

# Autonomy Support, Self-Regulation, and Weight Loss

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**Objective:** Social support is believed to contribute to weight loss success, yet the type of support received is rarely assessed. To develop more effective weight loss interventions, examinations of the types of support that are associated with positive outcomes are needed. Self-Determination Theory suggests that support for an individual's autonomy is beneficial and facilitates internalization of autonomous self-regulation. We examined whether autonomy support and directive forms of support were associated with weight loss outcomes in a larger randomized controlled trial. **Method:** Adults ( $N = 201$ ;  $48.9 \pm 10.5$  years; 78.1% women) participating in a weight loss trial were assessed at 0, 6, and 18 months. Autonomy support (AS), directive support, and autonomous self-regulation (ASR) were measured at 0 and 6 months and examined in relation to 18-month weight loss outcomes. **Results:** Baseline AS and ASR did not predict outcomes; however, AS and ASR at 6 months positively predicted 18-month weight losses ( $ps < .05$ ), encouragement of healthy eating at 6 months was negatively related to 18-month weight losses ( $p < .01$ ), and other forms of directive support were not associated with outcomes. **Conclusions:** Autonomy support predicted better weight loss outcomes while some forms of directive support hindered progress. Weight loss trials are needed to determine whether family members and friends can be trained to provide autonomy support and whether this is more effective than programs targeting more general or directive forms of support.

**Keywords:** autonomy support, social support, self-regulation, weight loss

Obesity and its well-documented medical, social, and societal costs are among the major public health concerns confronting the United States (Crawford et al., 2010; Finkelstein, Brown, Wrage, Allaire, & Hoerger, 2010; Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008). For overweight to moderately obese adults interested in managing their weight, the most empirically supported treatment available is behavioral weight control consisting of education in nutrition and physical activity and instruction in

key behavioral techniques such as self-monitoring (e.g., Wing, Gorin, & Tate, 2006). Programs typically produce modest weight losses and meaningful health improvements (e.g., Diabetes Prevention Program Research Group, 2002; Look AHEAD Research Group, 2007), yet regain is common even with ongoing intervention (e.g., Look AHEAD Research Group, 2010).

To improve weight loss outcomes, some have suggested that treatment needs to focus on the social influences on obesity and associated comorbidities (e.g., Ball & Crawford, 2003, 2006; Kieran et al., 2012). There is evidence that bringing spouses or other support partners to treatment (e.g., Gorin et al., 2005; Kumanyika et al., 2009) and addressing relational dynamics (e.g., Goldsmith, Lindholm, & Bute, 2006) may facilitate lifestyle change. Partners have been trained to praise and not criticize or punish weight loss efforts, model appropriate eating behaviors, contract and set behavioral goals, and devise solutions to weight-related problems (see Black, Gleser & Kooyers, 1990 and McLean, Griffin, Toney, & Hardeman, 2003 for reviews). Since the mid-1990s, there has been a dearth of studies on enhancing social support for weight control, surprising given the growing recognition of the importance of contextual factors in weight regulation (e.g., Christakis & Fowler, 2007; Gorin et al., 2008). To move intervention development forward, examinations of the type and amount of support that

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promotes long-term weight loss maintenance are needed (Kiernan et al., 2012).

Self-Determination Theory (SDT) offers a fresh perspective for understanding interpersonal support and the motivation for health-related behavior change. SDT suggests that motivation for any behavior varies in the degree to which it is experienced as autonomous or controlled (Deci & Ryan, 2000). An individual is autonomously self-regulated to the extent that he or she experiences goals to be self-generated and freely chosen rather than controlled by external or internal pressures. Autonomous self-regulation is associated with greater persistence, superior task performance, and better health outcomes (e.g., Deci & Ryan, 2000). Autonomous self-regulation is believed to exert its influence particularly on sustained change over time, precisely the limitation of many behavioral weight-loss interventions to date.

