

Body Satisfaction in 8-Year-Old Children After Long-term Dietary Counseling in a Prospective Randomized Atherosclerosis Prevention Trial

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Objective: To investigate whether dietary counseling designed for primary prevention of atherosclerosis and given repeatedly since infancy had an effect on prepubertal children's body satisfaction.

Design: Randomized controlled trial.

Participants: At the age of 7 months, 1062 infants were randomized to an intervention group (n=540) or a control group (n=522). At the age of 8 years, body satisfaction of 217 children in the intervention group and 218 in the control group was evaluated.

Intervention: Since the children were 8 months old, families in the intervention group had regularly received individualized health education and dietary advice aimed at decreasing the children's intake of saturated fat and cholesterol.

Main Outcome Measures: A pictorial instrument was used in measuring estimated current and desired body

sizes; a difference between the 2 indicated body dissatisfaction. Weight and height were measured.

Results: When adjusted for relative weight, there were no differences in the mean values of estimated current size, desired size, or body dissatisfaction between the girls in the intervention and control groups ($P=.62$, $P=.72$, and $P=.39$, respectively), or between the boys in the intervention and control groups ($P=.21$, $P=.64$, and $P=.53$, respectively). The proportions of children who were satisfied with their size, who wished to be thinner, or who wished to look heavier did not differ between the intervention and control groups in either girls ($P=.65$) or boys ($P=.85$).

Conclusion: Long-term, individualized dietary counseling since infancy with the focus on dietary fat did not enhance body dissatisfaction or desire to be thinner in 8-year-old children.

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INTERVENTIONS AIMED at health promotion may have unintended, untoward side effects. Safety of interventions needs to be carefully evaluated, in particular when they are targeted at children. The idea that promotion of healthful behaviors and prevention of coronary artery disease should begin in early life is well supported,¹ although suitability of fat restriction for children is still under debate.²⁻⁴ Effects and safety of diets low in saturated fat and cholesterol on somatic health of children have been investigated since the report by Friedman and Goldberg in 1976,⁵ but reports on psychological effects of dietary interventions aimed at atherosclerosis prevention are scanty. Among the few is the report from the Dietary Intervention Study in Children, in which adverse psychological effects of a cholesterol-lowering diet were not found in school-aged children when examined after 3 years of intervention.⁶

In the Special Turku Coronary Risk Factor Intervention Project for Children (STRIP), a long-term atherosclerosis prevention trial with onset in infancy, both efficacy and safety of the intervention were determined, and favorable effects were obtained. In this randomized, controlled trial in which a low-saturated-fat, low-cholesterol diet was recommended by individualized dietary counseling of families, intake of saturated fatty acids was markedly reduced during the first 5 years of life.⁷ This effect on the quality of dietary fat was shown to be present at the age of 7 years.⁸ The age-related increase in young children's serum cholesterol concentrations was also diminished.^{7,9}

Adverse somatic effects of the STRIP intervention have not been found. Dietary counseling of families had no untoward effects on young children's growth^{10,11} or neurological development.⁷ Observations regarding psychosocial development and

emotional well-being of the children participating in STRIP were less straightforward.¹²

Whenever diet is being modified, one aspect of safety arises from the complex and sensitive nature of eating behavior. Well-meaning actions may sometimes be harmful in regard to the attitudes and habits related to food and body, eg, some interventions designed to prevent eating disorders have paradoxically led to increases in behaviors that were intended to be decreased.^{13,14} Interestingly, in children's minds, healthy diet appears to be associated with adequate body size: Ross¹⁵ found that 10- to 12-year-old children described that someone who ate healthy foods would be "thin" or "not that skinny, not fat either." Accordingly, exposure to regular dietary advice emphasizing dietary fat in an atherosclerosis prevention project might evoke body size dissatisfaction and desire to be thinner, at least in individuals predisposed to such feelings. These phenomena are of concern in prepubertal children, as they may be a prelude to restrictive or disturbed eating.^{16,17}

We investigated whether long-term exposure to family-based, child-oriented dietary counseling in the STRIP had effects on 8-year-old children's body size estimations, body size ideals, or body satisfaction. The age of 8 years was chosen, as body dissatisfaction is evident in children from 8 years of age onward,¹⁸ but at this age puberty usually does not yet complicate body image.

