Tilmann von Soest, PhD

University of Oslo, Department of Psychology, Oslo, Norway

and

Norwegian Social Research, Oslo, Norway

Lars Wichstrøm, PhD

Norwegian University of Science and Technology, Department of Psychology, Trondheim, Norway

SECULAR TRENDS IN EATING PROBLEMS

Abstract

Objective: This study examines secular trends in eating problems among adolescents between 1992 and 2010. The study aims further to investigate whether such trends can be accounted for by secular changes in putative risk factors. **Method:** Three nationwide surveys of Norwegian senior high-school students were conducted in 1992, 2002, and 2010 (response rates 97.0, 91.0, and 83.2 %). At each time point, approximately 3,000 adolescents participated. Eating problems were assessed by means of the Dieting and the Bulimia and Food Preoccupation subscales of the Eating Attitude Test-12. Moreover, a variety of potential risk factors that might account for time trends in such problems were measured. **Results:** Dieting scores increased almost linearly for both genders during the research period. No differences over time in Bulimia and Food Preoccupation scores were seen among boys, whereas these symptoms peaked in 2002 for girls with considerably lower levels in both 1992 and 2010. The increase in Dieting from 1992 to 2010 for both genders could be attributed in part to increasing body mass index levels and, to a lesser degree, to depressive symptoms among females. The girls' time trend in Bulimia and Food Preoccupation was to some extent related to changes in appearance satisfaction, alcohol intoxication, and global self-worth. **Discussion:** This study is one of few to statistically examine how secular trends in eating problems are related to changes in putative risk factors. The study does not however provide conclusive information on the causal direction between putative risk factors and eating problems.

Secular trends in eating problems among Norwegian adolescents from 1992 to 2010

Knowledge about secular trends in eating disorders and sub-clinical forms of eating problems is necessary in order to recognize any consequent need for change in health care services. Moreover, insight into potential forces behind such changes is important for implementation of preventive efforts. The present study was designed to provide information on time trends in eating problems and secular trends of putative risk factors by using survey data measuring aspects of excessive dieting and bulimic symptoms among Norwegian adolescents collected in 1992, 2002 and 2010.

Most studies on eating disorder time trends have been conducted using data based on diagnoses in primary care settings.[1] Such studies have shown an increased incidence in anorexia nervosa among women from the 1950s to the 1980s in several Western countries,[2, 3] with more stable figures reported during the 1980s and 1990s in the UK,[4] the Netherlands,[2, 5] and Switzerland.[3] Research on bulimia nervosa based on data from general practitioners and medical records have yielded more mixed findings. In one study from the Netherlands, no significant change in the incidence of bulimia nervosa was observed between the 1980s and 1990s,[5] whereas a UK study showed an increase in primary care incidence of bulimia nervosa in/among women from 1988 to 1996, with a subsequent decrease toward the year 2000.[4]

However, examining time trends by means of primary care data is a vulnerable undertaking due to shifting tendencies in help-seeking, changes in symptom recognition, differing diagnostic practices among clinicians, as well as shifting availability of mental health services.[1, 6] Repeated population-based studies offer an alternative approach less susceptible to such biases, though relatively few such studies have been conducted to date. One exception is a US survey showing that the point prevalence of bulimic symptoms decreased from 1982 to 1992 among both

male and female university students, while less change in symptoms was seen between 1992 and 2002.[6] The results were supported by another US study where the prevalence of probable cases of bulimia nervosa remained fairly stable from 1990 to 2004 among undergraduate college women.[7] The generalizability of these results is nonetheless somewhat limited as both studies examined only college students. A study among junior and senior high school students from Germany and Greece, meanwhile, indicated a decrease in bulimic behavior from 1980 to 1998.[8] Finally, a population-based survey study of Australian adults reported an increased prevalence of binge-eating and purging from 1995 to 2005[9] with similar findings obtained in a replication study examining time trends between 1998 and 2008.[10] As such, repeated questionnaire studies provide a somewhat mixed picture of time trends in bulimic symptoms, with stable figures from the 1980s onwards in some studies and increased estimated frequencies in others. Such varied results may be related to differences in study design, measures used, and populations assessed.

Even less information is available on time trends in excessive dieting. One of few studies providing such information reported an increasing prevalence of such dieting among a population-based sample of Australian adults between 1995 and 2008.[9, 10] Since few population-based studies have thus far been conducted, more research using just such a design is warranted to provide information on time trends in bulimic symptoms as well as other types of eating problems such as excessive dieting.

