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Does length of relationship or gender predict response to behavioral diabetes intervention?: Generating hypotheses from secondary analysis of a randomized trial

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Abstract

Purpose—The purpose of this hypothesis generating study was to determine, through secondary analysis, if length of a couples' relationship and gender are associated with glycemic response to a type 2 diabetes (T2DM) behavioral couples based intervention. The larger objective of the paper is to begin to identify patients who could benefit from a couples based intervention.

Methods—A randomized trial was conducted to test the impact of a couples based, telephonic behavioral intervention on hemoglobin A1c (A1c) in T2DM patients; 104 patients and partners participated in the couples intervention arm and 94 individuals participated in the individual arm. A1C levels were measured at baseline and 1 year follow up.

Results—Results of the regression analysis show that for the T2DM men (n=35) in the couples intervention group, longer length of relationship was associated with lower A1C at 1 year follow up ((p = .01), controlling for baseline A1C, diabetes duration, and income. Length of relationship was not significantly related to follow up glycemic measures for women or for men with T2DM in the individual intervention.

Conclusions—This study suggests that for men with T2DM in a couples-based intervention, those in longer relationships may be most likely to benefit. More research is needed to better understand factors that contribute to successful couples based behavioral approaches to help adults with T2DM improve their glycemic control.

Research and clinical experience have demonstrated the importance of glycemic control for patients with type 2 diabetes (T2DM).¹ Failure to meet established standards of control is costly, both in terms of human suffering and dollars, for individuals, families, and society.² Unfortunately, it has been estimated that over 50% of T2DM patients do not reach glycemic targets.³ Both theory and research suggest that a family based approach to treatment and/or

management may provide unique advantages.^{4–7} Similar research supports a family/couples-based approach with the management of other chronic illnesses.⁸

Studies suggest that a stronger marital relationship is associated with better health outcomes.⁹ A partner's support may be particularly important for a patient with T2DM as key self-care activities (e.g. food purchasing, preparation, consumption) are often couples-based activities.^{10, 11} Although research suggests that marital quality predicts glycemic control for patients with T2DM,^{12, 13} and a couples focused intervention can improve T2DM outcomes,¹⁴ it is unclear how these associations differ across key couple variables (e.g., length and stability of relationship, gender of patient).

Length of relationship may be an important factor related to dyadic coping.¹⁵ Research shows that couples in long term relationships differ from their younger counterparts in that they are less likely to be emotionally negative and experience less physiological arousal during conflict.¹⁶ The long history of shared experience may serve as a protective factor in older couples.¹⁷ As a result, older couples may be well suited to dyadic treatment. In addition, research suggests there may be gender differences in couples-based treatment for diabetes as women and men approach support and experience diabetes-related distress differently.^{18–20}

We hypothesized that length of relationship would be related to the glycemic control outcome of a couples-focused behavior change intervention and that the association would differ by gender. Here we report data from the Diabetes Support Project,^{14, 21} a randomized controlled trial comparing the efficacy of a telephonic, couples-level behavioral diabetes intervention to a comparable individual intervention, and comparing both to diabetes education alone. The primary outcome variable in the study was hemoglobin A1c (A1c) at 12 months post baseline assessment, and potential predictor variables included length of relationship, and gender. We also controlled for baseline A1C, time since diagnosis, and income.

Methods

Trial Design

The Diabetes Support Project (DSP) was a multi-center, randomized clinical trial and consisted of 280 couples in which one partner had T2DM and was in poor glycemic control.²¹ The participants and their partners were randomized to one of three groups: couples-level behavior change intervention telephone calls (CC), individual behavior change intervention calls (IC), or individual diabetes education calls (DE). Primary outcome results have been previously reported.²¹ Data for this study were from the couples and individual intervention groups, to examine the relationship of length of relationship and gender to outcome for intervention participants. Data were gathered from pre-treatment to 12 months post baseline assessment. Participants were recruited in upstate New York and northern California. The trial was approved by the Institutional Review Boards at all appropriate institutions. Participants signed approved consent documents, and were compensated for assessment time.