METHODS

STUDY DESIGN

The design and protocol of the STRIP have been described in detail elsewhere.^{9,10} In brief, families of 5-month-old infants were recruited at the well-child clinics in the city of Turku, Finland. The families were enrolled in the study between February 23, 1990, and June 30, 1992. At the age of 7 months, 1062 infants (56.5% of the eligible cohort) were allocated into an intervention group (n=540) or a control group (n=522) by random numbers. The aims were to alter exposure of the intervention group children to environmental atherosclerosis risk factors by individualized dietary and lifestyle counseling of families, and to monitor effectiveness and safety of the intervention. Food consumption of the children was regularly recorded by parents or other caregivers. Serum lipid and lipoprotein concentrations, growth, and development were monitored during regular visits of the families to the STRIP counseling team. Counseling and data gathering took place at the Research Centre of Applied and Preventive Cardiovascular Medicine of Turku University, Turku. The STRIP study was approved by the Joint Commission on Ethics of Turku University and Turku University Central Hospital, and informed consent was obtained from the parents.

COUNSELING

As previously described in detail,¹⁹ the intervention group families received regular, individualized dietary advice and health education. Each family visited a pediatrician, a dietitian, and a nurse in the beginning of the trial at 1- to 3-month intervals, and half-yearly since the child was 2 years old. Risk factors for atherosclerosis were discussed, and the family received feedback on the child's diet based on 4-day food records. The dietitian suggested small changes in food choice and preparation; the main aim was a diet low in saturated fat and cholesterol.

From the age of 7½ years onward, dietary counseling was mainly directed at the child herself or himself. Age-adequate paper-pencil and plastic model tasks were introduced to enhance the child's knowledge of a heart-healthy diet.

The control group families met the STRIP team every 6 months at first and then, after the child was 7 years old, once a year. They received only the basic health education routinely given at the Finnish well-child clinics, with no special emphasis on atherosclerosis risk factors.

MEASUREMENTS

When the child was 8 years old, weight and height were measured with the child wearing underwear. Weight to the nearest 0.1 kg was measured with an electronic scale, and standing height to the nearest 0.1 cm was measured with a Harpenden stadiometer. Relative weight (deviation of weight in percentage from the mean weight of healthy children of the same height and sex) and relative height (deviation of height in SD units from the mean height of healthy children of the same age and sex) were calculated from growth curves for Finnish children.²⁰

Estimations of current body size and desired body size of the children were obtained by means of a pictorial instrument developed by Childress et al.²¹ 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 current and desired sizes, with positive values indicating desire to be thinner.

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

REPRESENTATIVENESS OF THE STUDY CHILDREN

Representativeness of the sample of the STRIP trial has been thoroughly described.⁷ According to Rask-Nissilä et al,⁷ there were no differences in the socioeconomic and health belief characteristics between the participating families and a randomly selected group of nonparticipating families, when analyzed after recruitment. Furthermore, the mean heights, weights, and serum cholesterol concentrations of the children who remained in the study (at age 5 years) were no different from those of the entire initial study cohort (at age 7 months).

At the age of 8 years, 658 children (62.0% of the original study cohort) were still participating in the STRIP trial. Of these, 444 children and their families were approached at the beginning of their visit to the STRIP counseling team and asked to take part in the present study. These children were not systematically selected; rather, the group was limited for practical reasons. As it was found to be important for the same person to inquire about body satisfaction of each child, sometimes the timetables of the picture test administrator (S.S.) and the families simply did not match. The families were asked whether the child would "complete a little task"; all parents gave oral consent, but 3 children (0.7%) refused to participate. Six (1.4%) were excluded because of unclear response to the inquiries about current and ideal sizes (eg, changing the response several times). Thus, the final subsample of STRIP children included in the present study consisted of 435 children, representing 66.1% of the total sample of 8-year-old STRIP participants. Subject progress through the phases of the study is shown as a flow diagram in the **Figure**.