When time trends are indeed identified, providing information about potential reasons for such trends becomes the next important step. One possible approach is to examine whether secular changes in previously identified or suggested risk factors show concomitant changes with trends found in eating problems. One such study was conducted by Johnson and colleagues[11] among students from a US high school, showing that a reduction in bulimic and dieting behavior between 1981 and 1986 coincided with a decrease in drive for thinness and increasingly positive

attitudes toward own weight, whereas a measure of appearance satisfaction remained stable. Changes in drive for thinness and attitudes toward own weight may thus be related to secular trends in bulimic symptoms and dieting behaviors. However, there are to date few other studies attempting to provide potential explanations for secular trends.[12, 13]

In the present study we will focus on a variety of psychological and social factors that have been supported as risk factors for eating disorders and sub-threshold eating problems, and which may function as potential explanatory time trend variables. Factors related to evaluation of own appearance and self-worth are considered, as research has indicated that appearance dissatisfaction[12, 14] and poor self-esteem and negative self-evaluation[13, 15] may influence disordered eating. Moreover, depressive symptoms is included as a potential explanatory variable, as some longitudinal research has shown such problems to predict disordered eating,[16, 17] in particular, bulimic symptoms.[18] Furthermore, while body mass may not appear to be a risk factor for eating pathology, research has shown that it can be considered a risk factor for dieting behavior.[12, 17] Factors related to drug use are as well examined as a potential time trend explanation, since substance abuse has also been suggested to affect disordered eating.[14] Parental relationship variables are addressed, as some studies have shown that parental attitudes toward the child may be related to disordered eating.[19, 20] Finally, changes in family structure, such as parental divorce and single parenthood may constitute a risk factor for disordered eating and weight control behaviors.[21] However, the risk factor status of most variables is far from conclusive; for instance, several studies show disordered eating to prospectively predict depressive symptoms, rather than vice versa[22, 23]. Likewise, research on how family factors and substance use are causally related to eating problems remains inconclusive.[12, 24]

Aims of the Study

In the present inquiry we examine secular trends in aspects of excessive dieting and bulimic symptoms among Norwegian adolescents using data from three population-based samples collected in 1992, 2002, and 2010. Should changes be seen during the 18 years investigated, we will subsequently examine whether putative risk factors change concomitantly, providing if so some indication that they could account for time trends in eating problems. Since few studies examining the issue have been conducted, the present study is of an exploratory nature, aiming to investigate a variety of psychological and social factors possibly related to secular changes in eating problems. All analyses are conducted separately for boys and girls, since disordered eating is more prevalent among females and predictors of disordered eating may differ in strength between genders.[25]

METHODS

Participants and Procedure

Students from 28 senior high-schools comprised the study sample in 1992. Only those students attending the first two years of senior high school, aged 16 and 17, were included in the study. Cluster-sampling was applied with the school as the unit. Every school in the country was included in the register from which schools that participated were selected. The sample was stratified according to geographic region and school size, which in Norway is closely related to degree of urbanization. Each school's sampling probability was proportional to the number of students enrolled at the school, thereby ensuring that the probability of being selected to participate in the study was equal for all students in Norway. In 2002, the study was replicated and new senior high-schools were selected according to the same procedures as in 1992. Because of a general tendency toward declining response rates, the third data collection in 2010 was conducted at the same schools as in 2002, on the assumption that teachers would be more willing to participate due to our prior contact with their school in the previous data collection round. Four schools declined to participate; one in

1992, one in 2002, and two in 2010. These were replaced by back-up schools with similar geographic location and size.

The students completed the questionnaires in class and those not present at the time of data collection were asked to complete the survey at a later occasion. In 1992, 2,994 students participated, whereas 3,438 and 2,813 students partook in 2002 and 2010, respectively. The response rate was 97.0% in 1992, 91.0% in 2002, and 83.2% in 2010.

With 48.8 % of respondents being female, no significant gender differences between the three samples were seen ($\chi 2[2] = 1.46$, $p = .48$). Of all participants, 13.3 % reported that at least one parent was unemployed or receiving occupational disability pension, with no differences detected between time points ($\chi 2[2]=5.51$, $p =0.06$). However, small albeit significant age differences between the three samples were found (mean age 1992 = 16.52, *SD* = .50; mean age 2002 = 16.59, *SD* = .49; mean age 2010 = 16.55, *SD* = .50; $F = 16.14$, $p < .01$). Likewise, the percentage of adolescents who reported having been born in another country than Norway differed significantly from time point to time point (1992: 3.8 %; 2002: 5.1 %; 2010: 6.4 %; $\chi 2[2]=21.57$ $p <0.01$). As a result, age and country of birth (Norway versus another country) were included as covariates in all analyses.