SDT emphasizes the importance of interpersonal support, primarily support for autonomy. Autonomy support is theorized to establish the context for the development of self-directed, personally meaningful choice by creating an environment that allows intrinsic motivation to flourish and/or by creating an environment in which external motives can be internalized in a benign and adaptive way (Deci & Ryan, 2000). Autonomy support is provided by acknowledging an individual's feelings and unique perspective, by using neutral language and refraining from excessive control and pressure, by providing choices and options, and by providing informational positive feedback (Reeve, Bolt, & Cai, 1999; Silva et al., 2010). Autonomy supportive environments are associated with greater autonomous self-regulation, and interventions delivered in an autonomy supportive fashion are linked with better goal functioning (e.g., Deci, Eghari, Patrick & Leone, 1994; Joussemet, Koestner, Lekes & Houliort, 2004; Powers, Koestner, & Gorin, 2008; Silva et al., 2010). In one study assessing the extent to which obese individuals perceived health care personnel to be supporting their autonomy as they pursued their health goals ("My doctor listens to how I would like to do things"), perceived autonomy support from the health care providers predicted autonomous self-regulation, which in turn predicted greater initial and long-term weight loss (Williams, Grow, Freedman, Ryan, & Deci, 1996). Similar results have been found in studies of diabetes management, smoking cessation, and other medical treatments (e.g., Ng et al., 2012; Williams, Gagne, Ryan & Deci, 2002; Williams, McGregor, Zeldman, Freedman, & Deci, 2004).

Most of the research examining autonomy support and health-related behavior has examined support from health care providers. Considering that weight management involves many eating and exercise choices made in the home, it is important to also examine the potential impact of supportive behavior from family members. Williams, Lynch, and colleagues (2006) developed a measure of autonomy support that patients perceived from their "important others" (IOSQ). They demonstrated that such support was associated with increases in perceived autonomy and perceived competence, as well as better outcomes in smoking cessation and dietary intervention trials. Autonomy support from important others provided variance distinct from autonomy support from the health care providers and was a stronger and more consistent predictor of dietary outcomes (Williams, Lynch et al., 2006). This finding highlights the importance of partners in weight management interventions and suggests that autonomy support from significant

others may be even more influential than the support of health care providers.

A review of the "support behaviors" included in the Black et al. (1990) meta-analysis and McLean et al. (2003) summary of family involvement in weight loss programs suggests that a wide range of behaviors were operationalized as supportive. It is possible that some of the behaviors were autonomy supportive while others may have been experienced as quite controlling (e.g., having a spouse provide financial incentives for weight loss progress may be perceived as external control). Despite the best of intentions, trained professionals and significant others may provide support in directive or even controlling ways that may undermine autonomous self-regulation and sabotage goal progress. Powers and colleagues (2008) in fact showed that autonomy support could be distinguished from more directive support from significant others. Participants reported greater weight loss when they perceived their family and friends as autonomy supportive of their weight loss efforts; however, no such association was found for more directive forms of support (e.g., reminding the person to exercise).

The present study examined whether autonomy support and directive support are distinct from one another as suggested by SDT, and whether these types of support differentially predict weight loss outcomes over an 18-month period. In the context of a larger trial comparing a home-environment-based program to a standard behavioral weight loss program (Gorin et al., 2013), we measured perceived autonomy support and more directive measures of behavioral support received from a household partner (i.e., partner encourages healthy eating habits, participates in exercise). First, we hypothesized that autonomy support would only be moderately positively correlated with directive support (Koestner, Powers, Carboneau, Milyavskaya, & Chua, 2012). Second, we hypothesized that autonomy support at 6 months would be significantly related to weight loss at both 6 months and 18 months and that the directive measures of support would show weaker relationships with weight loss outcomes. Third, we hypothesized that autonomous and controlled regulation would be relatively independent from each other and that only autonomous self-regulation would be associated with weight loss (Koestner, Otis, Powers, Pelletier, & Gagnon, 2008). We expected that autonomous self-regulation at 6 months would be positively related to autonomy support from partners. Controlled regulation was expected to be unrelated to autonomy support.

## Method

### Participants

Participants were recruited through advertisements in the local media and direct mailings in the greater Providence, Rhode Island area. Participants had to be between 21 and 70 years old with a body mass index (BMI) between 25 and 50 kg/m<sup>2</sup> and have a household member willing to participate in the study as a support partner. These partners had to reside in the same home as the participant, be between 15 and 70 years old, have a BMI between 25 and 50 kg/m<sup>2</sup>, and also be interested in weight loss. With the exception of the lower age limit, the same inclusion and exclusion criteria applied to both participants and partners. Detailed eligibility information and the full CONSORT diagram are published elsewhere (Gorin et al., 2013). In brief, to be enrolled in the study,

both participants and partners had to be appropriate for unsupervised activity and without contraindications for a low-fat, low-calorie diet.

