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Title: Sociodemographic and psychological characteristics associated with discrepancy between body satisfaction and weight change among adolescents

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Abstract

This study aimed to describe the discrepancy between body satisfaction change and weight change among adolescents following a 2-year school-based intervention, to identify associated sociodemographic factors, and to explore possible associations with perceived health indicators. We used data from a northeastern France representative adolescents sample (14-18 years old) who participated in the PRALIMAP (PRomotion de l'ALIMENTation et de l'Activité Physique) study (2006-2009). Weight change was measured by the change in body mass index z-score from the start to the end of the study. Body satisfaction and self-perceived health (anxiety, depression, eating disorder and quality of life) changes were assessed using self-administered questionnaires. Discrepancy between body satisfaction change and weight change was described with cross-tabulations, and subdivided into optimism/pessimism (i.e. positive/negative body satisfaction change compared to weight change). Sociodemographic factors associated with discrepancy were determined by multivariate logistic regression models. Adjusted linear regression models described 2-year change in weight and self-perceived health according to discrepancy. Among the 3279 adolescents included (aged 15.1 ± 0.6 years), the proportion of discrepancy was 74.8% (pessimism= 41.6%; optimism= 33.2%). Discrepancy, especially pessimism, was higher in boys than in girls (OR= 1.44 [1.19; 1.74], $p = .0002$), and in socially advantaged adolescents (OR= 1.82 [1.20; 2.74], $p = .004$) than in disadvantage ones. Body satisfaction change was rather in line with anxiety, depression and quality of life changes than weight change. Body satisfaction change should be considered in overweight and obesity prevention interventions alongside body weight change, and could be used as indicator of long-term behavior maintenance.

Clinical trials registry and number: ClinicalTrials.gov (NCT01688453)

Keywords: discrepancy; body satisfaction change; weight change; adolescent

1. Introduction

Main causes of overweight and obesity can be attributed to behaviors (Gurnani et al., 2015).

Promoting healthy behaviors (e.g healthy diet, regular physical activity), prevent excess weight gain among adolescents (Al-Khudairy et al., 2017; Bonsergent et al., 2013). Many interventions promoting healthy behaviors among adolescents were implemented and their effectiveness evidenced (Al-Khudairy et al., 2017). In a meta-analysis, the authors identified 20 behavioral interventions among adolescents with overweight or obesity and evidenced a significant lower mean body mass index (BMI) z-score change of 0.13 unit in intervention groups compared to control groups (Al-Khudairy et al., 2017).

The long-term maintenance of healthy behaviors following interventions remains challenging (Kwasnicka et al., 2016). Often, healthy behaviors developed during interventions are not sustained by participants. Rothman stressed that behavioral maintenance should be based on participants' satisfaction with the outcomes they have obtained (Rothman, 2000). Indeed, following an intervention, the weight loss could be as expected by participants and enhance their motivation to pursue the maintenance of behavioral changes. Besides weight change, motivation could be strengthened after a positive body satisfaction change. Body satisfaction can be defined as a person's positive thoughts and feelings about his or her body (Grogan, 2016). Thus, an adolescent who feels better about his or her body after a behavioral intervention might be more prone to sustain newly adopted behaviors on the long-term. For example, authors found that greater body satisfaction among adolescents was associated with healthier behaviors and (possibly as a consequence) lower probability of overweight and obesity five years later (Haines et al., 2007; Neumark-Sztainer et al., 2006).

Following Rothman's theory, the likelihood that adolescents would sustain behaviors after an intervention might be all the more important if they both felt better about their body and lost

weight. However, body satisfaction change and weight change may be discrepant. Specifically, adolescents may experience weight loss following an intervention, but not feel better about their body, or they may not lose weight, but experience an increased body acceptance. Consequently, adolescents' motivation to sustain behaviors may be modified based on the discrepancy between body satisfaction change and weight change. Noteworthy, given existing associations between body satisfaction and perceived health indicators as eating disorders, anxiety, depression and quality of life (Duchesne et al., 2016; Griffiths et al., 2017; Laporta-Herrero et al., 2018), changes in such indicators could explained discrepancy and deserved to be investigated.

