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Disordered eating behaviour and attitudes, associated psychopathology and health-related quality of life: results of the BELLA study

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Introduction

Many children and adolescents not only express dissatisfaction with their figure, shape and weight, but

■ **Abstract** *Objective* To identify disordered eating behaviour and attitudes in a large representative population in order to determine the relationship with body weight status, and to assess associated psychopathology and health-related quality of life. *Methods* A total of 11–17 year-old adolescents ($n = 1,895$) were randomly selected from the national representative sample of 17,641 families participating in the German Health Interview and Examination Survey for Children and Adolescents (KiGGS). Weight and height were assessed by trained staff. Mental health problems and health-related quality of life were examined by means of a telephone interview and different questionnaires. Eating disordered behaviour and attitudes were identified by the SCOFF, an instrument consisting of five questions originally developed to screen for eating disorders in clinical settings. *Results* About one third of the girls and 15% of the boys reported disordered eating behaviour and attitudes, which were most pre-

valent in overweight youth. There was a significant association between the presence of disordered eating behaviour and psychopathology, which was comprised of internalising and externalising behavioural problems. In addition, adolescents with disordered eating behaviour reported reduced quality of life. *Conclusion* The high prevalence of disordered eating in the general population of Germany is of great concern. Health professionals should not only be aware of disordered eating in underweight adolescents, but in all youth, especially overweight individuals. Disordered eating behaviour is associated with a wide range of psychopathological and psychosocial concerns. Thus, youngsters engaging in disordered eating behaviour should also be explored for other serious mental or social problems.

■ **Key words** disordered eating – psychopathology – body mass index – health-related quality of life

also exhibit disordered eating behaviour, such as binge eating (eating a large amount of food with a sense of lack of control), food restriction, laxative abuse and vomiting. In a Minnesota school-based survey with more than 80,000 participants, 56% of 9th

grade females and 28% of 9th-grade males reported disordered eating behaviours such as fasting, vomiting or binge eating; in 12th-grade females and males, slightly higher rates of 57 and 31%, respectively, were found [10]. In a North Italian study, 28% of 15 to 19-year-old female high school adolescents reported unhealthy eating behaviours as described above [51]. Two recent German studies demonstrated that more than one third of female high school students and 20% of males between 14 and 18 years of age scored in the pathological range of the EAT scale, a well-established instrument for assessing eating disorders [4]. In a study on weight concerns and dieting among 8–12-year-old children by the same group of authors, 18% of the boys and 19% of the girls had tried to lose weight at the time of the investigation [5]. However, it should be noted that the sample sizes of the latter studies were rather small.

In general, girls report more disordered eating and body image concerns than boys, and youngsters of higher grades are more vulnerable than those of lower grades. In contrast to former assumptions, eating disorder issues are not exclusively found in underweight females, but also in overweight adolescents of both sexes [37]. Several studies have found high prevalence rates of eating disorder symptoms like binge eating, body image concerns and maladaptive weight control behaviour in this population [11, 32, 52]. This finding is of special interest, as the increasing prevalence of overweight condition and obesity among children and adolescents is an important public health problem in Western industrial countries [12]. In a longitudinal epidemiological study, we were able to demonstrate that weight increased significantly during a 30-year period. In the city of Aachen, the mean BMI in 6-year-old girls went up from 15.3 kg/m² in 1968 to 16.4 kg/m² in 1999 [19].

Previous studies have shown that there is an association between excess weight and increased rates of behavioural problems in childhood [31, 37, 49]. In the majority of cases, overweight and obese children and adolescents suffer from anxious or depressive symptoms [8, 37, 53]. However, recently a relationship between externalising behavioural problems and overweight/obesity has emerged [11, 22, 31]. Moreover, Mamorstein et al. [33] reported on associations between disordered eating behaviours and externalising symptoms.

In addition to higher levels of psychopathology, overweight and obesity reduce quality of life in childhood and adolescence. Severely obese children report health-related quality of life (HRQoL) scores that are comparable to those of children diagnosed with cancer [45]. In a study by Williams et al. [55],

parent- and self-reported HRQoL decreased with increasing weight of the child.

