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## The importance of relationship processes for lowering BMI over time in women with type 2 diabetes in a randomized controlled trial

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## Research Letter

### ABSTRACT

**Objective:** Weight change may be affected by dyadic processes within couple relationships. The aim of this secondary data analysis was to explore trends in BMI across time, and assess whether relationship processes (i.e., relationship satisfaction, positive problem-solving), predict BMI trajectories in men and women.

**Methods:** Data are from 268 participants in the Diabetes Support Project, a randomized trial of behavioral intervention for individuals with type 2 diabetes (T2D) in poor glycemic control. For secondary analyses, BMI was measured at pre-treatment (baseline), 4 months (post-treatment), 8 months, and 12 months. Multiple relationship variables were measured at all time points and were modeled as predictors and correlates of change in BMI across time.

**Results:** In general, BMI trajectories had higher starting values (intercepts) for females than for males in the sample ( $b = -2.51, p < .05$ ), and slopes trended downward from pre-treatment to 12 months ( $b = -.09, p < .05$ ). Downward trajectories of BMI were more pronounced for women with higher relationship satisfaction ( $b = .05, p < .05$ ) and higher positive problem solving skills ( $b = .06, p < .05$ ) at baseline. Change in relationship processes were not correlated with change in BMI across time.

**Conclusion:** For women with T2D in this behavioral intervention study, relationship process scores at the beginning of treatment predicted changes in BMI over time, with better problem solving and higher relationship satisfaction at baseline related to steeper decreases in BMI across treatment. Additional research is needed to understand how improving relationship interaction prior to diabetes treatment may positively influence weight loss during treatment.

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## The importance of relationship processes for lowering BMI over time in women with type 2 diabetes in a randomized controlled trial



### Introduction

Some suggest that weight gain in marriage is a function of dyadic processes [1], and that relationship processes may play a role in weight reduction treatments [3]. A couples-based approach to treatment might add value [2–4]. The current study focuses on how relationship dynamics relate to BMI reduction among adults with type 2 diabetes (T2D). We hypothesized that relationship processes would predict BMI reduction across time for individuals involved in T2D behavioral interventions, and explored whether the association differed by gender.

### Methods

Data are from the Diabetes Support Project (DSP) [5], a randomized controlled trial of three telephone behavioral interventions (couples intervention, individual intervention, individual education intervention) to improve glycemic control. DSP trial design and primary outcome data were previously reported [5,6]. Enrolled participants ( $N = 268$ ) met the following criteria: diagnosed with T2D >1 year; baseline A1C >7.5% (A1c measures glycemic control);  $\geq 21$  years of age; literate/fluent in English; in a committed relationship for  $\geq 1$  year; no severe interfering medical or psychiatric conditions; telephone access.

BMI ( $\text{kg}/\text{m}^2$ ) was measured at pre-treatment, 4-months (post-treatment), 8 and 12-months by measuring weight and height. Relationship satisfaction was measured using 4-items from the Revised Dyadic Adjustment scale ( $\alpha = .75$ ) [7]. Positive problem solving was measured using 4-items from the Conflict Resolution Inventory ( $\alpha = .76$ ) [4].

Mixed regression models were estimated, with gender and relationship processes predicting initial levels of BMI and change in BMI across the four time points. We controlled for intervention arm, years since diabetes diagnosis, age, income, years in the relationship, treatment adherence, diabetes treatment (insulin vs. not), and baseline glycemic control.

### Results

Participants had been diagnosed with T2D for a mean of 12.41 ( $SD = 7.9$ ) years and married/partnered for a mean of 25.5 ( $SD = 14.8$ ) years. Females ( $n = 103, 38\%$ ) had higher mean BMI than males ( $p \leq .01$ ) at pre-treatment. Approximately 30% of the sample were racial/ethnic minorities [5].

The average BMI at baseline was just below 36, and declined by 1/10th of a point ( $b = .09, t = -2.067; p < .05$ ) per time-point (see Model 1, Table 1). As seen in Models 2 and 4, gender predicted the intercept of BMI indicating that females averaged around 2 points ( $b = 1.99, t = -2.058; p < .05$ ) higher BMI than males at baseline. As seen in Models 3 and 5, gender interacted with relationship satisfaction ( $b = .06, t = 2.073; p < .05$ ) and positive problem solving ( $b = .06, t = 1.875, p < .10$ ), indicating that relationship processes were linked with BMI slopes for females. Females with higher relationship satisfaction and higher positive problem solving at baseline showed a significant decrease in BMI across time (Fig. 1). Tests of simple slopes indicated that female BMI changes across time were statistically significant at a trend level ( $p < .10$ ), and that these represented approximately 1/10th of a standard deviation change across the course of the study. Additional analyses in which waist circumference and weight were modeled as outcomes showed similar patterns of results (available upon request).

Dual change score models [8] were estimated wherein change in relationship processes from pretreatment to 12-month follow up were correlated with change in BMI over time. Changes in rela-

**Table 1**  
Multilevel growth curve models of BMI across 4 waves (12 months post-baseline) predicted by marital satisfaction, problem solving, and their interaction with gender for the full sample (N = 268).

