Feeding behaviour in obesity

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In the German Democratic Republic, as in other highly developed countries, the number of people weighing more than is normal has steadily increased since the end of World War II. A recent survey showed that 32·6% of the entire population are overweight. The number of obese women is very much larger than that of obese men, the percentages being 42·2 and 19·2% respectively. Especially threatening is the increase in the incidence of obesity with advancing age. Epidemiological investigations show that the number of overweight persons is particularly great among the middle-aged and aged. This is particularly true of women as more than 50% of women in their fifties must be considered as having adiposity.

No wonder that the question as to the causes of excessive increases of weight has been raised time and again. Adiposity – at least in the light of pathogenetic principles – must be considered to be the result of an overbalance. Accordingly, it is the result of either hyperphagia or hypomotility. However, it has not yet been possible to answer unambiguously the question of the relative importance and interrelationships of the two phenomena. But the statement that obesity must be considered the result of an overbalance does not provide an answer to the question of the causes of the disorder, that is, its aetiology. It is true that we know how obesity develops, but what we lack is knowledge of why people tend to take insufficient exercise or why they eat too much or have diets based on improper principles. A discussion of the harmful factors involved will not, however, be the subject of this paper.

The assumption that an increase of weight may be triggered by improper nutrition, which is entirely correct from a pathogenetic point of view, has always been a matter of controversy. For example, the counter-arguments were that not all of the 'fatties' eat too much, that not all of the gluttons are fat, that not all persons weighing more than normal show a loss of weight when put on a restricted diet, and that some people would even grow stouter when put on a limited diet. Therefore, it is necessary to analyze exactly the eating habits of obese persons with a view to clarifying the actual situation. It was by extensive and intensive studies made within the framework of a large-scale research project that we endeavoured to make a major contribution to this all-important question.*

*This particular project of research into Nutrition and Functional Capacity has been coordinated by the Central Institute of Nutrition, Potsdam-Rehbrücke, Academy of Sciences of the German Democratic Republic, with Professor Dr H.-A. Ketz functioning as chief coordinator. Research teams of various university clinics and hospitals in the GDR, including that of our department participated in the project. The surveys in Leipzig were made by Dr Ingrid Hunecke. Her results were supplemented by additional results obtained within the framework of this research project and made available by Dr H. Karst. The statistical calculations were made by Dr Isle Sauer.

A uniform programme of investigation was used which provided for the collection of nutritional and sociological as well as biochemical and clinical results. The present report contains the most important results of the special nutritional anamnesis. However, the problems associated with the determination of nutritional anamneses and the techniques used cannot be described here in detail. They have been very well reported by e.g. Burke (1947), Bransby, Baubney & King (1948), Jahnke (1964). We chose a system developed by the Central Institute of Nutrition, by which it is possible to determine by a detailed interview about the diet, the amount of food consumed in 1 week. To obtain a consistent determination of the quantities of food reported by those who were interviewed, illustrations or pictures, respectively, were shown to the subjects, which showed quantitatively measurable kinds of nutrients. The nutritional values of the various items of food were calculated in accordance with tables of nutritive values (Souci, Fachmann & Kraut, 1969).

For the determination of the body-weight the tables published by Möhr & Johnson (1972) were used, by which it is possible to read directly the optimum weight and the degree of individual deviation, allowing for both body height and aspects of physique. There are tables for men and women as well as for five physique-typological groups. By using these tables it is possible to classify within these groups deviations of the body-weight from optimum weight with nine relative weight groups ranging from extreme underweight to extreme overweight.

Our investigations to date included a total of 1169 persons. They included 253 normal-weight persons, of whom 123 were men and 130 women, and 916 overweight persons, of whom 297 were men and 619 women. The age of the subjects was between 18 and 59 years. The results given are those currently available. The final report on the research project will be based on a much larger number of cases. The results reported in this paper relate primarily to the over-all energy consumption of, and the percentage nutrients consumed by, normal-weight and overweight persons.