Whereas most previous studies assessed the association between overweight/obesity and mental disorder symptoms, very few examined the relationship between disordered eating behaviour (apart from BMI) and behavioural problems. Furthermore, most of the above mentioned studies and surveys were performed in the USA or Australia, and there is a dearth of German or European studies. The majority of assessments were done in clinical samples from small regions, limiting the generalisability of the results to the general population.

Hence, the aim of this study was to assess eating behaviour in a large and representative sample and to examine the association between body weight status and disordered eating. In addition, the associations between disordered eating behaviour (after controlling for the effects of BMI) and both psychopathology and health-related quality of life were analysed.

Methods

■ Design

The background, rationale, design, procedures, and methods of the BELLA study as well as its association with the KiGGS study are described in detail elsewhere [41, 42].

The participants of the BELLA study were randomly recruited from the national representative sample of 17,641 families participating in the German Health Interview and Examination Survey for children and adolescents (KiGGS) conducted by the Robert Koch-Institute [21]. The KiGGS and the BELLA surveys took place between May 2003 and May 2006 in a representative sample of 167 cities and communities in Germany. The overall response rate was 66.6% (KiGGS). A random selection of 4,199 families from the KiGGS sample with children aged between 7 and 17 were asked to participate in the BELLA study. Of these eligible families, 70% agreed to participate, and 68% (1,389 girls and 1,474 boys) were surveyed. Of these 2,863 families that participated in the BELLA study, 1,142 had children aged 7–10 years, 780 had children aged 11–13 years and 941 had children aged 14–17 years. In each family one parent was questioned with a standardised computer-assisted telephone interview. Children aged 11 and older were interviewed as well. In addition, the participants were asked to fill in a mailed paper and pencil questionnaire. Sample data were weighted to correct for deviation of the sample from the age-, gender-, regional- and citizenship-structure of the German

population (reference data 31.12. 2004). Since the number of cases reported in tables and in text refers to the weighted sample data, it might deviate from the number of cases reported in the former description of the sample. The weighting procedure particularly affected the proportions of the different age groups [23].

■ Sample of the present study

A total of 1,895 children and adolescents aged 11–17 years were enrolled in the BELLA study (weighted data set, see “Design”). They were asked to fill in the KiGGS self-report questionnaire during their visit to the KiGGS examination centre. This self-report questionnaire contained questions pertaining to several topics such as demographic information, psychosocial well-being, bodily pain, and life circumstances. Also included were the five SCOFF questions. Furthermore, the children and adolescents were asked to participate in the standardised BELLA telephone interview and fill in the BELLA questionnaire approximately three weeks after the examination. This BELLA questionnaire was sent to the children and adolescents directly after the telephone interview was conducted. One parent also was interviewed and received an additional BELLA questionnaire. The BELLA interview and the BELLA questionnaire collected more detailed data on mental health problems and well-being (details of the procedures are given in [41]).

Of the 1,895 children and adolescents that came to the examination centre, complete data sets on disordered eating behaviour and attitudes were available for 1,850 participants. 7 cases were excluded from the analysis due to missing BMI data. The final sample consisted of 1,843 children and adolescents including 898 girls (48.7%) and 945 boys (51.3%) with a mean age of 14.6 (SD ± 2.0).

Due to the fact that not all parents and children participated in the BELLA telephone interview after the initial visit or did not send back the BELLA questionnaire, the sample size is diminished in analyses regarding mental health and behavioural problems.

■ Instruments/measures

Disordered eating behaviour—SCOFF

The SCOFF [34] is a screening instrument originally designed to be routinely used in all individuals considered at risk of eating disorders (especially anorexia or bulimia nervosa, but also atypical eating disorders). The abbreviation SCOFF stands for the content

of the instrument’s five questions: deliberate vomiting (“Do you make yourself sick because you feel uncomfortably full?”), loss of control over eating (“Do you worry you have lost control over how much you eat?”), weight loss (“Have you recently lost more than one stone in a three month period?”), body image distortion (“Do you believe yourself to be fat when others say you are too thin?”) and the impact of food on life (“Would you say that food dominates your life?”). The item “weight loss” was reworded in the present investigation when the child or adolescent lost more than six kilograms in three months (instead of ~7.7 kilo corresponding to one stone).