## Study Design

Participants were randomly assigned to one of two 18-month programs: standard behavioral weight loss treatment (BWL) or standard behavioral weight loss treatment plus modifications to the home environment (BWL + H). In BWL, only participants received treatment while in BWL + H both participants and partners received treatment. Participants and partners in both conditions were assessed at baseline, 6, and 18 months and each received \$25 for completing the 6-month assessment and \$50 for completing the 18-month assessment.

## Interventions

The treatment structure was similar across conditions and described in detail previously (Gorin et al., 2013). Both conditions had weekly group meetings for 6 months followed by biweekly meetings for 12 months. Modeling dietary prescriptions used in recent trials such as Look AHEAD and PRIDE (Subak et al., 2009; Look AHEAD Research Group, 2006), participants were placed on a standard caloric and fat restricted diet (e.g., 1,200–1,800 kcals/day and 30% fat, depending on initial weight) and given sample meal plans and a calorie guidebook to help them meet their goals. Participants were instructed to gradually increase their physical activity until they were achieving >200 minutes of moderate intensity physical activity per week. Behavioral skills were taught to help participants achieve these goals including self-monitoring, stimulus control, problem solving, goal setting, cognitive restructuring, and relapse prevention.

The primary difference between the treatment conditions was that BWL focused on the individual alone, while BWL + H targeted the individual plus physical and social cues within the home. BWL + H participants were given several items to prompt healthy behavior choices (i.e., treadmill, portion-size-appropriate plates, a full-length mirror, a scale, motivational posters) and were encouraged to do monthly surveys of their homes to ensure low-calorie, low-fat food choices were available. BWL + H partners identified during the screening process were encouraged to attend all weight loss groups and make the same diet and exercise changes as the participants. These partners were expected to set a 7–10% weight loss goal, to self-monitor their eating and exercise behaviors on a daily basis, and model healthy eating and exercise behaviors in the home and were not given any instruction on how to provide autonomy support. In contrast, BWL partners were provided with one session of basic weight loss information that did not include any discussion of how to provide support, and then attended assessments only.

## Data Collection

Assessments occurred at baseline, 6, and 18 months via clinic and home visits. Body weight was measured in street clothes with shoes removed using a calibrated digital scale (Tanita BWB 800) and recorded to the nearest 0.1 kg. Height was measured at baseline to the nearest centimeter using a calibrated, wall-mounted

stadiometer. BMI was calculated as  $\text{kg/m}^2$ . Demographic characteristics were obtained by self-report questionnaires at baseline only.

Measures of social support included the Sallis Social Support Surveys (Sallis, Grossman, Pinski, Patterson, Nader, 1987) and the Important Others Questionnaire (Williams, Lynch et al., 2006) in relation to the supportive behaviors of partners. Two versions of the Sallis were administered—one for diet and one for physical activity—and participants were asked to rate the behaviors of their partner participating in the study with them over the past 6 months. Participants rated items on a 5-point Likert scale ranging from 1 *none* to 5 *very often*. Subscales used in the present study include Encouragement for Healthy Eating, Participation in Exercise, and Use of Rewards and/or Punishment for Exercise. All items were stated in a positive direction. Family encouragement of healthy eating habits included five items with a range of possible scores from 5 to 25. Two items were: “encouraged me not to eat high-salt, high-fat foods when I’m tempted to do so” and “discussed my eating habit changes with me.” Family participation in exercise included nine items with a range of possible scores from 9 to 45. Two items were: “exercised with me” and “gave me encouragement to stick with my exercise program.” Family use of rewards and punishment for exercise included three items with a range of possible scores from 3 to 15. An item was “gave me rewards for exercising.”

The Sallis Support scales have adequate reliability and validity, show some associations with exercise and eating behaviors, and have been utilized in previous weight loss studies (Hagler et al., 2007; Trost, Owen, Bauman, Sallis, & Brown, 2002). In our study, we found the following reliabilities for the three scales: encouragement of healthy eating,  $\alpha = .83$ ; participation in exercise,  $\alpha = .93$ ; use of rewards and punishments for exercise,  $\alpha = .55$ . The lower reliability for the rewards and punishment scale is likely because it consists of only three items.