	Model 1	Model 2	Model 3	Model 4	Model 5
Intercept	35.82***	38.14***	38.13***	38.50***	38.52***
Time	-.09*	-.06	-.09	-.07	-.08
Predictors of BMI Intercept					
Gender		-1.99*	-1.99*	-2.05*	-2.06*
Marital satisfaction		.00	.03		
Problem solving			.03	.06	
Marital satisfaction* gender		-.05			
Problem solving* gender			-.06		
Predictors of BMI slope					
Gender		.16†	.17†		.14
Marital satisfaction		-.02	-.05*		
Problem Solving			-.03	-.06*	
Marital Satisfaction* gender		.06*			
Problem solving* gender			.06†		
Intercept/slope variance	55.78/.22	48.07/.19	48.10/.18	47.86/.18	47.84/.18
-2LL	3903	3306	3311	3333	3338

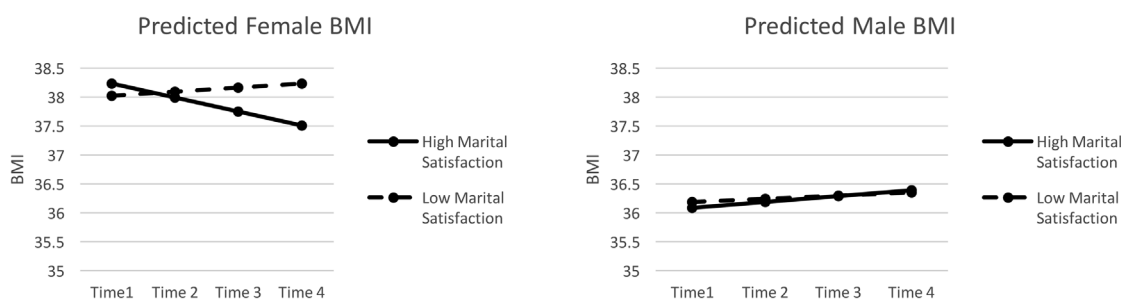
Control Variables in the models: Treatment group assignment, years since diabetes diagnosis, income, years in the relationship, treatment adherence, diabetes treatment type, baseline glycemic control, and age.

†  $p \leq .10$ .

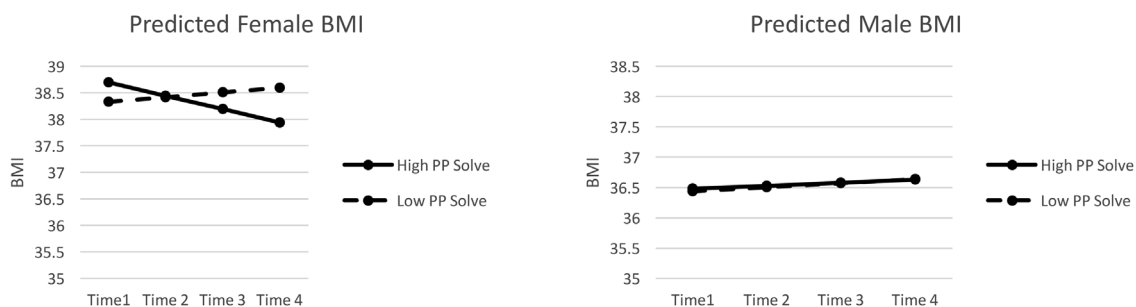
\*  $p \leq .05$ .

\*\*\*  $p \leq .001$ .

**Panel A: Marital Satisfaction by Gender Predicting BMI for Females and Males**



**Panel B: Positive Problem Solving by Gender Predicting BMI for Females and Males**



**Fig. 1.** Plots of gender interactions with marital satisfaction and positive problem solving predicting BMI across time.

Note: PP Solve = Positive Problem Solving

\*Test of simple slopes indicated that high marital satisfaction and high PP Solve slopes predicting female BMI are different from zero at  $p < .10$ . No other slopes were different from zero.

tionship processes were not related to changes in BMI for any relationship process scales in any treatment arm.

## Discussion

Higher relationship satisfaction and positive problem solving scores prior to treatment predicted decreases in BMI across time for female participants. The context of weight and diabetes management for many patients is centered in partner relationships [9].

Research has suggested that higher relationship quality is linked with better glycemic control (lower A1C), and better diabetes management [10]. However, research on relationship quality and BMI has been mixed [11]. The current study adds to prior research and provides some clarifications as well, with results showing that, for females with T2D, BMI decreases at a steeper rate when relationship satisfaction and positive problem solving are higher. In clinical terms, the change in BMI was statistically significant though small (1/10th of a standard deviation).

Relationship well-being may be more relevant to BMI decrease for females than for males with T2D. Some describe women as more emotionally aware of relational issues [12], perhaps leading to greater awareness of positive relational processes that help with weight loss, or to the internalizing of negative affect in relationships [13] potentially contributing to unhealthy eating. We note that the intervention was focused on glycemic control, with weight loss as secondary, and results may have been different if weight loss was the primary target.

## Conclusion

Women with T2D involved in behavioral interventions may benefit when efforts are made to enhance relationship satisfaction and promote positive problem solving. Future research should consider other contributors to weight loss (e.g., diet, exercise) and how they are impacted by relationship processes.

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## Ethical statement

The trial was approved by the Institutional Review Boards at all appropriate institutions. The research protocol was approved by the appropriate Institutional Review Boards.

## Statement of conflicts of interest

None.

## Trial registration

ClinicalTrials.gov NCT01017523.

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