Every student gave informed consent according to the standards prescribed by the Norwegian Data Inspectorate and the Regional Committee for Medical Research Ethics endorsed the surveys.

Measures

Eating problems. Eating problems were measured by two factors of the 12-item version of the Eating Attitude Test (EAT) developed by Lavik and colleagues.[26] The Dieting factor is comprised of four items, indicating an exaggerated concern with weight combined with dieting behavior and physical exercise to burn calories (i.e., “Preoccupied with the desire to be thinner”, “Engage in dieting behaviour”, “Feel uncomfortable after eating sweets”, “Exercise to burn up calories”).

The Bulimia and Food Preoccupation factor consisted of another four items, which address binge-eating, losing control of food intake, and compensatory behavior (i.e., "Vomit after meals", "Have gone on eating binges, unable to stop", "Give too much time and thought to food", "Food controls my life"). A 4-point response scale was employed, with the response alternatives never, seldom, often, and always. As in the original scale, response alternatives were coded 0, 0, 1, and 2, respectively, to ensure a certain severity to reported symptoms. Sum scores for both factors were computed, ranging from 0 to 8. In 1992, the third and final factor of the EAT, namely Oral Control – Anorexia, was included, but not assessed in 2002 or 2010 due to its comparatively low internal consistency.[27] In the present study, internal consistency (α values) of the four ordinal Dieting items[28] was .87 in 1992, .90 in 2002 and .88 in 2010 for girls. Boys' values were .83, .92, and .88, respectively. For the Bulimia and Food Preoccupation factor, internal consistency was .76, .84, and .83 for girls and .69, .88, and .90 for boys. Studies of the EAT-12 have suggested the reliability and factorial validity to be adequate[26, 29], and the construct validity was supported by its correlation with other eating problem measures.[27]

Potential explanatory variables. A revised version of the Self-Perception Profile for Adolescents (SPPA),[30] with the subscales Physical Appearance and Global Self-Worth, was included. Both subscales showed adequate internal consistency in the present study across gender and time points (physical appearance: .87, .90, .90 for girls and .85, .87, .87 for boys; global self-worth: .77, .86, .87 for girls and .75, .82, .83 for boys in 1992, 2002, and 2010, respectively). Previous studies support the construct validity and factorial validity of the revised version of the SPPA.[30] Kandel and Davies' Depressive Mood Inventory[31] was used as a measure of depressive symptoms, with internal consistency values of .79, .82, and .87 for girls and .77, .82, and .85 for boys in 1992, 2002, and 2010, respectively. A recent publication using the same data set showed

the factor structure of the instrument to be similar across genders and all three time points.[32] The instrument has shown to correlate highly with other measures of depressive symptoms and negative affect.[32] Body Mass Index (BMI; kg/m^2) was based on self-reports of weight and height, which have previously been found to correlate highly among adolescents with measured values.[33]

Alcohol intoxication was measured by asking how often during the preceding 12 months the respondents had "drunk so much that [they] felt clearly intoxicated" on a 6-point scale, ranging from "1 – never" to "6 – more than 50 times". The students were also asked if they had ever used cannabis, and whether or not they currently smoked cigarettes on a daily basis. Self-report measures of adolescent substance use have been shown to be reliable and recommended for use in most epidemiologic research settings.[34]

Relationship to parents was measured by items from the Parental Bonding Instrument.[35] Due to space limitations, only the six items with the most favorable psychometric properties of the original 25 were selected for inclusion in the study. Three items were taken from the Care subscale, while another three where taken from the Overprotection subscale. High scores on the Care subscale indicate a parent–child relationship based on emotional warmth, closeness, and empathy, whereas high scores on the Overprotection subscale indicate prevention of independent behavior, as well as control and parental intrusion.[35] Internal consistency of the Care subscale was .73, .71, and .71 for girls and .58, .63, and .57 for boys in 1992, 2002, and 2010, respectively. The corresponding statistics for the Overprotection subscale were .65, .63, and .64 for girls and .53, .60, and .56 for boys. Whether participants were living with both biological parents was as well determined.