The hypotheses of the study were as follows:

- discrepancy between body satisfaction change and weight change is expected
- sociodemographic factors are expected to be associated with discrepancy
- perceived health indicators could be associated with discrepancy

Therefore, this study aimed to describe the discrepancy between body satisfaction change and weight change among adolescents following a 2-year school-based intervention, to identify associated sociodemographic factors, and to explore possible associations with perceived health indicators

2. Materials and Methods

2.1. The PRALIMAP trial

In the current study, we used data from the PRALIMAP (“PRomotion de l’ALIMentation et de l’Activité Physique”) trial (Briançon et al., 2010). This controlled trial aimed at evaluating the effectiveness of 3 health promotion strategies –educational, screening and care, environmental– to prevent and reduce overweight and obesity prevalence among school-aged

adolescents. The PRALIMAP study was carried out from 2006 to 2009 in 24 public high schools, randomly selected from the 124 northeastern France state administrative high schools. High schools were assigned to receive the 3 strategies according to a 2×2× 2 factorial cluster (high school) randomization. Data were collected at grades 10 (T0=baseline), 11 and 12 (T2) entry. The study protocol was previously published and fully described in detail elsewhere (Briançon et al., 2010). The PRALIMAP trial was approved by the French National Commission for Computing and Liberties [CNIL] (no. 906312) and was registered at ClinicalTrials.gov (no. NCT00814554). A total of 3,504 adolescents completed the PRALIMAP study. From this sample, adolescents without body satisfaction change data at T2 were excluded.

2.2. Measurements

Weight change

Weight and height were measured twice in a single session by high school nurses at T0 and T2. The BMI was calculated as weight/height² from the mean of these 2 measurements. BMI z-score (i.e. age- and sex-specific BMI according to a reference) was calculated by measuring the distance (in SDs) between the measured BMI and the mean BMI of a WHO reference population (Onis et al., 2007). Weight change was calculated by the difference between BMI z-score at T2 and T0. According to Love-Osborne et al. (Love-Osborne et al., 2014), categories of BMI z-score differences were defined as follows: “weight loss” (< -0.05), “stable weight” (≥ -0.05 and ≤ 0.05), “weight gain” (> 0.05).

Body satisfaction change

Similarly to previous studies (Kruger et al., 2008; Mahfouz et al., 2018; Millstein et al., 2008), participants were asked to declare their body satisfaction change at T2 through the question: “Compared to how you were feeling at the start of the PRALIMAP study, how do

you feel about your weight today?”. Answers were to choose from “very definitely not as good”, “clearly not as good”, “not as good”, “just the same”, “better”, “clearly better”, “hugely better” and “do not know”.

Discrepancy between body satisfaction change and weight change

To match body satisfaction change with weight change, “very definitely not as good”, “clearly not as good” and “not as good” categories were combined into “worse”; “better”, “clearly better” and “hugely better” categories were clustered into “better”. We defined that body satisfaction change was consistent with weight change when adolescents in the “worse”, “just the same” and “better” groups matched with the “weight gain”, “stable weight” and “weight loss” groups, respectively. It was not possible to define which weight change matched to the answer “do not know”. Therefore, the discrepancy between body satisfaction change and weight change of adolescents who answered “do not know” could not be investigated. When body satisfaction change was consistent with weight change, adolescents were categorized in the *consistency* group; if not, they were categorized in the *discrepancy* group. Depending on the direction of discrepancy, the *discrepancy* group was sub-divided into the *optimism* group (i.e. body satisfaction change was positive compared to weight change) and the *pessimism* group (i.e. body satisfaction change was negative compared to weight change).

Sociodemographic characteristics

Sociodemographic data were collected at T0 from the Board of Education database and by auto-questionnaires, and consisted in age, sex, administrative area of high school (Meurthe-et-Moselle, Moselle, Meuse, Vosges), school boarding status (non-boarder, half-boarder, full boarder), family composition (two- or single-parent), school type (general and technological, professional), social and professional class of the family head (executives; intermediate jobs; farmers, shopkeepers, craftsmen and managers; employees and workers; inactive) (“Insee -

socioprofessionnelles agrégées,” 2003), schooling placement of adolescent (classical or advanced, late [in France, students classically enter grade 10 at the age of 15]), perceived family income level (low, moderate or high) and type of residence (rural or urban).

From these data, the “indice de position sociale des élèves” (IPSE) was derived to measure adolescents’ socioeconomic status (SES). The IPSE is a quantitative index developed by the statistical entity of the French Ministry of Education (Rocher, 2016). It summarized sociodemographic characteristics that define both parents’ occupations into a reference value. Reference values were applied to parents’ occupations in our database for defining adolescents’ SES. The IPSE index range from 40 (lowest SES) to 179 (highest SES) and was rescaled from 1 (lowest SES) to 10 (highest SES) for the current study. Based on some publications, an a priori classification of the IPSE scores in 5 classes was performed: [1-2] “Highly less advantaged”; [3-4] “Less advantaged”; [5-6] “Intermediate”; [7-8] “Advantaged” and [9-10] “Highly advantaged” (Akkoyun-Farinez et al., 2018; Legrand et al., 2017; Manneville et al., 2019).

