

# One-year Weight Losses in the Look AHEAD Study: Factors Associated With Success

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This report provides a further analysis of the first year weight losses in the Look AHEAD (Action for Health in Diabetes) study and identifies factors associated with success. Participants were a total of 5,145 men and women with type 2 diabetes who were recruited at 16 sites and randomly assigned to an intensive lifestyle intervention (ILI) or a control condition, Diabetes Support and Education (DSE). During year 1, participants in ILI received comprehensive diet and physical activity counseling in a total of 42 group and individual sessions, compared with three educational sessions for DSE participants. As reported previously, at the end of the year, ILI participants lost 8.6% of initial weight, compared to 0.7% for DSE ( $P < 0.001$ ). Within the ILI group, all racial/ethnic groups achieved clinically significant weight losses ( $>5.5\%$ ), although there were significant differences among groups. For the year, ILI participants attended an average of 35.4 treatment sessions and reported exercising a mean of 136.6 min/week and consuming a total of 360.9 meal replacement products. Greater self-reported physical activity was the strongest correlate of weight loss, followed by treatment attendance and consumption of meal replacements. The use of orlistat, during the second half of the year, increased weight loss only marginally in those ILI participants who had lost  $<5\%$  of initial weight during the first 6 months and chose to take the medication thereafter as a toolbox option. The lifestyle intervention was clinically effective in all subsets of an ethnically and demographically diverse population.

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## INTRODUCTION

The Look AHEAD (Action for Health in Diabetes) study is designed to assess the long-term health consequences of intentional weight loss in overweight and obese individuals with type 2 diabetes (1). More than 5,100 participants have been randomly assigned to a usual care condition or to an intensive lifestyle intervention (ILI) with a goal of inducing a loss of  $\geq 7\%$  of initial weight and increasing physical activity to  $\geq 175$  min/week. The study has statistical power to detect an 18% difference between the two groups in time for occurrence of myocardial infarction or stroke, as well as other cardiovascular outcomes. When completed, results of the trial should resolve (in diabetic patients) the conflicting findings from observational studies concerning the cardiovascular consequences of weight loss (2,3). Look AHEAD is the first randomized controlled trial to address this issue.

Results of the first year of treatment for Look AHEAD were reported recently (4) and revealed a loss of 8.6% of initial

weight in the ILI, compared to a significantly smaller 0.7% for the usual care group, referred to as Diabetes Support and Education (DSE). As expected, participants in ILI also had significantly greater reductions in systolic and diastolic blood pressure, triglyceride levels, hemoglobin A<sub>1c</sub>, and other cardiovascular risk factors than did those in DSE (4).

More than 2,500 individuals received the lifestyle intervention during the first year, making this by far the largest sample of individuals to receive the same program of behavioral weight control in a randomized controlled trial. The present study capitalized on this large sample to provide a detailed analysis of the influence of gender, age, education, ethnicity, and other factors on weight loss at 1 year. Based on previous investigations (5–7), we predicted that male gender, older age, and non-Hispanic white ethnicity would be associated with a greater percentage reduction in initial weight. We also predicted that measures of participants' treatment adherence,

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including attendance at intervention sessions, consumption of prescribed meals, and high levels of physical activity, would be associated with greater weight loss (8,9). Finally, we examined whether insulin use would attenuate weight loss, as suggested by prior reports (10–12).

## METHODS AND PROCEDURES

### Participants

Participants were a total of 5,145 men and women who were recruited at 16 centers across the United States. As described previously (4,13), participation was open to persons with type 2 diabetes who were 45–74 years of age and had a BMI  $\geq 25$  kg/m<sup>2</sup> (or  $\geq 27$  kg/m<sup>2</sup> if taking insulin). (The lower age criterion was raised to 55 years in the second year of recruitment to increase the rate of anticipated cardiovascular events.) For safety, participants were required to have blood pressure  $<160/100$  mm Hg, hemoglobin A<sub>1c</sub>  $<11\%$ , and triglyceride levels  $<600$  mg/dL. These measures were obtained during a screening visit, after applicants gave their written informed consent to participate (following the guidelines of the Helsinki Declaration and each site's institutional review board). In addition, applicants completed a graded exercise test as described previously (1,4,14) to ensure that they could safely adhere to the physical activity program prescribed in the ILI (15). All applicants also were required to have a primary care provider who would be responsible for providing their medical care (including for cardiovascular risk factors) during the 11.5-year trial.