The final sample in the present study did not differ from the rest of the 8-year-old STRIP participants (n=223) regarding the mean values of relative weight, years of education of mother and father, number of children in the family, and proportions of overweight children, underweight children, and 1-parent families.

DESCRIPTION OF SUBJECTS

Of the 435 eight-year-old 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 the boys, 113 (49.1%) were in the intervention group and 117 (50.9%) were in the control group. **Table 1** gives the body weight and height of the children. There were no differences in the mean values of weight, relative weight, height, or relative height between the girls in the intervention and control groups, or between the boys in the 2 groups ($P=.36$ to $.79$). Also, the percentages of overweight children and underweight children were no different between the 2 study groups, in either the girls or the boys ($P=.18$ to $.66$). Background data (years of parental education, size of family) are presented in **Table 2**.

STATISTICAL ANALYSES

Each analysis was conducted separately for the 2 sexes, because body dissatisfaction is markedly more common among school-aged girls than boys.²²⁻²⁴ This difference is prominent in the desire to be thinner.²⁵⁻²⁷

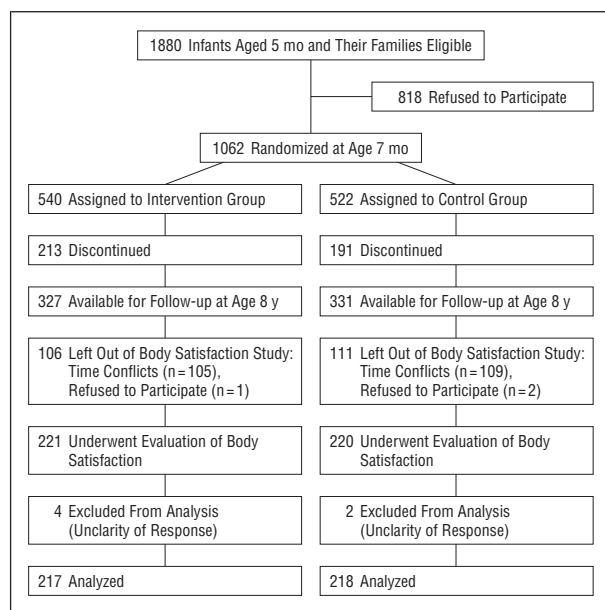
To analyze representativeness of the sample, the 8-year-old children included in the present study were compared with the rest of the 8-year-old STRIP participants. Wilcoxon 2-sample tests were used to evaluate between-group differences in relative weight, years of education of parents, and number of children in the family. Fisher exact test was conducted to compare proportions of underweight children, and χ^2 tests were conducted to compare proportions of overweight children and of children from 1-parent families in the 2 groups.

In the sample, differences in weight, relative weight, height, and relative height between the intervention and control groups were examined by Wilcoxon 2-sample test and unpaired, 2-tailed t test, where appropriate. Proportions of underweight children and overweight children were compared by means of Fisher exact test and χ^2 test, respectively. Actual body size of children is known to be positively correlated with body dissatisfaction^{25,28}; thus, estimated and desired body sizes and body dissatisfaction were adjusted for relative weight when the intervention and control groups were compared. Rank analysis of covariance²⁹ was used with children's relative weight as a covariate.

The χ^2 tests were conducted to compare the intervention and control groups regarding the proportions of those who were satisfied with their size, those who wished to be thinner, and those who wished to look heavier. Spearman correlation coefficients were calculated to measure whether estimated and desired body sizes and body dissatisfaction were correlated to relative weight. To investigate the possibility of a coefficient of relative weight and STRIP group on body size estimations, ideals, and body dissatisfaction in girls, the intervention and control groups were compared by means of unpaired, 2-tailed t tests separately among the heaviest and lightest girls, ie, those in the highest and lowest quartiles of relative weight, respectively.

