Objective: To investigate whether body dissatisfaction at prepuberty is associated with preceding changes in relative weight since infancy.

Design: A longitudinal cohort study. Follow-up of weight and height from age 7 months to 8 years; evaluation of body dissatisfaction at age 8 years.

Setting and Participants: The subjects were 205 girls and 230 boys participating in a prospective randomized atherosclerosis prevention trial in Finland.

Main Outcome Measures: A pictorial instrument was used in measuring estimated current and desired body sizes. A difference between the 2 indicated body dissatisfaction.

Results: Children, particularly girls, who wished to be thinner at age 8 years had, on average, a more rapid increase in relative weight between ages 3 and 8 years compared with other children. Slopes of the average trends of change in weight differed significantly between the children wishing to be thinner, those who were satisfied with their size, and those who wished to look heavier ($P = .002$ in girls; $P = .02$ in boys).

Conclusion: Body dissatisfaction at prepuberty may reflect changes in weight during the preceding several years.

Arch Pediatr Adolesc Med. 2005;159:567-571

Some extent of body dissatisfaction, broadly defined as negative thoughts and feelings about one’s own body, appears to be the experience of most individuals raised in Western culture. Body dissatisfaction is common even in children, and already at the elementary school age, girls are more dissatisfied with their bodies than boys. Body dissatisfaction is of concern, since it increases the risk for disordered eating. In children, there is a connection between body dissatisfaction and self-reported dieting.

Children are quite accurate in estimating their own body size. On average, they also appear to be logical and adequate with their ideals and preferences, in the sense that children with higher body weights express more body dissatisfaction. However, data are lacking on what the preceding pattern of change in weight looks like in prepubertal children who are dissatisfied with their bodies. Is it just the current weight status that is relevant? Our objective was to examine body dissatisfaction in prepubertal, 8-year-old, Finnish girls and boys by measuring their estimated current body size and their desired body size. We also aimed at exploring whether there was an association between body dissatisfaction at the age of 8 years and the preceding changes in relative weight since infancy.

Methods

Subjects

The subjects were participants in a long-term trial, the Special Turku Coronary Risk Factor Intervention Project for Children (STRIP). The design of STRIP has been described in detail. In brief, voluntary families of 1062 7-month-old children (56.5% of the eligible age cohort) were recruited in 1990 to 1992 and randomized either to regularly receive individualized health education and dietary advice (the intervention group [$n = 540$]) or to be given the standard health recommendations delivered to all Finnish families at the well-baby clinics (the control group [$n = 522$]). The main aim of the trial was to find out whether exposure of the intervention group children to environmental atherosclerosis risk factors could be safely altered by child-oriented dietary and lifestyle counseling. The children’s diet, growth,
were asked (“Which one of these looks like you the most?”; shown sex-specific figures, and “current” and “desired” sizes. The final sample (n=435) represented children ranging in size from very thin to obese. Each child was assigned to the intervention group and 101 (49.3%) to the control group of STRIP; of the boys, 113 (49.1%) and 117 (50.9%) belonged to the intervention group and 101 (49.3%) to the control group of STRIP. Of the girls, 104 (50.7%) belonged to the intervention group and 109 (50.3%) to the control group of STRIP. The group was limited because of incompatible timetables of the body image test administrator and some of the families. Three children (0.7%) refused to participate, and 6 (1.4%) were excluded from the present study during their visit to the STRIP counseling team.

The STRIP study was approved by the Joint Commission on Ethics of Turku University and Turku University Central Hospital, Turku, Finland.

Of the 658 children who participated in the STRIP trial at the age of 8 years, 444 children were asked to take part in the present study during their visit to the STRIP counseling team. The group was limited because of incompatible timetables of the body image test administrator and some of the families. Three children (0.7%) refused to participate, and 6 (1.4%) were excluded because of unclear response to the inquiries about current and desired sizes. The final sample (n=435) represented 66.1% of the total sample of 8-year-old STRIP participants.