In addition to these safety criteria, applicants were required to pass a test of behavioral adherence which consisted of recording their food intake and physical activity for two consecutive weeks. Candidates who did not keep satisfactory records for at least 12 of 14 days were not eligible to participate. This adherence criterion was included to facilitate the selection of highly motivated individuals who could meet the study's weight and activity goals.

Participants reported their age, education, race/ethnicity, and other demographic characteristics. The study's recruitment goals were to enroll approximately equal numbers of men and women, with  $\geq 33\%$  of participants from racial and ethnic minority groups.

### Procedure

Before randomization, eligible participants received an initial session of diabetes education that included general recommendations for adopting healthy eating and activity habits and addressed the management of hypoglycemia and foot care. Participants who remained interested in the study were then randomly assigned with equal probability to the ILI and DSE conditions. Randomization was stratified by clinical center. **Table 1** presents selected baseline characteristics of participants in the two conditions; a full description is provided elsewhere (13).

### Treatment conditions

Previous reports have described the interventions for the DSE and ILI groups for the full 11.5 years of the planned trial (1,15). The present description is limited to the first year.

**DSE.** During the first year, participants in DSE were invited to attend three 1-h group meetings that addressed diet, physical activity, and social support, respectively. These sessions provided information, but not specific behavioral strategies for adopting the diet and activity recommendations. Participants who wanted more help losing weight were told to speak with their own primary care providers (who were permitted to provide their usual recommendations).

**ILI.** These participants were provided a comprehensive intervention, expected to induce an average loss (across the 16 centers) 7% of initial weight. Individual participants were given a goal of losing  $\geq 10\%$  of initial weight to increase the likelihood of their meeting the 7% study-wide goal. The weight control intervention was adapted from the Diabetes

**Table 1** Baseline characteristics of participants in the ILI and DSE groups

Characteristic	ILI (N = 2,570)	DSE (N = 2,575)	P value
Sex (number of participants)			
Female	1,526 (59.3)	1,537 (59.6)	0.85 <sup>a</sup>
Male	1,044 (40.7)	1,038 (40.4)	
Ethnicity			
African American	399 (15.5)	404 (15.7)	0.28 <sup>a</sup>
American Indian/ Alaskan Native	130 (5.1)	128 (5.0)	
Asian/Pacific Islander	29 (1.1)	21 (0.8)	
Hispanic/Latino	339 (13.2)	338 (13.2)	
Non-Hispanic white	1,618 (63.1)	1,628 (63.3)	
Other/multiple	48 (1.9)	50 (1.9)	
Use of insulin	381 (14.8)	408 (15.8)	0.31 <sup>a</sup>
Age (years)	58.6 $\pm$ 6.8	58.9 $\pm$ 6.9	0.12 <sup>b</sup>
BMI (kg/m <sup>2</sup> )			
Females	36.3 $\pm$ 6.2	36.6 $\pm$ 6.0	0.15 <sup>b</sup>
Males	35.3 $\pm$ 5.7	35.1 $\pm$ 5.2	0.41 <sup>b</sup>
Weight (kg)			
Females	94.8 $\pm$ 17.9	95.4 $\pm$ 17.3	0.34 <sup>b</sup>
Males	108.9 $\pm$ 19.0	109.0 $\pm$ 18.0	0.94 <sup>b</sup>

Values shown are means  $\pm$  s.d. or frequency counts (with percentages).  
DSE, Diabetes Support and Education; ILI, intensive lifestyle intervention.  
<sup>a</sup>  $\chi^2$ -test. <sup>b</sup> Analysis of covariance, adjusted for clinical center.

Prevention Program (16,17) and was delivered to participants in groups of ~10–20 persons. (Group sessions were led by lifestyle counselors who included registered dietitians, behavioral psychologists, and exercise specialists.) During the first 6 months, participants attended group sessions (of 60–75 min) for the first 3 weeks of each month. The fourth week each month, they had an individual meeting (of 20–30 min) with their lifestyle counselors, and group sessions were not held this week.