Covariates. Information about respondents' age was obtained at all time points. Country of birth was assessed by asking the respondents whether they were born in Norway or not (yes/no). Finally, as a proxy of low socio-economic status, a dummy variable (yes/no) was constructed

indicating whether at least one of the respondent's parents was unemployed or receiving occupational disability benefits.

Statistics

In order to identify evidence of time trends, the extent to which Dieting scores and Bulimia and Food Preoccupation scores differed significantly between time points was examined by means of linear regression analyses. In these analyses, time period was dummy-coded and included as independent variable, with age and country of birth entered as covariate. The "repeated" contrast coding schedule[36] was employed, providing information about changes in mean level from one time point to the next (1992 to 2002 and 2002 to 2010). As in all linear regression analyses, the effect size of the period effect was measured by Cohen's d, indicating changes in the mean level of Dieting and Bulimia and Food Preoccupation scores between time points, measured in standard deviation.

In order to serve as a factor that can account for identified time trends, explanatory variables need to fulfil three criteria: 1) evidence of time trends corresponding to those trends identified in Dieting/Bulimia and Food Preoccupation, 2) a correlation with Dieting/Bulimia and Food Preoccupation, and 3) a reduction in or disappearance of time trends for Dieting/Bulimia and Food Preoccupation when adjusted for the explanatory variable (see[32, 37] for more information about the rationale for such analyses). A series of linear regression analyses was therefore run first, adjusted for age and country of birth, to examine time trends of the continuous potential risk factors. Logistic regression analyses were used to investigate time trends in dichotomous risk factors. For both types of analyses, the "repeated" contrast scheme was again employed. Second, all potential explanatory factors were correlated with the Dieting and the Bulimia and Food Preoccupation subscales. Third, potential explanatory factors were entered one by one into multiple linear regression analyses along with dummy variables representing the time

points to examine whether their inclusion contributed to a time trend reduction in Dieting/Bulimia and Food Preoccupation.

Analyses showed the Dieting and the Bulimia and Food Preoccupation scores to be non-normally distributed (Dieting: skewness=1.66, kurtosis=2.22; Bulimia and Food Preoccupation: skewness=2.95, kurtosis=10.74, all $p<.01$). As a result, standard errors and confidence intervals for all linear regression analyses were estimated by bootstrap procedures based on 5,000 bootstrap samples, thereby not assuming an underlying normal distribution.[38] All analyses were conducted for boys and girls separately, with age and country of birth included as covariates.

RESULTS

Secular Changes in Excessive Dieting and Bulimic Symptoms

Table 1 displays mean scores of the Dieting and the Bulimia and Food Preoccupation subscales at all three time points, adjusted for age and country of birth. The regression analyses showed that Dieting increased significantly from 1992 to 2002, and again from 2002 to 2010 for both girls and boys. Bulimia and Food Preoccupation scores peaked in 2002 for girls, with levels in turn significantly lower in both 1992 and 2010. In contrast, no significant differences were found between time points for boys. The effect size of the significant changes in Dieting and Bulimia and Food Preoccupation ranged from a Cohen's d of .10 to .19, indicating small time effects from one time point to the next.

TABLE 1 ABOUT HERE

Identification of Potential Risk Factors Associated with Secular Trends

Time trends for some of the putative risk factors have already been published in a previous paper using the same data set.[32] As depicted in Table 1, satisfaction with own physical appearance remained stable between 1992 and 2002 and increased in 2010 among boys, whereas girls had similar scores in 1992 and 2010, but lower physical appearance evaluation levels in

2002. BMI increased for both boys and girls from 1992 to 2010, although the increase for girls from 2002 to 2010 was not significant. Global self-worth remained stable for girls between 1992 and 2002 and improved thereafter, while it improved gradually during the 18-year period for boys. As displayed in Table 2, depressive symptoms increased between 1992 and 2002 for both boys and girls, whereas no significant change was observed between 2002 and 2010. Moreover, alcohol intoxication showed a marked increase between 1992 and 2002 with an equally strong decrease from 2002 to 2010 for both genders (Table 1). A similar trend was observed for cannabis use, as seen in Table 2. For both genders, daily smoking rates remained rather constant between 1992 and 2002, but were greatly reduced in 2010 (Table 2). Table 1 also shows that both perceived parental care and overprotection increased for girls and boys between 1992 and 2002, while no changes were found between 2002 and 2010. Finally, the frequency of adolescents not living with both of their biological parents increased gradually over the 18-year period (Table 2). In summary, by virtue of their increases, most notably BMI, depressive symptoms, and not living with both biological parents showed time trends in accordance with those seen in the Dieting subscale, while trends in physical appearance, alcohol intoxication and cannabis use among girls were similar to time trends in Bulimia and Food Preoccupation.