The study group was not substantially different from the rest of the 8-year-old STRIP participants (n=233) with regard to the mean values of relative weight, proportions of overweight children and underweight children, mean years of education of mother and father, and proportions of 1-parent families. Of the 435 children, 205 (47.1%) were girls. Of the girls, 104 (50.7%) belonged to the intervention group and 101 (49.3%) to the control group of STRIP; of the boys, 113 (49.1%) and 117 (50.9%) belonged to each group, respectively.

**MEASUREMENTS**

Weight and height of the children were measured at the ages of 8 and 13 months and 2, 3, 4, 5, 6, 7, and 8 years. At the ages of 7 months and 13 months, weight to the nearest 0.01 kg was measured using an infant scale and thereafter to the nearest 0.1 kg with an electronic scale. Length to the nearest millimeter was at first measured using an infant board, and from the age of 2 years onward, standing height was measured with a stadiometer. Relative weight (deviation of weight in percentage from the mean weight of healthy children of the same age and sex) and relative height (deviation of height in standard deviation units from the mean height of healthy children of the same age and sex) were calculated from growth curves for Finnish children.

Estimations of current body size and desired body size were obtained by means of a pictorial instrument developed by Children et al. It consisted of 8 figure drawings representing children ranging in size from very thin to obese. Each child was shown sex-specific figures, and “current” and “desired” sizes were asked (“Which one of these looks like you the most?”, “Which one of these would you like to look like the most?”). Body dissatisfaction was indicated by the difference between the 2 ratings. Positive values indicated desire to be thinner.

Background data (eg, education of parents, number of parents in the family) were collected by means of questionnaires mailed to the parents in fall 1999. Data on weight, height, and body satisfaction of the children were gathered between August 1997 and November 1999.

**STATISTICAL ANALYSES**

Previously, we showed that in this sample of children there were no statistically significant differences in the mean values of estimated current or desired body sizes or body dissatisfaction between the intervention and control groups of STRIP. Further, the proportions of children who wished to be thinner, who were satisfied with their size, or who wished to look heavier were closely similar in the intervention and control groups of STRIP. Thus, STRIP group was ignored in the analyses of the present study.

Current and desired body sizes and body dissatisfaction were adjusted for relative weight when girls and boys were compared; rank analysis of covariance was used with children’s relative weight as a covariate. The χ² tests were conducted to compare the sexes regarding the proportions of those who wished to be thinner, those who were satisfied with their size, and those who wished to look heavier.

Change in relative weight from the age of 7 months to 8 years was compared between those who wished to be thinner, those who were satisfied with their size, and those who wished to look heavier by applying linear mixed models with random coefficient. The fitted model was a subject-specific linear regression (growth curve) model. In this model, each group has a population-average regression line of weight by age, and each subject is allowed to have a subject-specific regression line with its own intercept and slope parameter. The idea of this modeling technique is that in addition to the estimation of the overall average trend growth in each group, the subject-specific trend growth is also allowed for each subject, which is formulated in the model using random parameters. In our data, the growth curves were nonlinear for the total age period from 7 months to 8 years. Instead of fitting a nonlinear regression function into the whole data, the age period was analyzed in 2 subperiods, 7 months to 3 years and 3 to 8 years. The growth trends of relative weight were estimated with linear regression models fitted separately into these subperiods to improve the goodness of fit of the model and the interpretation of the parameters. The modeling was done with and without adjusting for relative weight at the age of 8 years. The computations were done with MIXED procedure of the SAS system (version 8.2; SAS Institute Inc, Cary, NC).

**RESULTS**

Data on body weight and height of the children at the age of 8 years are presented in Table 1. As presented in Table 2, girls were on average more dissatisfied with their bodies than boys, and they chose significantly thinner figures both as representing their own size and as their ideal size, when adjusted for relative weight. The Figure presents the mean curves of relative weight since infancy in girls and boys who at the age of 8 years wished to be thinner, were satisfied with their size, or wished to look heavier. Table 3 presents the slope estimates for average trends of change in relative weight of the children.
Between the ages of 7 months and 3 years, there were no significant differences in the slopes of the average trends of change in weight between those who at the age of 8 years wished to be thinner, were satisfied, or wished to look heavier. However, the average level of relative weight differed in the 3 groups ($P<.001$ in girls; $P=.003$ in boys). Those who wished to be thinner had on average been heavier than the other children for the age period 7 months to 3 years. Between the ages of 3 and 8 years, the slopes of the trends of change in weight differed in the groups ($P=.002$ in girls; $P=.02$ in boys), because the increase in relative weight was more rapid for those who at the age of 8 years wished to be thinner compared with the other groups.