Other health data

Eating disorders were assessed using the validated EAT-40 auto-questionnaire (Garner et al., 1982). This questionnaire screens for anorexic and bulimia symptoms, and consists of 40 items scored on a 6-point Likert scale. Anxiety and depression were measured with the HAD, an auto-questionnaire validated among adolescents (White et al., 1999; Zigmond and Snaith, 1983). The HAD is composed of 14 items scored on a 4-point Likert scale. Physical, mental, social and general quality of life were assessed using the Duke Health Profile-adolescent version, a validated auto-questionnaire with 17 items scored on a 3-point Likert scale (Vo et al., 2005). Scores of all questionnaires were normalized from 0 to 100, with 0 referring to

lowest eating disorders, lowest anxiety and depression disorders, and worst quality of life.

Age- and sex-specific international BMI cut-off values were used to define overweight and obesity (Cole et al., 2000).

2.3. Statistical analysis

First, continuous variables were described with mean \pm SD and categorical variables with number (%). Included adolescents were compared with excluded adolescents in terms of baseline sociodemographic characteristics and health data using the Student *t* test for continuous outcomes and the chi-square test for categorical variables.

Second, the evolution of BMI z-score from T0 to T2 was examined depending on body satisfaction change using linear regression models adjusted on age, sex and SES because the latter were associated with body satisfaction change.

Third, the discrepancy between body satisfaction change and weight change was described with cross-tabulations and results were reported as numbers (%). Weighted Cohen's kappa coefficient and its 95% confidence interval (CI) were computed to evaluate the degree of discrepancy.

Fourth, sociodemographic characteristics of adolescents in the *consistency* group were compared with the ones of adolescents in the *discrepancy*, *optimism* and *pessimism* groups using chi-square, Student *t* tests and ANOVA. Multivariate logistic binomial (discrepancy vs consistency) and multinomial (pessimism vs consistency; optimism vs consistency) regression models were conducted to examine associations of sociodemographic characteristics with *discrepancy*, *optimism* and *pessimism* groups. In these models, the *consistency* group was the reference group. SES (IPSE classes) was used as categorical variable to measure differences between social classes and as a discrete variable to test for trend between discrepancy and SES.

Finally, additional adjusted (age, sex, SES) linear regression models were computed to describe changes from T0 to T2 in BMI z-score, eating disorders, anxiety and depression scores, physical, mental, social and general quality of life scores according to consistency and discrepancy.

$P < .05$ was considered statistically significant. Statistical analyses involved use of SAS v9.4 (SAS Institute, Inc., Cary, NC).

3. Results

Description of the study sample

From the initial sample ($n = 3,504$), 225 adolescents (6.4%) without body satisfaction change data at T2 (non-respondents) were excluded. Thus, 3,279 adolescents (mean \pm SD age, 15.1 ± 0.6 years) were included in our study. Compared to excluded adolescents, included adolescents were more likely to be younger ($p < .0001$), to be girls ($p < .0001$), to perceive a higher family income level ($p = .008$), to be in a general and/or technological school ($p < .0001$), to have higher SES ($p = .03$), to come from high schools located in Moselle ($p = .04$), to not be overweight or obese ($p = .01$) and to have less depression symptoms ($p < .0001$) (**Table 1**).

Evolution of BMI z-score according to body satisfaction change

With regards to their body satisfaction change, 424 (12.9%) adolescents felt better, 2,164 (66.0%) just the same, 301 (9.1%) worse and 390 (11.9%) did not know. On average, BMI z-score significantly decreased from T0 to T2 for adolescents who felt better (mean = -0.24 ; $p < .0001$) and just the same (mean = -0.05 ; $p < .0001$) (**Table 2**). Adolescents who felt worse had a significant increase in their BMI z-score (mean = $+0.12$; $p < .0001$). There was no significant

change in BMI z-score among adolescents who did not know how their body satisfaction changed.

Discrepancy between body satisfaction change and weight change

Nearly three quarters (74.8%) of adolescents had discrepant body satisfaction change in relation to their weight change (**Table 3**). Among them, 41.6% were pessimistic: feeling worse while having lost weight (n= 86) or stable weight (n= 43), feeling the same while having lost weight (n= 1,073). Optimistic were distributed as follows: feeling better while having gained weight (n= 120) or stable weight (n= 43), feeling the same while having gained weight (n= 797). The weighted Cohen's kappa coefficient indicated poor consistency between body satisfaction change and weight change ($\kappa= 0.09$; 95% CI [0.07; 0.11]).

Sociodemographic characteristics associated with discrepancy

Bivariate analyses (**Supplementary Table 1**) showed that compared to girls, boys were significantly more likely to be discrepant than consistent (41.3% vs 35.2%; $p= .004$). Similar results were observed among pessimistic (44.1% vs 35.2%; $p= .0001$) but not optimistic (37.8% vs 35.2%; $p= .27$). Adolescents with higher SES tended to be more pessimistic than consistent.