Fig. 1 shows the daily energy intake for normal-weight and overweight males. There was only a small difference in overall energy consumption between the normal weight group and a group of persons who were approximately 20% overweight. A breakdown of overweight persons into different weight classes gave a slight, though not statistically significant, increase up to those about 50% overweight. With respect to the relatively high intake by the group of extremely overweight persons only a cautious assessment should be made because of the very small number of cases. There were also only small differences between normal-weight women and a group who were moderately overweight (Fig. 2). A breakdown of those weighing more than is normal into different classes of weight did not show any significant differences, except for the group of extreme cases. It is true that the persons most overweight had, on average, the highest energy consumption values, but statistical evidence of this finding could not be obtained.

In addition, we were also interested in determining the percentage distribution in the daily diet of the three principal nutrients. The values given in Fig. 3 show

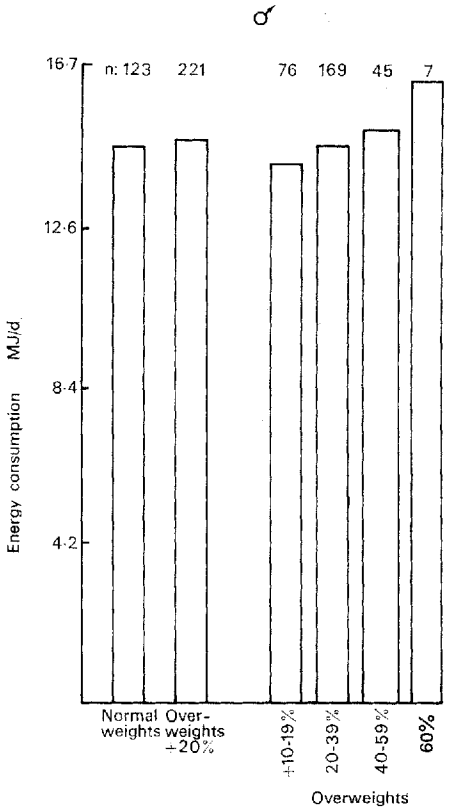

Fig. 1. Mean values for the daily energy consumption by normal-weight and overweight men.

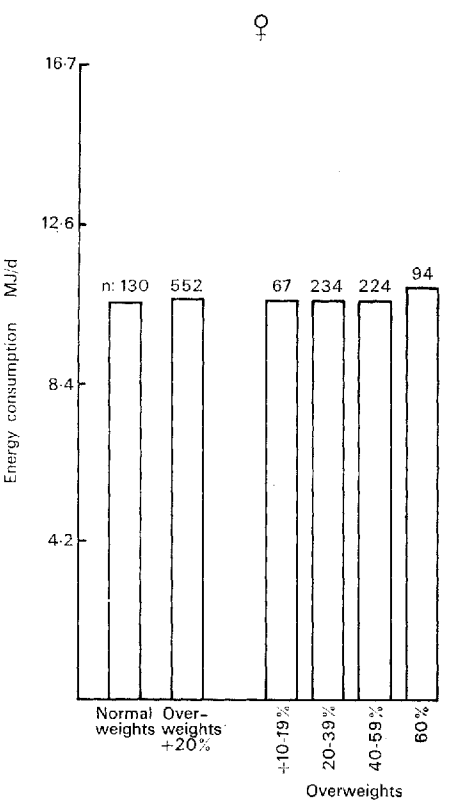

Fig. 2. Mean values for the daily energy consumption by normal-weight and overweight women.

virtually the same situation for normal-weight and overweight persons. A breakdown of overweight persons into those moderately and those extremely overweight also gave no significant differences. Thus, the information given about the composition of food was almost consistent, irrespective of body-weight.

