Social Learning Intervention to Promote Metabolic Control in Type I Diabetes Mellitus: Pilot Experiment Results

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Patients with type I, or insulin-dependent, diabetes mellitus (IDDM) must comply with a complex behavioral regimen to control their diabetes. Compliance is often poor in teenage patients who are adversely influenced by peers. During a diabetes summer school, we randomly assigned 21 IDDM patients to one of two groups. One group participated in daily social-learning exercises designed to improve social skills and the ability to resist peer influence. The second group spent an equal amount of time learning medical facts about diabetes care. Four months after the intervention, hemoglobin A_1 was significantly lower in the social skills intervention group. A variety of variables were significantly correlated with good metabolic control. These included self-reported compliance with a diabetes regimen and attitudes toward self-care. Unexpectedly, variables correlated with poor diabetes control included social problem-solving ability and satisfaction with social support. DIABETES CARE 1985; 8:152–55.

For patients with type I, or insulin-dependent, diabetes mellitus (IDDM) a complex regimen of diet, exercise, and insulin injections may prevent short-term symptoms and the risk of long-term complications.[1] Rigorous self-care is difficult for diabetic individuals of any age. However, it is a particular challenge for adolescents who are desirous of the care-free lifestyle typified by their peers. IDDM teenagers often violate their self-care protocol because they are unable to resist peer influence. We developed a social learning program designed to help teenagers with diabetes resist peer influence. Results from a pilot evaluation of the program are reported in this article.

Most educational programs for diabetic youths emphasize factual knowledge about the disease process. However, correlations between factual knowledge and diabetes control are often disappointing.[2] Many IDDM teenagers apparently know how to control their condition but lack the skill or desire to implement these behaviors. The failure of educational programs might be considered analogous to research on smoking prevention. Traditional smoking education programs that emphasized facts about cigarette smoking and its health consequences often showed the expected changes in knowledge and attitudes about cigarette use. However, these programs have typically not resulted in reductions in smoking behavior.[3–6]

In contrast to traditional educational approaches, recent efforts derived from social learning theory have produced more impressive results. These programs emphasize peer modeling, peer communication, and the immediate and primary social consequences of smoking behavior.[7–9] In one study it was demonstrated that adolescents exposed to a social learning program about cigarette smoking were less likely to begin using cigarettes than comparable students not exposed to the program. Nearly 3 yr after the program, three times as many control subjects had initiated a smoking habit in comparison with the experimental group. The program emphasized peer modeling and provided practice in counter-arguing.[10] Social skills programs based on social learning theory have been successful in areas other than smoking. Sarason and Sarason[11] used similar methods with high school students who had difficulty resisting peer influence. In a variety of situations, including truancy and antisocial behavior, they found that social learning experiences reduced the likelihood of teenagers being inappropriately influenced by their peers.

Social learning interventions that emphasize social skills and skills in resisting peer influence have been successful in several circumstances. We evaluated the value of social learning interventions for helping IDDM teenagers avoid peer influence. These interventions were evaluated in comparison with a control group that experienced a more traditional diabetes education program.

METHOD

Subjects. In the summer of 1983, San Diego State University offered a 3-wk summer school program for diabetic youths

TABLE 1
Characteristics of participants in diabetes summer school by group

Variable	Social skills group		Education control group	
	Mean	SD	Mean	SD
Age (yr)	14.9	1.6	14.0	1.4
Height (in)	64.9	4.4	64.2	26.5
Weight (lb)	133.0	31.9	129.3	26.5
Quetelet's rule (ht/wt^2)	3.1	0.5	3.0	0.5
Age at diagnosis (yr)	8.6	4.1	8.0	4.4
Daily insulin dose (U)	61.7	34.2	60.6	40.2
Hb_{A1} (%)	12.6	2.4	13.5	1.6
Random glucose (mg/dl)	229.6	90.6	229.8	84.0
Self-care knowledge (items correct)	21.1	5.4	22.0	3.9
Female (%) of group	46.2	—	53.8	—

The *t*-tests for each comparison were nonsignificant; df = 19 for all comparisons except random glucose and Hb_{A1} (df = 15).

between the ages of 13 and 18 yr. With the assistance of the local chapter of the American Diabetes Association, information about the program was distributed through local physicians, public schools, nurses, and other local organizations. The summer school was offered for 3 h each weekday for 3 consecutive wk beginning in late June and ending in mid-July. Each day the adolescents participated in a lecture/discussion session led by an expert in diabetes care (i.e., endocrinologist, ophthalmologist, podiatrist, etc.). They also participated in learning exercises, and the social learning experiment to be described below.