Bivariate results were confirmed in multivariate analyses (**Table 4**). Compared to girls, boys remained more likely to be discrepant than consistent (Odds Ratio (OR)= 1.29; 95%CI [1.08; 1.53]; $p= .005$). This association was only present among pessimistic (OR= 1.44; 95%CI [1.19; 1.74]; $p= .0002$). The odds of being discrepant was higher among adolescents with high SES (Highly advantaged vs Highly less advantaged: OR= 1.59; 95%CI [1.09; 2.32]; $p= .01$), especially among pessimistic (OR= 1.83; 95%CI [1.21; 2.76]; $p= .004$). Trend test showed that discrepancy proportion significantly increased with increasing SES (OR= 1.09; 95%CI

[1.01; 1.17]; $p = .03$). This association was found among pessimistic only (OR= 1.12; 95%CI [1.03; 1.21]; $p = .007$).

Changes in BMI z-score, eating disorders, anxiety, depression and quality of life according to discrepancy

Results in **Table 5** showed that effect size of mean change in BMI z-score was lower among discrepant adolescents than consistent ones. For instance, among adolescents who lost weight, BMI z-score decreased by 0.52 ($p < .0001$), 0.35 ($p < .0001$) and 0.40 ($p < .0001$) for those who felt better, similar and worse, respectively. Optimistic adolescents exhibited significant decrease in eating disorders and anxiety scores. For example, adolescents who gained weight and felt similar showed a significant decrease in eating disorders (mean change= -0.92; $p = .004$) and anxiety (mean change= -1.26; $p = .04$) scores. Pessimistic, specifically adolescents who lost weight and felt worse had significant increase in eating disorders, anxiety and depression scores, and decrease in all quality of life dimensions. For example, general quality of life decreased by 7.04 points ($p < .0001$).

4. Discussion

The results of the current study are in line with our initial hypotheses. First, high discrepancy between body satisfaction change and weight change was highlighted in school-aged adolescents. Pessimistic students were more numerous than optimistic. Second, being a boy and coming from high SES were associated with discrepancy, specifically pessimism. Third, perceived health indicators (eating disorders, anxiety, depression and quality of life) were associated with discrepancy. Several results related to our hypotheses deserved to be discussed.

Overall, change in BMI z-score according to body satisfaction change was consistent with the literature. Eisenberg et al. evidenced that body satisfaction change was inversely associated

with BMI change (Eisenberg et al., 2006). Adolescents more satisfied with their body change had a decrease in BMI and those less satisfied with their body satisfaction had an increase in BMI (Eisenberg et al., 2006). Moreover, Mintem et al. studied the effect of BMI z-score change from childhood to adulthood on body satisfaction (Mintem et al., 2015). They evidenced that satisfaction with body was higher among individuals who exhibited a decrease in BMI z-score than among those with an increase in BMI z-score.

The discrepancy between body satisfaction change and weight change was high in our study (74.8%). This result can be explained by several reasons. First, discrepancy was observed mainly among adolescents who gained weight and felt similar (27.6%), and among those who lost weight and felt similar (37.1%). Thus, the effect size of weight change may not be large enough to be perceived by the adolescents, and therefore to affect body satisfaction of the latter. Second, it was shown that body satisfaction is associated with inter-related health factors as eating disorders, anxiety, depression and quality of life (Duchesne et al., 2016; Griffiths et al., 2017; Laporta-Herrero et al., 2018). Therefore, a change in these health outcomes could affect body satisfaction change, with a different direction from the one of the weight change. For example, adolescents might exhibit a weight decrease but feeling more negative about their body satisfaction due to an increase in eating, anxiety and depression disorders or a decrease in quality of life. This assumption is supported in our study. Overall, optimistic adolescents showed a decrease in eating disorders, anxiety and depression scores, an increase in quality of life scores, and the opposite for pessimistic ones. Thus, body satisfaction change would be more in line with perceptual rather than objective changes. Third, body image concern of adolescents might have changed during the PRALIMAP intervention. An adolescent who is increasingly concerned about his or her weight during the study could feel less good or similar even if he or she lost weight. This change in body image concern could be at risk of engaging in unhealthy weight control behaviors such as skipping

meals, self-induced vomiting, smoking cigarettes or excessive exercise (Lampard et al., 2016; Oellingrath et al., 2016; White and Halliwell, 2010). Fourth, change in body acceptance (i.e. accepting one's body regardless of not being completely satisfied with all aspects of it) might have occurred during the study (Griffiths, 2017). Adolescents could feel better or similar because they accept better their body even if they gained weight, and conversely.

