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Optimistic and pessimistic self-assessment of own diets is associated with age, self-rated health and weight status in Danish adults

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Abstract

The aim of this study was to analyse concordance between Danish adults' recorded diet quality and their own assessment of the healthiness and to examine socio-demographic, health and behavioural characteristics associated with an optimistic or pessimistic self-assessment.

Data were derived from The Danish National Survey of Diet and Physical Activity 2011-2013 and included a random sample of 3014 adults (18-75 y). Diet quality was evaluated on the basis of seven-day pre-coded food diaries and categorised 'unhealthy', 'somewhat healthy' and 'healthy'. Self-assessment of the healthiness of own diets was registered via personal interviews and categorised healthy enough 'to a high degree', 'to some degree' or 'not at all/only partly'. Highly and somewhat optimistic self-assessment, respectively, were defined as assessing own diets as healthy enough to a high degree or to some degree while having unhealthy diets. Highly and somewhat pessimistic self-assessment, respectively, were defined as assessing own diets as not healthy enough or healthy enough to some degree while having healthy diets. Multiple logistic regression models were used to examine characteristics associated with optimistic and pessimistic self-assessments, respectively.

Among individuals with unhealthy diets, 13 % were highly optimistic and 42 % somewhat optimistic about the healthiness of their diets. Among individuals with healthy diets, 14 % were highly pessimistic and 51 % somewhat pessimistic about the healthiness of their diets. Highly optimistic self-assessment was associated with increasing age, excellent self-rated health, normal weight and a moderate activity level. Highly pessimistic self-assessment was associated with decreasing age, good self-rated health and being overweight or obese. The findings indicate that people seem to use personal health characteristics as important references when assessing the healthiness of their diets.

Keywords

Estimated diet quality, diet index, self-assessed diet healthiness, cross-sectional study, random sample, adults

Introduction

The association between diet and health is well-established (Nordic Council of Ministers, 2014; World Cancer Research Fund/American Institute for Cancer Research, 2007; World Health Organization, 2003). Accordingly, food and health authorities in Denmark and other Western countries outline evidence-based dietary guidelines (Danish Veterinary and Food Administration, 2013; Dietary Guidelines Advisory Committee, 2015; Food and Agriculture Organization of the United Nations, 2016). In order to promote healthier diets among populations, action plans are often used and several initiatives implemented at various levels (Danish Veterinary and Food Administration, 2016; Nordic Council of Ministers, 2006; Research Centre for Prevention and Health, 2009; World Health Organization, 2015). However, compliance with food-based dietary guidelines (FBDG) remains low (Amcoff et al., 2012; Pedersen et al., 2015; Rossum et al., 2011; Totland et al., 2012). In the Danish adult population, 97 % do not comply with the recommendation for saturated fat (<10 E %), 83 % do not comply with the recommendation for fruit and vegetables (600 gr/10 MJ/day), and 33 % eat more than the recommended maximum intake of sugar (<10 E %) (Pedersen et al., 2015).

Concurrently, earlier findings from the Danish National Survey of Diet and Physical Activity 2005-2008 showed that 79 % of Danish adults considered their diets to be healthy enough, and 80 % believed that they ate enough vegetables (Groth et al., 2009). Among adults who believed they ate enough vegetables, 78 % had a vegetables intake below the recommended amount (Sørensen et al., 2013). Thus, there seems to be considerable differences between Danish adults' compliance with Danish FBDG and Danish adults' self-assessments of the healthiness of their own diets.

Previous studies have found that people who assessed the healthiness of their diets optimistically were less likely to intend changing to healthier eating behaviours (Brug et al., 1994; Jansink et al., 2012; Lechner et al., 1997; Variyam et al., 2001), and it has been suggested that optimistic self-assessment is a potential barrier in the promotion of healthier diets. Optimistic self-assessment refers to people assessing own diets as healthier than evaluated by means of a self-reporting instrument and with FBDG as the reference of a healthy diet. The association between optimistic self-assessment and intention to change was typically explained by referring to the Precaution Adoption Process Model (Weinstein, 1988). According to this model, people need to be aware that their behaviour is a potential health risk in order to be motivated to initiate a behaviour change process.

In previous studies, 27-42 % assessed the healthiness of their dietary intake optimistically (Brug et al., 1994; Glanz et al., 1997; Jansink et al., 2012; Lechner et al., 1997; Variyam et al., 2001), while 20-28 % assessed the healthiness of their dietary intake pessimistically. Several studies concluded that an important step in health promotion initiatives is to make people aware of their unhealthy diets (Brug et al., 1994; Jansink et al., 2012; Lechner et al., 1997; Variyam et al., 2001), either by giving them feedback on their dietary intake (Brug et al., 1994; Dijkstra et al., 2014; Variyam et al., 2001) or by increasing the knowledge of FBDG (Lechner et al., 1997). However, potential reasons for optimistic self-assessments

have not been explored in-depth, and the suggested solutions – making people aware of their unhealthy diets or increasing the knowledge about FBDG – seem speculative.