The Important Other Climate Questionnaire (IOCQ; Williams, Lynch et al., 2006) assessed participants’ perceptions of autonomy supportive behaviors from their partners. The scale consisted of 15 items which were rated on a 1–7 point scale with 1 corresponding to *not at all true*, 4 to *somewhat true*, and 7 to *very true*. The range of scores was from 15 to 105. All items except one were stated in a positive direction. Two items were: “I feel that my partner has provided me choices and options about my weight” and “My partner listens to how I would like to do things regarding my weight.” Evidence for the validity of the scale is provided in Williams, Lynch, and colleagues report (2006). We obtained excellent reliability for the scale,  $\alpha = .88$ .

The 12-item Treatment Self-Regulation Questionnaire (TSRQ; Ryan & Connell, 1989) assessed autonomous and controlled reasons for engaging in weight control efforts. There were six items for autonomous self-regulation and six for controlled regulation. All items were rated on a 1–7 point scale with 1 corresponding to *not at all true*, 4 to *somewhat true*, and 7 to *very true*. The range of possible scores was from 6 to 42 for both scales. All items were stated in a positive direction. The items asked why participants would try to control their weight and offered 12 possible reasons. Two of the autonomous reasons were: “I feel that I want to take responsibility for my own health” and “it is consistent with my life goals.” Two controlled reasons were: “because I would feel guilty or ashamed of myself if I did not try to control my weight” and

“because others would be upset with me if I did not.” The TSRQ scales have adequate reliability and validity, show some associations with exercise and eating behaviors, and have been utilized in previous weight loss and health care studies (Williams et al., 1996; Williams et al., 2004). In our study, we found the following reliabilities for the two scales: autonomous self-regulation,  $\alpha = .82$  and controlled regulation,  $\alpha = .83$ .

## Data Analysis

Statistical analyses were performed using PASW Statistics 19, Release 19.0.0 (SPSS, Inc., 2011, Chicago, IL). No baseline group differences were obtained for body weight, any type of support, or self-regulation variables. Two participants were excluded because they were multivariate outliers. The primary analyses used hierarchical multiple regressions to determine the relations of the self-regulation and support variables to weight loss at both 6 months and 18 months. These analyses controlled for treatment condition, gender, age, education level and the interaction of treatment condition and gender. Supplemental analyses showed that the relation of weight loss to autonomous self regulation, autonomy support, and family encouragement was not affected by treatment condition (e.g., the condition  $\times$  support interaction effects did not approach significance) and these analyses are not presented.

## Results

Descriptive data is presented in Table 1. At study entry, participants were  $49.5 \pm 10.5$  years old with a mean BMI of  $36.4 \pm 6.1$  kg/m<sup>2</sup>. The majority of participants were women (78.1%), Caucasian (82.4%), had earned a high school degree or higher (81.4%), and were married (81.1%). Participants and partners were demographically similar (see Table 1).

Preliminary analyses were conducted to examine differences on support and self-regulation measures at baseline and 6 months. Participation in exercise, encouragement of healthy eating, and use of rewards and/or punishment for exercise were all significantly higher at 6 months than at baseline ( $ps < .05$ ). Level of autonomy support was not higher at 6 months than at baseline,  $t(172) = 1.33$ ,  $p = .19$ . Levels of autonomous and controlled regulation were also not higher at 6 months than baseline ( $ps > .20$ ). Note that although time had no mean effects on autonomy support and self-regulation, this fact does not address whether overtime variability on these

measures for participants in the sample may be systematically associated with weight loss.

Table 2 presents the means, standard deviations, and ranges for all of the baseline variables, as well as the correlations among them. It can be seen that there was a large range of scores for all measures, including for autonomy support and encouragement of healthy eating, where the mean scores were considerably above the scales midpoint. The three Sallis Support scales were significantly positively correlated with each other, but only at a moderate level (average  $r = .42$ ). Autonomy support was significantly positively related to the three Sallis Support scales, as well as with autonomous self-regulation. Autonomy support was negatively related to controlled regulation. Autonomous and controlled regulation were significantly positively correlated.

Table 3 presents the means and correlations for the 6-month measures. There was a large range of scores for all measures. Although the correlations generally resembled those at baseline, the results for partners' use of rewards and/or punishment for exercise were somewhat different than obtained earlier. Specifically, use of rewards and/or punishment at 6 months was significantly negatively related to both autonomy support and autonomous self-regulation at 6 months.