The SCOFF has been validated in university students and adolescents [43, 44]. With respect to the identification of eating disorders, satisfying sensitivity (81.9%) and specificity (78.7%) were reported in a randomly selected sample of 241 adolescent students when a cut-off score of 2 was applied [44]. Since the negative predictive value was high in several studies (e.g., exceeding 90% in Rueda et al. [43, 44]), the SCOFF may be used to rule out an eating disorder when there are fewer than 2 abnormal responses. However, the SCOFF is characterised by a tendency toward overinclusion [30]. This tendency toward overinclusion is reflected in low positive predictive values ranging from 24.2–62.1% in the validation studies cited above [30, 43, 44]. Therefore, adolescents from a population sample who obtain SCOFF scores of 2 and above do not necessarily suffer from eating disorders. Nevertheless, two positive answers in the five SCOFF questions indicate disordered eating behaviour and attitudes.

Weight status—BMI

Body weight and height were measured by trained staff in the examination centre. BMI values (weight in kilograms divided by height in meters squared) were interpreted according to national age- and sex-specific reference values by Kromeyer-Hauschild et al. [26] developed from 17 studies including 34,422 children in Germany. According to the scientific recommendations, we used the 90th and 97th percentiles to identify overweight and obesity, respectively [38].

Depression—CES-DC

The Centre for Epidemiological Studies Depression Scale for Children (CES-DC, [13, 14, 54]) was administered in self-report and proxy-report versions. It contains 20 items that cover positive mood as well as cognitive, behavioural, affective, and somatic symptoms associated with depression. Higher values indicate higher levels of depressive symptomatology.

Depression—DIKJ

The depression inventory for children and adolescents (Depressions-Inventar für Kinder und Jugendliche, DIKJ) was developed on the basis of the children's depression inventory (CDI; [24, 25]) with a focus on high concordance in form and content. The revised version [48] contains 26 items that cover emotional, cognitive, motivational, and somatic symptoms of depression. Again higher values indicate higher symptomatology levels.

Anxiety—SCARED

Information on anxiety disorders was obtained by administering the Screen for child anxiety related emotional disorders—questionnaire (SCARED, [6]) as a self-report and as a parent-report instrument. This questionnaire contains 41 items [6] that can be assigned to five subscales according to the factor structure of the instrument: panic/somatic, generalised anxiety, separation anxiety, social phobia, and school phobia. The present report provides results of a reduced version with five items that includes one item from each factor and shows similar psychometric properties to the full SCARED [6]. Along with this overall score the results of the SCARED subscale “social phobia” are also reported. Higher values indicate higher levels of symptomatology.

Perceived difficulties—SDQ-Impact

The SDQ impact questionnaire [18] was administered as a self-report and as a parent-report. The SDQ impact supplement queries about difficulties regarding emotions, concentration, behaviour or getting along with other people. If these are endorsed, associated chronicity, distress, social impairment and burden for others are additionally enquired. Since only the answering options “quite a lot” and “a great deal” were scored with “1” or “2” respectively, children and adolescents with an impact score above zero necessarily have at least “quite a lot” of impairment in at least one domain [17, 18].

Health-related quality of life—KINDL-R

To measure health-related quality of life (HRQoL), the generic KINDL-R Questionnaire [39, 40] was administered to children as well as their parents. It consists of 24 Likert-scaled items, which assess the respondent's HRQoL in the following six domains: physical well-being, psychological well-being, self-esteem, family, friends, and everyday functioning (school). The scores on each KINDL-R subscale and the total score were transformed to values between 0 and 100 with higher values indicating better HRQoL scores.