Studies about people's optimistic and pessimistic self-assessment of the healthiness of their dietary intake have been conducted as cross-sectional studies in the Netherlands (Brug et al., 1994; Dijkstra et al., 2014; Glanz et al., 1997; Jansink et al., 2012; Lechner et al., 1997) and in the US (Glanz et al., 1997; Variyam et al., 2001). The majority of studies were conducted in specific populations such as patients with type 2 diabetes (Jansink et al., 2012), older people (Dijkstra et al., 2014), meal planners/preparers of households (Variyam et al., 2001) or in local communities (Brug et al., 1994; Glanz et al., 1997) and include between 367 (Lechner et al., 1997) and 15.440 participants (Glanz et al., 1997). As FBDG and other national public health initiatives are targeted the general population, it is important to study the phenomenon of optimistic and pessimistic self-assessment in a representative sample of the general population. Furthermore, in order to prevent people's optimistic self-assessment and promote more realistic self-assessments, more in-depth knowledge about mechanisms behind optimistic self-assessment is needed.

The present study is the first of two studies comprising a mixed method study. The aim of this study was to analyse concordance between Danish adults' recorded diet quality and their own assessment of the healthiness and to examine socio-demographic, health and behavioural characteristics associated with an optimistic or pessimistic self-assessment. The second study was a qualitative study exploring considerations underlying lay people's optimistic self-assessments of unhealthy diets (Sørensen & Holm, 2016). Examining criteria underlying lay people's self-assessment in depth as well as in width is likely to bring about a more complete picture of the phenomenon (Bryman, 2006; Greene et al., 1989; Padgett, 2012). This knowledge is likely to be valuable in future health promotion initiatives.

Material and methods

Study design

Data were derived from The Danish National Survey of Diet and Physical Activity 2011-2013 (DANSDA). DANSDA is a nationwide, cross-sectional survey where data on diets, physical activity, weight status and health-related lifestyle factors were collected in a nationwide random sample of the Danish population from spring 2011 to summer 2013. Data were collected with seven-day pre-coded food diaries and pedometer step counts, measured anthropometrics and structured face-to-face interviews (socio-demography and health-related lifestyle). A sample of 7,253 individuals (4-75 y) were drawn from the Danish Civil Registration System (Pedersen, 2011) and 3,946 (54 %) participated with valid data (Pedersen et al., 2015). Among adults (18-75 y) the response rate was 52 % which comprised a total sample of 3016. In order to ensure sufficient language knowledge, individuals who did not speak Danish were excluded from the random sample. Furthermore, to ensure sufficient knowledge about dietary intake, disabled individuals, nursing home residents and home-dwelling individuals receiving meals from outside their homes regularly were excluded from the random sample (Pedersen et al., 2015). Compared to the Danish population, individuals with basic education were underrepresented, while men and 19-54 year olds were slightly underrepresented (Pedersen et al., 2015).

DANSDA was conducted in accordance with the Declaration of Helsinki and approved by the Danish Data Protection Agency. The Danish National Committee on Health Research Ethics has reviewed the study protocol and reported that DANSDA did not require approval by this authority according to Danish Law.

Measures

Estimated diet quality

Participants recorded their dietary intake in pre-coded food diaries for seven consecutive days (Biltoft-Jensen et al., 2009; Pedersen et al., 2015). The food diary was structured according to a typical Danish meal pattern (breakfast, lunch, dinner and in-between meals) and included the most commonly eaten foods and drinks with an opportunity to add food and drinks not included in the pre-codes. Portion size was estimated using household measures (cups, glasses etc.) and photographs in a booklet containing a series of 41 photographs with 6 different portion sizes. Intakes of energy, nutrients and food items were calculated for each individual using the software system GIES version 1.000.i6 (developed at the National Food Institute, Technical University of Denmark, Søborg, Denmark) and the Danish Food Composition Databank version 7.0 (National Food Institute Technical Unversity of Denmark, 2009).