These monthly individual meetings were used to tailor the intervention to participants' individual needs, including those related to dietary preferences (18,19). During months 7–12, participants continued to have a monthly individual meeting with their lifestyle counselors, but the number of group sessions was reduced from three to two per month.

During weeks 1–2, participants were instructed to eat a self-selected diet of conventional foods and to record their daily food and calorie intake in diaries provided. The energy goal for participants  $<114$  kg (250 lb) was 1,200–1,500 kcal/day and for individuals  $\geq 114$  kg was 1,500–1,800 kcal/day (15). Participants were told to consume  $<30\%$  of calories from fat, with  $<10\%$  from saturated fat. During weeks 3–19, participants were prescribed a liquid-meal replacement plan, given findings that this approach significantly increased weight loss compared to a self-selected diet of conventional foods with the same calorie goal (20,21). They were instructed to replace two meals (i.e., breakfast and lunch) with a liquid shake and one snack with a bar. They potentially could choose from four meal replacement products (including Slimfast (Unilever, London, UK and Rotterdam, Netherlands), Glucerna (Abbott Laboratories, Abbott Park, IL), Optifast (Nestle, Vevey, Switzerland), and HMR (Health Management Resources Corporation, Boston, MA)) which were provided free of charge by their manufacturers. For dinner, participants were instructed to consume a meal of conventional foods, which included the option of prepared food entrées (22). They added fruits and vegetables to their diet until they met their daily calorie goal. Persons who declined the use of meal replacements were provided

menu plans that specified conventional foods to be consumed (17,23). Meal plans were culturally tailored. During months 7–12, participants were instructed to replace one meal and one snack a day with shakes and bars to facilitate the maintenance of lost weight (24). The dietary intervention during this time also focused on eating more fruits and vegetables and other foods consistent with a low-energy-density diet (25). For the entire year, participants were instructed to record daily their food and calorie intake and to submit their records at each visit. Lifestyle counselors provided feedback on the records.

The ILI's physical activity goal was 175 min/week of moderately intense activity, to be achieved gradually by month 6. Persons who achieved this goal were encouraged to increase to 200 min/week from months 7 to 12. The activity program relied on unsupervised (at home) exercise which, for most participants, consisted of brisk walking. Participants recorded their weekly activity in their diaries; only bouts  $\geq 10$  min counted toward the weekly goal.

The ILI included a toolbox approach to help unsuccessful participants meet the study's diet and activity goals (17). In addition to problem solving (26) and motivational interviewing approaches (27,28), the toolbox included the weight loss medication, orlistat (29,30). The medication was used in three circumstances. First, participants who, after the first 6 months, had lost  $<5\%$  of initial weight were encouraged by their lifestyle counselors to try orlistat and were shown a videotape that explained it. Second, participants who had lost  $5\%$  of initial weight but  $<10\%$  were informed that they were eligible for the medication but were not expressly encouraged to take it. Third, participants who had lost  $10\%$  were not offered the medication because of its lack of efficacy in increasing weight loss beyond this amount (31). However, individuals in this category who, after month 6, regained  $\geq 2\%$  above their lowest weight (e.g., had lost  $12.5\%$  but regained to  $10.5\%$ ) were allowed to take the medication to prevent further weight gain. Participants who took orlistat were monitored by a study physician (or nurse practitioner).

### Dependent measures

**Weight.** Weight was measured on all participants at randomization and 1 year later using a digital scale (model BWB-800; Tanita, Willowbrook, IL). These weights were obtained by study staff (masked to participants' treatment status) and comprised the study's formal outcome weights. (Height was measured on the same schedule using a wall-mounted stadiometer.) Individuals in ILI also were weighed at each treatment visit by (unmasked) intervention staff who informed participants of their weight change. These weights were entered in a tracking system that provided staff monthly reports of their participants' weight losses.

These data were used in the present report to provide information about weight loss during different phases of treatment.

**Behavioral adherence.** Three measures were used to estimate adherence to the prescribed treatment regimen. First, participants' attendance at all group and individual meetings was recorded by study staff. Second, we summed the weekly number of minutes of brisk physical activity that participants reported in their diaries. Third, weekly use of meal replacement products (shakes and bars), as recorded in food diaries, also was tracked. In cases in which participants failed to submit records of their physical activity or meal replacement use, they were asked to bring the data to their next visit. If they did not, they received a value of 0 for data missing for the week in question.