RESULTS

The children in the intervention group did not differ from the children in the control group regarding the mean values of estimated current body size, desired body size, or



Flow diagram of the Special Turku Coronary Risk Factor Intervention Project for Children.

body dissatisfaction, in either girls or boys (**Table 3**). The proportions of girls and boys who were satisfied with their size, who wished to be thinner, or who wished to look heavier did not differ between the intervention and control groups (Table 3).

A positive correlation between relative weight and estimation of current body size, seen in the other groups of children except in the girls in the intervention group, indicates reasonable accuracy in children's ability to estimate their own size (**Table 4**). Unlike for boys, relative weight and desired body size of the girls in the intervention group correlated inversely, ie, the heavier the girl, the thinner the desired size. A similar trend was observed in the girls in the control group. In the intervention and control groups and in both sexes, body dissatisfaction correlated positively with relative weight, indicating that the heavier the child, the stronger the dissatisfaction and desire to be thinner (Table 4). As the girls in the intervention group appeared to differ from the other groups of children—they were poorer in estimating their own size, and body dissatisfaction was only weakly correlated with relative weight—the possibility of a coefficient of the STRIP intervention and relative weight on estimated and desired body sizes and body dissatisfaction in girls was analyzed. There were no differences between the STRIP groups in these variables when analyzed in the heaviest and lightest girls separately, showing that there was no coefficient of relative weight and the STRIP intervention (**Table 5**).

COMMENT

The results show that 8-year-old children who were targets of regular, intensive, family-based dietary counseling and health education in the STRIP project since infancy did not differ from controls regarding body dissatisfaction or desire to be thinner. This adds a new point of view to earlier evaluations of safety of STRIP.^{7,10,11,30} Effective coun-

Table 1. Weight, Relative Weight, Height, Relative Height, and Proportions of Overweight and Underweight Children at Age 8 Years*

	Girls		Boys	
	Intervention (n = 104)	Control (n = 101)	Intervention (n = 113)	Control (n = 117)
Weight, kg, mean (SD)	27.0 (4.0)	27.8 (5.3)	27.5 (4.0)	27.9 (4.0)
Relative weight, mean (SD)	+3.4 (10.7)	+5.0 (13.6)	+1.7 (10.8)	+2.6 (10.8)
Height, cm, mean (SD)	128.4 (5.5)	128.9 (4.9)	129.8 (5.2)	130.0 (4.9)
Relative height, mean (SD)	+0.07 (1.04)	+0.16 (0.93)	+0.21 (0.93)	+0.25 (0.87)
Overweight children, %	9.6	15.8	6.2	7.7
Underweight children, %	1.0	2.0	0.9	3.4

*Relative weight is the deviation of weight in percentage from the mean weight of healthy Finnish children of the same height and sex. Relative height is the deviation of height in SD units from the mean height of healthy Finnish children of the same age and sex. Overweight was defined as a relative weight of +20% or more and underweight as a relative weight of -15% or less. None of the differences between the intervention and control groups were significant.

Table 2. Background Data at Age 8 Years: Years of Education of Parents, Number of Children in the Family, and Proportion of 1-Parent Families

	Girls		Boys	
	Intervention (n = 84-93)*	Control (n = 88-96)*	Intervention (n = 91-98)*	Control (n = 100-110)*
Years of education of mother, mean (SD)	14.8 (3.5)	14.9 (4.1)	15.2 (3.3)	14.1 (3.6)
Years of education of father, mean (SD)	13.3 (3.0)	13.7 (3.8)	14.3 (4.5)	14.0 (4.2)
No. of children in the family, mean (SD)	2.3 (0.7)	2.3 (1.0)	2.3 (0.8)	2.4 (0.8)
1-Parent families, %	11.0	3.2	9.4	11.8

*Sample sizes vary slightly because of missing data.

