Effects of a Psychoeducational Group on Mood and Glycemic Control in Adults with Diabetes and Visual Impairments

Linda Trozzolino, Pamela S. Thompson, Mara S. Tansman, and Stanley P. Azen

Abstract: This study evaluated the effectiveness of a 12-week psychoeducational group therapy program in improving mood and glycemic control in adults with diabetes and visual impairments. The participants made statistically significant gains in glycemic control, and there was a significant positive relationship between control and improvement in depression, but greater knowledge of diabetes self-care did not correlate with improved glycemic control.

Given the increasing number of people who are diagnosed with diabetes and the attendant public health costs, the development of effective interventions is critical. A major multicenter longitudinal study has clearly established the relationship between intensive glucose control and a significant reduction in the risk of vision loss from diabetic retinopathy (Diabetes Control and Complications Trial Research Group, 1995). Achieving consistently good glucose control requires excellent self-management, with the person usually providing 95% or more of the daily care (Anderson, 1985).

Effecting adherence to a prescribed therapeutic regimen of self-care behaviors to reduce the occurrence of medical complications is crucial in the treatment of diabetes mellitus and remains a challenge to health care professionals (Delamater et al., 2001; Glasgow, McCaul, & Schafer, 1987).

The self-care behaviors, including changes in diet and exercise, monitoring of glucose, and the administration of medication, require daily discipline and are often experienced as burdensome by people with diabetes (Polonsky & Welch, 1996). When a person is visually impaired (that is, is blind or has low vision), these requirements can be overwhelming. Vision loss impairs the performance of self-care behaviors, including blood sampling and reading glucose monitors as well as the measurement and administration of insulin. Therefore, assessment of the level of visual impairment and the rehabilitation of skills are essential prerequisites to intensive diabetes self-management.
Compared to the general population, there is a significantly higher level of emotional distress and depression in people with diabetes (Gavard, Lustman, & Clouse, 1993; Lustman, Griffith, Clouse, & Cryer, 1986; Mayou, Peveler, & Davies, 1990; Popkin, Callies, Lentz, Colon, & Sutherland, 1988) and in individuals with significant visual impairments (Jacobson, Rand, & Hauser, 1985). Visual impairment is a frequent complication of diabetes, and even mild to moderate impairment in visual functioning is correlated with psychosocial dysfunction (Wulsin, Jacobson, & Rand, 1991). Since emotional distress, including anxiety and depression, has been known to interfere with successful self-care and metabolic control (Frenzel, McCaul, Glasgow, & Schafer, 1988; Lustman, Griffith, Gavard, & Clouse, 1992; Mazze, Lucido, & Shamo, 1984; Polonsky & Welch, 1996), there are clear indications for systematic psychological interventions in a treatment program.

It has been well documented that cognitive-behavior therapy can significantly reduce depression, anxiety, and the adverse effects of a variety of stressors by addressing dysfunctional attitudes and coping styles (Barlow, 1993; Meichenbaum, 1977; Meichenbaum, & Jaremko, 1983). The development of effective psychological interventions for diabetes self-management depends, in part, on understanding the relationship of emotional variables to adherence to a therapeutic regimen and glycemic control. Although some studies have found that depression and anxiety are associated with poor glycemic control and medical complications (Lustman et al., 1986; Lustman et al., 1992; Lustman, Griffith, & Clouse, 1988; Mazze et al., 1984; Niemcyrk, Speers, Travis, & Gary, 1990; Peyrot & Rubin, 1997), others have failed to demonstrate this correlation (Bernbaum et al., 1989; Jacobson, Adler, Wolfsdorf, Anderson, & Derby, 1990; Spiess et al., 1994). The concept of coping style as an important variable has emerged in at least two studies, in which higher levels of stress resulted in higher glycemic levels only in individuals with specific coping styles (Peyrot & McMurry, 1992; Spiess et al., 1994).

Diabetes education programs are typically structured around imparting knowledge, with little or no systematized professional psychosocial component, despite the fact that several controlled studies have failed to demonstrate a correlation between glycemic control and knowledge of diabetes (Bernbaum et al., 1989; Jacobson et al., 1990). The literature does demonstrate, however, that psychosocial interventions, including cognitive-behavior therapy, empowerment of clients, and support, result in both improved psychological status and improved glycemic control in the general diabetic population (Anderson et al., 1995; Lustman et al., 1988; Pieber et al., 1995). As for people with diabetes and visual impairments, at least one controlled study, using an intensive multidisciplinary program, found significant improvement in glycemic control, psychological status, and knowledge of diabetes. But, again, no relationship between improved glycemic control and either improved psychological status or improved knowledge was found (Bernbaum et al., 1989).

