Improvements in Cardiovascular Risk Factors in Young Adults in a Randomized Trial of Approaches to Weight Gain Prevention

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Objective: Weight gain occurs commonly in young adults and increases the risk of cardiovascular disease (CVD). Following on a previous report that two self-regulation interventions reduced weight gain relative to control, this study examines whether these interventions also benefit CVD risk factors.

Methods: The Study of Novel Approaches to Weight Gain Prevention was a randomized trial in two academic settings (N = 599; 18-35 years; BMI 21-30 kg/m²) comparing two interventions (Self-Regulation with Small Changes; Self-Regulation with Large Changes) and a control group. Small Changes taught participants to make daily small changes in calorie intake (approximately 100 calories) and activity. Large Changes taught participants to initially lose 5 to 10 pounds to buffer anticipated weight gains. CVD risk factors were assessed at baseline and at 2 years in 471 participants.

Results: Although Large Changes was associated with more beneficial changes in glucose, insulin, and homeostatic model assessment of insulin resistance than Control, these differences were not significant after adjusting for multiple comparisons or 2-year weight change. Comparison of participants grouped by percent weight change from baseline to 2 years showed significant differences for several CVD risk factors, with no interaction with treatment condition.

Conclusions: Magnitude of weight change, rather than specific weight gain prevention interventions, was related to changes in CVD risk factors in young adults.

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Introduction

Young adults aged 20 to 35 years experience the fastest weight gain, averaging 1 to 2 pounds per year (1-3). This weight gain is associated with worsening cardiovascular disease (CVD) risk factors, including lipids, blood pressure, glucose, and insulin, and increased risk of metabolic syndrome (4-7). In the Coronary Artery Risk Development in Young Adults (CARDIA) Study, for example, individuals aged 18 to 30 years gained approximately 21 kg over 25 years, with larger weight gains at younger ages (8). The 16% who maintained their weight (± 5 pounds) over the first 15 years had no changes in CVD risk factors, whereas those who gained weight (> 5 pounds) had worsening risk factors and increased prevalence of metabolic syndrome (7-9). Other epidemiological studies have shown that weight gain during young adulthood is associated with increased risk of coronary heart disease events, type 2 diabetes, hypertension, and a variety of other disease (10-14). In fact, weight gained by young adults has stronger negative associations with cancer risk and mortality than weight gained at later ages (15,16).

There have been few large randomized trials designed to prevent weight gain in young adults (17-19). Those that have been conducted have had limited long-term success (4,20). Moreover, we are not aware of any weight gain prevention studies in young adults that have examined the effect of these interventions on change in CVD risk factors. In contrast, weight gain prevention in older individuals has had beneficial effects on CVD risk factors (21,22).

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We recently reported positive results from the Study of Novel Approaches to Weight Gain Prevention (SNAP), a randomized trial of two new approaches to weight gain prevention in 599 young adults (23). The interventions were both based on self-regulation and stressed the importance of daily self-weighing and making changes in diet and physical activity based on those weights (24). One intervention focused on making small daily changes in eating and exercise behaviors, whereas the other recommended larger periodic changes to buffer against expected weight gains. We found significant effects of both interventions, relative to the control group, on the primary outcome of weight gain over the average of 3 years of follow-up; moreover, weight in the Large Changes condition was significantly reduced relative to the Small Changes condition. In the present study, we hypothesized that the Large Changes intervention would produce the most positive effects on CVD risk factors in association with its effect on weight change.

Methods

Design

SNAP was an NIH-funded clinical trial conducted at two clinical sites (University of North Carolina, Chapel Hill, and The Miriam Hospital in Providence, Rhode Island) (Supporting Information Figure S1); Wake Forest University Health Sciences was the coordinating center. The study was approved by the institutional review boards at each of these locations. SNAP targeted 600 young adults who were randomly assigned with equal probability to one of three groups: Control, Small Changes, or Large Changes. Assessments were completed at baseline, 4 months, and then annually. Lipids, glucose, and insulin were assessed only at baseline and at 2 years; thus, those time points are the focus of the present analyses. Change in CVD outcomes was a prespecified secondary outcome for this trial. The design has been described in detail and the CONSORT diagram has been provided in a prior publication (25). Participants were recruited from 2010 to 2012 and data were analyzed from 2015 to 2016.