Table 3. Estimated Current Body Size, Desired Body Size, Body Dissatisfaction (Distinction Between Current and Desired Sizes), and Proportions Satisfied or Dissatisfied at Age 8 Years

	Girls			Boys		
	Intervention (n = 104)	Control (n = 101)	P Value	Intervention (n = 113)	Control (n = 117)	P Value
Current body size*						
Mean (SD)	3.72 (0.77)	3.85 (0.86)	.62	4.13 (0.92)	4.02 (0.95)	.21
Range	2 to 5	2 to 6		2 to 6	1 to 6	
Desired body size*						
Mean (SD)	3.55 (0.86)	3.48 (0.82)	.72	4.08 (1.17)	4.02 (1.06)	.64
Range	1 to 6	1 to 5		1 to 7	1 to 6	
Body dissatisfaction*						
Mean (SD)	+0.17 (1.02)	+0.38 (1.07)	.39	+0.05 (1.23)	0.0 (1.21)	.53
Range	-3 to 3	-1 to 3		-3 to 5	-2 to 3	
Satisfaction, %						
Satisfied	46.2	40.6	.65	31.9	35.0	.85
Wishing to be thinner	32.7	38.6		33.6	30.8	
Wishing to look heavier	21.2	20.8		34.5	34.2	

*Current and desired body sizes were rated on a scale of 1 to 8. Body dissatisfaction was rated on a scale of -7 to 7, with positive values indicating desire to be thinner.

selling with the focus on heart-healthy diet and dietary fat had no influence on young children's growth^{10,11} or neurological development⁷; it had no effect on the frequency of eating problems of young children reported by mothers³⁰; and now we have shown that it did not add to body dissatisfaction in prepubertal children.

Body image and body satisfaction are complex constructs, and satisfaction with body size is not easy to measure precisely. Instruments with human figures ranging in size have many advantages: they are economical and

especially suitable for children, as they require no special verbal ability and are simple and quick to administer.³¹ Pictorial instruments do have limitations when used with children.³² They have also been criticized for being coarse and for forcing a continuous variable into an ordinal scale.³³ However, the validity of the picture method appears to be quite good.³⁴ While aware of the limitations, we found the silhouette measure developed by Childress et al²¹ appropriate and comprehensible for 8-year-old children. To enhance reliability, the same person using

Table 4. Correlations of Estimated Current Body Size, Desired Body Size, and Body Dissatisfaction (Distinction Between Current and Desired Sizes) With Relative Weight of the Children at Age 8 Years

	<i>r</i> (<i>P</i> Value)			
	Girls		Boys	
	Intervention (<i>n</i> = 104)	Control (<i>n</i> = 101)	Intervention (<i>n</i> = 113)	Control (<i>n</i> = 117)
Current body size	0.15 (.13)	0.39 (<.001)	0.42 (<.001)	0.26 (.005)
Desired body size	-0.19 (.05)	-0.17 (.09)	-0.04 (.67)	-0.11 (.24)
Body dissatisfaction	0.25 (.01)	0.47 (<.001)	0.34 (<.001)	0.30 (<.001)

Table 5. Estimated Current Body Size, Desired Body Size, and Body Dissatisfaction (Distinction Between Current and Desired Sizes) Among the Thinnest and Heaviest Girls at Age 8 Years*

	Thinnest Girls			Heaviest Girls		
	Intervention (<i>n</i> = 23)	Control (<i>n</i> = 23)	<i>P</i> Value	Intervention (<i>n</i> = 20)	Control (<i>n</i> = 26)	<i>P</i> Value
Current body size, mean (SD)	3.61 (0.78)	3.48 (0.85)	.59	3.87 (0.70)	4.04 (0.95)	.38
Desired body size, mean (SD)	3.83 (0.94)	3.70 (0.82)	.62	2.94 (0.88)	2.79 (0.82)	.35
Body dissatisfaction, mean (SD)	-0.22 (1.0)	-0.22 (0.80)	>.99	0.30 (1.18)	0.90 (1.01)	.16

*The thinnest girls were girls in the lowest quartile of relative weight; the heaviest were those in the highest quartile of relative weight.

similar instructions and style of interaction administered the picture test to all children.