Participants

Couples were eligible if patients, with a willing partner able to speak and read English, met these criteria: diagnosed with T2DM >1 year [diagnosis confirmed by medical record and/or A1C]; baseline A1c $\leq 7.5\%$ (58 mmol/mol); ≥ 21 years of age; able to speak and read English; in a self-defined committed relationship for ≥ 1 year; no severe medical or psychiatric conditions that might interfere with participation; telephone access.

Interventions

After two phone calls providing comprehensive diabetes education, patients in individual and couples intervention groups received ten additional calls (for complete details regarding the intervention see references 14,21). Briefly, in the couples intervention, partners participated in all calls, received the same information as patients, and were encouraged to provide mutual support for change, using collaborative problem-solving techniques. The individual intervention was identical, except partners were not involved, and problem-solving calls focused on individual techniques. Calls occurred weekly for 12 weeks. Educators were dietitians with significant diabetes experience. They were trained for protocol adherence and to promote discussion and interaction within couples, audio-taped for supervision until deemed competent, with tapes randomly reviewed by an independent team of reviewers for quality assurance.

Outcomes and Measures

1. Glycemic control: A1C was measured using the AccuBase A1c Test Kit from Diabetes Technologies, Inc. Samples were mailed to a CLIA-licensed, College of American Pathologist proficient lab. Specimens were screened for abnormal hemoglobins, abnormal peaks and/or red blood cell disturbances.
2. Income, diabetes duration, length of relationship, and gender were gathered from self-report questionnaires.

Statistical Analysis

Descriptive analyses were used to calculate measures of central tendency for main study variables (see Table 1). Mean differences were examined in the study variables across gender using t-tests and ANOVA. A1C values at 12 months were regressed on length of relationship and gender, with baseline A1C values, time since diagnosis, and income modeled as control variables (all predictors were centered at the grand mean so that intercepts could be interpreted as the A1c at follow up for someone with average levels of the baseline A1c, time since diagnosis, income, and relationship length). Our initial model tested the interaction between gender and length of relationship predicting A1C. Additional models were estimated separately for male and female participants to better understand the interaction. To explore significant findings for males, we estimated models across treatment groups. Preliminary analyses included baseline marital satisfaction; however, as it was not associated with A1C, it was not included in further analyses. Mean difference tests and regression models were estimated using IBM SPSS version 23.

RESULTS

Participants

Patient participants had T2DM (61.6% male), and had been diagnosed for 12.4 years on average (SD = 7.9 years). Respondents had been married (or in a committed relationship) for a mean of 25.5 years (SD = 14.8), and most reported to be Caucasian (30.4% reported to be members of minority groups, see Table 1). There were no significant gender differences in either baseline or follow up HbA1c.

Glycemic control, length of relationship and gender

An interaction between gender and length of relationship predicting A1C was tested to explore how length of relationship was related differently for males and females. As seen in model 1 of table 2, that interaction effect was statistically significant ($p < .05$). The interaction is plotted in figure 1 and suggests that higher relationship length is associated with lower A1C for males at 12 months. As seen in models 2 of table 2, we next ran models individually for each gender to better understand the interaction found in model 1. Results from these models also indicated higher length of relationship was related to lower A1C at 12 months for men but not for women. We further explored the significant finding for men by examining length of relationship in the context of couple and individual treatment groups (see models 3 table 2). We found that length of relationship was significantly related to A1C levels at 12 months (controlling for baseline A1c) only for men in the couples treatment group ($p = .05$). Specifically, for every year a married/partnered male patient had been in this relationship his HbA1c was .02 lower at follow up. For example, a male in the couple treatment who had been married 10 years would have an A1c score at follow up around 9.50%, whereas an equivalent male married 40 years would have an A1c around 8.90% at follow up. A formal test of the interaction between length of relationship and treatment groups was not statistically different from zero ($p = .44$), suggesting the treatment group differences merit further exploration.