### Statistical analyses

Differences between the DSE and the ILI groups in changes in weight were examined using ANOVA. The percentages of participants in the two groups who met different weight loss criteria (e.g., weight loss  $\geq 7\%$ ) were compared using  $\chi^2$ -tests. Randomization and 1-year weights, obtained by masked assessors, were used for all of these comparisons. Within the ILI condition, similar analyses were used to assess differences in weight loss among participants that were related to demographic factors. Data from the tracking system were used to compare differences between ILI participants that were related to session attendance, adherence to meal replacement and physical activity prescriptions, and the use of orlistat.

For each family of comparisons, alpha was controlled using Bonferroni's method. As reported previously (4), the two groups did not differ significantly on any of the baseline characteristics shown in Table 1.

A total of 2,496 (97.1%) ILI and 2,463 (95.7%) DSE participants completed the 1-year assessment ( $P = 0.004$ ). The 186 persons who did not complete the assessment were significantly ( $P < 0.001$ ) more likely to be taking insulin than were completers (21.0 vs. 15.1%, respectively).

The noncompleters included 101 individuals who missed the scheduled assessment and will be contacted for future follow-up visits. As described elsewhere (4), an additional 76 participants withdrew from the trial, and nine individuals died during the first year.

## RESULTS

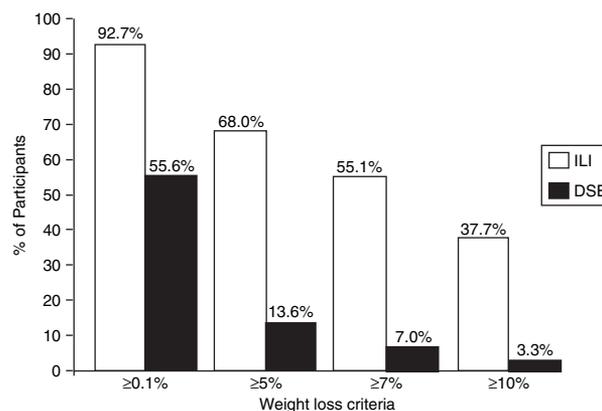
### Weight loss in ILI and DSE groups

As reported previously (4), at the end of year 1, ILI participants lost  $8.6 \pm 6.9\%$  of initial weight ( $8.6 \pm 8.2$  kg), compared to a significantly ( $P < 0.001$ ) smaller  $0.7 \pm 4.8\%$  ( $0.7 \pm 5.0$  kg) for individuals in DSE. As shown in Figure 1, 55.1% of ILI participants met the study-wide goal of losing  $\geq 7\%$  of initial weight, compared with only 7% of individuals in DSE ( $P < 0.001$ ). As expected, significantly ( $P < 0.001$ ) more ILI than DSE participants also lost  $\geq 10\%$  of initial weight (37.7 vs. 3.3%, respectively). Approximately 45% of DSE participants gained weight during the year, compared with only 7.3% of individuals in ILI ( $P < 0.001$ ).

Use of insulin and other diabetes medications was associated with smaller weight losses. In the DSE group, weight losses for participants who took insulin, other diabetes medications, or no medications were  $0.4 \pm 5.1$ ,  $0.7 \pm 4.7$ , and  $1.0 \pm 4.4\%$ , respectively (with no significant differences among groups). Corresponding values in the ILI group were  $7.4 \pm 7.2$ ,  $8.7 \pm 6.9$ , and  $9.3 \pm 6.8\%$ , respectively. Participants on insulin lost significantly ( $P < 0.002$ ) less weight than those in the two other groups (which did not differ significantly).

### Weight loss within the ILI group

Participants in the ILI, taken together ( $N = 2,570$ ), lost an average of  $8.2 \pm 5.7\%$  at week 26, which increased to  $8.7 \pm 6.9\%$  at 1 year. This 1-year value, which was calculated from data in the tracking system, differed by only 0.1% from that obtained when weights from the outcome ascertainment visits were analyzed (4).



**Figure 1** Percentage of participants in the intensive lifestyle intervention (ILI) and Diabetes Support and Education (DSE) groups that met different weight loss criteria.