The overall diet quality of each individual was evaluated by means of a diet index score based on five food and nutrient guidelines from the Danish FBDG 2013: energy from saturated fat (max 10 %), energy from added sugar (max 10 %), intake of fruits and vegetables (600 g/10 MJ/day), intake of fish (350 g/10 MJ/week) and intake of wholegrain (min 75 g/10 MJ/day) (Tetens et al., 2013). The diet index was a

slightly modified version of a validated diet index based on the Danish FBDG 2005 (Knudsen et al., 2012). In accordance with the updates of the guidelines in 2013, total fat (max 30 E %) was excluded from the index, and intake of potatoes, rice, pasta and wholemeal bread (min 500 g/10 MJ/day) was replaced with intake of wholegrain. Danish FBDG 2013 consists of ten guidelines. Besides the five guidelines directly included in the index, the recommendations include to eat a varied diet, not too much and be physically active, to choose lean meat, cold cuts and low fat dairy products, to eat food with less salt and to drink water. For each individual, a score between 0 and 1 was calculated according to the compliance with each of the five guidelines included in the index. For example, if an individual complied with the fruit and vegetables guideline (600 g/10 MJ/day), the score was 1. With an intake of 300 g/10 MJ/day, the score was 0.5, and with a zero intake, the score was 0. The total score was calculated as the sum of the five scores, ranging from 0 to 5 where 0 was most far from complying with the dietary guidelines and 5 was compliance with all five dietary guidelines.

To distinguish individuals with low, intermediate and high diet quality, individuals were divided in tertiles according to the total diet index score. This was in accordance with previous studies (Brug et al., 1994; Glanz et al., 1997). A diet index score in the lowest tertile was defined as unhealthy diets (score range 0.00-3.01). A score in the intermediate tertile was defined as somewhat healthy diets (score range 3.02-3.80) while a score in the highest tertile was defined as healthy diets (score range 3.81-5.00). Thus, the categorization was relative and healthy diets were not necessarily equivalent to complying with all the guidelines. Less than 1 % complied with all five guidelines and therefore it was not a relevant cut-off point for distinguishing healthy and unhealthy diets.

Self-assessed diet healthiness

Information about self-assessed diet healthiness was obtained with the following question: Do you consider your dietary habits to be healthy enough? The question was part of a structured face-to-face interview conducted by trained interviewers before participants recorded their diets. The interviewer probed the response of the participant and chose one of the following response categories: (1) Yes, to a high degree; (2) Yes, to some degree; (3) No, only partly; and (4) No, not at all. Due to low numbers in the last category (5.2 %), category 3 and 4 were merged.

Definition of optimistic and pessimistic self-assessment of diet healthiness

Optimistic and pessimistic self-assessment of diet healthiness was defined by comparing the measure of estimated diet quality with the measure of self-assessed diet healthiness (Figure 1). Optimistic self-assessment was defined as having a diet index score in the lowest tertile of the total diet index (unhealthy diets) and at the same time assessing own diets as healthy to a high degree (highly optimistic) or to some degree (somewhat optimistic). Having unhealthy diets and assessing own diets as only partly/not at all healthy enough was defined as being realistic about own unhealthy diets. Pessimistic self-assessment was defined as having a diet index score in the highest tertile of the total diet index (healthy diets) and at the same time assessing own diets as not at all/only partly healthy enough (highly pessimistic) or to some degree healthy enough (somewhat pessimistic). Having healthy

diets and assessing own diets as healthy enough to a high degree was defined as being realistic about own healthy diets.

Socio-demographic, health and lifestyle characteristics

Information about education and household income, self-rated health and self-reported elevated cholesterol, slimming diet, physical activity level and smoking behaviour were obtained in structured face-to-face interviews. Information on gender and age were derived from the Danish Civil Registration System (Pedersen, 2011).

Anthropometric measurements

Height, weight and waist circumference were measured by the interviewer using standardized procedures. Weight was measured with an electronic scale (ADE, Germany) while wearing light indoor clothing, and height was measured with a portable stadiometer (Charder HM200P Portstad) with an accuracy of 0.1 kg and 0.1 cm, respectively. Waist circumference was measured with a tape measure in a horizontal line between the hip bone and the lowest rib and with an accuracy of 1.0 cm. All anthropometric measurements were made twice and an average calculated. BMI was calculated as weight (kg)/height $(m)^2$. The classification of weight status and abdominal weight status was based on international standards (World Health Organization, 2000).

Statistical analyses

In descriptive analyses group differences were tested using Chi-square test for categorical variables and ANOVA test for continuous variables ($P<0.05$). Results are presented overall and by gender. To account for non-response bias in DANSDA, the presented proportions of optimistic and pessimistic assessors were weighted according to gender, age and education using census data from Statistics Denmark. The results of the descriptive analyses, except for study sample characteristics (Table 1), were based on weighted data. Sensitivity analyses were conducted in order to examine if different cut-off points affected the proportions of optimistic and pessimistic assessors. Thus, the extent of optimistic self-assessment was analysed among the quartile with the lowest diet index score and the extent of pessimistic self-assessment was analysed among the quartile with the highest diet index score.