In our study, being a boy increased the probability of discrepancy between body satisfaction change and weight change. The sociocultural model of body satisfaction developed by Thompson et al. may support this result (Franko et al., 2015; Thompson et al., 1999). Society (i.e., peers, parents and media) promotes an appearance culture that highlights the desirability of physical attractiveness and beauty ideals for individuals. Beauty ideals are then internalized by individuals, and, to the extent that their body satisfaction does not match these ideals, they become dissatisfied with their body (Franko et al., 2015; Lawler and Nixon, 2011; Thompson et al., 1999; Vries et al., 2016). Beauty ideal refers to a muscular or mesomorphic physique for boys (Lawler and Nixon, 2011). Therefore, an increase in weight among boys might be due to an increase in their muscle mass to achieve their ideal, and being close to or achieving this ideal would make boys feel better with their body. Thus, the fact of feeling worse after a weight loss might be explained by a decrease in muscle mass and consequently a distance from the beauty ideal. As girls' beauty ideal (thinness and low weight) differs from that of boys, their propensity to be discrepant might be lower. Weight reduction among girls brings them closer to their beauty ideal, thus increase body satisfaction. Discrepancy, especially pessimism was higher among adolescents from high SES compared to those from lower SES. It may suggest that physical appearance play a more significant role in body satisfaction among adolescents from high than low SES. Higher desire to be thinner was evidenced for youth from high than low SES (Wang et al., 2005). Thereby, even if adolescents from high SES showed weight loss, it might not be enough for them to positively affect their body

satisfaction. Interestingly, the discrepancy increased with increasing SES which could evidence a social gradient in discrepancy among adolescents. Therefore, when intervening on body satisfaction among adolescents, the scale and modalities of the intervention could be proportionate to their SES, respecting the proportionate universalism concept for instance (Marmot, 2010).

Limitations and strengths

The results of our study should be interpreted considering its limitations. First, body satisfaction change was assessed using a single self-administered question at T2 designed for the PRALIMAP study. It would have been better to measure body satisfaction at T0 and T2 to compute discrepancy. It would have allowed to take baseline body satisfaction into account but such data were not collected. Also, assessing satisfaction with the body and the appearance, instead of satisfaction with weight change, could have been interesting. However, the question focused on adolescents' feelings about their weight, which is consistent with Grogan's body satisfaction definition (Grogan, 2016). Specifically, this definition encompasses a feeling dimension that refers to emotions associated with body shape and size. Also, using a self-administered questionnaire may lead to reporting bias but numerous studies used this method to measure body satisfaction (Fan and Eiser, 2009; Neves et al., 2017). Second, eating disorders, anxiety and depression were assessed with questionnaire not specifically designed for adolescents but are frequently used and/or validated for this specific age group (Gleaves et al., 2014; White et al., 1999; Williams, 1987). Third, it would be interesting to simultaneously investigate discrepancy between body satisfaction change and weight change, and lean body and fat mass change. Unfortunately, the lean body and fat mass of adolescents were not measured in the current study. Besides these limitations, our study had some strengths such as its 2-year longitudinal design and large sample size. In addition,

weight and height were measured twice at T0 and T2 and not self-reported by adolescents, which limits measurement bias.

5. Conclusion

This study provides evidence that discrepancy between body satisfaction change and weight change is high among school-aged adolescents with increased likelihood for boys and adolescents with high socioeconomic status. It suggests that body satisfaction change could be considered in obesity prevention interventions alongside body weight change. This could improve the sustainability of behaviors adopted by adolescents and *in fine* the long-term effectiveness of interventions. Specific attention should be given to boys and socially advantaged adolescents to avoid possible inequalities in durable behavior maintenance.

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Table 1. Characteristics of adolescents included and excluded in the study