After adjusting for relative weight at age 8 years, the association between the average level of relative weight at age 7 months to 3 years and body dissatisfaction at age 8 years was no longer statistically significant. Difference in the slopes of the trends of change in weight from age 3 to 7 years remained statistically significant between those wishing to be thinner, satisfied, and wishing to look heavier, after the adjustment for relative weight at age 8 years ($P=.001$ in girls; $P=.02$ in boys), be- cause the increase in relative weight was more rapid for those who at the age of 8 years wished to be thinner compared with the other groups.

In children, current body size (body mass index) and body dissatisfaction are known to be associated. Adiposity correlates with higher degrees of body dissatisfaction and desire to be thinner.$^{20}$ This was the case also in our sample, as described earlier; relative weight correlated positively with body dissatisfaction.$^{27}$ Gardner et al$^{2}$ found that with larger increases in weight during the previous year, 7- to 13-year-old children became more dissatisfied with their bodies and wanted a thinner body size, and with larger increases in height, the children became less dissatisfied with their bodies and wanted a larger body size. Thus, there appears to be a logical connection also between body dissatisfaction and the changes in weight and height in children. To our knowledge, for the first time we now show that body dissatis- faction at prepuberty is actually associated with the preceding change in relative weight since infancy. Eight-year-old girls and boys showing a desire to be thinner were on average heavier since the age of 7 months, and their weight gain (increase in relative weight) was more rapid between the ages of 3 and 8 years compared with their peers. When the effect of weight status at the age of 8 years was controlled for, the difference in the increase of relative weight per year from the age of 3 years onward remained significant between those wishing to be thinner, those who were satisfied, and those wishing to look heavier.

The 2 sexes differed regarding body dissatisfaction. The 8-year-old girls in our sample were on average more dissatisfied with their bodies and reported more desire to be thinner in comparison with boys. This sex difference is a consistent finding observed in the Western societies, in adults,$^{21,22}$ adolescents,$^{23-25}$ and children.$^{3-5}$ Further, we found that the increase in relative weight during the preceding 5 years was most prominent in prepubertal girls wishing to be thinner.

### Table 2. Estimated Current Body Size, Desired Body Size, Body Dissatisfaction (Distinction Between Current and Desired Sizes), and Proportions of (Dis)satisfaction At Age 8 Years

<table>
<thead>
<tr>
<th></th>
<th>Girls ($n = 205$)</th>
<th>Boys ($n = 230$)</th>
<th>$P$ Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current body size, mean (SD)$^*$</td>
<td>3.79 (0.82)</td>
<td>4.07 (0.93)</td>
<td>$.001†</td>
</tr>
<tr>
<td>Range</td>
<td>2 to 6</td>
<td>1 to 6</td>
<td></td>
</tr>
<tr>
<td>Desired body size, mean (SD)$^*$</td>
<td>3.51 (0.84)</td>
<td>4.05 (1.11)</td>
<td>$.001†</td>
</tr>
<tr>
<td>Range</td>
<td>1 to 6</td>
<td>1 to 7</td>
<td></td>
</tr>
<tr>
<td>Body dissatisfaction, mean (SD)$^*$</td>
<td>0.27 (1.04)</td>
<td>0.03 (1.22)</td>
<td>.04†</td>
</tr>
<tr>
<td>Range</td>
<td>–3 to 3</td>
<td>–3 to 5</td>
<td>.006</td>
</tr>
<tr>
<td>Satisfaction, No. (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wishing to be thinner</td>
<td>35.6 (73)</td>
<td>32.2 (74)</td>
<td></td>
</tr>
<tr>
<td>Satisfied</td>
<td>43.4 (89)</td>
<td>33.5 (77)</td>
<td></td>
</tr>
<tr>
<td>Wishing to look heavier</td>
<td>21.0 (43)</td>
<td>34.3 (79)</td>
<td></td>
</tr>
</tbody>
</table>

$^*$Current and desired body sizes were rated on a scale of 1 to 8.
†Adjusted for relative weight.
‡Body dissatisfaction was rated on a scale of −7 to 7 with positive values indicating desire to be thinner.