Participants

The SNAP study recruited individuals aged 18 to 35 years with a BMI of 21 to 30.9. Young adults with overweight and normal weight were included because both weight groups are at increased risk of weight gain relative to older individuals. Other eligibility criteria included access to the Internet, English speaking, no history of or current anorexia or bulimia nervosa, and completion of screening and baseline assessment visits. Of the 599 participants in SNAP, 76 did not have measured weight at 2 years, and an additional 52 had neither blood pressure nor blood work at this time, bringing the sample for this analysis to \( N = 471 \).

Interventions

The interventions have been described in detail (23,25). The Control group attended one face-to-face meeting in which participants were introduced to both the Small and Large Changes approaches to prevention of weight gain, but this group did not receive any further assistance with weight gain prevention. The two active interventions were both based on self-regulation; participants were encouraged to weigh themselves daily and to use the information from the scale to make changes in diet and physical activity as needed (26–29). Both interventions began with 10 face-to-face group meetings over the first 4 months. The Small Changes intervention group was introduced to a variety of strategies to reduce daily intake by approximately 100 calories each day (e.g., omitting a slice of cheese from a sandwich; selecting wine rather than a mixed drink) (30–34). Participants were given pedometers and taught to increase their daily steps by 2,000 steps per day (thereby expending approximately an additional 100 calories in activity) through changes such as using the stairs and parking further from their destination. The Large Changes intervention group was encouraged to lose 5 pounds if normal weight and 10 pounds if overweight to produce a buffer against the expected weight gains (21). The weight loss was produced by prescribing an initial weight loss calorie goal and encouraging gradual increases in moderate to vigorous activity until achieving a goal of 250 minutes per week. At the end of the 4 months, participants in both groups were instructed to report their weight at least once a week via the SNAP website or text message. They received monthly email feedback on their weight based on a color-coded system (24,25) and were either reinforced for their success, encouraged to use problem solving, or recommended additional strategies that were consistent with the Small or Large Changes approach to help reverse weight gain. Participants who gained above baseline were encouraged to contact us for additional guidance, but few participants used this option. In addition, after the initial 4 months, both interventions were offered two 4-week online refresher courses each year to help them reinstate the Large or Small Changes strategies. Approximately 50% of participants joined these optional refreshers, with comparable participation in Large and Small Changes.

Statistical analyses

All analyses were completed on the 471 participants who had weight and at least one CVD risk factor assessed at baseline and year 2. Baseline descriptive statistics were computed overall and by treatment group. Means and SDs were obtained for continuous variables; frequencies and percentages were obtained for categorical variables. Differences at baseline among the treatment groups were assessed using analysis of variance (ANOVA) for continuous measures, and \( \chi^2 \) or Fisher’s exact tests were used for categorical measures depending on the adequacy of the sample size. Changes
in weight and CVD risk factors from baseline to year 2 were compared among the three treatment groups using multiple linear regression; all models included clinic as a covariate. Additionally, models for blood pressure and lipids excluded participants who had ever taken medication for that condition (no participants had ever taken diabetes medication). Both the nominal P values and the Bonferroni adjusted bounds (type I error = 0.05) required for significance are provided. In addition, an observational analysis was conducted to examine the effects of changes in weight on the risk factor changes. Participants were divided into five categories based on percent change in weight between baseline and year 2 (lost ≥ 5%, lost < 5% to lost > 1%, lost ≤ 1% to gained < 1%, gained > 1% to gained < 5%, gained ≥ 5%). These categories were chosen because they corresponded to the clinically significant 5% weight change and the 0.45 kg weight gain used in the primary statistical analyses (23) and because they resulted in similar sample sizes among the categories. CVD risk factor changes were compared across the five categories, adjusting for clinic and treatment group. Interactions between treatment group and percent change in weight categories were assessed. All analyses were performed using SAS version 9.4 (SAS Institute Inc., Cary, North Carolina).

Results
Baseline characteristics of these participants are shown in Table 1. Few differences among the three groups were seen at baseline. On average, participants were 28.3 (4.4) years of age and had a BMI of 25.5 (2.6). Twenty-three percent were males and twenty-five percent reported minority race/ethnicity. In general, this was a very healthy group; on average, they had blood pressures of 110/71 mmHg, total cholesterol of 173 mg/dL, and fasting glucose of 90 mg/dL. The 471 participants included in this analysis represented 78%, 77%, and 81% of the participants who were originally randomized to Control, Small Changes, and Large Changes, respectively. A greater proportion of included participants were from the University of North Carolina than from Providence relative to those not included; site was used as a covariate in subsequent analyses. No other differences at baseline or in weight changes during the trial were observed between those with and without 2-year data.