A greater understanding of these variables is critical for developing effective interventions. It has been recommended that more studies are needed to evaluate psychosocial interventions that are aimed at improving emotional status, self-care, and glycemic control in client groups with spe-
cific medical complications (Delamater et al., 2001). The study presented here investigated the effectiveness of a 12-week psychoeducational group (the Vision Maximizer group) for persons with diabetes and significant visual impairments. The emphasis of the program was on psychological intervention, using interventions that were found to be effective in the studies just reviewed. A nonrandomized comparison of outcomes was made between the Vision Maximizer group and a control group.

Methods

The participants were 48 adult clients of a low vision rehabilitation center who had low vision (corrected visual acuity greater than 20/70 or visual fields of less than 30–40 degrees) and diabetes. All clients who met the criteria for inclusion were invited to participate in the study. The participants were divided into two groups: the experimental group (Vision Maximizer group) and the control group. The Vision Maximizer group consisted of 24 persons who lived within the geographic area served by the center’s transportation program. The control group consisted of 24 persons who lived within the same metropolitan region as those in the Vision Maximizer group but beyond the geographic area in which transportation is provided to group meetings. The participants in both groups received low-vision optometric and rehabilitation training that provided them with the techniques and devices necessary to resume independent diabetes self-care after vision loss.

After the low vision examination, optometric devices, such as loupes or microscopes for use in administering medication and monitoring blood glucose, were prescribed to the participants as needed. If practice and reinforcement were necessary, the participants received training in their homes on the proper use of the devices when drawing insulin and testing blood glucose levels. Recommendations were also made regarding the glucometer that was the easiest to read and use for individual participants.

Even when the center’s low vision optometrist is able to prescribe low vision optical devices to measure insulin and blood sugar, clients are usually trained with a backup nonoptical adaptive device as well. A guide to the technical devices that are available to people with visual impairments and diabetes is published yearly by *Diabetes Forecast* (“Resource Guide,” 2003). Products, such as Count-A-Dose, are available to enable clients who are blind or have low vision to measure insulin accurately. Voice modules for glucometers provide auditory information about blood glucose levels when clients are unable to see the digital numbers on their meters.

Rehabilitation teachers provided individualized in-home education and training that included setting up an area with adequate lighting and contrast for optimal home testing. After the clients were able to administer their insulin or oral medications and test their blood sugar levels independently, they were eligible to participate in the study.

The protocol of the study, as approved by the California School of Professional Psychology review board, was explained to all the participants, and informed consents were obtained. For the Vision Maximizer group, four group treatments, with an average of six participants each, were conducted. The intervention consisted of 10 sessions of cognitive-behavioral group psychotherapy, one session of basic diabetes self-care information, and one session of
Sample items from the questionnaires.

**Beck Depression Inventory (BDI)**

<table>
<thead>
<tr>
<th>Score</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>I do not feel sad.</td>
</tr>
<tr>
<td>1</td>
<td>I feel sad.</td>
</tr>
<tr>
<td>2</td>
<td>I am sad all the time, and I can't snap out of it.</td>
</tr>
<tr>
<td>3</td>
<td>I am so sad or unhappy that I can't stand it.</td>
</tr>
</tbody>
</table>

**Michigan Diabetes Knowledge Test (DKT)**

Which is the best method for testing blood glucose?
- a. Urine testing
- b. Blood testing
- c. Both are equally good

**Problem Areas in Diabetes (PAID)**

Not having clear and concrete goals for your diabetes care?
Feeling constantly concerned about food and eating?
Feeling unsatisfied with your relationship with your diabetes physician?

\[Box 1.\]

dietary information. The psychological component focused on factors that influence adherence to a diabetes regimen, such as attitude, assertiveness, relationships with health care providers, and social support. Emotional factors, such as depression, helplessness, anxiety, and anger, were addressed, as were coping styles and strategies. Behavioral techniques were used to change eating and self-monitoring patterns. The participants kept daily records of their blood glucose levels and related these levels to food intake and exercise. Relapse-prevention strategies were discussed at the end of the program, and the participants were given the option of transferring to an ongoing support group to maintain their gains.