Suicide ideation/suicidal behaviour—CBCL items

In order to obtain information on suicide ideation or suicidal behaviour two items from the German version of the youth self report of the child behavior checklist (CBCL [3]) were employed (“I think about killing myself” and “I deliberately harmed myself or attempted suicide”). The answering options were “not true”, “sometimes” and “often/always”.

Externalising problems—CBCL scales

In order to identify externalising behavioural problems, the externalising scale of the parent-reported German version of the CBCL ([3]; original by Achenbach and Edelbrock [1, 2]) was administered in parents. It includes two subscales: delinquent behaviour with 13 items and aggressive behaviour with 20 items. Higher scores indicate a higher level of symptomatology.

■ Statistical analyses

Children and adolescents were split into different weight status groups, and the percentages of participants with high (>1) and low SCOFF scores were calculated for each group.

Univariate generalised linear models were employed to determine the estimated marginal means of the following psychometric instruments (CES-DC, DIKJ, SCARED overall score (short form), SCARED social phobia subscale, SDQ-Impact-Supplement, and CBCL externalising problems scale) in the two SCOFF groups (normal and abnormal scores) adjusting for age, sex, and BMI SDS-score as covariates. 95% confidence intervals were calculated.

Effect sizes (η^2) were given according to Cohen [9]. Effect sizes between 0.01 and 0.03 were designated as small; those between 0.04 and 0.15 were considered as moderate and those over 0.16 as large.

To test for differences in the suicidal behaviour and ideation of children and adolescents with normal versus abnormal SCOFF scores, percentages of self-reported suicidal behaviour or suicidal ideation were calculated for each group (low SCOFF score versus high SCOFF score) and tested for statistical significance using Chi-square-statistics. *P* values < 0.05 were considered statistically significant.

Further analyses of variance were used to test differences in health-related quality of life in the children and adolescents without disordered eating behaviour (low SCOFF scores) versus those with disordered eating behaviour (high SCOFF scores). Again, results were controlled by analysis of covariance adjusting for age, gender and BMI-SDS. In order to adjust for

Table 1 Weight characteristics and prevalence of disordered eating by BMI-classes, sex, and age groups

SCOFF	Severely underweight ($<P3$)	Underweight ($P3 < x < P10$)	Normal weight ($P10 \leq x < P25$)	Normal weight ($P25 \leq x < P50$)	Normal weight ($P50 \leq x < P75$)	Normal weight ($P75 \leq x < P90$)	Overweight ($P90 < x \leq P97$)	Obese ($> P97$)	Total
Low	% 89.1%	94.5%	92.8%	90.5%	70.8%	77.5%	63.6%	46.5%	78.3%
<2 Total	<i>n</i> 41	103	194	408	300	207	124	66	1443
High	% 10.9%	5.5%	7.2%	9.5%	29.2%	22.5%	36.4%	53.5%	21.7%
2–5 Total	<i>n</i> 5	6	15	43	124	60	71	76	400
Only boys									
Low	% 97.1%	94.9%	94.1%	92.2%	86.2%	82.3%	75.3%	48.4%	85.6%
<2 Total	<i>n</i> 33	56	112	226	175	107	67	31	807
High	% 2.9%	5.1%	5.9%	7.8%	13.8%	17.7%	24.7%	51.6%	14.4%
2–5 Total	<i>n</i> 1	3	7	19	28	23	22	33	136
Only girls									
Low	% 66.7%	92.2%	92.1%	88.8%	56.1%	72.5%	54.3%	44.2%	70.6%
<2 Total	<i>n</i> 8	47	82	182	124	100	57	34	634
High	% 33.3%	7.8%	7.9%	11.2%	43.9%	27.5%	45.7%	55.8%	29.4%
2–5 Total	<i>n</i> 4	4	7	23	97	38	48	43	264
Only 11–13									
Low	% 100%	91.1%	95.9%	93.5%	79.3%	80.4%	55.7%	51.0%	81.0%
<2 Total	<i>n</i> 12	41	94	159	115	86	54	26	587
High	% 0%	8.9%	4.1%	6.5%	20.7%	19.6%	44.3%	49.0%	19.0%
2–5 Total	<i>n</i> 0	4	4	11	30	21	43	25	138
Only 14–17									
Low	% 85.3%	96.9%	90.9%	88.6%	66.3%	75.6%	71.4%	44.0%	76.6%
<2 Total	<i>n</i> 29	62	100	249	185	121	70	40	856
High	% 14.7%	3.1%	9.1%	11.4%	33.7%	24.4%	28.6%	56.0%	23.4%
2–5 Total	<i>n</i> 5	2	10	32	94	39	28	51	261
Total	% 100%	100%	100%	100%	100%	100%	100%	100%	100%
	<i>n</i> 46	109	209	451	424	267	195	142	1843