TABLE 2 ABOUT HERE

In step 2, all potential explanatory factors were correlated with the two measures of eating problems. The results displayed in Table 3 show physical appearance and global self-worth to be particularly strongly correlated to both types of eating problems among girls, with considerably weaker associations for boys. Depressive symptoms and alcohol intoxication showed as well a stronger relationship with eating problems in girls than boys. BMI showed a relatively high correlation with the Dieting subscale for both genders, while the correlation with Bulimia and

Food Preoccupation was lower yet still significant. The relationship to both symptom sets was rather weak for the other potential explanatory variables included in the study.

TABLE 3 ABOUT HERE

In a third step, variables were entered in multiple linear regression analyses to identify potential explanatory factors of Dieting and Bulimia and Food Preoccupation. For this purpose, each potential explanatory variable was included one by one with time point, age, and country of birth as independent variables. The results for the Dieting subscale among girls, as displayed in Table 4, show that changes in Dieting were reduced both from 1992 to 2002 and from 2002 to 2010 when BMI was adjusted for, as indicated by the reduced Cohen's d when compared to the Baseline Model. More specifically, the time period effect was reduced to insignificance from 1992 to 2002, whereas 20% of the time effect was accounted for between 2002 and 2010. Somewhat of a decrease in the effect of time was found for depressive symptoms during both timeframes, with each of the time intervals demonstrating a 10% reduction. The inclusion of other variables did not lead to a reduction of Cohen's d at either time interval.

Concerning girls' Bulimia and Food Preoccupation scores, the inclusion of physical appearance, global self-worth, and alcohol intoxication was related to a reduction of the period effect for both timeframes, as indicated by reduced Cohen's d of between 5 and 27%. The inclusion of other variables did not lead to a reduction of the time effect at either time interval.

TABLE 4 AND 5 ABOUT HERE

Table 5 depicts analyses of potential risk factors accounting for time trends in Dieting scores for boys. As with girls' dieting, the inclusion of BMI among boys showed a reduction of the period effect for both time intervals, whereas no other variables showed similar reductions.

DISCUSSION

Three nationwide representative surveys of Norwegian senior high-school students were conducted over an 18-year time span, showing that Dieting increased almost linearly between 1992 and 2010 for both genders. Girls' Bulimia and Food Preoccupation scores peaked in 2002, with considerably lower levels in both 1992 and 2010. No differences in such scores over time were found for boys. To our knowledge, the present study is one of very few in its approach: examining whether time trends in eating problems can be statistically accounted for by time trends in previously identified and suggested risk factors. The increase in Dieting scores from 1992 to 2010 among both girls and boys could be statistically attributed in part to increasing levels of BMI during the same time span, and to a lesser degree to depressive symptoms among females. Time trends in alcohol intoxication, evaluation of own physical appearance, and global self-worth showed to be concomitant with secular trends in girls' Bulimia and Food Preoccupation scores.

Identified time trends in Dieting scores are in accordance with results from Australian studies showing increases in excessive dieting from 1995 to 2008,[9, 10] whereas few publications from other countries have documented dieting behavior time trends. The importance of BMI in partially accounting for dieting trends concurs with previous research showing BMI to be a risk factor for dieting[12, 17] but not for other eating problems, such as bulimic symptoms.[12] The specific association between BMI and Dieting scores is also indicated in the present study insofar as the correlation between BMI and Dieting was shown to be substantially stronger than that between BMI and Bulimia and Food Preoccupation.