Weight change
The weight change data have been reported previously (23) but are presented here (Figure 1) to show results for the 471 participants included in this manuscript. Mean (SE) weight changes at 2 years (when blood work was completed) were +0.49 (0.37), −1.00 (0.37),

### Table 1 Baseline data for participants with a year 2 visit (N = 471)

|                         | Overall          | Control          | Small Changes | Large Changes | P value |
|-------------------------|------------------|------------------|---------------|---------------|---------|
| Number of participants  | 471 (100%)       | 158 (33.5%)      | 154 (32.7%)   | 159 (33.8%)   |         |
| Age (y)                 | 28.3 ± 4.4       | 28.3 ± 4.3       | 28.1 ± 4.6    | 28.5 ± 4.4    | 0.79    |
| Gender: male (%)        | 107 (22.7%)      | 37 (23.4%)       | 34 (22.1%)    | 36 (22.6%)    | 0.96    |
| Clinic (%)              |                  |                  |               |               |         |
| Chapel Hill             | 256 (54.4%)      | 85 (53.8%)       | 84 (54.5%)    | 87 (54.7%)    | 0.98    |
| Brown                   | 215 (45.6%)      | 73 (46.2%)       | 70 (45.5%)    | 72 (45.3%)    |         |
| Race (%)                |                  |                  |               |               |         |
| African American        | 52 (11.0%)       | 16 (10.1%)       | 17 (11.0%)    | 19 (11.9%)    | 0.59    |
| White                   | 353 (74.9%)      | 114 (72.2%)      | 118 (76.6%)   | 121 (76.1%)   |         |
| Other/mixed             | 66 (14.0%)       | 28 (17.7%)       | 19 (12.3%)    | 19 (11.9%)    |         |
| Education: HS or more (%) | 452 (96.0%)    | 154 (97.5%)      | 147 (95.5%)   | 151 (95.0%)   | 0.54    |
| Current smoker (%)      | 22 (4.7%)        | 10 (6.4%)        | 9 (6.0%)      | 3 (1.9%)      | 0.09    |
| Weight (kg)             | 71.5 ± 10.8      | 71.5 ± 10.4      | 71.8 ± 10.9   | 71.3 ± 11.3   | 0.92    |
| BMI (kg/m²)             | 25.5 ± 2.6       | 25.6 ± 2.8       | 25.6 ± 2.3    | 25.2 ± 2.6    | 0.24    |
| Cholesterol (mg/dL)     | 173.3 ± 30.8     | 171.8 ± 29.2     | 176.9 ± 32.9  | 171.2 ± 30.3  | 0.20    |
| HDL (mg/dL)             | 57.6 ± 15.6      | 58.4 ± 15.2      | 58.0 ± 16.3   | 56.4 ± 15.2   | 0.47    |
| LDL (mg/dL)             | 97.5 ± 27.6      | 96.1 ± 27.4      | 100.6 ± 28.8  | 95.8 ± 26.4   | 0.23    |
| Triglycerides (mg/dL)   | 91.0 ± 47.4      | 86.1 ± 38.5      | 91.7 ± 47.0   | 95.2 ± 54.9   | 0.23    |
| Glucose (mg/dL)         | 89.9 ± 6.6       | 89.6 ± 7.0       | 89.9 ± 6.8    | 90.3 ± 5.9    | 0.60    |
| Insulin (µU/mL)         | 8.2 ± 4.3        | 7.8 ± 3.8        | 8.3 ± 4.3     | 8.4 ± 4.7     | 0.36    |
| HOMA ([(mg/dL)²*µU/mL]) | 1.8 ± 1.0        | 1.7 ± 0.8        | 1.9 ± 1.0     | 1.9 ± 1.1     | 0.29    |
| SBP (mmHg)              | 110.3 ± 10.9     | 109.6 ± 11.1     | 111.2 ± 10.5  | 110.3 ± 11.2  | 0.44    |
| DBP (mmHg)              | 70.6 ± 8.7       | 70.1 ± 8.4       | 70.6 ± 9.4    | 71.1 ± 8.3    | 0.55    |
| Hypertensive medication (%) | 9 (1.9%)       | 2 (1.3%)         | 4 (2.6%)      | 3 (1.9%)      | 0.65    |
| Lipid medication (%)    | 15 (3.2%)        | 2 (1.3%)         | 3 (1.9%)      | 10 (6.3%)     | 0.03    |