Characteristics	Total		Included		Excluded		p ^a
	N= 3,504		N=3,279 (93.6%)		N=225 (6.4%)		
	N	%	N	%	N	%	
Age (Mean ± SD)	15.2 ± 0.6		15.1 ± 0.6		15.4 ± 0.8		< .0001
School placement							< .0001
Advance (< 15 years)	363	10.4	342	10.4	21	9.3	
Classical (15 years)	2,316	66.1	2,200	67.1	116	51.6	
Late (> 15 years)	825	23.5	737	22.5	88	39.1	
Sex							< .0001
Boy	1,482	42.3	1,352	41.2	130	57.8	
Girl	2,022	57.7	1,927	58.8	95	42.2	
Perceived family income level							.008
High	2,054	61.1	1,945	61.7	109	52.4	
Low or average	1,308	38.9	1,209	38.3	99	47.6	
Missing	142		125		17		
Residence							.12
Urban	1,690	50.2	1,571	49.8	119	55.3	
Rural	1,677	49.8	1,581	50.2	96	44.7	
Missing	137		127		10		
School type							< .0001
General and/ or technological	2,981	85.1	2,823	86.1	158	70.2	
Professional	523	14.9	456	13.9	67	29.8	
Social and professional class of the family							.02
Executives, intermediate jobs, farmers, shopkeepers, craftsmen, managers	1,897	54.6	1,796	55.2	101	45.3	
Employees and workers	1,382	39.7	1,276	39.2	106	47.5	
Inactive (retired, unemployed)	198	5.7	182	5.6	16	7.2	
Missing	27		25		2		
Administrative area of high school							.04
Meurthe-et-Moselle	1,090	31.1	1,015	31.0	75	33.3	
Moselle	1,313	37.5	1,246	38.0	67	29.8	
Meuse and Vosges	1,101	31.4	1,018	31.0	83	36.9	
Socioeconomic status (IPSE classes)							.03
Highly advantaged	318	9.1	301	9.2	17	7.6	
Advantaged	683	19.5	653	19.9	30	13.3	
Intermediate	1,027	29.3	962	29.3	65	28.9	
Less advantaged	956	27.3	889	27.1	67	29.8	
Highly less advantaged	520	14.8	474	14.5	46	20.4	
Overweight or obesity at T0							.01
Yes	637	18.2	582	17.8	55	24.4	
No	2,867	81.8	2,697	82.2	170	75.6	
Overweight or obesity at T2							.26
Yes	605	17.3	560	17.1	45	20.0	
No	2,899	82.7	2,719	82.9	180	80.0	
Body Mass Index z-score (Mean ± SD)	0.23 ± 1.0		0.23 ± 0.9		0.34 ± 1.1		.13
Eating disorders (Mean ± SD)	11.2 ± 8.1		11.2 ± 8.1		11.8 ± 8.7		.32
Anxiety (Mean ± SD)	38.1 ± 17.8		38.2 ± 17.8		37.4 ± 18.0		.57
Depression (Mean ± SD)	18.1 ± 12.4		17.8 ± 12.2		21.6 ± 14.5		< .0001
Quality of life (Mean ± SD)							
Physical	75.9 ± 18.0		75.8 ± 18.0		77.6 ± 18.1		.17
Mental	65.9 ± 22.6		66.0 ± 22.7		64.7 ± 21.5		.41
Social	69.2 ± 18.9		69.3 ± 18.8		67.7 ± 20.3		.22

General	70.3 ± 15.3	70.4 ± 15.3	70.0 ± 15.1	.72
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^a *p* values were determined using Chi square and Student *t* tests

Table 2. Body mass index z-score change depending on body satisfaction change among adolescents of the study sample (n= 3,279)













Body satisfaction change	T0 Mean (SD) ^a	T2 Mean (SD) ^a	T2-T0						
			Mean [IC 95 %] ^a	p ^b	Min	Q1	Med	Q3	Max
Better (n= 424)	0.56 (1.0)	0.33 (0.9)	-0.24 [-0.28; -0.19]	< .0001	-1.7	-0.5	-0.2	0.1	1.8
Just the same (n= 2,164)	0.13 (1.0)	0.08 (1.0)	-0.05 [-0.07; -0.03]	< .0001	-2.0	-0.3	-0.1	0.2	1.5
Worse (n= 301)	0.31 (1.0)	0.43 (1.0)	0.12 [0.07; 0.17]	< .0001	-2.5	-0.1	0.1	0.4	2.1
Do not know (n= 390)	0.27 (1.0)	0.24 (1.0)	-0.03 [-0.07; 0.01]	.13	-1.9	-0.3	-0.0	0.3	1.7

Note: T0, baseline; T2, end of the PRALIMAP intervention; Min, Minimum; Q1: first quartile; Med: Median; Q3: third quartile; Max: Maximum

^a means are adjusted on sex, age and socioeconomic status

^b p values were determined using linear regression models for differences in BMI z-score from T0 to T2 adjusted on sex, age and socioeconomic status

Table 3. Description of consistency and discrepancy between body satisfaction change and weight change among adolescents (n=2,889)

Weight change	Body satisfaction change	Consistency/ discrepancy (optimism and pessimism)
 n= 1,089 (37.7%)	 n= 172 (15.8%)	<i>consistency:</i> Feeling worse while having gained weight
	 n= 797 (73.2%)	<i>optimism:</i> Feeling similar while having gained weight
	 n= 120 (11.0%)	<i>optimism:</i> Feeling better while having gained weight
 n= 380 (13.1%)	 n= 43 (11.3%)	<i>optimism:</i> Feeling better while having stable weight
	 n= 294 (77.4%)	<i>consistency:</i> Feeling similar while having stable weight
	 n= 43 (11.3%)	<i>pessimism:</i> Feeling worse while having stable weight
 n= 1,420 (49.1%)	 n= 86 (6.0%)	<i>pessimism:</i> Feeling worse while having lost weight
	 n= 1,073 (75.6%)	<i>pessimism:</i> Feeling the same while having lost weight
	 n= 261 (18.4%)	<i>consistency:</i> Feeling better while having lost weight







 refers to feeling better;
  refers to feeling similar;
  refers to feeling worse;
  refers to a weight loss;
  refers to stable weight;
  refers to a weight gain
 Data are n(%). Consistency and discrepancy could not be investigated among the 390 adolescents who did not know how their body satisfaction changed.

