

# Friend and Family Support for Weight Loss in Adolescent Females

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## Abstract

**Background:** Overweight and obesity rates in children and adolescents are concerning, particularly among girls. Social support from friends has been associated with healthier eating and higher levels of physical activity, yet little is known about the relationship between social support and weight loss among adolescents. This aim of this study was to prospectively examine the relationship between baseline social support from friends and family, changes in social support, and weight loss.

**Methods:** Sixty-five adolescent girls completed a one-year weight loss intervention trial. Data were collected at baseline, 6 months, and 12 months.

**Results:** At baseline, family support was higher compared to friend support; however, lower friend support at baseline and increases in friend support from baseline to 6 months and 12 months were associated with weight loss. When controlling for other predictors of weight loss, change in friend support for healthy eating was predictive of weight loss at 12 months.

**Conclusions:** These findings suggest that weight loss interventions for adolescent females might consider including strategies to elicit or to create and promote social support for healthy eating from peers. Future studies are needed to test this relationship.

## Introduction

One-third of females age 12 to 19 years are overweight/obese,<sup>1</sup> and secondary health conditions present a significant public health problem.<sup>2</sup> Helping obese youth lose weight and maintain a healthy weight remains a priority, and is important to reverse the trend of obesity that can develop into severe obesity before adulthood.<sup>3-5</sup> Increasing social support for healthy weight-related behaviors may be one area in which to intervene, thereby improving targeted intervention efforts for youth.

Weight loss involves changing diet and activity behaviors to promote negative energy balance, and social support may be helpful as people try to change behavior. Both source and type of support may be important. For adults, having more social support from family and friends is associated with positive diet and exercise behaviors.<sup>6-9</sup> Earlier research among adolescents suggests that the relationship between support and physical activity may be inconsistent;<sup>10</sup> however, more recent research has shown positive, consistent associations between social support and overall physical activity in both cross-sectional and longitudinal studies.<sup>11</sup> With respect to healthy eating among adolescents, social support from friends, family,

and teachers increases likelihood of eating healthy foods,<sup>12</sup> and parental encouragement has shown positive associations with fruit and vegetable consumption.<sup>13</sup> However, less is known about the type or source of social support that is associated with better weight loss among adolescents and whether support for eating or exercise may be associated with success.

Several weight loss studies have looked at the benefits of involving family and friends in weight loss efforts;<sup>14-16</sup> however, little is known about the effects of naturally occurring support for weight loss. In the above studies, social support was tested through enrolling supportive partners with the index participant, pairing weight loss participants with others in the group, and specifically creating a supportive group environment. Naturally occurring social support is a type of unconstructed, informal social support provided by parents, siblings, and friends, and is different from formal, organized or constructed support that may be provided by doctors, nurses, clinicians, and educators. In a study of adults, Kiernan et al. found that there was not a direct dose-response relationship between amount of support in a person's existing network and weight loss success, such that those who had no support from friends at baseline and those who had the highest levels of support lost more

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weight than participants who reported some support.<sup>17</sup> Among adolescents, Kulik et al.<sup>18</sup> found that social support from weight loss group peers could be created during the course of a weight loss intervention; however, this support did not result in increased weight loss during the treatment phase of the intervention.

The purpose of this study is to examine the relationship between naturally occurring family and friend social support and weight loss among adolescents enrolled in a weight loss trial. It is hypothesized that family and friend support for diet and physical activity will increase over the course of the intervention and will be positively associated with weight change.

## Methods

### *Participants, Design, and Procedures*

Data for this study were from a weight loss intervention trial for overweight/obese adolescent girls that compared a group Behavioral Weight Loss Treatment alone (BT) with a group Behavioral Weight Loss Treatment enhanced with an online Internet component (BT+I). The primary outcomes of the study were change in percent overweight at 6 and 12 months. All study procedures were approved by the university institutional review board.