DISCUSSION

The purpose of these analyses in this hypothesis generating study was to begin to identify patient-related factors associated with improvement in glycemic control after involvement in a couples based self-management program, with a focus on length of relationship and gender as potential predictor variables. Results showed that, after controlling for A1C at baseline, diabetes duration, and income, a longer length of relationship was a significant predictor of lower A1C for men at the 12 months follow up visit.

It is important to ask what factors may contribute to the finding that men in longer-term relationships had significantly greater decreases in A1C levels than men in shorter-term relationships after involvement in a diabetes intervention over time in this study. Previous research suggests social support from a spouse/partner, across age groups, helps individuals cope with chronic illness, decrease stress, and improve health outcomes.^{22–25} As salient theory has suggested,¹⁵ a dyadic or shared approach to problem solving and coping provides a broader base when working on issues that impact all family members,²⁶ but why may this

approach be uniquely beneficial for long-term couples? One author suggests that, as couples grow older they become more interdependent in both coping and health-related decision making, while their circle of social support outside the couple's relationship shrinks over time.²⁷ As older couples become each other's primary (or at times only) source of coping and support those with a mutually agreed upon sense of "shared responsibility" for disease management may have better adherence and relational satisfaction.^{11, 28} Perhaps the men in the long term dyads in the couples intervention showed greater changes in A1C due to the overt focus of the intervention on working more effectively as a team to solve diabetes-related problems and improve couples-level adherence.

Previous research also informs the findings regarding gender differences. Specifically, the literature highlights key differences in how women and men provide support (instrumental vs. verbal, directive vs. invitation)¹⁹, the amount and timing of support,¹⁸ how diabetes-related issues are discussed,²⁹ and illness-related expectations of a partner.¹¹ Interestingly, there seems to be more clarity regarding the female partner's support given to a male patient than vice versa,²⁷ prompting calls for more research on female patients and male partners.³⁰ This call is salient as other researchers have found it easier to identify and predict male patient adherence and outcomes than female.^{28, 31}

Although the explanation for the non-significant relationship between length of relationship and A1C at one year follow up for female participants is unclear, a number of plausible explanations may serve as prompts for future research. Because both female and male participants showed similar levels of change over time in terms of glycemic control in the larger intervention study from which the data was drawn,¹⁴ it may simply be that the factors that contribute to change for female T2DM patients were not measured in this study.²⁸ One potential explanation, which needs empirical testing, is men take longer to form a "we" identity in marriage and the benefits of a shared responsibility for illness may come over time for males. However, women may adapt to relationships and shared experiences more quickly, thereby making length of relationship less salient for their management. Although results regarding gender differences are mixed, there is research support that factors related to dyadic coping and "we talk" in couples is related to key outcomes, including health.^{32–35} Additional research is needed that tests these constructs, dyadic coping and we talk, with couples facing T2DM at various points in the life cycle.

Strengths/Limitations

The larger study from which this current project was derived is unique in that it was the first RCT- designed, couples based intervention trial that compared a dyadic treatment to a comparable individual treatment.¹⁴ The approach was also unique in that telephone intervention likely increased the reach of the intervention and allowed patients (and partners) to participate who might have otherwise been limited by transportation, mobility or other barriers to access. The sample was also diverse in terms of gender, ethnicity, race, and included a 1 year follow up. The main limitation of these analyses is related to the fact that we can only generate hypotheses from this analysis. These analyses were not powered for these secondary analyses, and the small Ns by gender in each intervention arm may have affected results. Perhaps, with a larger N, the same effect would have been found for women.

Similarly, with fewer short-term relationship couples in the sample, we may have missed an effect in that group. Also, because the sample was largely older and in long-term relationships, the results cannot speak to younger couples or remarried couples. Finally, because the intervention was delivered by telephone, additional research is needed to determine if outcomes are similar for those who receive treatment in traditional office settings.