To analyse factors associated with optimistic and pessimistic self-assessments, respectively, multiple logistic regression models were used. Results are presented as odds ratios (OR) with 95 % confidence intervals (CI). In the analysis of optimistic self-assessment of diet healthiness, highly optimistic assessors were compared with realistic assessors, and the analysis was conducted among participants with a low diet index score. In the analysis of pessimistic self-assessment of diet healthiness, highly pessimistic assessors were compared with realistic assessors, and the analysis was conducted among participants with a high diet index score. Somewhat optimistic and somewhat pessimistic assessors, respectively, were not included in the outcome, due to a risk of misclassifying participants as optimistic or pessimistic assessors based on the response that they consider their diets to some degree healthy

enough. However, sensitivity analyses were performed where somewhat optimistic assessors and somewhat pessimistic assessors, respectively, were included in the outcome.

All potential explanatory variables of interest were included in the first model: gender, age, educational level and household income, self-rated health, self-reported elevated cholesterol, weight status and abdominal weight status, slimming diet, physical activity level and smoking behaviour. Using backward selection, the least significant variable was removed model by model ($P<0.05$). Gender, age and education were kept in the models as they are known to be associated with the proportion of non-response (Pedersen et al., 2015). Potential interactions between the remaining explanatory variables were tested in the logistic regression model using the same backward selection procedure. The goodness of fit was assessed using Hosmer-Lemeshow goodness of fit. All analyses were performed using IBM SPSS Statistics 21.

Results

Study population

Valid interview and dietary intake data were available from 3014 participants aged 18-75 years. Characteristics of the study population are shown in Table 1. The mean diet index score was 3.3 (0.3-5.0). Twenty five percent considered their diets to be healthy enough to a high degree, 51 % to some degree, and 24 % considered their diets not to be healthy enough. Among adults with unhealthy diets, there were a higher number of men (61 %) and younger adults (18-24 y: 16 %, 25-44 y: 35 %), lower educated (elementary school: 20 %) and adults with unfavourable health characteristics (obese: 22 %, abdominal obese: 35 %, fair/poor self-rated health: 11 %) and unfavourable behavioural characteristics (smoking: 34 %, sedentary activity level: 13 %) compared to the total sample. Among adults with healthy diets, there were a higher number of women (64 %) and older adults (45-64 y: 45 %, 65-75 y: 21 %), more educated (medium higher education: 26 %, long higher education: 16 %) and adults with favourable health characteristics (normal weight: 48 %, excellent self-rated health: 28 %) and favourable behavioural characteristics (non-smoking: 89 %, moderate physical activity level: 36 %) compared to the total sample.

Extent of optimistic and pessimistic assessors

When weighting the data according to the Danish adult population on gender, age and education, the proportion of adults with unhealthy diets was 40 %, 32 % had somewhat healthy diets, while 28 % had healthy diets (data not tabulated).

Among adults with unhealthy diets, 13 % were highly optimistic about the healthiness of their diets, 42 % somewhat optimistic and 45 % were realistic about their unhealthy diets (Table 2). Among adults with healthy diets, 14 % were highly pessimistic about the healthiness of their diets, 51 % somewhat pessimistic and 35 % were realistic about their healthy diets. In the entire sample, 29 % were optimistic

about the healthiness of their diets (5+17+7), while 26 % were pessimistic (8+14+4), and 46 % (10+18+18) were found to be realistic assessors (Figure 1). The sensitivity analyses with different cut-off points (quartiles) did not change the proportions of optimistic and pessimistic self-assessments significantly (data not shown).

Factors associated with optimistic and pessimistic self-assessment of diet healthiness

Among adults with unhealthy diets, highly optimistic self-assessment was associated with age, self-rated health, weight status and physical activity level (Table 3). Thus, 65-75-year-olds were more likely to be optimistic about their unhealthy diets than 45-64-year-olds (OR 2.84 (1.42; 5.69)), and 18-44-year-olds were less likely to be optimistic assessors (18-24 y: OR 0.05 (0.02; 0.15); 25-44 y: OR 0.14 (0.07; 0.27), respectively). Individuals with very good or good self-rated health were less likely to be optimistic assessors compared to those with excellent self-rated health (OR 0.36 (0.19; 0.69); OR 0.34 (0.17; 0.65), respectively) and overweight or obese individuals were less likely to be optimistic assessors compared to normal weight individuals (OR 0.40 (0.23; 0.71); OR 0.11 (0.05; 0.24), respectively). Finally, individuals with a light or sedentary physical activity level were less likely to be optimistic assessors than individuals with a moderate physical activity level (OR 0.48 (0.27; 0.85); OR 0.36 (0.15; 0.83), respectively). None of the tested interactions between the explanatory variables proved to be statistically significant.