*Influence of demographic characteristics.* Examining all participants in ILI, men lost significantly ( $P < 0.001$ ) more weight than women at 1 year ( $9.2 \pm 7.1$  vs.  $8.1 \pm 6.8\%$ ). Among men, 58.5% met the study-wide criterion of a 7% weight loss, and 41.6% lost  $\geq 10\%$ . Comparable values for women were 52.9 and 35.2%, respectively. The study's oldest participants (65–74 years of age at baseline) lost a significantly ( $P = 0.04$ ) greater percentage of initial weight than those in the middle group (55–64 years) or the youngest group (45–54 years), with 1-year losses of  $9.4 \pm 6.3$ ,  $8.5 \pm 7.0$ , and  $7.9 \pm 7.2\%$ , respectively. In each of these three age groups, 63.1, 54.6, and 50.0% met the 7% weight-loss criterion, respectively, and 44.7, 37.5, and 32.7% met the 10% criterion, respectively. No consistent effect of education on weight loss was observed. Participants with 13–16 years of education lost significantly ( $P < 0.001$ ) less weight than those with  $>16$  years, with participants with  $<13$  years of education falling in between these two groups.

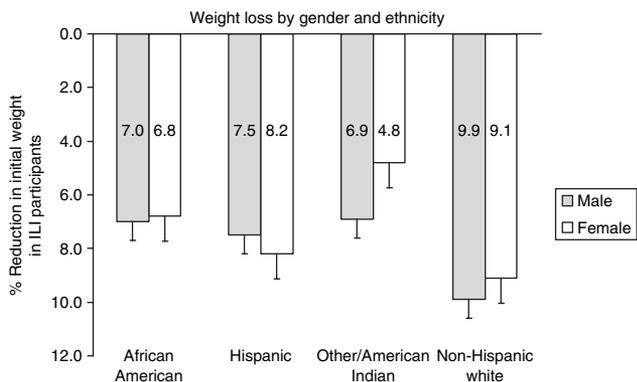
A significant relationship was observed between race/ethnicity and weight loss, as shown in Figure 2. At 1 year, non-Hispanic white participants lost  $9.5 \pm 7.3\%$  of initial weight, compared to losses of  $8.0 \pm 6.2$ ,  $6.8 \pm 5.4$ , and  $5.5 \pm 6.0\%$  for Hispanic, African-American, and “other” participants, respectively (Figure 3). (Participants in the “other” category consisted principally of American Indians and are identified hereafter as American Indian/other.) ANOVA revealed that the four ethnic groups all differed significantly ( $P < 0.001$ ) from each other, but there was not a statistically significant

ethnicity-by-gender interaction. Additional analyses that controlled for age, education, income, and insulin use did not change the statistical differences among the four ethnic groups. Among the four groups, 60.5% of non-Hispanic whites, 53.3% of Hispanics, 45.5% of African Americans, and 35.8% of American Indians/others met the 7% weight-loss criterion. In addition, 43.5, 38.1, 24.7, and 18.8% of participants in the four groups, respectively, lost  $\geq 10\%$  of initial weight.

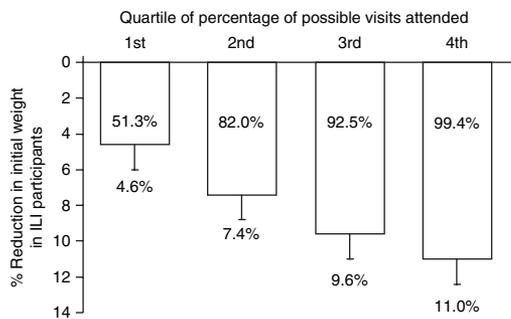
**Treatment adherence and weight loss**

During the first year, participants in ILI attended an average of  $35.4 \pm 7.3$  of a possible 42 group and individual sessions. Correlation analysis revealed that the more sessions participants attended, the greater their weight loss at month 12 ( $r = 0.31$ ,  $P < 0.001$ ). Additional analyses, which divided participants into quartiles of attendance for year 1, showed that the odds (95% confidence interval) in favor of reaching the 7 and 10% weight loss goals for those in the highest quartile of attendance were 5.3 (4.0–7.0) and 8.1 (5.7–11.5) times the odds of the lowest quartile reaching the goals, respectively. Figure 4 presents the weight losses for each of the four quartiles, based on percentage of possible treatment sessions attended during the first year.