Participants were recruited from the local community in the northeast section of the United States through physician offices, newspapers, churches, school nurses, and radio advertisements. Participants were eligible if they were between the ages of 14 and 17 years; between 30% and 80% overweight as determined by BMI for age and gender (*i.e.*, a 15-year-old 5'5" female between 155 and 215 pounds); had at least one parent available to participate; and were able to speak and read English. Participants were ineligible if they had a medical condition that would interfere with participation, were currently in treatment or displayed evidence of a psychiatric disorder, currently involved in weight loss treatment, or intended to relocate.

The treatment protocol was modeled after existing behavioral weight loss interventions.<sup>19–21</sup> Components of this intervention included diet, exercise, and behavior modification. Nine treatment sessions were delivered in person over six months to participants in both groups. Sessions were 60 minutes long and included nutrition, physical activity, and behavioral skills training. The BT+I group also received Internet group chats once per week between face-to-face group sessions. The chats were synchronous online meetings which followed a structured protocol<sup>22</sup> where group leaders checked in on weight loss progress, introduced new topics and skills, and led problem solving discussions as needed. Participants were assessed at 6 months at the end of active treatment and at 12 months after 6 months of no treatment.

Participants in both groups experienced statistically significant decreases in weight at 6 and 12 months. The weight loss differences between groups were not statistically significant in either the completers or intent to treat analysis;

therefore, data were collapsed across treatment groups for this analysis.

### *Measures*

*Demographic/anthropometric characteristics.* At baseline, a questionnaire was used to collect age and race/ethnicity data. Height was measured with a wall-mounted stadiometer and weight was measured in hospital gowns, without shoes, on a calibrated balance beam scale. Height, weight, and age were used to calculate percent overweight.<sup>23</sup> Percent overweight was calculated as the percentage the participants' BMI was above the CDC's median BMI for age and gender, and with samples of obese adolescents for whom zBMI and BMI are not considered optimal measures, percent overweight is the recommended primary outcome measure.<sup>24,25</sup>

*Social support.* Family and friend support for healthy eating and exercise was measured using the Social Support and Eating Habits (SSEH) survey and Social Support and Exercise (SSE) survey self-report questionnaires.<sup>6</sup> The SSEH scale is a 10-item eating habits questionnaire designed to measure the separate influence of friends/family during the previous three months. Items 1–5 (minimum=0; maximum=25) measure friend/family encouragement (*e.g.*: During the past three months, friends/family reminded me not to eat high fat/high calorie foods); while items 6–10 (minimum=0; maximum=25) measure friend/family discouragement (*e.g.*: During the past three months, friends/family ate high fat/high calorie foods in front of me). The SEH is a 10-item exercise habits questionnaire (minimum=0; maximum=50) designed to measure the influence of friend/family during the previous three months (*e.g.*: During the past three months, friends/family offered to exercise with me). Items are summed to generate a total score for exercise participation support. Test-retest reliability of the healthy eating and exercise scales factors is acceptable ( $r=0.55–0.86$ ), and internal consistencies are high ( $r=0.61–0.91$ ,  $r=0.68–0.84$  in this sample).<sup>6</sup>

*Attendance.* Attendance was measured by the number of face-to-face sessions attended by each participant (maximum=9).

### *Statistical Analysis*

Data were double-entered for verification and were analyzed using SPSS 19.0 (IBM, Armonk, NY). Descriptive statistics were used to investigate the distributions of all variables. Absolute value change scores subtracting the 6- and 12-month values from baseline values were calculated for percent overweight to represent weight loss.

Residualized change scores were created for all social support variables used in the correlations and regression models. They were calculated by regressing each change score on the corresponding baseline value, and adding the grand mean of the change score to each residual. This procedure follows a method used by Sallis, Calfas,

Alcaraz, Gehrman, and Johnson,<sup>26</sup> and are preferred to raw change scores because they describe the direction and magnitude of the change, and take into account starting baseline values on the outcome, while retaining the original metric of the raw scores.<sup>27</sup>

Absolute value and change in social support and the association with weight loss were compared among participants using Spearman correlations. All tests were two-sided, with nominal  $\alpha$  set at 0.05. Multiple linear regression was used to model the effect of social support on weight loss at both 6 and 12 months. Underlying assumptions of normality and homoscedasticity were tested. Social support variables that were significantly associated with weight loss and attendance were entered into the models. The  $p$ -value of each predictor and overall  $R^2$  explained by the predictors were calculated. Analyses were on participants with data at all three time points: baseline, 6 months and 12 months.