Table 4. Socioeconomic characteristics associated with discrepancy among adolescents (n= 2,889): multivariate analyses

Socioeconomic characteristics		discrepancy (n= 2,162)		pessimism (n= 1,202)		optimism (n= 960)	
Weight change	Body satisfaction	BMI z-score	Eating disorders	Anxiety	Depression		
		Odds Ratio [95% CI]	p ^a	Odds Ratio [95% CI]	p ^a	Odds Ratio [95% CI]	p ^a
Age		1.07 [0.93; 1.23]	.34	1.05 [0.90; 1.23]	.50	1.09 [0.93; 1.28]	.29
Sex			.005		.0002		.30
	Girl	1		1		1	
	Boy	1.29 [1.08; 1.53]		1.44 [1.19; 1.74]		1.11 [0.91; 1.36]	
Socioeconomic status			.08				
	Highly less advantaged	1		1		1	
	Less advantaged	1.20 [0.91; 1.58]	.19	1.34 [0.98; 1.82]	.06	1.06 [0.78; 1.45]	.70
	Intermediate	1.07 [0.82; 1.41]	.61	1.15 [0.85; 1.56]	.35	0.99 [0.73; 1.35]	.96
	Advantaged	1.30 [0.97; 1.75]	.08	1.49 [1.07; 2.07]	.02	1.11 [0.79; 1.56]	.54
	Highly advantaged	1.59 [1.09; 2.32]	.01	1.83 [1.21; 2.76]	.004	1.36 [0.89; 2.08]	.16
	Test for trend ^b	1.09 [1.01; 1.17]	.03	1.12 [1.03; 1.21]	.007	1.05 [0.97; 1.15]	.24

Note: 95% CI, 95% Confidence Interval

^ap values were determined using multivariate binomial (discrepancy vs consistency) and multinomial (pessimism vs consistency; optimism vs consistency) logistic regression models. In each model, the consistency group was the reference group.

^bThe significance of the test for trend evidenced that discrepancy increase with increasing socioeconomic status.

Consistency and discrepancy could not be investigated among the 390 adolescents who did not know how their body satisfaction changed.

























		Mean at T0 (SD)	Mean change (SD) ^a	p ^a	Mean at T0 (SD)	Mean change (SD) ^a	p ^a	Mean at T0 (SD)	Mean change (SD) ^a	p ^a	Mean at T0 (SD)	Mean change (SD) ^a	p ^a
Weight change		Quality of Life											
	 satisfaction n= 172 (15.8%)	0.33 (1.1)	0.43 (0.3)	< .0001	12.9 (8.5)	2.52 (8.6)	.0001	44.1 (18.2)	-0.37 (16.8)	.35	18.9 (12.5)	3.54 (14.7)	.002
	 n= 797 (73.2%)	0.04 (1.2)	0.34 (0.3)	< .0001	10.3 (9.0)	-0.92 (9.0)	.004	35.9 (19.1)	-1.26 (17.7)	.04	17.3 (13.0)	-0.58 (15.4)	29
	 n= 120 (11.0%)	0.05 (1.1)	0.32 (0.3)	< .0001	11.6 (8.4)	-1.33 (8.4)	.08	38.7 (17.9)	-1.70 (16.5)	.26	17.5 (12.2)	-0.29 (14.5)	.82
	 n= 43 (11.3%)	0.44 (0.9)	0.01 (0.0)	.34	10.3 (6.4)	-1.16 (6.6)	.26	40.8 (17.2)	-5.61 (16.3)	.03	18.8 (11.9)	-1.99 (12.4)	.30
	 n= 294 (77.4%)	0.07 (1.0)	0.00 (0.0)	.59	9.2 (6.9)	-1.18 (7.1)	.005	36.1 (18.2)	-2.58 (17.3)	.01	17.1 (12.8)	-1.97 (13.3)	.01
	 n= 43 (11.3%)	0.44 (0.9)	0.01 (0.0)	.17	14.4 (6.4)	-0.56 (6.6)	.58	48.1 (16.9)	-1.47 (16.0)	.55	21.0 (11.9)	2.25 (12.4)	.24
	 n= 86 (6.0%)	0.23 (0.9)	-0.40 (0.3)	< .0001	12.2 (7.9)	2.74 (8.2)	.002	41.2 (16.8)	4.05 (16.8)	.03	17.3 (12.2)	5.80 (13.9)	.0001
	 n= 1,073 (75.6%)	0.22 (0.9)	-0.35 (0.3)	< .0001	10.2 (8.3)	-1.21 (8.5)	< .0001	35.7 (17.6)	-1.03 (17.5)	.05	17.6 (12.8)	-1.06 (14.3)	.01
	 n= 261 (18.4%)	0.83 (0.9)	-0.52 (0.3)	< .0001	12.6 (7.9)	-0.83 (8.1)	.10	36.8 (16.9)	-0.45 (16.8)	.67	17.5 (12.3)	-2.19 (13.8)	.01