Numbers of participants (%) or means ± SDs. χ² tests used for categorical variables, Fisher’s exact tests used for categorical variables with cell sizes less than 10, and ANOVA used for continuous variables. Abbreviations: DBP, diastolic blood pressure; HDL, high-density lipoprotein; HOMA, homeostatic model assessment; HS, high school; LDL, low-density lipoprotein; SBP, systolic blood pressure.
Changes in CVD risk factors by weight loss

We next examined the effect of percent change in weight over 2 years of follow-up on the changes in CVD risk factors. Collapsing across the three treatment groups, we divided participants into the following categories based on their percent weight change from baseline to 2 years: lost ≥ 5% (n = 103), lost > 1% to < 5% (n = 130); no change (lost ≤ 1% to gain ≤ 1%) (n = 62); gain > 1 to < 5% (n = 103); gain ≥ 5% (n = 73). Intervention condition and clinic were both associated with the proportion of participants in each of the weight categories and were thus entered into the subsequent analyses (Supporting Information Table S1). Table 3 and Figure 2 show the differences among the weight change categories for the CVD risk factors and provide the nominal P values. With Bonferroni adjustments, larger weight loss at 2 years was significantly associated with more positive changes in high-density lipoprotein cholesterol, triglycerides, insulin, HOMA-IR, and systolic blood pressure. There were no significant interactions between the weight change categories and intervention condition or clinic; thus, weight change per se, not the type of intervention, was associated with the changes in CVD risk factors.

Discussion

This study shows that weight changes over 2 years in young adults are strongly related to changes in CVD risk factors and suggests that interventions to prevent this weight gain, especially if resulting in weight loss, can impact the health of this age group. Although the mean changes in CVD risk factors were not large in this sample, which had normal CVD risk factors at baseline, the worsening in CVD risk factors occurred over just 2 years, raising concern about the longer-term consequences of continued weight gain with age in young adults. However, our data also suggest that weight losses of just 5% or more among the three groups, with greater improvements from baseline to 2 years in Large Changes than Control. However, after adjusting for either multiple comparisons or for weight change at 2 years, there were no significant differences in CVD risk factor changes among the treatment groups.

Changes in CVD risk factors by treatment group

Table 2 shows the changes in CVD risk factors from baseline to 2 years in each of the three groups. Changes in glucose (P = 0.05), insulin (P = 0.03), and the HOMA-IR ratio (P = 0.02) differed among the three

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**TABLE 2 Change in weight and CVD risk factors from baseline to year 2 by treatment arm**

| Least square means (SEs) by treatment arm | Nominal P value | Adjusted P value |
|------------------------------------------|-----------------|-----------------|
| Weight change (kg)                       |                 |                 |
| Control                                  | 0.49 (0.37)     |                 |
| Small Changes                            | −1.00 (0.37)    |                 |
| Large Changes                            | −1.58 (0.37)    | 0.001           |
| Percent weight change                    |                 |                 |
| Control                                  | 0.65 (0.50)     |                 |
| Small Changes                            | −1.26 (0.51)    |                 |
| Large Changes                            | −2.14 (0.50)    | 0.001           |
| Cholesterol (mg/dL)                      |                 |                 |
| Control                                  | −0.56 (1.75)    |                 |
| Small Changes                            | 0.74 (1.73)     |                 |
| Large Changes                            | 1.33 (1.75)     | 0.73            |
| HDL (mg/dL)                              |                 |                 |
| Control                                  | −0.09 (0.83)    |                 |
| Small Changes                            | 1.43 (0.82)     |                 |
| Large Changes                            | 2.12 (0.83)     | 0.16            |
| LDL (mg/dL)                              |                 |                 |
| Control                                  | −0.01 (1.46)    |                 |
| Small Changes                            | 0.16 (1.44)     |                 |
| Large Changes                            | 1.43 (1.46)     | 0.75            |
| Triglycerides (mg/dL)                    |                 |                 |
| Control                                  | −2.29 (3.77)    |                 |
| Small Changes                            | −4.15 (3.73)    |                 |
| Large Changes                            | −11.02 (3.77)   | 0.23            |
| Glucose (mg/dL)                          |                 |                 |
| Control                                  | 1.48 (0.49)     |                 |
| Small Changes                            | 0.4 (0.49)      |                 |
| Large Changes                            | −0.18 (0.48)    | 0.05            |
| Insulin (μU/mL)                          |                 |                 |
| Control                                  | −0.27 (0.33)    |                 |
| Small Changes                            | −0.73 (0.33)    |                 |
| Large Changes                            | −1.48 (0.32)    | 0.03            |
| HOMA-IR [(mg/dL] × [μU/mL])              |                 |                 |
| Control                                  | −0.03 (0.08)    |                 |
| Small Changes                            | −0.15 (0.08)    |                 |
| Large Changes                            | −0.33 (0.08)    | 0.02            |
| SBP (mmHg)                               |                 |                 |
| Control                                  | −1.73 (0.69)    |                 |
| Small Changes                            | −3.72 (0.7)     |                 |
| Large Changes                            | −2.66 (0.69)    | 0.13            |
| DBP (mmHg)                               |                 |                 |
| Control                                  | −0.41 (0.51)    |                 |
| Small Changes                            | −2.14 (0.52)    |                 |
| Large Changes                            | −1.33 (0.51)    | 0.06            |