multiple testing, only P values < 0.001 were considered statistically significant. Effect sizes were given as described above.

All analyses were performed using the statistical software SPSS (Statistical Package for the Social Sciences; version 14).

Results

■ Weight characteristics and prevalence of disordered eating by different BMI-classes

A total of 8.4% of the sample were underweight (BMI < 10 th percentile) and 18.3% were overweight or obese (BMI > 90 th percentile, data not shown) according to national age- and sex-specific reference values [26]. While only 10.9% of the severe underweight and 5.5% of the underweight subsample obtained scores above the threshold value of the SCOFF for disordered eating behaviour, 36.4% of the overweight and 53.5% of the obese participants scored in the pathological range. In the underweight group, the item “Does food dominate your life?” was the most affirmed question, whereas the item “Do you worry you have lost control over how much you eat” was the

most often asserted in the overweight group (data not shown).

In total, 29.4% of the girls and 14.4% of the boys obtained SCOFF-values beyond the threshold. The mean value of the total SCOFF score in girls was higher ($m = 0.97$, $SE = 0.03$) than in boys ($m = 0.66$, $SE = 0.03$, $P < 0.001$) after controlling for age and BMI-SDS. The effect was small ($\eta^2 = 0.028$) (Table 1).

In older adolescents (14–17 years), higher SCOFF mean scores were found ($m = 0.86$; $SE = 0.03$) than in younger adolescents (11–13 years) ($m = 0.72$; $SE = 0.04$, $P = 0.002$) after controlling for sex and BMI-SDS. The effect was very small ($\eta^2 = 0.005$).

■ General psychopathology and disordered eating

Strong and statistically significant differences with effect sizes up to $\eta^2 = 0.063$ were found in the depression and anxiety levels of adolescents reporting high SCOFF scores versus those with low scores. It can be observed that these differences in depression and anxiety scores between the two groups are more consistent and stronger in the adolescents' self-report (Table 2).

Table 2 General psychopathology and disordered eating

Psychometric subscale	Self-reported mental health				Parent-reported mental health			
	Low SCOFF* m (95% CI)	High SCOFF* m (95% CI)	<i>P</i> Value	η^2	Low SCOFF* m (95% CI)	High SCOFF* m (95% CI)	<i>P</i> Value	η^2
CES-DC**	(<i>n</i> = 1,378) 9.1 (8.7–9.4)	(<i>n</i> = 393) 12.5 (11.8–13.1)	<0.001	0.038	(<i>n</i> = 1,376) 8.2 (7.9–8.5)	(<i>n</i> = 374) 9.5 (8.8–10.1)	0.001	0.006
DIKJ**	(<i>n</i> = 1,171) 6.9 (6.6–7.3)	(<i>n</i> = 309) 10.8 (10.1–11.5)	<0.001	0.063				
SCARED-5**	(<i>n</i> = 1423) 1.2 (1.1–1.2)	(<i>n</i> = 402) 1.7 (1.6–1.9)	<0.001	0.031	(<i>n</i> = 1,377) 0.8 (0.7–0.9)	(<i>n</i> = 376) 1.1 (1.0–1.3)	<0.001	0.011
SCARED social phobia**	(<i>n</i> = 1,381) 2.4 (2.3–2.5)	(<i>n</i> = 393) 2.7 (2.5–2.9)	0.014	0.003	(<i>n</i> = 1,375) 2.1 (2.0–2.2)	(<i>n</i> = 373) 2.2 (2.0–2.4)	0.630	0.000
SDQ-Impact-Supplement**	(<i>n</i> = 1,180) 0.3 (0.2–0.3)	(<i>n</i> = 313) 0.7 (0.6–0.8)	<0.001	0.029	(<i>n</i> = 1,212) 0.4 (0.4–0.5)	(<i>n</i> = 319) 0.6 (0.5–0.7)	0.011	0.004
CBCL external**					(<i>n</i> = 1,212) 7.6 (7.2–8.0)	(<i>n</i> = 315) 9.6 (8.7–10.4)	<0.001	0.010