In the sensitivity analysis of factors associated with somewhat and highly optimistic self-assessment, the overall findings were the same (data not shown). However, self-rated health was no longer significantly associated with optimistic self-assessment.

Among adults with healthy diets, highly pessimistic self-assessment was associated with age, self-rated health and weight status (Table 4). Thus, 25-44-year-olds were more likely to be pessimistic about the healthiness of their diets than 45-64-year-olds (OR 2.78 (1.52; 5.08)), while 65-75-year-olds were less likely to be pessimistic assessors (OR 0.48 (0.24; 0.95)). Further, individuals with good self-rated health were more likely to be pessimistic assessors compared with those who had an excellent self-rated health (OR 3.59 (1.85; 6.99)) and obese individuals were more likely to be pessimistic assessors compared to normal weight individuals (OR 3.75 (1.82; 7.73)). In addition, physical activity level was borderline significantly associated with pessimistic self-assessment, indicating that adults with sedentary activity level were more likely to be pessimistic assessors (P=0.068). None of the tested interactions between the explanatory variables proved to be statistically significant.

In the sensitivity analysis of factors associated with somewhat and highly pessimistic self-assessment, the overall findings were the same (data not shown). However, some of the findings were less marked when somewhat pessimistic assessors were included in the outcome. Additionally, slimming diet and leisure time physical activity was significantly associated with pessimistic self-assessment.

Discussion

In this representative sample of the Danish adult population, we found that just above half of Danish adults with unhealthy diets were optimistic assessors of their own diets and two out of three adults with healthy diets were pessimistic assessors of their own diets. Increasing age and favourable health characteristics were found to be associated with optimistic self-assessments, while decreasing age and less favourable heath characteristics were associated with pessimistic self-assessments.

The findings indicate that people may use personal health characteristics as important references when assessing the healthiness of their diets. Thus, feeling healthy and looking healthy may function as significant signs of healthy eating behaviours, while feeling less healthy and being obese may function as signs of unhealthy eating behaviours. This interpretation has previously been suggested by studies examining associations between health characteristics and optimistic self-assessment of physical activity (Godino et al., 2014; Lechner et al., 2006; van Sluijs et al., 2007; Watkinson et al., 2010). The qualitative study (Sørensen & Holm, 2016) that followed the present study explored considerations underlying lay people's self-assessment of unhealthy diets, and the findings support this interpretation. Thus, perceptions of a healthy weight and wellbeing were found to be decisive criteria when interviewees assessed the healthiness of their diets optimistically. (For further information see Sørensen & Holm, 2016).

Previous findings of socio-demographic characteristics of optimistic and pessimistic assessors are inconsistent. Variyam et al. (2001) found that men were more likely to be optimistic assessors, while Glanz et al. (1997) found that women were more likely to be optimistic assessors. In accordance with the present study, Dijkstra et al. (2014) found no association with gender. Contrary to our findings, none of the previous studies found age to be associated with optimistic or pessimistic self-assessment of diet healthiness (Dijkstra et al., 2014; Glanz et al., 1997; Variyam et al., 2001), probably due to a more narrow age span compared to the present study. Furthermore, the study of Dijkstra et al. (2014) found lower education to be associated with optimistic self-assessments. The studies of Glanz et al. (1997) and Variyam et al. (2001) support this finding, however with a less clear trend. The various studies differ in study populations and the outcome varies between overall diet quality and intake of single food items. Further, the studies vary in measures and cut-off points, in definitions of self-assessment groups, and in assessment methods. Therefore, one explanation of the inconsistent findings is likely to be methodological differences between the studies.

The extent of optimistic and pessimistic self-assessments varies considerably between different studies. Previous studies found that 27-42 % (Brug et al., 1994; Glanz et al., 1997; Lechner et al., 1997; Variyam et al., 2001) and 2-19 % (Dijkstra et al., 2014) were optimistic assessors, while 20-28 % (Glanz et al., 1997; Variyam et al., 2001) and 1-16 % (Dijkstra et al., 2014) were pessimistic assessors. Extent of optimistic and pessimistic assessors was calculated as the percentage of all participants. In the present study, this was found to be 29 % for optimistic assessors and 26 % for pessimistic assessors. The only

other study examining overall diet quality found that 40 % were optimistic about their diet quality (Variyam et al., 2001). The same study found a decrease in the proportion of optimists when estimating the extent of optimistic self-assessment of four individual nutrients in the period from 1989-1990 to 1994-1996. It was hypothesized that the proportion related to the overall diet quality would also decrease with time. The relatively low proportion of optimistic assessors identified in the present and recent study supports this. Variyam et al. (2001) suggested that a decrease could be due to policy changes such as nutrition labels. Glanz et al. (1997) emphasized that the more focus in the public on fat intake, the more awareness on own intake and thereby more realistic self-assessments. The lower proportion of optimistic assessors in the present study compared to older studies might be influenced by an increased focus on health and healthy lifestyles today than 20 years ago. Various methodological differences between the studies are also likely to explain some of the differences, why comparisons should be made with caution.