Table 5. Changes from T0 to T2 in body mass index (BMI) z-score, eating disorders, anxiety and depression scores, physical, mental, social and general quality of life scores according to consistency and discrepancy between body satisfaction change and weight change (n= 2,889)

 refers to feeling better;  refers to feeling similar;  refers to feeling worse;  refers to a weight loss;  refers to stable weight;  refers to a weight gain

^a Mean change and p values were determined using adjusted (age, sex, socioeconomic status) linear regression models for difference in score from baseline (T0) to end of the intervention (T2). Consistency and discrepancy could not be investigated among the 390 adolescents who did not know how their body satisfaction changed.

Table 5 (continued). Changes from T0 to T2 in body mass index (BMI) z-score, eating disorders, anxiety and depression scores, physical, mental, social and general quality of life scores according to consistency and discrepancy between body satisfaction change and weight change (n=2,889)

	change		Physical			Mental			Social			General		
			Mean at T0 (SD)	Mean change (SD) ^a	p ^a	Mean at T0 (SD)	Mean change (SD) ^a	p ^a	Mean at T0 (SD)	Mean change (SD) ^a	p ^a	Mean at T0 (SD)	Mean change (SD) ^a	p ^a
 n= 1,089 (37.7%)		n= 172 (15.8%)	73.0 (17.9)	-6.44 (18.9)	<.0001	57.67 (22.5)	-4.81 (21.5)	.003	65.8 (20.0)	-1.01 (21.6)	.54	65.5 (15.1)	-4.07 (13.9)	.0001
		n= 797 (73.2%)	77.7 (18.8)	-1.13 (19.7)	.11	68.7 (23.6)	0.84 (22.5)	.29	70.5 (21.0)	0.46 (22.6)	.56	72.3 (15.8)	0.07 (14.6)	.89
		n= 120 (11.0%)	76.4 (17.6)	0.21 (18.5)	.90	65.2 (22.1)	2.59 (21.2)	.18	69.8 (19.7)	1.95 (21.2)	.63	70.5 (14.8)	1.25 (13.7)	.32
 n= 380 (13.1%)		n= 43 (11.3%)	77.3 (16.8)	-0.32 (18.0)	.91	64.9 (20.2)	3.34 (21.7)	.32	72.4 (19.5)	-0.41 (20.5)	.90	71.5 (14.4)	0.88 (13.7)	.68
		n= 294 (77.4%)	77.9 (18.2)	-1.13 (19.5)	.32	70.9 (21.8)	-0.76 (23.5)	.58	71.3 (21.1)	1.06 (22.1)	.41	73.3 (15.5)	-0.20 (14.8)	.81
		n= 43 (11.3%)	70.0 (16.8)	-0.22 (18.0)	.94	58.0 (20.2)	-4.69 (21.8)	.16	65.9 (19.5)	0.14 (20.5)	.96	71.5 (14.4)	-1.56 (13.7)	.46
 n= 1,420 (49.1%)		n= 86 (6.0%)	72.8 (17.4)	-6.39 (19.0)	.002	62.0 (21.7)	-7.52 (21.7)	.01	67.8 (18.7)	-6.88 (21.6)	.003	67.5 (14.5)	-7.04 (14.4)	<.0001
		n= 1,073 (75.6%)	77.3 (18.3)	-0.74 (19.9)	.22	68.7 (22.8)	0.67 (22.5)	.33	69.9 (19.6)	1.25 (22.4)	.07	71.9 (15.2)	0.47 (14.9)	.30
		n= 261 (18.4%)	77.3 (17.6)	-0.59 (19.1)	.62	66.6 (22.0)	-0.63 (21.8)	.64	70.9 (18.9)	0.16 (21.5)	.90	71.6 (14.7)	-0.37 (14.3)	.67

 refers to feeling better;  refers to feeling similar;  refers to feeling worse;  refers to a weight loss;  refers to stable weight;  refers to a weight gain

^a Mean change and p values were determined using adjusted (age, sex, socioeconomic status) linear regression models for difference in score from baseline (T0) to end of the intervention (T2). Consistency and discrepancy could not be investigated among the 390 adolescents who did not know how their body satisfaction changed.