## Results

The 65 participants were mostly Caucasian ( $n=48$ ; 75%), with a mean age of 15.6 years and a median body mass index (BMI) of 32.4 kg/m<sup>2</sup> as shown in Table 1. Forty-nine participants (75.4%) had weight and social support for healthy eating data at baseline and 12 months, and 47 participants (72%) had weight and social support for exercise data at baseline and 12 months. The mean percentage overweight at baseline was 59.1% (+/-14.6). From baseline to 6 months and baseline to 12 months, participants lost an average of 7.9 pounds (+/-13.4) and 6.0 pounds (+/-17.4), respectively. Participants with complete data did not differ

by race/ethnicity or any of the social support variables compared to those who did not have data at both time points; however, groups did differ by percent overweight ( $p=0.030$ ) and age ( $p=0.040$ ) at baseline, with dropouts being heavier and older than those with complete data.

### *Social Support over 6 and 12 Months*

On a scale from 0 to 25, the baseline mean of friend encouragement for healthy eating was significantly lower (8.5+/-3.9) compared with the amount of encouragement support reported from family (16.3+/-5.1),  $t(65)=13.10$ ,  $p<0.001$ ,  $d=1.62$ . Mean support for exercise was significantly greater from family (25.0+/-9.4) compared to that received from friends (18.1+/-7.0) on a scale from 0 to 50,  $t(65)=5.29$ ,  $p<0.001$ ,  $d=0.67$ . At 12 months, family encouragement for healthy eating was significantly higher than friend encouragement,  $t(51)=5.201$ ,  $p<0.000$ ,  $d=0.72$ ; however, the difference in support for exercise between friends and family was no longer significant,  $t(49)=1.58$ ,  $p=0.12$ ,  $d=0.22$ .

Perception of support did not significantly change over the course of the intervention, as shown in Table 2. Though participants showed an increase from baseline to 12 months in friend encouragement ( $t(48)=-1.95$ ,  $p=0.057$ ,  $d=0.37$ ) and friend support for exercise ( $t(46)=-1.90$ ,  $p=0.064$ ,  $d=0.31$ ), the changes were not statistically significant at the  $p<0.05$  level.

### *Social Support and Weight Loss Associations*

Baseline values of social support measured existing family and friend support prior to the start of the weight loss intervention. Results show a statistically significant positive correlation between friend encouragement for healthy eating at baseline and weight loss at 6 months,  $r=0.342$ ,  $p<0.05$ , and 12 months,  $r=0.360$ ,  $p<0.05$ , as shown in Table 3, which suggests that participants with lower levels of support from friends in their existing network at baseline had greater weight loss at both time points. Level of friend encouragement at baseline was not associated with the weight status of participants,  $r=0.096$ ,  $p=0.513$ . Baseline support from family was not associated with weight loss at either 6 or 12 months.

Support provided from family and friends was examined during the no-treatment maintenance phase from months 6 to 12 showing a statistically significant negative association between friend encouragement measured at 12 months (reflecting the previous three months) and weight loss from baseline to 12 months,  $r=-0.381$ ,  $p<0.01$ , suggesting that participants who reported higher levels of support at 12 months lost more weight. Family discouragement for healthy eating measured at 12 months was significantly negatively associated with weight loss,  $r=-0.358$ ,  $p<0.05$ .

When examining change in social support from baseline to 12 months and weight loss, results show statistically significant negative associations between change in friend encouragement for healthy eating and weight loss,  $r=-0.431$ ,  $p<0.01$ ; change in friend discouragement and

**Table 1. Demographic and Anthropometric Characteristics of the 65 Study Participants at Baseline**

Characteristics	BT and BT + I groups combined
Age, mean (SD), yrs	15.6 (1.0)
Height, mean (SD), in	64.0 (2.4)
Weight, mean (SD), lbs	186.8 (22.0)
Median Body Mass Index (kg/m <sup>2</sup> )	32.4
% Overweight, mean (SD)	59.1 (14.6)
Ethnicity, $n$ (%)	
White	48 (75.0)
Black	5 (7.8)
Asian	1 (1.6)
Hispanic	9 (14.1)
Multiracial	1 (1.5)
Not reported (not included in total %)	1 (1.5)