It is worth noting that a relatively high proportion of the participants in the presents study were realistic about their unhealthy diet (45 %). According to the Precaution Adoption Process Model, awareness of own risk behaviour is an important precondition for being motivated to change the behaviour (Weinstein, 1988). Therefore, as mentioned in the introduction, making people aware of their unhealthy diets has been suggested as an important first step in the promotion of healthier diets and personal feedback on dietary intake has been suggested as a strategy. The findings of the present study, along with the findings of the qualitative study (Sørensen & Holm, 2016), add to these suggestions. The qualitative study showed that lay people might be well aware of unhealthy diets (Sørensen & Holm, 2016). However, as long as they felt good and did not perceive themselves as overweight, they did not see any reasons for changing their diets. For this group, it seems likely that awareness of unhealthy diets may not be motivation enough for dietary change. Instead, there seems to be a need of increasing the knowledge of adverse health effects of unhealthy diets, and promoting health benefits of a healthy diet, regardless of present health and weight status.

Methodological considerations

A strength of the present study is the use of a nationwide random sample that enables generalizability of the results to the general adult population. A limitation is the response rate of 52 % as non-response bias may occur. The weighting of data cannot fully substitute for non-response. For example, studies have found that non-respondents are likely to have more unfavourable health and lifestyle characteristics (Christensen et al., 2015; Nyholm et al., 2008), and the findings of the present study should therefore be evaluated in this light.

Another strength is that estimated diet quality is based on data derived from seven-days pre-coded food diaries that are considered more accurate (Thompson & Subar, 2008) than food frequency questionnaires applied in other studies in this research field (Brug et al., 1994; Dijkstra et al., 2014; Glanz et al., 1997; Jansink et al., 2012; Lechner et al., 1997). Furthermore, the categorizations of healthy

and unhealthy diets were based on a modified version of a validated diet quality index (Knudsen et al., 2012). The diet index has proved to be a useful tool to describe the degree of compliance with FBDG. However, the diet index does not include absolute cut-off points defining healthy, intermediate and unhealthy foods – but a score that mirrors the compliance with five of the 10 food-based dietary guidelines that are quantifiable. Therefore, the categorizations of healthy and unhealthy diets were based on a relative measure. It is a strength that the identified proportions of optimistic and pessimistic assessors were found not to be sensitive to different cut-off points of the index score.

A major limitation of the study is that the question used to measure self-assessed diet healthiness has not been validated in the context used in this study. The question was formulated in order to identify how individuals experience the healthiness of own diets. In accordance with the intention of the question, our qualitative study (Sørensen & Holm, 2016) showed how interviewees did consider the healthiness of their diets subjectively when responding to the question. Furthermore, the overall categorisation of optimistic assessors and realistic assessors was replicated in the qualitative study. Another limitation of the question is the rather broad response category 'to some degree healthy enough'. The fact that half of the participants were categorised in this category (Table 1), substantiate a rather broad interpretation of what defines this category. Due to the risk of misclassifying individuals as optimistic and pessimistic assessors on the basis of this response category, it was decided to distinguish between highly and somewhat optimistic and pessimistic assessors. Furthermore, somewhat optimistic and pessimistic assessors were only included in the outcomes of the logistic regression models in sensitivity analyses.

Another potential limitation is that data on diet quality were collected in seven consecutive days, while data on self-assessed diet healthiness was a general assessment. In DANSDA 2011-2013, 70 % reported that their dietary intake in the registration period corresponded to their normal dietary habits (unpublished data from DANSDA). Thus, it cannot be excluded that some of the remaining 30 % were misclassified on this basis. However, participants' self-assessed disagreement between their dietary intake in the registration period and their normal dietary habits needs to be interpreted carefully. Deviations in the registration period, such as a birthday, prompt participants to report that their dietary intake do not correspond with their normal dietary habits even though a birthday party is not unusual in most people's lives. Furthermore, it would require significant dietary changes in the registration period to be classified in a different group of healthy, intermediate and unhealthy diets, and the issue is therefore considered to be of minor importance.

Conclusion

The present study found, that just above half of Danish adults with unhealthy diets assessed the healthiness of their own diets optimistically and two out of three of Danish adults with healthy diets assessed the healthiness pessimistically. Optimistic self-assessment was more likely among older adults and adults with favourable health characteristics, while pessimistic self-assessment was more

likely among younger adults and adults with less favourable health characteristics. The findings indicate that people seem to use personal health characteristics as important references when assessing the healthiness of their diets.