Model adjusted for treatment arm and clinic. With nine CVD risk factors and Bonferroni correction for multiple comparisons (type I error = 0.05), P < 0.0045 needed; thus, after adjustment for multiple comparisons, there were no significant differences in changes in CVD risk factors among the three interventions.

Abbreviations: DBP, diastolic blood pressure; HDL, high-density lipoprotein; HOMA-IR, homeostatic model assessment of insulin resistance; LDL, low-density lipoprotein; SBP, systolic blood pressure.
lead to significantly greater improvements in lipids and glycemic control relative to remaining weight stable or gaining weight.

We also showed that the Large Changes approach led to significantly greater improvements in lipids and glycemic control relative to remaining weight stable or gaining weight.

As seen in Figure 1, the Large Changes approach was associated with marked weight loss at 4 months and then gradual regain from month 4 to 2 years. However, we found no evidence that the initial 4-month weight change in the Large Changes condition contributed either positively or negatively to the changes in glucose, insulin, or insulin resistance at 2 years, independent of the weight changes at 2 years (data not shown). In contrast to these findings, in Look AHEAD, a study of 5,145 individuals with overweight or obesity and type 2 diabetes, half of whom were randomized to lifestyle intervention, we found that individuals who had the largest weight losses from baseline to 1 year had the most positive effects for glycemic control at 4 years, even if they regained this weight between years 1 and 4 (35). This difference between the outcomes in the two studies may relate to the characteristics of the participants (in particular, Look AHEAD participants all had diabetes and were older) or to the magnitude and timing of weight loss and regain. Moreover, the current study, like others (36-38), failed to find any adverse effects of weight loss followed by weight regain (or “weight cycling”) on the CVD risk factors. Rather, in this study, the effects of weight loss on CVD risk factors appeared to be due entirely to weight losses at the time of the assessment of the CVD risk factor and did not differ according to the pattern of earlier weight changes.

The Control group in this study gained 0.49 kg over 2 years. This was less than anticipated and less than seen in the CARDIA study (7,8). It is possible that weight gain was blunted by the initial education session, the feedback on weight and risk factors after each assessment, or the fact that all participants had joined a weight gain prevention study. The smaller weight gain in the Control group relative to CARDIA may also reflect temporal trends in weight gain (8). However, it is important to note that in the Control group, 46% gained weight and 39% lost weight over the 2 years. In contrast, in the intervention groups, 34% to 36% gained weight and over half of the participants lost weight (54% and 56%). Thus, these interventions produced a favorable shift in the distribution of weight changes experienced over 2 years.

Strengths of this study include the large sample size, randomized design, and 2-year follow-up. The major limitations relate to the generalizability of the results to the broader population of young adults, who may have more abnormal CVD risk factors and less interest in weight gain prevention than our participants. In addition, the supporting analyses comparing changes in CVD risk factors across weight change categories has the potential to be affected by unmeasured confounding factors, such as family history of CVD and level of motivation to lose weight. Finally, we measured CVD risk factors only at baseline and 2 years; the differences in CVD risk factor changes among the three intervention groups may have been much greater at 4 months and 1 year, when the groups differed more dramatically in their weight changes.