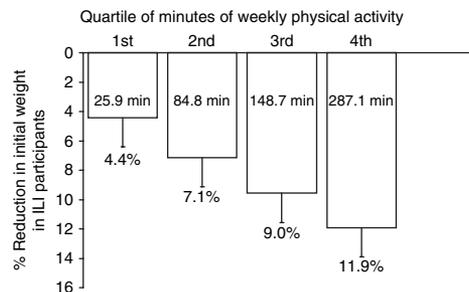
*Physical activity.* Participants reported engaging in brisk physical activity an average of  $136.7 \pm 110.4$  min/week during the



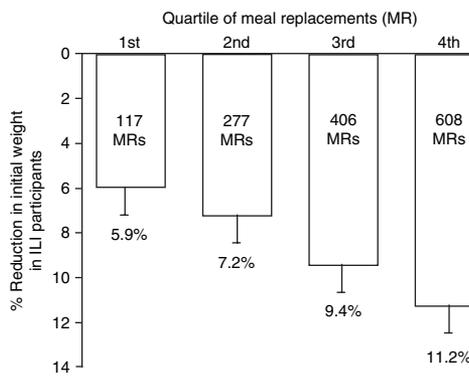
**Figure 2** Percentage reduction in initial weight (in the ILI group) based on gender and ethnicity. ILI, intensive lifestyle intervention.



**Figure 3** Percentage reduction in initial weight at 1 year based on quartile of percentage of possible visits attended. The number within each bar shows the mean percentage of visits attended for that quartile.



**Figure 4** Percentage reduction in initial weight at 1 year based on quartile of average weekly minutes of self-reported physical activity. The number within each bar shows the mean number of weekly minutes of physical activity.

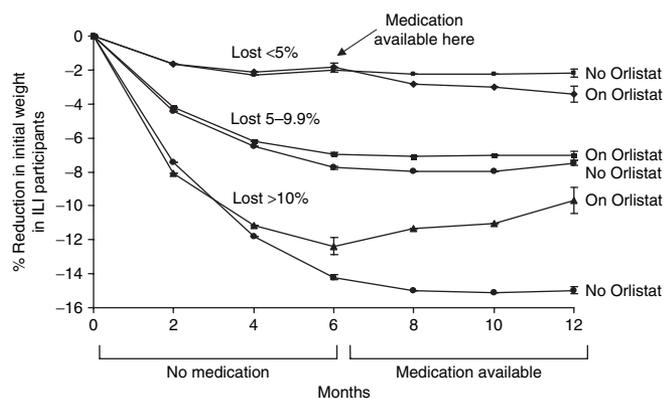


**Figure 5** Percentage reduction in initial weight at 1 year based on quartile of meal replacement (MR) products used. The number within each bar shows the mean number of products used in that quartile.

rst year. Correlation analysis revealed that the greater the minutes of weekly physical activity, the greater participants' weight loss at month 12 ( $r = 0.41$ ,  $P < 0.001$ ). The odds of reaching the 7 and 10% weight loss goals for participants in the highest quartile of physical activity were 7.5 (5.7–9.9) and 9.4 (6.8–13.0) times greater than the odds of participants in the lowest quartile, respectively. **Figure 5** presents weight loss based on quartiles of weekly minutes of physical activity.

**Meal replacements.** ILI participants reported consuming an average total of  $233.3 \pm 113.3$  meal replacement products during the first 6 months, equal to  $9.7 \pm 5.1$  per week during weeks

3–26 (when meal replacements were recommended). They consumed an average total of  $127.6 \pm 100.8$  meal replacements from months 7 to 12, equal to  $4.6 \pm 4.1$  per week during this time. The self-reported total consumption for the year averaged  $360.9 \pm 193.5$ . The number of meal replacements consumed in the first 6 months was significantly related to weight loss at week 26 ( $r = 0.32$ ,  $P < 0.001$ ), as was the total number consumed for the year to weight loss at week 52 ( $r = 0.30$ ,  $P < 0.001$ ). Participants in the highest quartile of meal replacement use had 4.0 (3.1–5.1) times greater odds of reaching the 7% weight loss goal and 4.1 (3.1–5.4) times greater odds of reaching the 10% goal than did participants in the lowest quartile. **Figure 6** presents the relation between quartile of meal replacement use and weight loss.