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Tables and figure

Table 1. Characteristics of the entire sample and of participants with unhealthy diets (diet index score ≤3.01) and healthy diets (diet index score ≥3.81)

	All N=3014	Unhealthy diets N=1005	Healthy diets N=1004
Socio-demography			
Gender (%, N)			
Men	48.6 (1464)	61.1 (614)	36.1 (362)
Women	51.4 (1550)	38.9 (391)	63.9 (642)
Age groups, years (%, N)			
18-24	11.4 (345)	15.8 (159)	9.2 (92)
25-44	30.4 (917)	35.2 (354)	25.7 (258)
45-64	40.7 (1228)	36.3 (365)	44.6 (448)
65-75	17.4 (524)	12.6 (127)	20.5 (206)
Age, years (mean, SD)	47.5 (16.0)	44.1 (16.2)	49.9 (15.6)
Educational level (%, N), N=2988			
Elementary school	14.2 (423)	19.6 (195)	9.9 (99)
Upper secondary school	7.9 (235)	9.4 (93)	7.1 (71)
Vocational training	38.6 (1154)	43.7 (434)	33.9 (338)
Short higher education	7.3 (219)	6.5 (65)	7.7 (77)
Medium higher education	20.1 (601)	13.8 (137)	25.7 (256)
Long higher education	11.9 (356)	6.9 (69)	15.7 (157)
Household income[a] DDK (%, N), N=2767			
<250.000	18.3 (507)	22.1 (202)	15.8 (145)
250.000-399.999	18.6 (516)	19.7 (180)	17.9 (164)
400.000-599.999	21.7 (601)	22.5 (206)	20.3 (186)
600.000-799.999	21.5 (595)	21.5 (197)	20.9 (191)
≥800.000	19.8 (548)	14.3 (131)	25.1 (230)
Health behaviour			
Diet index score (mean, SD)	3.3 (0.9)	2.4 (0.5)	4,3 (0.3)
Diet index, categorical (%, N), N=3014			
Low (unhealthy diets)	33.3 (1005)	100 (1005)	-
Intermediate (somewhat healthy diets)	33.3 (1005)	-	-
High (Healthy diets)	33.3 (1004)	-	100 (1004)
Self-assessed diet healthiness (%, N), N=3012			
Yes, to a high degree	25.2 (759)	15.0 (151)	35.7 (358)
Yes, to some degree	50.5 (1522)	44.5 (447)	51.9 (521)
No, only partly/not at all	24.3 (731)	40.4 (406)	12.4 (124)
Smoking behaviour (%, N), N=2993	20.8 (623)	34.2 (340)	11.5 (115)
Self-assessed PA level, leisure time (%, N), N=2992			
Vigorous	5.9 (177)	5.7 (57)	4.7 (47)
Moderate	32.3 (967)	27.1 (269)	35.9 (358)
Light	54.4 (1628)	53.9 (535)	55.4 (552)
Sedentary	7.4 (220)	13.3 (132)	4.0 (40)
Slimming diet[b] (%, N), N=2993			
No	60.3 (1805)	63.3 (630)	57.7 (575)
Yes, now	6.0 (180)	4.4 (44)	6.9 (69)
Yes, within the last year	10.2 (304)	9.9 (99)	10.5 (105)
Yes, more than one year ago	23.5 (704)	22.3 (222)	24.8 (247)
Health			
Weight status (%, N), N=2719			
Normal weight (BMI <25)	43.4 (1181)	39.0 (355)	47.6 (429)
Overweight (BMI 25 - <30)	39.2 (1067)	39.0 (355)	38.6 (348)
Obese (BMI ≥30)	17.3 (471)	22.0 (200)	13.8 (124)
Abdominal weight status (%, N), N=2717			
Healthy[c]	41.8 (1137)	39.3 (353)	44.2 (398)
Abdominal overweight[d]	25.6 (696)	25.5 (229)	25.1 (226)
Abdominal obesity[e]	32.5 (884)	35.2 (316)	30.7 (277)
Self-reported elevated cholesterol, N=3001	12.7 (382)	9.6 (96)	15.4 (154)
Self-rated health (%, N), N=2994			
Excellent	24.1 (722)	21.4 (213)	27.5 (274)
Very good	37.6 (1127)	33.9 (337)	39.6 (395)
Good	30.0 (898)	33.5 (333)	27.2 (271)
Fair/poor	8.2 (247)	11.3 (112)	5.7 (57)