The peak of Bulimia and Food Preoccupation, for its part, seen among girls in 2002 has not been identified in other studies. However, few studies to date have actually examined time trends in bulimic symptoms after the year 2000, with mixed results at best.[6-10] The finding that

appearance evaluation accounted for some of the time trends in Bulimia and Food Preoccupation is in accordance with research showing appearance evaluation to be a risk factor of disordered eating.[12, 14] Alcohol intoxication showed time trends in accordance with trends in bulimic symptoms in girls; the parallel trends in these phenomena support research showing comorbidity between alcohol use and bulimic behaviors.[24]

It is further noteworthy that several potential explanatory variables showed time trends not in accordance with those for Dieting. Satisfaction with physical appearance and global self-worth in particular increased from 2002 to 2010, whereas a reverse trend for these variables would have been expected were they explanatory of the Dieting time trend. Adjustments for these factors were as such accompanied by increasing estimates of the Dieting period effects, particularly for girls. These results can be interpreted as a suppressor effect, indicating that if there had not been certain positive time trends in adolescents' psychological well-being between 2002 and 2010, such as increased satisfaction with physical appearance and increased global self-worth, the increase in the Dieting score between 2002 and 2010 would have been even greater.

Several of the putative risk factors showed considerable change in prevalence over time. The strong decline from 2002 to 2010 in the percentage of adolescents who smoke may be most probably accounted for by the implementation of new tobacco legislation in Norway in 2004 prohibiting smoking in bars and restaurants, at the same time as a number of anti-smoking campaigns were launched (see[32]). Moreover, in accordance with the present study's findings, researchers in several European countries including Norway revealed a strong increase in alcohol and illicit drug consumption among young people in the 1990s, a development that was coined "a new culture of intoxication".[39] A gradual decline in drug use after about the year 2000 has as well been observed in several European countries, Norway included.[39]

Limitations

The results at hand must be evaluated in the context of several study limitations. First, the cross-sectional nature of the data does not provide information on the causal order between putative risk factors and Dieting and Bulimia and Food Preoccupation. Secular changes in putative risk factors may well, then, be a result of changes in eating behavior rather than the cause. Though several studies have shown BMI, for its part, to be a dieting risk factor,[12, 17] others indicate that weight reduction strategies can also lead to increased body weight;[40] the causal direction of the association between dieting and BMI is as such not yet clearly delineated. Likewise, even if one recent review article notes that research has consistently supported substance use as a risk factor for eating problems,[14] reverse causal directions and underlying confounding factors may also at least partially explain the correlation between substance use and bulimic symptoms.[24] Even less insight has been provided into the causal status of other potential explanatory factors, such as family context.[12]

Second, the study is of an exploratory nature, and it would be well advised for further research to examine more specific hypotheses about potential explanations of time trends. Moreover, although a wide range of potential explanations for the period effect were included in the study, several important potential explanatory factors were not, as the data collections in 1992 and 2002 were not originally designed to provide information for the present research question. Thus, when overall changes in eating problems were not fully accounted for, the inclusion of additional risk factors might have altered this. In particular, important risk factors such as perfectionism, drive for thinness, and thin-ideal internalization[12, 14] were not included in this study.

Third, dieting is a prevalent phenomenon among 16 to 17 year-old adolescents, though the onset of bulimia nervosa is typically some years later. It remains therefore unclear whether the

study results for the Bulimia and Food Preoccupation subscale can be generalized to other age groups.

Fourth, data collection procedures differed at the three time points; in 2010, the same schools were asked to participate as in 2002, whereas the schools in 1992 and 2002 were selected independently from each other. However, all three samples differed only slightly in socio-demographics, indicating that they are similarly representative of the Norwegian adolescent population. The exception is that an increasing percentage of adolescents were born in other countries than Norway, which may be expected due to the country's rising immigration rates over the past decades.

Finally, limitations have to be noted concerning the eating problem measures employed. Not all aspects of disordered eating were covered; symptoms of anorexia, for instance, were not assessed. Moreover, although the validity of the EAT and its factors has been examined in several studies (see for instance[26, 27, 29]), the use of other more comprehensive instruments assessing in more detail specific symptoms of eating disorders might have proven advantageous. Additionally, several of the included putative risk factor measures were assessed by only one question. The instrument measuring parental care and overprotection bore low internal consistency and was based on self-report only, which is a serious limitation of the present study as regards interpretability of the parental relationship results. The reliability and validity of this measure could conceivably have been improved upon by using more comprehensive instruments and obtaining data based on other sources than self-report.

Conclusion

The current study is one of the first to examine how secular trends in eating problems among adolescents covary on an individual level with time trends in a variety of putative risk factors for such symptoms. Many questions remain however unanswered; in particular, causal

relationships between putative risk factors and eating problems are not delineated. Likewise, information is needed on the potential influence of several unmeasured factors, such as drive for thinness and thin-ideal internalization, as well as the impact of broader societal and cultural changes on secular trends in eating problems. Although these issues remain to be addressed, the current study does indicate that secular trends in eating problems coincided with time trends in several potential risk factors. Adiposity, alcohol intoxication, self-worth, and appearance satisfaction are all potentially malleable factors. Should future research provide additional support for their status as true risk factors for eating problems in adolescents, the development and evaluation of population-based efforts to reduce these risks at the population level will be warranted.