Of the initial STRIP cohort of 1062 seven-month-old infants, 658 (62.0%) participated in the trial at the age of 8 years, and, of those, 435 (66.1%) were included in the present study. When nonparticipation in the beginning of the STRIP trial and later discontinuation were analyzed, representativeness of the children in the trial appeared quite good.⁷ It is a limitation that about one third of the eligible 8-year-old STRIP participants were left out of the sample of the present study. However, the children were unselected and were left out because of a time conflict between the family and the picture test administrator. The final sample of the present study was no different from the rest of 8-year-old STRIP participants regarding the background variables that we found relevant (eg, relative weight). Representativeness of the children included in the final analysis thus appears to be reasonable.

As we studied 8-year-old children, the conclusion that the long-term dietary intervention did not enhance body dissatisfaction is, of course, limited to this age point. It is possible that the negative effect of the intervention would appear later. Although body dissatisfaction and overweight concerns are already quite prevalent among young children,^{27,35} these concerns increase with age.³⁶ In the prospective, ongoing STRIP trial, we intend to carry out a follow-up study on body satisfaction at the age of 13 years in the study children.

Whether our findings can be generalized to other dietary interventions is difficult to answer. Besides STRIP, only a few prospective long-term dietary intervention trials in large samples of children have been carried out, and each is unique. One example is the Dietary Intervention Study in Children, a randomized trial designed to assess the efficacy and safety of a lipid-lowering diet in chil-

dren with elevated low-density lipoprotein cholesterol levels.³⁷ While STRIP is a population-based study in which the participants were exposed to dietary intervention since infancy, in the Dietary Intervention Study in Children the intervention was targeted at high-risk children aged 8 to 10 years at the beginning of the trial. The intervention given in the Dietary Intervention Study in Children was more intensive, as it included frequent group and individual sessions and telephone contacts, while the STRIP intervention consisted of individual counseling sessions only. How these attributes—age at onset and intensity of the intervention—influence the risk of body dissatisfaction is speculative.

Altogether, although our findings do not support concerns, we think that this aspect of intervention safety, effects on body satisfaction, is important to take into consideration in all kinds of dietary interventions. Especially girls and overweight subjects may be vulnerable to body image distortions. Interestingly, in our population, heavier girls tended to have thinner body size ideals, whereas in boys relative weight and body size ideals were not connected. Fortunately, however, we found no effect of relative weight and the STRIP intervention on estimated or desired body size, or on body dissatisfaction in girls.

Within the limitations of our study, the results are unique, as psychological side effects (or lack of them) of dietary interventions aiming at disease prevention have rarely been studied. To broaden the perspective, the results could be looked at through the debate about the legitimacy of health education. Body dissatisfaction and weight consciousness are almost an epidemic in the Western countries, at least in females.³⁸ It has been speculated that health education and health promotion may be partly responsible for increasing these pressures,^{39,40} and that messages about healthy eating are being read

What This Study Adds

In the prospective randomized STRIP, it was shown that atherosclerosis prevention via early promotion of healthy diet is compatible with normal growth and neurological development. Safety of this long-term intervention focusing on dietary fat needed to be evaluated regarding the effects on body dissatisfaction and desire to be thinner: due to the complex and sensitive nature of eating behavior, intervening dietary habits may have adverse psychological effects. Reports on psychological side effects of dietary interventions and health education are, altogether, scanty.

Regular, family-based dietary counseling and health education since infancy in the STRIP did not add to body dissatisfaction or desire to be thinner in 8-year-old children. Generalizability of these observations beyond the STRIP and beyond the age of 8 years remains a question; thus, this aspect of safety might be given some thought in any intervention that focuses on eating habits.

as meaning that one should lose weight.³⁹ There is evidence of this association in children.¹⁵ Whether the Finnish 8-year-olds associate healthy diet with appropriate body size cannot directly be gathered from our data. If they do, at least this association did not show as an increase in body dissatisfaction and desire to be thinner among children who had been repeatedly encouraged to eat healthily and to pay attention to dietary fat.

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