**Table 2. Social Support Mean Values for Healthy Eating and Exercise at Baseline and 12 Months by Type of Support**

Type of social support	Baseline mean (SD)	6 months mean (SD)	12 months mean (SD)	Difference 0–6 (95% CI)	Within group p-value	Difference 0–12 (95% CI)	Within group p-value
Family encouragement for healthy eating <sup>a</sup>	16.3 (5.1)	17.3 (3.4)	16.3 (5.3)	0.89 (–0.63 to 2.40)	0.243	–0.08 (–1.9 to 1.7)	0.928
Family discouragement for healthy eating <sup>a</sup>	12.0 (5.2)	12.3 (4.5)	11.5 (4.2)	0.15 (–1.2 to 1.5)	0.826	–0.49 (–2.1 to 1.2)	0.534
Friend encouragement for healthy eating <sup>a</sup>	8.5 (3.9)	9.7 (3.6)	10.0 (4.7)	1.2 (–0.16 to 2.50)	0.083	1.57 (–0.05 to 3.2)	0.057
Friend discouragement for healthy eating <sup>a</sup>	11.9 (4.3)	11.2 (4.3)	11.8 (4.5)	0.85 (–2.20 to 0.45)	0.196	–0.12 (–1.5 to 1.3)	0.863
Family support for exercise <sup>b</sup>	25.0 (9.4)	25.2 (8.7)	23.4 (10.8)	0.19 (–2.4 to 2.9)	0.883	–1.5 (–4.3 to 1.2)	0.274
Friend support for exercise <sup>b</sup>	18.1 (7.0)	19.6 (7.9)	20.7 (8.7)	1.3 (–1.4 to 4.0)	0.349	2.4 (–0.14 to 4.9)	0.064

<sup>a</sup>Range: 0–25.

<sup>b</sup>Range: 0–50.

weight loss,  $r = -0.357$ ,  $p < 0.05$ ; and change in family discouragement for healthy eating and weight loss,  $r = -0.371$ ,  $p < 0.01$ ; as shown in Table 3. Change in family encouragement for healthy eating and friend support for exercise were not associated with weight loss over 12 months.

### Social Support Predicting Weight Loss

Least squares multiple regression was used to examine the significant social support variables to predict 6- and 12-month weight loss. Baseline friend encouragement for healthy eating and program attendance were entered into the regression model to predict six-month weight loss during the active treatment phase. The total variance explained by the entire model ( $r^2 = 9.6\%$ ,  $F(2,51) = 3.80$ ,  $p < 0.05$ ) suggests this combination of social support variables significantly predicted weight loss at six months. Friend encouragement at baseline ( $\beta = 0.277$ ,  $p < 0.05$ ) was significantly associated with weight loss at six months; however, attendance was not, as shown in Table 4.

Attendance, change in friend and family discouragement, and change in friend encouragement from baseline to 12 months were used to predict 12-month weight loss. The total variance explained by the model ( $r^2 = 25.6\%$ ,  $F(4,44) = 6.13$ ,  $p < 0.01$ ) suggests this combination of variables significantly predicted weight loss at 12 months. Change in friend encouragement from baseline to 12 months ( $\beta = -0.393$ ,  $p < 0.01$ ) was significantly associated with weight loss at 12 months.

## Discussion

The purpose of this study was to examine the trajectory of naturally occurring family and friend support for healthy eating and exercise over the course of a weight loss in-

tervention for adolescent females. We determined if existing social support for healthy eating and exercise at the start of the intervention, changes in social support over the course of the intervention, and support at the end of the intervention were associated with better weight loss outcomes. Our hypotheses were partially supported. Family and friend support for weight loss behaviors did not significantly increase over the course of the intervention, and not all types and sources of support were important for weight loss. Findings presented suggest lower levels of baseline support from friends were associated with better weight loss at 6 months, and an increase in friend support for healthy eating over the course of the intervention was predictive of weight loss at 12 months, even after controlling for other predictors of weight loss.