*Cell entries represent adjusted means, standard errors and 95% confidence interval
**Estimated marginal means adjusted for age, gender and BMI z-score

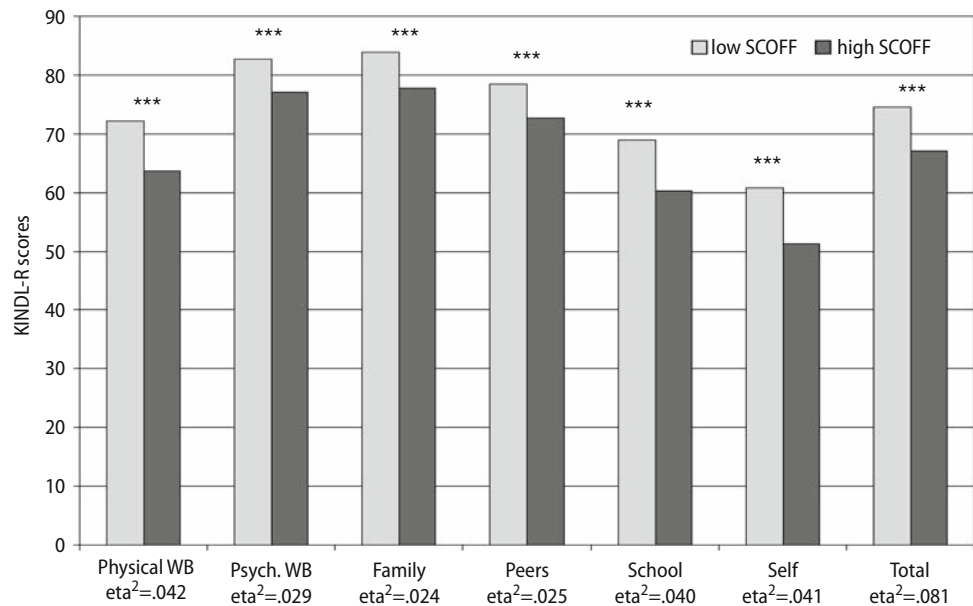
In addition, adolescents with SCOFF scores beyond the threshold level declared significantly more suicidal ideation (7.9%) than those with low levels (2.7%) (Chi-square = 24.5; *df* = 2; *P* < 0.001). Correspondingly, these adolescents also reported more suicidal behaviour (5.4%) than adolescents without disordered eating behaviour (2.2%) (Chi-square = 17.7; *df* = 2; *P* < 0.001). Disordered eating attitudes were also significantly associated with externalising behavioural problems as indicated by the parents.

Moreover, youngsters with high SCOFF scores reported a higher level of perceived difficulties regarding mental health problems than did those with subjectively normal eating.

Disordered eating behaviour and health-related quality of life

Figure 1 shows the mean scores in the six HRQoL dimensions of the KINDL-R [39] after adjustment for age, sex and BMI-SDS of probands with high and low SCOFF scores. Probands with scores beyond the threshold showed significantly lower values for all of the KINDL-R-subcales and for the total score ($\eta^2 = 0.081$). Thus, adolescents with disordered eating behaviour described decreased quality of life in all dimensions such as physical, psychological and social well-being.