**Figure.** Relative weight, by percentage (mean ± SEM), between the ages of 7 months and 8 years in girls (A) and boys (B) who at the age of 8 years wished to be thinner, were satisfied with their size, or wished to look heavier. Relative weight is the deviation of weight in percentage from the mean weight of healthy Finnish children of the same height and sex.$^{15}$
Table 3. Slope Estimates (95% CIs) for Trends of Change in Relative Weight

<table>
<thead>
<tr>
<th></th>
<th>7 mo to 3 y</th>
<th>3-8 y*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate (95% CI)</td>
<td>Adjusted Estimate (95% CI)†</td>
</tr>
<tr>
<td>Girls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wishing to be thinner</td>
<td>-1.26 (-1.99 to -0.52)</td>
<td>-1.25 (-1.99 to -0.51)</td>
</tr>
<tr>
<td>Satisfied</td>
<td>-2.08 (-2.74 to -1.42)</td>
<td>-2.09 (-2.76 to -1.43)</td>
</tr>
<tr>
<td>Wishing to look heavier</td>
<td>-2.62 (-3.58 to -1.66)</td>
<td>-2.62 (-3.58 to -1.66)</td>
</tr>
<tr>
<td>Boys</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wishing to be thinner</td>
<td>-0.30 (-0.96 to 0.37)</td>
<td>-0.30 (-0.96 to 0.37)</td>
</tr>
<tr>
<td>Satisfied</td>
<td>-0.68 (-1.34 to -0.02)</td>
<td>-0.67 (-1.32 to -0.01)</td>
</tr>
<tr>
<td>Wishing to look heavier</td>
<td>-1.12 (-1.77 to -0.47)</td>
<td>-1.11 (-1.76 to -0.47)</td>
</tr>
</tbody>
</table>

Abbreviation: CI, confidence interval.
*Estimates adjusted for relative weight at age 8 years were calculated for the age period of 3 to 7 years.
†Adjusted for relative weight at age 8 years.

Body image and body satisfaction are complex constructs and difficult to measure precisely. Using silhouettes representing various body sizes to measure body image has been criticized, for example, for being coarse and for forcing continuous variables into an ordinal scale. Second, measuring body satisfaction with figures ranging from thin to obese may undermine the true degree of body dissatisfaction among boys; a boy desiring a more muscular body, but not a fatter one, may select a “compromise” image that does not fully reveal the magnitude of the desired change in body size. Despite limitations, distinction between current and desired sizes in a figure rating scale is strongly correlated with body dissatisfaction measured with other methods, which indicates reasonable validity. Further, body-figure rating scales have many advantages, especially when used with children, because they require no special verbal ability, are simple, and quick to administer.

In conclusion, body dissatisfaction in children is not a random phenomenon, or a whim of fashion. Body dissatisfaction, especially desire to be thinner, may be the result of a long development. The found association between body dissatisfaction at prepuberty and the preceding weight gain is compatible with a hypothesis that, perhaps from early on, one observes being bigger or heavier than one’s peers and that, perhaps from early on, one becomes aware of society’s standards concerning the ideal, preferable (ie, slim) body size and shape. Since body image disturbances and obesity in youth are current and increasing problems, attempts to support the development of positive body-esteem and efforts to prevent excessive weight gain in children are important goals. Our findings suggest that aspiring to these 2 goals, which are closely connected, should start early.

Accepted for Publication: January 20, 2005.
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Funding/Support: This study was supported by grants from the Finnish Cultural Foundation, Helsinki; the Juho Vainio Foundation, Helsinki; the Signe and Ane Gyllenbert Foundation, Helsinki; the Emil Aaltonen Foundation, Tampere; the Oskar Oflund Foundation, Espoo; and the Foundation for Pediatric Research, Helsinki.

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