[a] 7.45 Danish kroner = 1 Euro

[b] A diet with the aim of losing weight

[c] Men: <94 cm; women: <80 cm, [d] Men: 94-101 cm; women: 80-87 cm, [e] Men: ≥102 cm; women: ≥ 88 cm

Table 2. Optimistic and realistic self-assessment among adults with unhealthy diets (diet index score ≤3.01) and pessimistic and realistic self-assessment among adults with healthy diets (diet index score ≥3.81). Percentages

	All	Men	Women	P-value*
Unhealthy diets (n=1005)				0.003
Highly optimistic assessors	13	15	9	
Somewhat optimistic assessors	42	41	44	
Realistic assessors	45	44	47	
Healthy diets (n=1004)				0.156
Highly pessimistic assessors	14	18	13	
Somewhat pessimistic assessors	51	48	52	
Realistic assessors	35	34	35	

* Gender differences. Tested using Chi-square (P<0.05)

Table 3. Odds Ratios (OR, 95 % CI) for highly optimistic self-assessment of diet healthiness among participants with unhealthy diets[a] (diet index score ≤3.01) (outcome variable: highly optimistic vs realistic assessors) (N=497[b])

		OR	95 % CI	P-value[c]
Age				**<0.001**
	18-24	**0.05**	**0.02-0.15**	**<0.001**
	25-44	**0.14**	**0.07-0.27**	**<0.001**
	45-64	1.00		
	65-75	**2.84**	**1.42-5.69**	**0.003**
Self-rated health				**0.004**
	Excellent	1.00		
	Very good	**0.36**	**0.19-0.69**	**0.002**
	Good	**0.34**	**0.17-0.65**	**0.001**
	Fair/poor	0.56	0.24-1.30	0.177
Weight status				**<0.001**
	Normal weight[d] (BMI <25)	1.00		
	Overweight (BMI 25 - <30)	**0.40**	**0.23-0.71**	**0.002**
	Obese (BMI ≥30)	**0.11**	**0.05-0.24**	**<0.001**
Physical activity, leisure time				**0.037**
	Vigorous	0.49	0.14-1.78	0.281
	Moderate	1.00		
	Light	**0.48**	**0.27-0.85**	**0.011**
	Sedentary	**0.36**	**0.15-0.83**	**0.017**

[a] Included factors: gender, age, educational level, household income, weight status, abdominal weight status, self-reported elevated cholesterol, self-rated health, slimming diet, self-assessed physical activity, smoking behaviour. Gender, age and education were kept in the model
[b] Optimistic assessors n=151, realistic assessors n=406, missing data n=60
[c] Tested using logistic regression (P<0.05)
[d] 1 % was underweight (BMI <18.5)

Table 4. Odds Ratios (OR, 95 % CI) for highly pessimistic self-assessment of diet healthiness among participants with healthy diets[a] (diet index score ≥3.81) (outcome variable: highly pessimistic vs realistic assessors) (N=424[b])

		OR	95 % CI	P-value[c]
Age				**<0.001**
	18-24	1.40	0.46-4.27	0.557
	25-44	**2.78**	**1.52-5.08**	**0.001**
	45-64	1.00		
	65-75	**0.48**	**0.24-0.95**	**0.035**
Self-rated health				**0.002**
	Excellent	1.00		
	Very good	1.89	0.99-3.60	0.054
	Good	**3.59**	**1.85-6.99**	**<0.001**
	Fair/poor	1.41	0.42-4.71	0.577
Weight status				**0.002**
	Normal weight[d] (BMI <25)	1.00		
	Overweight (BMI 25 - <30)	1.58	0.90-2.77	0.112
	Obese (BMI ≥30)	**3.75**	**1.82-7.73**	**<0.001**

[a] Included factors: gender, age, educational level, household income, weight status, abdominal weight status, self-reported elevated cholesterol, self-rated health, slimming diet, self-assessed physical activity, smoking behaviour. Gender, age and education were kept in the model

[b] Pessimistic assessors n=124, realistic assessors n=358, missing data n=58

[b] Tested using logistic regression (P<0.05)

[c] Less than 1 % were underweight (BMI <18.5)

		Self-assessed diet healthiness		
		To a high degree healthy	To some degree healthy	Partly/not at all healthy
Estimated diet quality	Unhealthy diets	Highly optimistic self-assessment 5 %	Somewhat optimistic self-assessment 17 %	Realistic self-assessment 18 %
	Somewhat healthy diets	Somewhat optimistic self-assessment 7 %	Realistic self-assessment 18 %	Somewhat pessimistic self-assessment 8 %
	Healthy diets	Realistic self-assessment 10 %	Somewhat pessimistic self-assessment 14 %	Highly pessimistic self-assessment 4 %

Figure 1. Proportions of optimistic, pessimistic and realistic assessors in the adult Danish population (N=3014)