Fig. 1 Disordered eating and self-reported health-related quality of life (Kindl-R, [39] (comparison adjusted for age, sex, BMI-SDS))



A comparison of *self-reported HRQoL* in the different weight groups showed significant overall mean differences ($P < 0.001$) between the KINDL-R total scores of underweight participants ($m = 72.9$; $SD = 10.5$; $CI: 71.3-74.6$; $n = 154$), normal weight participants ($m = 73.5$; $SD = 10.0$; $CI: 72.9-74.2$; $n = 864$) and overweight and obese participants ($m = 70.9$; $SD = 11.0$; $CI: 69.7-72.1$; $n = 332$). Analogous results were obtained when parent-reported HRQoL was compared between the weight groups. However, when examining both self- and parent-reported data, only the difference between normal weight participants and overweight/obese participants remained significant after correcting for multiple testing (Bonferroni-post hoc test).

Discussion

To our knowledge, this study is the first German survey to investigate systematically disordered eating behaviour in a large nationally representative sample and to examine the relations between disordered eating, general psychopathology and health-related quality of life.

The high prevalence of overweight and obesity (18.3% beyond the 90th percentile of the reference population) is in line with other international or national studies which find an increase of BMI during recent years [19]. For example, in The Netherlands, 20% of six-year-olds in 1997 exceeded the 90th percentile of 1980 [15].

■ Prevalence of disordered eating behaviour and attitudes

Nearly one-third of the girls and 15% of the boys in this sample endorsed disordered eating behaviour. These prevalence rates are similar to those of other European [51] and German studies [4], although different investigation methods were used. They are somewhat lower than those reported in US surveys [37].

In accordance with other studies [5, 37], girls and older adolescents reported significantly more disordered eating behaviour than boys and younger probands. Rates of disordered eating were highest among overweight and obese youth. This result is in line with those of other studies [37, 51, 52]. In a recent investigation by Lundstedt et al. [32] at the Karolinska University Hospital in Stockholm, adolescent obese girls were comparable to DSM-IV eating disorder-diagnosed girls on the majority of the subscales of the eating disorder inventory, a well-known detailed instrument for assessing eating disorders in adoles-

cence. This indicates that psychological traits like feelings of ineffectiveness associated with eating disorder diagnoses also appear among obese patients, particularly among girls.

The item of the SCOFF that was most often endorsed by the overweight and the obese subsample was that corresponding to loss of control over eating (affirmed by 36.5% of overweight adolescents and 60.6% of the obese adolescents). This may point to the experience of binge eating, although we did not assess this behaviour specifically. Binge eating is a well established phenomenon in overweight adolescents. In a recent investigation of non-treatment seeking six- to thirteen-year-old overweight children more than 20% practiced objective overeating, and more than 9% endorsed subjective or objective binge eating [49]. In our own study, this trend was shown even in the youngest participants. In preschool children, 6.3% of those fulfilling the BMI-criterion for overweight condition or obesity reported binge eating in contrast to 1.6% of normal weight preschoolers [28]. Overweight individuals may be more likely to engage in dieting with the intention to lose weight, thus putting themselves at greater risk for binge eating [47]. Stigmatisation of obese children and adolescents is a common event and is probably increasing. In 2001, obese children were even rated more negatively by their peers than in 1961 [29]. Thus, the societal pressure to be slim might enhance dieting behaviour and reduce self-esteem. On the other hand, there is also prospective evidence that binge eating in childhood or adolescence increases the likelihood for subsequent obesity [46].

The low prevalence of high SCOFF scores in the underweight group is quite surprising. This may be due to the fact that adolescents with a full-blown eating disorder (e.g. anorexia or bulimia nervosa) often deny their problem. However, the study's prevalence rate (0.6%) of high SCOFF scores in underweight females (all female subjects with a body weight less than 10th percentile) fits well to established estimation rates of the prevalence of anorexia nervosa in the general population (0.3–1%, [20]).

■ Psychopathology

Probands who reported disordered eating behaviour had significantly higher levels of depression and anxiety, even after controlling for BMI. This was not only reported by the adolescents themselves, but also by their parents, although to lesser extent. The observed higher impairment of adolescents with disordered eating behaviour according to the self-report rather than the parent-report can be attributed to the fact that internal behavioural problems are more

reliably assessed by the individual than by an outside observer [50].