## Weight Loss Outcomes

Gorin et al. (2013) reported that at 6 months participants in the BWL + H group displayed significantly greater weight loss than participants in the BWL group ( $-9.1 \pm 0.7$  vs.  $-6.8 \pm 0.7$  kgs,  $p = .017$ ), but at 18 months this difference was no longer observed ( $-7.3 \pm 1.0$  vs.  $-5.5 \pm 1.0$  kgs,  $p = .19$ ). Gender moderated the treatment response at both 6 months and 18 months (Group  $\times$  Gender at 6 months,  $p = .011$ ; at 18 months,  $p = .006$ ) with females losing significantly more weight in the BWL + H group than the BWL group, whereas males lost the same amount in both groups at 6 months and tended to lose more in the BWL group at 18 months. Subsequent analyses controlled for treatment condition and gender although the pattern of results did not change when looking at each treatment condition separately. The present study used a subsample of participants because only those who completed support and self-regulation scales at both baseline and 6 months were included in the analyses. Weight losses in this subsample were  $-6.3 + .5$  kgs at 6 months and  $-5.0 + .8$  kgs at 18 months.

Table 1  
Characteristics of Participants and Partners by Treatment Condition

Characteristic	Participants			Partners		
	Total (N = 201)	BWL (N = 99)	BWL + H (N = 102)	Total (N = 201)	BWL (N = 99)	BWL + H (N = 102)
Age (yrs), mean ( $\pm SD$ )	48.9 ( $\pm 10.5$ )	50.4 ( $\pm 9.3$ )	47.5 ( $\pm 11.3$ )	47.8 ( $\pm 13.1$ )	47.9 ( $\pm 13.3$ )	47.8 ( $\pm 13.0$ )
Female, n (%)	157 (78.1)	78 (78.8)	79 (77.5)	94 (46.8)	47 (47.5)	47 (46.1)
White race, n (%)	164 (82.4)	78 (78.8)	86 (84.3)	161 (80.5)	78 (78.8)	83 (82.2)
Hispanic or Latino, n (%)	14 (7.0)	7 (7.1)	7 (6.9)	13 (6.5)	5 (5.1)	8 (7.9)
Education $\geq$ high school, n (%)	79 (81.4)	79 (79.8)	86 (84.3)	154 (78.6)	78 (80.4)	76 (76.8)
Married/partnered, n (%)	163 (81.1)	83 (83.8)	80 (78.4)	163 (81.1)	78 (78.8)	85 (83.3)
Baseline BMI (kg/m <sup>2</sup> ), mean ( $\pm SD$ )	36.4 ( $\pm 6.1$ )	36.1 ( $\pm 6.1$ )	36.7 ( $\pm 6.2$ )	32.9 ( $\pm 5.9$ )	33.1 ( $\pm 5.7$ )	32.8 ( $\pm 6.1$ )

Table 2  
Means, Standard Deviations, and Correlations for All Measures at Baseline

	Mean	SD	Range	1	2	3	4	5	6
Weight (kgs) (1)	99.5	21.0	58–177	—					
Partner participation in exercise (2)	23.4	9.6	10–45	-.01	—				
Partner encouragement of healthy eating (3)	14.1	5.3	5–25	.19*	.52*	—			
Partner use of rewards/punishment (4)	3.6	1.2	3–8	.07	.48*	.31*	—		
Autonomy support (5)	86.4	13.7	40–105	-.06	.33*	.41*	.18*	—	
Autonomous self-regulation (6)	38.3	4.6	18–42	-.13	.10	.17*	-.02	.21*	—
Controlled regulation (7)	18.8	8.0	6–42	.14*	.05	.07	.11	-.13	.15*

Note.  $n = 199$ .

\* indicates  $p < .05$ .

Two hierarchical multiple regression analyses were conducted with weight loss at 6 months and weight loss at 18 months as the dependent variable. Baseline weight was entered along with gender, age, and education level as a first set of predictors. Treatment condition was entered next, followed by the interaction of gender and treatment condition. A fourth set of predictors consisted of the baseline measures of autonomy support, participation in exercise, encouragement of healthy eating, use of rewards and/or punishment for exercise, autonomous self-regulation, and controlled regulation. The final set of predictors consisted of the 6 month scores for the four support measures and the two self-regulation measures. All measures were standardized prior to being entered in the regressions. Because baseline measures are entered before 6 month indicators, the latter can be interpreted as residual change scores from baseline to 6 months. Table 4 presents the standardized regression coefficients ( $\beta$ s) for all variables.