**ASSESSMENT**

All the participants were administered three baseline psychometric tests via telephone by the same female investigator (see Box 1). The same questionnaires were repeated 12 weeks later. The Vision Maximizer participants received the group intervention program between times of measurement. In addition to the questionnaires, the Vision Maximizer group participants' serum glycosylated hemoglobin (HbA\(_1c\)) was measured just before and immediately after the intervention. Glycosylated hemoglobin was not measured for the control group. Because the control group did not receive the benefit of the intervention, it was considered to be unfair to require them to undergo the inconvenience
and expense of two blood tests. The measures were as follows:

**Beck Depression Inventory (BDI)**. The revised BDI is a widely used 21-item paper-and-pencil questionnaire that is designed to assess the severity of depression in adolescents and adults. It measures 21 symptoms and attitudes on a four-point scale, ranging from zero to three in severity. The higher the score, the greater the severity of depression. Symptoms from the cognitive, affective, somatic, and vegetative realms are included (Beck & Steer, 1993).

**Michigan Diabetes Knowledge Test (DKT)**. This general test of knowledge of diabetes consists of 23 multiple-choice questions in which only one of four answers is correct. The scale measures broad knowledge of the diabetes diet, exercise, insulin, acute illness, and complications. The total number of correct responses is summed and converted to a percentage of correct answers (Davis, 1995).

**Problem Areas in Diabetes Survey (PAID)**. The PAID is a 20-item survey in which each item represents a unique area of diabetes-related psychosocial distress. Each item is rated on a six-point Likert scale, reflecting how problematic the item is perceived to be at the time the measure is taken. The overall level of diabetes-related emotional distress is computed by summing the total item responses, with a higher score representing greater distress (Polonsky et al., 1995).

**Serum glycosylated hemoglobin (HbA1c)**. HbA1c can accurately portray an average blood glucose level over a two- to three-month period. The target for people with diabetes is an HbA1c level of less than 6.5%. The Vision Maximizer participants’ personal physicians supplied the results of the blood tests after releases of information were obtained.

**Statistical methods**

Baseline data for the Vision Maximizer and control groups were compared using independent *t*-tests for continuous variables and *chi-square* tests for categorical variables. Baseline data included age; type of diabetes; use of insulin; and baseline scores on the PAID, DKT, and BDI. Measurements of HbA1c were made only for the Vision Maximizer group. Variables found to be statistically significant between the two nonrandomized groups at the alpha = .10 level were used as covariates in the statistical analyses of outcomes.

Postintervention changes (post-pre) were tested for significance within each group using paired *t*-tests. Changes were contrasted between the two groups using analysis of variance (ANOVA) and analysis of covariance (ANACOVA), adjusting for covariates found to be significant in the baseline analyses. Significance testing of postintervention changes was conducted at the alpha = .05 level.

**Results**

The Vision Maximizer group consisted of 17 women and seven men, with a mean age of 63.5 ± 10.1 years. The control group consisted of 14 women and 10 men, with a mean age of 61.4 ± 9.6 years. In each group, 20 participants were insulin dependent, and 4 were noninsulin dependent. Twenty-three participants in each group had Type 2 diabetes, and one in each group had Type 1 diabetes. The participants in both groups were matched for type of diabetes (Type 1 or Type 2) and whether or not they used insulin. On average, half the participants in each group were Caucasian, and half were Hispanic or African American.

The analysis of the baseline data (see Table 1) found no significant differences for
Table 1
Description of the Vision Maximizer and control groups at baseline.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Vision Maximizer group</th>
<th>Control group</th>
<th>p-value*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n = 24)</td>
<td>(n = 24)</td>
<td></td>
</tr>
<tr>
<td>Age (in years)</td>
<td>63.5 ± 10.1</td>
<td>61.4 ± 9.6</td>
<td>0.48</td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type I</td>
<td>1 (4%)</td>
<td>1 (4%)</td>
<td>0.99</td>
</tr>
<tr>
<td>Type II</td>
<td>23 (96%)</td>
<td>23 (96%)</td>
<td></td>
</tr>
<tr>
<td>Noninsulin dependent</td>
<td>4 (17%)</td>
<td>3 (13%)</td>
<td>0.99</td>
</tr>
<tr>
<td>PAID</td>
<td>62.7 ± 25.1</td>
<td>43.1 ± 19.8</td>
<td>0.004</td>
</tr>
<tr>
<td>DKT (%)</td>
<td>61.0 ± 17.3</td>
<td>70.8 ± 20.6</td>
<td>0.08</td>
</tr>
<tr>
<td>BDI</td>
<td>11.7 ± 9.7</td>
<td>7.0 ± 7.6</td>
<td>0.07</td>
</tr>
<tr>
<td>HbA1c (%)</td>
<td>0.085 ± 0.183</td>
<td>NA</td>
<td></td>
</tr>
</tbody>
</table>

Note: PAID = Problem Areas in Diabetes, DKT = Diabetes Knowledge Test, BDI = Beck Depression Inventory, HbA1c = Hemoglobin A1c, and NA = not applicable.