Given the impact of weight change on the changes in CVD risk factors in young adults, more research is needed to develop stronger weight gain approaches. These efforts could include strategies to increase the initial weight loss and/or prevent the subsequent weight regain that occurred in the Large Changes group or to produce additional periods of weight loss in future years by reinstating Large Changes. Alternatively, strategies to produce better maintenance of
TABLE 3 Change in CVD risk factors from baseline to 2 years by percent weight change

| Means (SEs) by percent weight loss categories | Lost ≥ 5% | Lost < 5% to lost > 1% | Lost ≤ 1% to gained ≤ 1% | Gained > 1% to gained < 5% | Gained ≥ 5% | Nominal P value | Adjusted P value |
|---------------------------------------------|----------|------------------------|--------------------------|---------------------------|-------------|----------------|------------------|
| Weight change (kg)                          | -6.98 (0.19) | -2.1 (0.17)           | -0.04 (0.24)             | 1.96 (0.19)              | 6.35 (0.23) | <0.0001        |                  |
| Percent weight change                       | -9.52 (0.24) | -2.97 (0.21)           | -0.04 (0.31)             | 2.77 (0.24)              | 8.93 (0.29) | <0.0001        |                  |
| Cholesterol (mg/dL)                         | -4.42 (2.16) | 0.54 (1.91)            | -0.26 (2.78)             | 1.16 (2.12)              | 6.87 (2.61) | 0.03           | 0.27             |
| HDL (mg/dL)                                 | 4.21 (1.02)  | 2.44 (0.99)            | -0.53 (1.31)             | -0.04 (1)                | 1.24 (1.23) | 0.0007         | 0.0063           |
| LDL (mg/dL)                                 | -4.66 (1.79) | 0.14 (1.59)            | 1.41 (2.31)              | 1.79 (1.76)              | 5.78 (2.17) | 0.006          | 0.054            |
| Triglycerides (mg/dL)                       | -20.01 (4.60) | -10.26 (4.07)       | -5.76 (5.91)             | 1.21 (4.52)              | 11.92 (5.55) | 0.0002         | 0.0018           |
| Glucose (mg/dL)                             | -0.99 (0.60) | 0.12 (0.53)            | 0.93 (0.77)              | 1.77 (0.60)              | 1.56 (0.73) | 0.01           | 0.09             |
| Insulin ([U/mL])                            | -2.62 (0.39) | -1.25 (0.34)           | -0.53 (0.5)              | 0.15 (0.39)              | 0.8 (0.47)  | <0.0001        | 0.0009           |
| HOMA-IR ([(mg/dL) * [U/mL])                 | -0.61 (0.09) | -0.28 (0.08)           | -0.08 (0.12)             | 0.07 (0.09)              | 0.22 (0.11) | <0.0001        | 0.0009           |
| SBP (mmHg)                                  | -4.34 (0.85) | -3.45 (0.76)           | -4.04 (1.08)             | -1.41 (0.85)             | 0.31 (1.02) | 0.002          | 0.018            |
| DBP (mmHg)                                  | -2.01 (0.64) | -2.05 (0.57)           | -1.86 (0.81)             | -0.35 (0.64)             | 0.27 (0.77) | 0.05           | 0.45             |

Model adjusted for percent weight change from baseline to year 2, treatment arm, and clinic. Interaction of percent weight change and treatment arm was not significant in any of these analyses. With nine CVD risk factors and Bonferroni adjustment for multiple comparisons, P < 0.0045 is needed; bold font signifies that the differences among the five weight loss categories are statistically significant after adjustment.

Abbreviations: DBP, diastolic blood pressure; HDL, high-density lipoprotein; HOMA-IR, homeostatic model assessment of insulin resistance; LDL, low-density lipoprotein; SBP, systolic blood pressure.

Behavior changes and, consequently, better maintenance of weight with Small Changes might be effective longer-term if the Control group continues to gain weight as anticipated. The SNAP trial continues to provide intervention to the Large and Small Changes groups and will follow all participants through 6 years with repeated measures of CVD risk factors at year 6. This will provide important information on the effects of the interventions on longer-term weight change and on the association between weight change and change in CVD risk factors in these young adults.

In conclusion, these analyses show that weight change over 2 years is strongly related to changes in CVD risk factors over the same time period and suggest that interventions that reduce weight gain over time, especially if resulting in weight loss, will have a positive impact on CVD risk in young adults.

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