Twenty-one students volunteered to participate in the program. Table 1 summarizes characteristics of the volunteer group. All participants were white and from middle-class backgrounds. Sixty-two percent were female. The mean age at the time of diagnosis was approximately 8 yr. All participants were using insulin and 90% had experience with self-monitoring of blood glucose.

Social learning experiment. Participants in the summer school were randomly assigned to one of two experimental conditions. Males and females were randomized separately to assure equal distribution of sexes in the two groups. Half the participants were assigned to the social learning intervention. Over the course of 3 wk, this group identified social situations in which peer influence might lead to variation from the diabetes regimen. Under the guidance of a psychology graduate student, the group then suggested appropriate responses to these situations. All group members participated in rehearsal exercises in which problem situations and their solutions were enacted. Finally, a series of video tapes of these situations was created. The program culminated in the filming of these situations in a television studio. The development of the intervention was guided by the principles of social learning and self-efficacy theory.[12,13] This theory suggests that behavior change will be greatest when participants have been exposed to similar role models and given the opportunity to enact these roles for others. Guided practice with reinforcement was used to develop the social skills.[13]

The control group was assigned to discuss medical information relevant to diabetes. Over the course of the 3-wk period, they met in small groups and discussed medical knowledge gained during the lecture portions of the summer school. They also learned facts about diabetes through an interactive computer system and watched educational films from the American Diabetes Association library. In addition, they were given the assignment of identifying those facts that were most important for diabetic teenagers to learn. A series of video tapes in which the participants discussed diabetes information with peers was created. The group culminated in the filming of segments entitled "What Is Diabetes?" in a television studio.

Outcome measures. Data were obtained during the first meeting of the summer school, the final day of the summer school, at a summer school reunion held 4 mo after the completion of the summer school, and through the mail for those who could not attend the reunion. The primary outcome measure was glycosylated hemoglobin.[14] Samples of venous blood were obtained during the summer school and at the reunion. The samples were analyzed within 2 days using the Isolab kit (QS 9100). Using this method, whole blood is hemolyzed and placed in a prefilled column. One buffer is used to elute the fast hemoglobin fraction from the column and the remaining hemoglobins are eluted with a second buffer. The second fraction is diluted with water and the absorbances of both are read using a spectrophotometer. The first blood sample was taken as an index of blood glucose control before the program, while the second sample was considered a reflection of blood glucose control in the period immediately following the program.

A variety of other variables were also measured. Diabetes knowledge, attitudes, and behavior were assessed using scales developed by the Rand Corporation.[2] The Rand group has provided detailed reports on the validity and reliability of these measures. In addition, a measure of social support developed by Sarason and colleagues[15] was also administered. Heitzmann and Kaplan[16] reviewed all existent social support measures and found the Sarason Social Support Questionnaire to have the best documented record of reliability and validity. Finally, the Means Ends Problem Solving (MEPS) Test was administered following the summer school. The MEPS has

been reported to be a valid measure of social skill among teenagers.[17]

RESULTS

Comparisons between experimental and control groups using *t*-tests did not reveal significant differences on any of 10 variables before the summer school (Table 1). Of particular interest is the equivalence of scores for Hb_{A1} at the initial assessment ($t = 0.75$, df = 15, $P = 0.47$).

Information was obtained from 19 of the 21 participants at the 4-mo reunion or through mail contact. Fourteen of the original 17 students who agreed to have blood samples taken during the summer also consented to provide a second sample at the reunion. Two of the three who did not provide samples were not available for the reunion. (One had moved to Japan and the other lived in another city and had come to the program while visiting San Diego for the summer.) Those who did not provide a second sample were not significantly different (within 1 SE of the mean) from the others for initial Hb_{A1} age, self-reported control, behaviors, or social skills. An Hb_{A1} value was eventually obtained from the physician of a fifteenth youth. It was low and had not risen since the summer. In summary, Hb_{A1} values were obtained from 82% of those who provided an original sample. There is no evidence that those from whom data were not systematically obtained purposely eliminated themselves from the sample.

At the reunion, those in the experimental group had significantly low hemoglobin A_1 values ($M = 11.72$) suggesting they were in better metabolic control ($t = 2.98$, df = 12, $P < 0.05$) than the control group ($M = 14.42$). The experimental social learning group showed a small decline in Hb_{A1}; the education group showed a slight increase. For the teenage group, control may be better in the summer, when teenagers are physically more active and have greater control over their eating patterns. With the beginning of school, exercise decreases, stress increases, and there are greater variations from the diabetes regimen. Thus, it appears that those in the social learning group were less inclined to be in poor control during the beginning of the school year.