*a The p-value was obtained using the independent t-test for age, PAID, DKT, and BDI. Chi-square tests were conducted for type of diabetes and insulin dependence.

*b The HbA1c was not obtained for the control group; see the text for the explanation.

We found statistically significant differences for the PAID (p < .03) and the DKT (p < .01). However, after we adjusted for baseline differences in these parameters using ANACOVA, we found that between-group differences persisted only for the DKT (p = .05).

For the Vision Maximizer group, the postintervention changes in HbA1c were correlated with the postintervention changes in the PAID, DKT, and BDI (see Table 3). In the Vision Maximizer group, there was a statistically significant (p < .04) correlation between a decrease in depression, as measured by the BDI, and a decrease in HbA1c. A marginally significant correlation (p < .07) was found between the PAID and HbA1c. There was no correlation between the DKT and HbA1c.

Limitations of the Study

In this study, we demonstrated the potential benefits of the Vision Maximizer Program. However, an important limitation of the study is the fact that the primary measure of diabetes control, HbA1c, was not measured in the control group. There was
Table 2
Postintervention changes stratified by group.

<table>
<thead>
<tr>
<th></th>
<th>Vision Maximizer group (n = 24)</th>
<th>Control group (n = 24)</th>
<th>p-value&lt;sup&gt;a&lt;/sup&gt;</th>
<th>p-value&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAID</td>
<td>-12.7 ± 23.7&lt;sup&gt;*&lt;/sup&gt;</td>
<td>-1.0 ± 9.4</td>
<td>0.03</td>
<td>0.30</td>
</tr>
<tr>
<td>DKT (%)</td>
<td>8.2 ± 12.0&lt;sup&gt;*&lt;/sup&gt;</td>
<td>-2.8 ± 16.4</td>
<td>0.01</td>
<td>0.05</td>
</tr>
<tr>
<td>BDI</td>
<td>-0.96 ± 6.1&lt;sup&gt;**&lt;/sup&gt;</td>
<td>-0.75 ± 3.6</td>
<td>0.89</td>
<td>0.85</td>
</tr>
<tr>
<td>HbA&lt;sub&gt;1c&lt;/sub&gt;</td>
<td>-0.012 ± 0.011&lt;sup&gt;**&lt;/sup&gt;</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: PAID = Problem Areas in Diabetes, DKT = Diabetes Knowledge Test, BDI = Beck Depression Inventory, and HbA<sub>1c</sub> = Hemoglobin A<sub>1c</sub>.

<sup>*</sup> = P < 0.01.
<sup>**</sup> = P < 0.0001 by paired t-test.
<sup>a</sup>Analysis of variance.
<sup>b</sup>Analysis of covariance, adjusting for group differences at the baseline in the PAID, DKT, or BDI.

no funding available to cover the costs of the medical tests and transportation. It was particularly difficult to justify requiring low-income clients with visual impairments who were not receiving the benefit of a treatment intervention to assume the expenses and inconvenience of obtaining blood tests on two occasions. We attempted to obtain HbA<sub>1c</sub> results from the control participants’ physicians’ medical records, but not all the participants in this group were receiving an HbA<sub>1c</sub> every three months, and some had never had the test. The finding that improvement in glycemic control in the Vision Maximizer group was significantly or marginally correlated with the observed improvements in the BDI and PAID (see Table 2) suggests that if measured, HbA<sub>1c</sub> would not have improved in the control group, since there were no significant changes in the BDI and PAID in the control group (see Table 1). However, confirmation is needed in a fully randomized trial, in which HbA<sub>1c</sub> is measured in both groups.

Also of concern is the lack of randomization of treatments to the participants. Because this study evaluated an existing program, it was not possible randomly to deny clients the possibility of participating in an intervention that we believed had the potential of helping them cope with their illness. By necessity, the control group consisted of clients who could not attend the group because of geographic distance from the site. This nonrandomization may have contributed to the imbalance at the baseline between the two groups (see Table 1). Although the imbalance was mathematically adjusted for through the use of ANACOVA, a fully randomized clinical trial with larger samples is needed to confirm these findings.

Table 3
Correlation of postintervention change in HbA<sub>1c</sub> with postintervention changes in PAID, DKT, and BDI in Vision Maximizer group.

<table>
<thead>
<tr>
<th></th>
<th>PAID</th>
<th>DKT</th>
<th>BDI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlation</td>
<td>0.31</td>
<td>-0.17</td>
<td>0.36</td>
</tr>
<tr>
<td>p-value</td>
<td>0.07</td>
<td>0.20</td>
<td>0.04</td>
</tr>
</tbody>
</table>

Note: PAID = Problem Areas in Diabetes, DKT = Diabetes Knowledge Test, and BDI = Beck Depression Inventory.