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Table 1. Mean Scores (Standard Deviations) of the Dieting Subscale, the Bulimia and Food Preoccupation Subscale, and Potential Explanatory Variables in 1992, 2002, and 2010 by Gender. All Means Adjusted for Age and Country of Birth.

	Girls						Boys					
	1992	2002	2010	Change from 1992 to 2002	Change from 2002 to 2010	Overall change	1992	2002	2010	Change from 1992 to 2002	Change from 2002 to 2010	Overall change
	M (SD)	M (SD)	M (SD)	d	d	p	M (SD)	M (SD)	M (SD)	D	D	p
Dieting	1.69 (1.87)	1.89 (2.12)	2.10 (2.19)	.10**	.10**	<.01	.45 (.99)	.57 (1.27)	.80 (1.56)	.11**	.16**	<.01
Bulimia and Food Preoccupation	.66 (1.13)	.90 (1.44)	.69 (1.32)	.19**	-.15**	<.01	.35 (.73)	.36 (0.97)	.40 (1.18)	.01	.05	.27
Physical appearance	2.40 (.65)	2.31 (.74)	2.45 (.73)	-.13**	.19**	<.01	2.80 (.60)	2.84 (.68)	3.02 (.67)	.06	.27**	<.01
Body mass index	20.65 (2.43)	21.45 (3.52)	21.52 (3.51)	.27**	.02	<.01	21.44 (2.47)	22.27 (3.33)	22.73 (4.31)	.28**	.12**	<.01
Global self-worth	2.77 (.53)	2.76 (.67)	2.84 (.68)	-.02	.12**	<.01	2.98 (.51)	3.11 (.59)	3.22 (.60)	.24**	.19**	<.01
Alcohol intoxication	2.66 (1.62)	3.27 (1.69)	2.72 (1.59)	.37**	-.34**	<.01	2.79 (1.75)	3.44 (1.79)	2.69 (1.69)	.37**	-.43**	<.01
Parental care	3.14 (.59)	3.29 (.63)	3.31 (.64)	.25**	.03	<.01	3.07 (.52)	3.22 (.60)	3.25 (.60)	.27**	.05	<.01
Parental overprotection	1.94 (.58)	2.08 (.62)	2.13 (.60)	.23**	.08	<.01	2.08 (.54)	2.17 (.60)	2.21 (.58)	.16**	.07*	<.01

Notes: * p <.05, ** p<.01; d= Cohen's d

Table 2. Prevalence of Explanatory Variables in 1992, 2002, and 2010 by Gender

	Girls						Boys					
	1992	2002	2010	Change from 1992 to 2002	Change from 2002 to 2010	Overall change	1992	2002	2010	Change from 1992 to 2002	Change from 2002 to 2010	Overall change
	%	%	%	OR (95% CI)	OR (95% CI)	p	%	%	%	OR (95% CI)	OR (95% CI)	p
Depressive symptoms	8.8	11.4	13.4	1.30* (1.02-1.65)	1.22 (.98-1.52)	<.01	2.9	6.1	5.5	2.15** (1.49-3.10)	.90 (.66-1.22)	<.01
Daily smoking	23.4	24.6	7.0	1.06 (.90-1.25)	.23** (.18-.30)	<.01	23.8	22.9	7.0	.93 (.79-1.10)	.25** (.20-.32)	<.01
Cannabis use	4.8	12.5	5.6	2.78** (2.09-3.70)	.42** (.32-.55)	<.01	7.2	20.0	9.6	3.10** (2.46-3.91)	.42** (.34-.53)	<.01
Not living with both biological parents	29.3	36.8	44.2	1.40** (1.21-1.63)	1.37** (1.18-1.58)	<.01	28.1	32.3	40.0	1.22* (1.05-1.41)	1.40** (1.21-1.62)	<.01

Notes: * p <.05, ** p<.01;

OR = odds ratio

95% CI = 95% confidence intervals of odds ratio

All OR adjusted for age and country of birth

Table 3. Correlations between the Dieting Subscale, the Bulimia and Food Preoccupation Subscale, and all Potential Explanatory Variables for Boys and Girls Separately (Data from all Three Data Collections Combined)