Baseline measures of social support are reflective of participants' existing network as they begin weight loss treatment; and these measures show that family encouragement for healthy eating was higher overall than the levels reported from friends at both baseline and 12 months, suggesting a continued reliance on family for support for diet over the course of the intervention. Family climate, including satisfaction with life and overall family satisfaction, can have a powerful influence on treatment effectiveness.<sup>28</sup> The developing importance of friends as children move through early and late adolescence does not suggest that parents are less influential or provide less support, but rather, friends gain prominence as autonomy needs of adolescents begin to be more pronounced.

The observed significantly lower levels of baseline friend support, compared with family, may be because overweight youth have fewer friends, are more likely to be socially isolated and peripheral to social networks than are normal-weight adolescents,<sup>29</sup> and are less likely to spend

**Table 3. Spearman Correlations between Type of Support and 6 and 12 Month Weight Loss**

<b>Baseline</b>	<b>0 to 6 months weight loss N = 48</b>	<b>0 to 12 months weight loss N = 49</b>
Family encouragement for healthy eating <sup>a</sup>	0.169	0.053
Family discouragement for healthy eating <sup>a</sup>	0.015	-0.022
Friend encouragement for healthy eating <sup>a</sup>	0.342*	0.360*
Friend discouragement for healthy eating <sup>a</sup>	0.150	0.079
Family support for exercise <sup>b</sup>	-0.033	0.076
Friend support for exercise <sup>b</sup>	0.023	-0.033
<b>Support at 6 months</b>		
Family encouragement for healthy eating <sup>a</sup>	-0.115	-0.012
Family discouragement for healthy eating <sup>a</sup>	0.221	0.191
Friend encouragement for healthy eating <sup>a</sup>	-0.194	-0.220
Friend discouragement for healthy eating <sup>a</sup>	0.018	-0.006
Family support for exercise <sup>b</sup>	-0.247	-0.077
Friend support for exercise <sup>b</sup>	0.107	-0.047
<b>Support at 12 months</b>		
Family encouragement for healthy eating <sup>a</sup>	-0.209	-0.157
Family discouragement for healthy eating <sup>a</sup>	-0.278	-0.358*
Friend encouragement for healthy eating <sup>a</sup>	-0.396**	-0.381**
Friend discouragement for healthy eating <sup>a</sup>	-0.254	-0.277
Family support for exercise <sup>b</sup>	-0.086	0.121
Friend support for exercise <sup>b</sup>	-0.172	-0.183
<b>Change in social support over 12 months</b>		
Family encouragement for healthy eating <sup>a</sup>		-0.168
Family discouragement for healthy eating <sup>a</sup>		-0.371**
Friend encouragement for healthy eating <sup>a</sup>		-0.431**
Friend discouragement for healthy eating <sup>a</sup>		-0.357*
Family support for exercise <sup>b</sup>		0.131
Friend support for exercise <sup>b</sup>		-0.157
<sup>a</sup> Range: 0–25.		
<sup>b</sup> Range: 0–50.		
*Significant at 0.05 level (2-tailed).		
**Significant at 0.01 level (2-tailed).		

time or interact with friends than their thinner peers.<sup>30</sup> This may disconnect them from peers who are influential in supporting positive diet and physical activity behaviors.<sup>12,31</sup> While number of friends and specific details about participants' social network cannot be ascertained from this data, lower levels of friend support at baseline suggest that there may be a need for additional support within this sample, and evidence suggests that peer support may not always be helpful to overweight youth. For example, Neumark-Sztainer et al. found that weight teasing was associated with disordered eating behaviors;<sup>32</sup> and Thompson

et al. found that overweight girls received more negative comments about their appearance and did not have as many peer conversations about their looks and bodies compared to normal weight girls.<sup>33</sup> However, in this study, over the course of the intervention, participants reported increasing levels of friend support, whereas family support remained constant. The increase in friend support may indicate a new establishment or a reconnection to peer groups, and suggests a shift in source of support (from solely family to family and friends) and importance of that support as it relates to weight loss. The increase in friend support may also be