**Figure 6** Percentage reduction in initial weight (in the ILI group) for individuals who did and did not receive orlistat after month 6. Individuals who had lost <5% of initial weight at month 6 were encouraged to use the medication. Those who had lost 5.0–9.9% were allowed to use orlistat upon request. For participants who had lost ≥10% at month 6, only those who had regained ≥2% points above their lowest weight were allowed to use medication. (Participants were not randomized to medication conditions.)

**Intercorrelation of measures.** Additional analyses showed that the three measures of adherence were highly correlated. Attendance correlated with physical activity ( $r = 0.47$ ,  $P < 0.001$ ) and meal replacement use ( $r = 0.56$ ,  $P < 0.001$ ), and the two latter variables also were positively related ( $r = 0.51$ ,  $P < 0.001$ ). Stepwise multiple regression, which allowed the model to enter the strongest variable first (i.e., Maximum  $R^2$  procedure), revealed that minutes of physical activity accounted for 16.1% of the variance. This value increased to 19.0% with the addition of attendance and to 19.6% with the inclusion of meal replacements. All three variables contributed significantly ( $P < 0.001$ ).

#### Adherence in relation to demographic characteristics

**Table 2** presents findings for treatment adherence according to gender, age, and ethnicity. Over the year, men reported more weekly minutes of physical activity ( $P < 0.05$ ) and greater total consumption of meal replacements ( $P < 0.05$ ) than women. The study's oldest participants (65–74 years) had significantly ( $P < 0.05$ ) better treatment attendance than did participants in the

**Table 2** Participants' attendance at treatment sessions and self-reported physical activity and consumption of meal replacements

Characteristic	Number of treatment sessions attended during year 1	Average minutes of weekly physical activity during year 1	Total number of meal replacements used	
			6 Months	12 Months
Gender				
Male	35.8 ± 7.4 <sup>a</sup>	173.7 ± 124.4 <sup>a</sup>	239.4 ± 117.1 <sup>a</sup>	374.2 ± 201.8 <sup>a</sup>
Female	35.2 ± 7.2 <sup>a</sup>	129.4 ± 96.2 <sup>b</sup>	229.2 ± 110.5 <sup>b</sup>	351.7 ± 187.0 <sup>b</sup>
Age				
45–54 years	34.9 ± 7.3 <sup>a</sup>	129.9 ± 97.5 <sup>a</sup>	236.3 ± 113.0 <sup>a,b</sup>	353.2 ± 197.3 <sup>a</sup>
55–64 years	35.3 ± 7.5 <sup>a</sup>	143.3 ± 109.7 <sup>a</sup>	227.5 ± 111.8 <sup>a</sup>	352.7 ± 189.3 <sup>a</sup>
65–74 years	36.8 ± 6.4 <sup>b</sup>	179.0 ± 121.5 <sup>b</sup>	245.5 ± 116.8 <sup>b</sup>	391.8 ± 197.4 <sup>b</sup>
Ethnicity				
Non-Hispanic white	35.9 ± 6.9 <sup>a</sup>	155.6 ± 115.5 <sup>a</sup>	243.4 ± 115.8 <sup>a</sup>	378.3 ± 199.8 <sup>a</sup>
African American	35.6 ± 7.1 <sup>a,b</sup>	125.8 ± 99.6 <sup>b</sup>	228.2 ± 110.2 <sup>a,b</sup>	343.1 ± 184.5 <sup>b</sup>
Hispanic	34.5 ± 7.8 <sup>b</sup>	151.2 ± 94.9 <sup>a</sup>	215.2 ± 93.2 <sup>b,c</sup>	340.0 ± 160.3 <sup>b</sup>
American Indian/Other	32.2 ± 8.8 <sup>c</sup>	113.8 ± 104.5 <sup>b</sup>	186.4 ± 115.2 <sup>c</sup>	280.5 ± 182.8 <sup>c</sup>

Within columns and demographic groupings, values with different superscript letters (i.e., a, b, and c) differ significantly from each other ( $P < 0.05$ ). Thus, for example, examining minutes of physical activity, men reported exercising significantly more minutes than women (a vs. b). By contrast, there was no significant difference between men and women in attendance, as shown by the shared superscript letter "a".