Weight loss at 6 months was significantly predicted by the entire model,  $F(18, 151) = 4.28, p < .001, R^2 = .34$ . Age and weight at baseline were significantly positively related to weight loss, indicating that older participants and participants who weighed more at baseline lost more weight than those who were younger and weighed less at baseline. The interaction of gender and treatment condition was significantly related to weight loss. None of the baseline measures of support or self-regulation were associated with 6-month weight loss. However, autonomy support at 6 months and autonomous self-regulation at 6 months were each significantly positively related to greater weight loss. By contrast, partner encouragement of healthy eating at 6 months was significantly negatively related to weight loss at 6 months. No other effects were significant.

The preceding analysis was repeated using weight loss at 18 months as the dependent variable and the exact same pattern was revealed. Weight loss at 18 months was significantly predicted by the entire model,  $F(18, 145) = 3.70, p < .001, R^2 = .31$  (see Table 4). Age and weight at baseline were again significantly positively related to weight loss, as was the interaction of gender and treatment condition. None of the baseline measures of support or self-regulation were associated with 18-month weight loss. However, autonomy support at 6 months and autonomous self-regulation at 6 months were each significantly positively related to greater weight loss. By contrast, partner encouragement of healthy eating at 6 months was significantly negatively related to weight loss at 18 months. No other effects were significant.

## Discussion

This study examined whether perceived support for weight loss was associated with 6- and 18-month outcomes among overweight and obese individuals participating in a behaviorally based lifestyle intervention. Support was conceptualized in two ways—from a directive behavioral perspective (i.e., having a partner who exercises with you, encourages healthy food choices, and rewards or punishes you for your progress) and from a self-determination perspective (i.e., having a partner who validates your feelings, minimizes control or pressure, provides you with choices and options). While there are several studies linking autonomy support to goal progress (e.g., Koestner et al., 2012; Powers et al., 2008; Silva et al., 2010) and some reports of directive support being associated with health outcomes (e.g., Kiernan et al., 2012), our study makes a unique contribution in that we measured both types

Table 3  
Means, Standard Deviations, and Correlations for All Measures at 6 Months

	Mean	SD	Range	1	2	3	4	5	6
Weight loss (kgs) (1)	6.3	7.4	-8.6–46.4	—					
Partner participation in exercise (2)	26.3	9.7	10–45	.01	—				
Partner encouragement of healthy eating (3)	16.7	4.7	5–25	-.07	.37*	—			
Partner use of rewards/punishment (4)	3.9	1.4	3–9	-.03	.29*	.10	—		
Autonomy support (5)	88.5	16.5	15–105	.11	.29*	.31*	-.17*	—	
Autonomous self-regulation (6)	38.3	4.9	18–42	.25*	.27*	.17*	-.17*	.32*	—
Controlled regulation (7)	18.2	8.2	6–42	-.14*	-.06	.15*	.05	-.06	.12

Note.  $n = 175$ .

\* indicates  $p < .05$ .

Table 4  
Standardized Regression Coefficients (Betas) From Hierarchical  
Regression Analyses of 6-Month and 18-Month Weight Loss

	6-Month weight loss	18-Month weight loss
<i>Set 1</i>		
Gender (1 = Female/2 = Male)	.11	.11
Age	.22*	.21*
Education	.09	.07
Baseline weight	.27**	.25**
<i>Set 2</i>		
Condition (1 = Standard/2 = Home-based)	.07	.02
<i>Set 3</i>		
Condition × gender	.18*	.20**
<i>Set 4</i>		
Partner participation in exercise BL	.05	.08
Partner encouragement of healthy eating BL	-.18	-.18
Partner use of rewards/punishment BL	-.05	-.02
Autonomy support BL	-.02	-.10
Autonomous self-regulation BL	-.03	.03
Controlled regulation BL	-.02	-.01
<i>Set 5</i>		
Partner participation in exercise 6 mon	-.02	.00
Partner encouragement of healthy eating 6 mon	-.19*	-.24**
Partner use of rewards/punishment 6 mon	.08	.14
Autonomy support 6 mon	.30**	.21*
Autonomous self-regulation 6 mon	.21*	.23*
Controlled regulation 6 mon	-.01	-.02

Note. BL = baseline.