Conclusions and Implications for practice

As reported previously,^{6, 7, 22} treatment is benefited, both in chronic illness generally and with T2DM specifically, when a family member can be enlisted to provide support. The results reported in this paper support previous findings and suggest that diabetes educators may wish to consider a couples-based approach to intervention when working with T2DM patients, particularly, when the patient is male, for those in long term marriages/partnerships. However, we note the limitations of these secondary analyses, and present them as exploratory; future research should be designed to specifically address the role of gender and length of relationship in response to behavioral intervention. In the current RCT,^{14, 21} spouses/partners participated in the couples intervention arm, which included a focus on helping couples learn how to use problem solving communication to discuss diabetes-related conflict in the relationship. Educators may wish to help long-term couples identify conflict related to management, and then learn to develop a plan to resolve it in effective ways. Additional research is needed to develop better interventions to help partners, regardless of gender, support adults with T2DM so they can more effectively manage their disease.

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Figure 1.
Plot of Interaction between Gender and Length of Relationship Predicting A1c levels at 12 Month Follow up.

Table 1

Demographic characteristics (Mean (Standard Deviation), and Mean Differences) of the sample at baseline by gender.

Participant characteristics	Total (N=268)	Females (n=103)	Males (n=165)	t or f value
Baseline HbA1c (%)	9.10 (1.51)	9.17 (1.61)	9.06 (1.44)	−0.57
Follow up HbA1c (%)	8.46 (1.49)	8.56 (1.73)	8.39 (1.31)	−0.81
Diabetes Duration (Years)	12.41 (7.90)	12.55 (8.52)	12.31 (7.51)	−0.24
Relationship Duration (Years)	25.49 (14.83)	26.05 (15.12)	25.14 (14.67)	−0.49
Income	^a 3.52 (1.42)	^a 3.25 (1.50)	^a 3.68 (1.34)	2.29 *
Age (Years)	56.78 (10.88)	55.82 (10.57)	57.38 (11.06)	1.14
Education	^b 4.10 (1.15)	^b 3.90 (1.07)	^b 4.22 (1.19)	2.20 *
Ethnicity	7.1% Latino	7.8% Latino	6.7% Latino	0.34
Race				
White	69.6%	71.3%	68.6%	0.74 ^c
Asian	9.2%	5.9%	11.3%	
Black or African American	17.3%	18.8%	16.4%	
Other	3.8%	4.0%	3.8%	

* p .05

Note: “t” and “f” values used to compare female and male means.

^a Income reported is on a 1–5 scale, and the median (“3”) is equal to \$30,000–\$50,000/yr.

^b Education reported is on a 1–5 scale, and the median (“3”) is equal to “Some college or Associates Degree”.

Table 2
Unstandardized regression coefficients where A1c is predicted by length of committed relationship and gender

Predictors	HbA1c at 12 month follow up				
	Model 1	Models 2		Models 3	
	Males & Females (n = 169)	Females (n = 68)	Males (n=101)	Males in CC Treatment (n=35)	Males in IC Treatment (n=37)
Constant ^a	9.526 ***	8.87 ***	8.50 ***	9.20 ***	8.93 **
Length of relationship	-.049 *	.01	-.02 **	-.03 *	-.01
Gender	-.579	--	--	--	--
Len.Rel.*Gender	.029 *	--	--	--	--
Baseline HbA1c	.64 ***	.76 ***	.55 ***	.93 ***	.47 **
Income	-.008	-.06	.02	-.16	-.14
Years since diagnosis	.012	.01	.02	.05 +	.01
R ²	.36	.34	.39	.50	.45

+* p .10; p .05;

** p .01;

*** p .001

Len.Rel. = Length of Relationship; CC: Couples calls intervention; IC: Individual calls intervention

^aConstant equals final follow up A1c where all predictors have a value of zero