0.00
Total Calories consumed	0.00	0.00	0.00
Self-care Behaviors	-1.17*	------	0.21
Average Number of Readings	-0.15	0.03	-------
Number of Readings Yesterday	-0.07	-0.01	-------

Notes: *= significant predictor $p < 0.05$; + = marginally significant predictor $p < 0.10$

Table 5

Group and Time Means (SE) on Psychological Outcomes, controlling for SES

	Diabetes		Healthy	
	Year 1	Year 2	Year 1	Year 2
Depressive Symptoms	1.75 (.09)	1.73 (.01)	1.62 (.11)	1.76 (.13)
Life Satisfaction	5.33 (.21)	5.30 (.20)	5.68 (.16)	5.77 (.24)
Loneliness	1.70 (.15)	1.74 (.12)	1.59 (.13)	1.70 (.15)
Perceived Stress	2.51 (.14)	2.55 (.14)	2.20 (.17)	2.50 (.17)

Table 6

Group and Time Means (SE) on Parent Relationship Outcomes, controlling for SES

	Diabetes		Healthy	
	Year 1	Year 2	Year 1	Year 2
Contact with parents		2.09 (0.26)		2.29 (0.33)
Visiting home[b]		4.04 (0.37)		2.87 (0.49)
How close with parents[B]		4.58 (0.17)		3.93 (0.22)
Confide in parents[b]		3.66 (0.19)		3.04 (0.27)
Parental Monitoring[a]	3.71 (0.13)	3.48 (0.14)	3.62 (0.16)	3.36 (0.17)
Child Disclosure of Feelings	3.26 (0.14)	3.48 (0.13)	3.17 (0.17)	3.22 (0.16)
Child Disclosure of Daily Activities[c]	3.68 (0.12)	3.93 (0.12)	3.87 (0.15)	3.79 (0.14)
Parental Control	2.29 (0.16)	1.75 (0.15)	2.00 (0.20)	1.81 (0.18)

Notes: A= time effect $p < 0.05$; a= time effect $p < 0.10$; B=group effect $p < 0.05$; b=group effect $p < 0.10$; C= time*group effect $p < 0.05$; c=time*group effect $p < 0.10$

Table 7

Group and Time Means (SE) on Peer Relationship Outcomes, controlling for SES[1]

	Diabetes		Healthy	
	Year 1	Year 2	Year 1	Year 2
Friend Companionship	3.73 (.18)	4.02 (.15)	3.80 (.19)	3.73 (.18)
Friend Emotional Support	3.82 (.17)	3.73 (.16)	3.83 (.17)	3.60 (.19)
Friend Instrumental Support	4.01 (.14)	4.04 (.15)	3.83 (.17)	3.60 (.19)
Friend Intimacy	3.81 (.18)	3.75 (.16)	3.67 (.21)	3.81 (.18)
Friend Insensitivity	1.54 (.11)	1.58 (.13)	1.54 (.13)	1.51(.15)
Friend Impatience	1.85 (.13)	1.70 (.13)	1.59 (.16)	1.60 (.16)
Friend Interference	1.73 (.11)	1.91 (.12)	1.51 (.13)	1.65 (.14)
Friend Rejection[c]	1.45 (.08)	1.36 (.10)	1.26 (.10)	1.45 (.13)
In a romantic relationship?				
Yes	39.3%	44.8%	52.6%	60.0%
No	60.7%	55.2%	47.4%	40.0%

Notes: c=time*group effect $p < 0.10$

[1]Percents do not control for SES

Table 8

Group and Time Means (SE) on Health Behaviors, controlling for SES[1]

	Diabetes		Healthy	
	Year 1	Year 2	Year 1	Year 2
Physical Symptoms	1.60 (.09)	1.56 (.09)	1.62 (.11)	1.67 (.11)
Sleep quality[b]	2.66 (.34)	2.38 (.33)	3.49 (.41)	3.16 (.40)
Binge Drinking[a]	1.35 (.17)	2.00 (.26)	1.35 (.20)	1.80 (.31)
Alcohol abuse[c] (n=18)	1.10 (.12)	1.24 (.12)	1.17 (.11)	1.13 (.11)
Personal Consequences (n=18)	1.29 (.11)	1.72 (.28)	1.09 (.10)	1.2 (.25)
Social Consequences (n=18)	1.28 (.27)	1.61 (.21)	1.50 (.24)	1.21 (.18)
Smoking in past year	Y: 34.5%	Y: 41.4%	Y: 25%	Y: 30%
Smoking in last month	Y: 80%	Y: 66.7%	Y: 80%	Y: 66.7%
Paffenberger Total Activity (kcal per week)	3218.81 (560.70)	25421.23 (459.23)	3461.03 (680.35)	3722.77 (558.04)
Recall Energy Expended[a]	2005.82 (94.15)	1763.90 (80.22)	1944.91 (111.77)	1678.14 (95.23)
Recall Active Energy Expended	979.37 (70.35)	789.70 (58.01)	971.14 (83.52)	767.80 (68.87)
Recall: Calories	1521.93	1523.44	2000.11	2004.47

Consumed[B]	(149.82)	(140.38)	(171.70)	(160.89)
Recall: Grams	169.69	174.91	193.96	289.27
Cholesterol[BC]	(19.67)	(29.12)	(22.43)	(33.21)
Recall: Grams sugar[B]	66.38	67.74	108.31	96.85
	(9.17)	(9.69)	(10.51)	(11.11)
Recall: % Protein[c]	0.17 (.01)	0.16 (.01)	0.15 (.01)	0.16(.01)
Recall: % Carbohydrate	0.49 (.20)	0.49 (.02)	0.53 (.02)	0.450 (.02)
Recall: % Fat	0.36 (.01)	0.35 (.02)	0.34 (.01)	0.35 (.02)
Recall: % Saturated Fat	0.12 (.01)	0.12 (.01)	0.12 (.01)	0.12 (.01)

Notes: A= time effect $p < 0.05$; a= time effect $p < 0.10$; B=group effect $p < 0.05$; b=group effect $p < 0.10$; C= time*group effect $p < 0.05$; c=time*group effect $p < 0.10$

[1] Percents do not control or SES

Table 9

Pump or Injection Affecting Psychological Well-Being and Self-Care

	Pump (n=19)		Insulin (n=8)	
	Year 1	Year 2	Year 1	Year 2
SES	44.03 (10.85)		43.69 (7.41)	
Depressive Symptoms	1.78 (0.11)	1.73 (.10)	1.64 (.18)	1.71 (.16)
Loneliness	1.78 (0.20)	1.70 (.13)	1.69 (.18)	1.82 (.11)
Perceived Stress	2.45 (0.16)	2.42 (.13)	2.59 (.24)	2.81 (.20)
Life Satisfaction[Bc]	5.53 (0.20)	5.65 (.17)	4.83 (.30)	4.25 (.26)
Self-care[B]	3.83 (0.12)	3.73 (.11)	3.37 (.19)	3.21 (.17)
Average blood glucose tests per day[b]	6.17 (0.32)	5.83 (.44)	5.13 (.48)	4.63 (.66)
BG readings yesterday[b]	6.22 (0.43)	5.56 (.44)	4.63 (.65)	4.63 (.66)

Notes: A= time effect $p < 0.05$; a= time effect $p < 0.10$; B=group effect $p < 0.05$; b=group effect $p < 0.10$; C= time*group effect $p < 0.05$; c=time*group effect $p < 0.10$