Although several mostly clinical studies have documented an association between obesity and psychopathology [7, 8], especially depressive symptoms, there is still disagreement about the strength and nature of this relationship. In epidemiological studies, this relationship has been found to be weak or inconsistent [27, 35].

There is even less consensus on the association between disordered eating and symptoms of mental disorders in population-based studies. Our results are in line with those of Neumark-Sztainer and Hannan [37], who found strong associations between disturbed eating, high levels of depression (also measured by means of the CES-DC), feelings of stress and low self-esteem. In accordance with our results, the authors also found a strong correlation between disordered eating and suicidal ideation. In another investigation by the same group [16], severity of depression in adolescents was positively associated with weight concerns, perceived barriers to healthy eating and unhealthy weight control behaviours. In a very recent study, body dissatisfaction prospectively predicted depressive mood and low self-esteem five years later in adolescent girls and boys [36].

In contrast to the many studies examining internalising problems in eating disordered adolescents, there are few studies that have investigated the coincidence of disturbed eating behaviour and externalising symptoms.

In a longitudinal investigation of externalising behaviour and disordered eating attitudes at 11, 14 and 17 years of age, externalising behaviour predicted increases in weight preoccupation, body dissatisfaction and the use of inappropriate weight control behaviours. The converse was also confirmed: earlier use of inappropriate compensatory weight control behaviours predicted increases in externalising behavioural problems [33]. In our study, parents described significantly more externalising problems in their sons and daughters with disordered eating behaviour than did parents of children without such problems. Unfortunately, because of the cross-sectional nature of our study, it is impossible to state whether disordered eating or externalising disorders were the primary problem, and which preceded the other.

■ Disordered eating behaviour, mental health problems and HRQoL

In our investigation, youngsters with disordered eating behaviour confirmed that mental health problems had a significantly higher impact on their life than

was reported by the non-eating disordered subsample with low SCOFF scores. This pattern suggests that disordered eating behaviour may point to a greater underlying psychopathology or to stressful living situations [37], which should not be underestimated by health professionals.

Although the negative effects of childhood overweight and obesity on quality of life have been shown in clinical [45] and population-based studies [55], as far as we know there is no extant study on health-related quality of life in children or adolescents with disordered eating attitudes. In a previous study, overweight and obese children most strongly differed from normal weight children regarding their physical and social functioning, while their emotional and school functioning seemed to be relatively unaffected [55]. In our study, adolescents with disordered eating behaviour differed from the normal group in literally all aspects: physical, psychological, and social well-being as well as their degree of daily functioning at school. Since this comparison was adjusted for the higher proportion of overweight children in the group with disordered eating behaviour, this result indicates the importance of disordered eating attitudes with respect to the general well-being of young people.

A limitation of this study is the use of an instrument that has been developed for the screening of a clinical eating disorder, but not for eating disorder symptoms in an older adolescent or general population. Moreover, this instrument was not validated in a German sample. Nevertheless, the prevalence rates of disordered eating behaviour found in our study are very similar to those of other investigations that used different assessment methods. Note, however, that the SCOFF does not assess eating disorder diagnoses according to DSM- or ICD-classification criteria.

A second limitation of the study is that psychopathology was only assessed by parent- or self-report questionnaires and standardised telephone interviews, not by a more thorough clinician-guided investigation.

However, a major strength of the study was the use of a nationally representative sample, thus allowing for the extrapolation of findings from this sample to the general adolescent German population. The results indicate an urgent need for intervention in youth with disordered eating behaviour not only at the individual and familial, but also at the societal level.

In conclusion, the high prevalence of disordered eating behaviour in the general population of Germany is of great concern. Health professionals should not only be aware of disordered eating in underweight adolescents, but in all youth, especially in overweight and obese individuals. Disordered eating behaviour is associated with a wide range of psychopathologies and with psychosocial burden. Thus, youngsters

engaging in disordered eating behaviour should also be explored for other serious mental or social issues.

■ **Conflict of interest** All authors declare no conflict of interest.

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