Table 2 lists several correlations between Hb_{A1} and other variables taken during the summer school. There were three significant negative correlations with Hb_{A1}. High scores on Hb_{A1} indicate poor control. The negative correlation between self-reported behavior and control suggests that those who report the most judicious pattern of self-care behavior (high scores on the behavior scale) have lower Hb_{A1} values. In other words, appropriate self-care behavior is associated with better control. A lesser correlation was found for attitudes. Interestingly, there was a significant correlation for the lie scale. The lie scale, created for the Rand index, was designed to assess social desirability, or the tendency to give the desired response. However, inspection of the items on the scales revealed that they represent appropriate self-care behavior for diabetic teenagers. For example, items on the lie scale include "I never skip meals." Students reporting that they never deviated from the prescribed regimen were in the best metabolic control. In other words, the "lie" scale probably is not a measure of social desirability. Rather, it may be a real index of rigid self-control. Consistent with previous studies,[2] there was no correlation between diabetes knowledge and diabetes control.

TABLE 2
Correlates of diabetes control as measured by Hb_{A1}

Variable	Pearson correlation	P<
Knowledge	0.04	NS
Behavior	−0.78	0.01
Attitudes	−0.41	0.1
Lie scale	−0.56	0.01
Social support satisfaction	0.33	NS
MEPS	0.68	0.01

Significance tests use r to t transformation with 19 df.

Two correlations in Table 2 are of particular interest. First, there was a positive correlation between social support satisfaction and Hb_{A1}. Similarly, there was a significant positive correlation between the MEPS and Hb_{A1}. These correlations suggest that those most satisfied with their social support and those with greatest social skill were actually in the poorest control.

Correlation analysis was also used to identify variables associated with improved control between the initial and follow-up assessments. The analysis revealed that changes in knowledge were not significantly associated with lowered Hb_{A1} ($r = 0.22$). Changes in attitudes were also not correlated with changes in control ($r = -0.06$). However, those who improved their self-care behaviors also enhanced their metabolic control ($r = 0.50$, $P < 0.05$) as measured by Hb_{A1}.

DISCUSSION

Several interesting results are suggested by this pilot study. First, diabetes knowledge and changes in diabetes knowledge were unrelated to metabolic control as measured by the glycosylated hemoglobin assay. The social learning intervention appears to have been successful at improving metabolic control relative to an intervention that focused on diabetes facts. These results are consistent with a variety of experiments that demonstrate social skills obtained through social learning experiences play an important role in self-regulatory behavior.[10,11] The results of this study also underscore the importance of behavior in the control of type I diabetes. Although knowledge is a prerequisite for self-care, many well-informed teenagers do not translate their knowledge into self-care behavior. We found no correlation between knowledge and Hb_{A1} in this group of sophisticated teenagers. However, we found a substantial correlation between self-reported self-care and diabetes control. These results are consistent with those obtained in a larger scale study by Marquis and Ware.[2]

The associations between social support, social skills, and control are of interest. Our data suggest that those in poor

metabolic control may actually be very content with their social support networks. This may be a particular problem for teenagers who are close to their peer network and are strongly influenced by them. Several years ago, Skyler[18] criticized psychological research on diabetes care. He observed that the work was rarely theory based and often used global personality measures in an effort to capture an elusive "diabetic personality." Previous work has rarely focused on the specific personal problems encountered by diabetic individuals on a daily basis.

Glasgow and McCaul[19] responded to Skyler's critique by introducing social learning theory. Although rarely applied to diabetes care programs, the theory is supported by a large number of empirical studies.[20] Social learning theory emphasizes identification of influences in the psychosocial environment that reinforce specific patterns of behavior. It also emphasizes specific social skills required in problem situations.

In our pilot study specific problem situations for IDDM teenagers were identified in group discussions. Social skills for dealing with these situations were then identified and modeled by instructors and peers. These skills were rehearsed and reinforced in successive sessions. Programs developed from social learning theory have also been successful in helping adolescents resist peer influence in a variety of problem situations.[9–11]

Although intriguing, our results should be interpreted with great caution. We consider this a pilot study; it had a very small sample size and the subjects were self-selected and not representative of the general population. However, the subjects may be representative of those who volunteer for a program. The participants were assigned to groups by a random process and there were no differences between groups before the program. Although we are hesitant to generalize from this small pilot study, we believe these preliminary results are interesting and worthy of continued investigation.

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