	Dieting		Bulimia and Food Preoccupation	
	Girls	Boys	Girls	Boys
Bulimia and Food Preoccupation	.47**	.40**	--	--
Physical appearance	-.39**	-.17**	-.27**	-.06**
Body mass index	.26**	.30**	.12**	.10**
Global self-worth	-.34**	-.13**	-.30**	-.07**
Depressive symptoms	.15**	.08**	.19**	.09**
Alcohol intoxication	.12**	.00	.10**	.02
Daily smoking	.03	-.02	.05**	.03
Cannabis use	.04**	.04**	.05**	.07**
Parental care	-.06**	-.02	-.11**	-.07**
Parental overprotection	.05**	.04*	.07**	.07**
Not living with both biological parents	.02	.04**	.02	.04*

Note. * = $p < .05$; ** = $p < .01$

Table 4. Adjusted Means of the Dieting Subscale and the Bulimia and Food Preoccupation Subscale in 1992, 2002, and 2010 for Girls.

	Dieting scores						Bulimia and Food Preoccupation scores					
	Adjusted means			Changes in Dieting scores			Adjusted means			Changes in Bulimia and Food Preoccupation scores		
	1992	2002	2010	1992 to 2002	2002 to 2010	Overall	1992	2002	2010	1992 to 2002	2002 to 2010	Overall
	M	M	M	d	d	p	M	M	M	d	d	p
	Baseline Model						*Baseline Model*					
Without predictors	1.69	1.89	2.10	.10**	.10**	<.01	.66	.90	.69	.19**	-.15**	<.01
	Model adjusted for covariates one by one						*Model adjusted for covariates one by one*					
Physical appearance	1.71	1.81	2.19	.05	.18**	<.01	.66	.87	.72	.16**	-.11**	<.01
Body mass index	1.77	1.84	2.02	.04	.08*	<.01	.68	.89	.67	.17**	-.17**	<.01
Global self-worth	1.67	1.86	2.16	.10**	.14**	<.01	.65	.88	.72	.18**	-.12**	<.01
Depressive symptoms	1.70	1.88	2.08	.09*	.09*	<.01	.67	.90	.67	.18**	-.17**	<.01
Alcohol intoxication	1.73	1.83	2.12	.05	.13**	<.01	.68	.87	.71	.15**	-.12**	<.01
Daily smoking	1.67	1.88	2.12	.11**	.11**	<.01	.65	.89	.70	.19**	-.13**	<.01
Cannabis use	1.70	1.87	2.11	.09*	.11**	<.01	.67	.89	.69	.17**	-.15**	<.01
Parental care	1.66	1.90	2.11	.12**	.10**	<.01	.63	.91	.69	.22**	-.16**	<.01
Parental overprotection	1.69	1.89	2.09	.10**	.09*	<.01	.66	.90	.68	.19**	-.16**	<.01
Not living with both biological parents	1.69	1.89	2.10	.10**	.10**	<.01	.66	.90	.68	.19**	-.16**	<.01

Notes: * p <.05, ** p<.01; d = Cohen's d. All means adjusted for age and country of birth

Table 5. Adjusted Means of the Dieting Subscale in 1992, 2002, and 2010 for Boys.

	Adjusted means			Changes in Dieting scores		
	1992	2002	2010	1992 to 2002	2002 to 2010	Overall
	M	M	M	d	d	p
	Baseline Model					
Without predictors	.45 (.99)	.57 (1.27)	.80 (1.56)	.11**	.16**	<.01
	Model adjusted for covariates one by one					
Physical appearance	.41	.55	.86	.12**	.22**	<.01
Body mass index	.52	.55	.73	.03	.13**	<.01
Global self-worth	.40	.57	.85	.15**	.20**	<.01
Depressive symptoms	.45	.56	.80	.10*	.17**	<.01
Alcohol intoxication	.44	.57	.80	.11**	.16**	<.01
Daily smoking	.44	.57	.80	.11**	.16**	<.01
Cannabis use	.45	.56	.81	.10*	.18**	<.01
Parental care	.44	.57	.80	.11**	.16**	<.01
Parental overprotection	.45	.56	.80	.10**	.17**	<.01
Not living with both biological parents	.45	.57	.79	.11**	.16**	<.01

Notes: * p <.05, ** p<.01; d = Cohen's d. All means adjusted for age and country of birth