**Table 4. Multiple Regression Analysis Summary for Social Support Predicting Weight Loss at 6 and 12 Months**

<b>6 month weight loss</b>	<b>B</b>	<b>SEB</b>	<b><math>\beta</math></b>	<b>P-value</b>
Face-to-face group attendance	-1.330	0.783	-0.222	0.096
Baseline friend encouragement	0.685	0.323	0.277	0.039*
Constant	-5.948	5.802		0.310
<b>12 month weight loss</b>	<b>B</b>	<b>SEB</b>	<b><math>\beta</math></b>	<b>P-value</b>
Face-to-face group attendance	-1.514	1.160	-0.188	0.199
Change in family discouragement 0-12	0.733	0.638	0.218	0.256
Change in friend encouragement 0-12	-1.130	0.408	-0.393	0.008**
Change in friend discouragement 0-12	0.428	0.572	0.135	0.458
Constant	2.810	7.227		0.699

because teens that were successful at initial weight loss had become less marginalized as a result of their new weight status, or were explicitly soliciting support for eating and exercise from their peers, which may in turn have reinforced and sustained their initial weight loss success. These potential explanations should be explored in future studies.

The importance of friend support for adolescents is not surprising. Furman and Buhrmester found that 10th graders rated parents somewhat lower than same-sex friends on levels of support, compared to younger youth (7th grade and 4th grade), who rated parents as most active providers of support and on the same level as friends, respectively.<sup>34</sup> Peer relations are central to adolescents' healthy social and emotional development, and middle adolescence has been defined as a time during which adolescents may be most influenced by peers.<sup>35</sup> Our data support the influence of friends as a key source of support for weight loss success during both treatment and maintenance phases. However, it is important to also point out that support from family and friends might not always be positive.

Previous studies showed social support from friends to be a powerful motivator for adolescent eating behaviors<sup>36,37</sup> and weight control.<sup>38</sup> One explanation for this influence is that support from friends for healthy eating and physical activity may encourage individual behavior modification<sup>39</sup> above and beyond the support provided from family, given the value teens place on peer relationships at this developmental stage. A key feature of this program was to encourage adolescents to take responsibility for their behavior, thereby shifting the burden of eating and exercise decision making away from their parents. This may be one reason why friend support showed such a strong and consistent relationship with weight loss compared to family support.

### Implications

The clinical implications of these findings suggest that weight loss interventionists might consider including strategies to elicit or explicitly create and promote social

support for healthy eating from peers as a promising practice for adolescents. When looking at source and type of support for weight loss, adolescents with lower levels of friend support for healthy eating might benefit from specific strategies on how to increase their support for healthy eating from friends during both the treatment and maintenance phase of the program. While our study did not show a significant increase in social support over the course of the intervention, the medium effect sizes for change in friend encouragement for healthy eating and change in friend support for exercise show promise as potential variables to explore.

The current study has several strengths. It is a prospective longitudinal study where source, types, and change in social support that predict weight loss success were studied, a reliable and valid measure of social support was used, and the sample size was adequate to detect differences between family and friend support.

This study also has limitations. Because participants were not randomized to intervention groups to create and test social support, this study was only able to examine the role of existing support in participants' network and its association with weight loss; therefore, no causal inferences can be drawn. While weight was objectively measured, other instruments were self-report; therefore, there may have been a self-report bias among the participants. Finally, this study examined weight loss but did not measure other potential mediators of the relationship between social support and weight loss, such as self-efficacy, motivation, home availability of healthy foods, and other environmental variables.<sup>38,40</sup>

This study highlights the relationship between peer encouragement for healthy eating and weight loss over one year in a sample of overweight adolescent girls. Since health behaviors are complex and multiply determined, increasing social support for healthy eating from peers may be one additional way to reinforce behavior change, especially when support from parents is already high. Future

research could also explore baseline levels of friend support as a moderator of treatment effectiveness, or examine ways to increase or create social support from friends among overweight adolescents.

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## Author Disclosure Statement

The authors of this study declare no conflict of interest. No competing financial interests exist.

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