\*  $p < .05$ . \*\*  $p < .01$ .

of support concurrently and examined prospective associations with weight loss over 18 months. Our results suggest that directive and autonomy support are distinct from one another and that they differentially predict weight loss outcomes. Specifically, we found that among individuals with weight loss partners, autonomy support facilitated weight loss progress while directive types of support were not particularly helpful and perhaps even harmful.

Our findings are consistent with Self-Determination Theory (SDT), which posits that environments that support the autonomous pursuit of goals facilitate autonomous self-regulation and promote goal progress (Deci & Ryan, 2000). Higher levels of autonomy support from one's partner at 6 months, adjusted for baseline levels, predicted better weight loss outcomes at 6 and 18 months. In contrast, some of the more directive forms of support, specifically encouragement of healthy eating, were associated with less weight loss. The directionality of this relationship is not certain. It may be that partners begin to use more encouragement when they see that their family member is struggling with weight loss, thus encouragement may represent a consequence rather than a cause of lack of progress. However, it is also possible, and consistent with SDT, that these types of "encouraging" vocal expressions (e.g., "encouraged me not to eat 'unhealthy foods' when I'm tempted") by partners are perceived as controlling and block internalization of behavior change and interfere with initial weight loss and maintenance. Interventions that encourage this type of support by family members and significant others may inadvertently impede behavior change. Future studies should also consider, in line with Self-Determination theory, whether interventions support the

two other psychological needs that are central to adaptive functioning, competence and relatedness, and whether these needs are associated with weight loss outcomes.

It is interesting to note that we found that levels of support and autonomous and controlled self-regulation at baseline were not predictive of weight loss progress at 6 or 18 months. Moreover, the mean level of support and self-regulation did not change over time. However, there was variability in the degree of change on these measures and the type of support provided during the active phase of the intervention, not prior to the start of behavior change, and autonomous self-regulation at 6 months, adjusted for baseline level, were predictive of weight loss success at 6 and 18 months. It appears that where you start off in terms of your support and motivation is not as important as what happens over time, and that building autonomy support for behavior change can lead to the internalization of autonomous self-regulation and weight loss success. In contrast, controlled regulation was unrelated to weight loss. A careful examination of previous research using the personal goal paradigm reveals that this is often the case (Judge, Bono, Erez, & Locke, 2005; Shahar, Kanitzki, Shulman, & Blatt, 2006; Sheldon & Elliott, 1998). Our study, as well as the preponderance of published evidence, supports a significant positive association between autonomous self-regulation and goal progress, but does not consistently support a significant negative association between controlled regulation and goal progress.

Strengths of this study include the measurement of several different types of support, allowing a finer-tuned understanding of the social environment's impact on weight loss outcomes than has been previously reported in the literature. Support was measured in the context of a state-of-the-art lifestyle intervention with objective weights obtained over 18 months of treatment. Perhaps most novel is that we measured support provided by an adult family member rather than from a health care provider, as has typically been done in prior investigations of autonomy support (Williams et al., 2002, 2004; Williams, Lynch et al., 2006). However, participants were required to identify a support partner within their home who was also interested in losing weight and willing to enroll in the study. This may have resulted in a sample that had higher levels of baseline support than the general weight loss population, thus caution is warranted when generalizing the study findings. The study is also limited in that the support measures assessed only the participants' perceptions of supportive behaviors. These perceptions are themselves important information, but more objective assessments of the supportive behavior of partners may also be useful. While the results are correlational, they are prospective as well. Therefore, although causal explanations are not confirmed by the data, autonomy support clearly predicted greater weight loss. Finally, although there was some attrition in the follow-up data, retention rates were quite high over the 18-month assessment period.

Our research suggests that meaningful distinctions exist between autonomy support and more directive forms of support and that these distinctions need to be reflected in the conceptualization and measurement of social support in future research. Our work also highlights that support provided by family members and important others can have a powerful influence on weight loss outcomes and that examinations of

support should not be limited to support from health care professionals. Our results suggest that autonomy support from partners can enhance autonomous self-regulation and facilitate weight loss. Studies are therefore needed to test whether interventions can be designed specifically to target and increase autonomy support for weight loss from family members and significant others and to evaluate whether these interventions enhance autonomous self-regulation for behavior change and improve initial and long-term weight loss outcomes.

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