Discussion and implications for practice

The purpose of the Vision Maximizer group was to improve the participants’ psychological status and adherence to a diabetes regimen, using cognitive-behavior therapy, group support, and diabetes educa-
tion, with the ultimate goal of improving the participants' blood glucose levels. It was also hypothesized that improvement in glycemic control would be related to improvement in psychological status and knowledge of diabetes.

The program was successful in its most important goal, which was to help the Vision Maximizer group gain better control of their blood glucose levels. It is hoped that in keeping with the findings of the Diabetes Control and Complications Trial (1995), these lower blood glucose levels will slow the progression of diabetic retinopathy in these clients. Although the finding of improved glucose control in the Vision Maximizer group is important, perhaps more interesting is the finding of the significant correlation between the improved depression score and improved glucose control in the Vision Maximizer group.

The participants whose depression improved also gained better control of their blood glucose levels. Almost half the participants in the Vision Maximizer group were identified as depressed by the BDI, but the majority of them were less depressed by the end of the program. Thus, it seems imperative for health care professionals to screen people with diabetes for depression and treat the depression to maximize the opportunity for glycemic control.

The correlation between diabetes-related emotional distress and blood glucose level approached significance. A larger sample may have allowed this relationship to attain significance. The PAID covers a wide spectrum of areas of distress, including fear and worry about the illness, anger and frustration with a diabetes regimen, interpersonal distress, and disappointment with medical care. All these problem areas were addressed in the cognitive-behavioral segments of the group format. The cognitive restructuring focused, in part, on empowering the participants to promote their greater involvement in treatment, which has been related to better self-care (Anderson et al., 1995).

Another important contributor to the participants' empowerment was the vision rehabilitation component. The goal of this training is to improve a person's ability to self-monitor glucose levels accurately. It should be noted that in a number of cases, a participant's self-report of his or her ability to monitor glucose independently was inaccurate. Some participants reported that they tested daily, but when asked to demonstrate a test performance during the evaluation session, they were unable to do so. Difficulties included the inability to see the screen, inability to see the blood sample, or unfamiliarity with the process. Therefore, it is imperative that physicians not depend on self-reports, but routinely ask their patients to demonstrate their ability to perform self-care behaviors, rather than rely on verbal reports, and refer patients for rehabilitation when indicated.

Although the program was effective in increasing the level of knowledge of diabetes in the Vision Maximizer group, this increase did not correlate with improved glycemic control, consistent with the findings of Bernbaum et al. (1989) and Jacobson et al. (1990). It defies common sense to say that improving knowledge is not helpful, but it does seem clear that the present emphasis in diabetes education programs on imparting knowledge and skills training, without a systematic psychological component delivered by a professional psychologist, is inadequate.

Although we cannot assert cause-and-effect relationships with these data, our
findings, in the context of those of other studies, suggest that cognitive-behavior therapy contributed to the decrease in depression and diabetes distress, which, in turn, contributed to better self-care and improved glucose control. A multidisciplinary approach to diabetes treatment that includes a professional psychologist is essential to enable clients to make sufficient changes in their self-care behavior.

In this evaluation study, the size of the therapy groups was small, permitting the psychologist to pinpoint key dysfunctional attitudes and coping styles for each person and then to tailor the cognitive restructuring and behavioral goals to each individual each week. Future research may investigate whether this model could be adapted for use with larger groups, thus improving the cost-effectiveness of the program. In addition, follow-up studies to measure the maintenance of the treatment effects would be valuable.

References


emotional distress. Diabetes Spectrum, 9(1), 8–11.

Linda Trozzolino, Ph.D., director; Diabetes Group Therapies, Center for the Partially Sighted, 12301 Wilshire Boulevard, Suite 600, Los Angeles, CA 90025. Pamela S. Thompson, Ph.D., director of psychological services, Center for the Partially Sighted, 12301 Wilshire Boulevard, Suite 600, Los Angeles, CA 90025; e-mail: <pthompson@low-vision.org>.
Mara S. Tansman, Psy.D., clinical psychologist in private practice, 23030 Lyons Avenue, Number 205, Newhall, CA 91321. Stanley P. Azen, Ph.D., professor and co-director, Division of Biostatistics, director, Statistical Consultation and Research Center, assistant associated dean, Scientific Affairs, 1540 Alcazar Street, CHP 218, Los Angeles, CA 90089.