From the results so far reported it is evident that the daily amounts of food determined by the interview on diet for normal-weight persons were only insignificantly smaller than the average values obtained for overweight persons. The average daily energy intake determined for normal weight men was of the order of 14·5 MJ (3507 kcal). This corresponds to an amount of food which, according to the approximate values given by Pose, Möhr & Ketz (1970), should be recommended for younger heavy workers. As there were only few heavy workers among our subjects, the quantity of food consumed must, in general, be considered to be too large. A comparison of the average value of 10·5 MJ (2506 kcal) calculated for normal-weight women with the approximate values given by Pose *et al.* (1970) shows that the value is comparable to the recommendations for middle-aged women doing moderately heavy work. For the women in question, and in view of the jobs done by them, it was, therefore, well above the recommendable standard. It can be said, therefore,

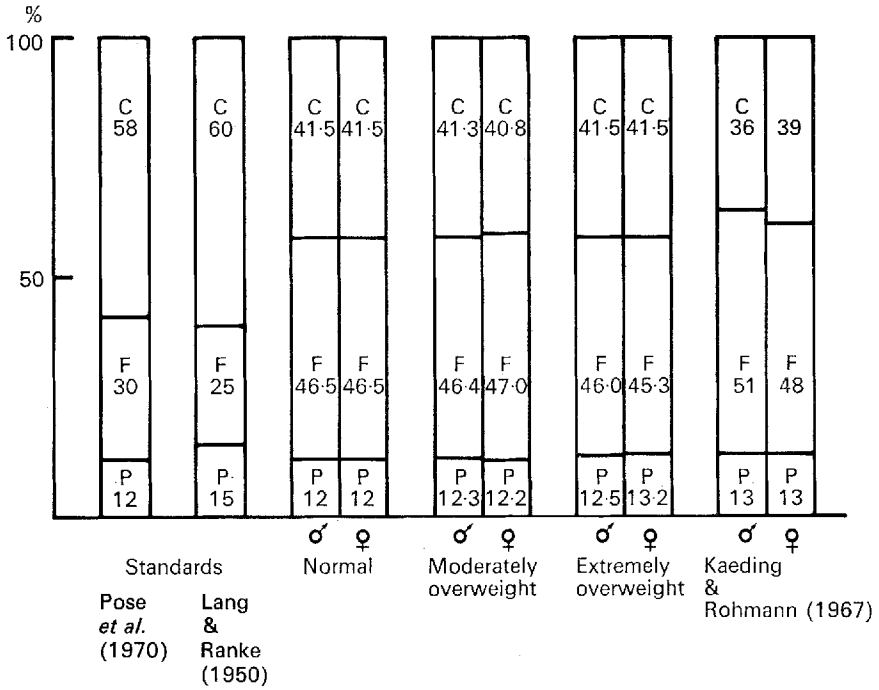

Fig. 3. Percentage distribution of energy from the daily intakes of the three main nutrients (P protein, F fat, C carbohydrate) for normal- and overweight persons compared with ideal diets given by Pose, Möhr & Ketz (1970) and Lang & Ranke (1950) and with results given by Kaeding & Rohmann (1967).

that for normal weight persons, the men ate larger amounts of food relative to the optimum diet than did the women.

For normal-weight men and women the distribution of basic nutrients was 12% for protein, 46·5% for fat, and 41·5% for carbohydrates (Fig. 3). Except for protein, therefore, the percentages differed considerably from the approximate values developed by Pose *et al.* (1970) and recommended for the GDR population as well as from the ideal diet proposed by Lang & Ranke (1950). A particularly serious sign in this respect is the very high percentage of fats, which, calculated as percentage energy, accounts for the largest part of the daily food intake. These results correspond to a long-observed trend that is prevalent in all highly-developed countries (see e.g. Mašek, 1960; Virtanen, 1963; Wirths, 1966).

The finding that the total daily amounts of food eaten by persons weighing more than normal are on average only slightly above those obtained for normal-weight persons may be somewhat surprising as polyphagia is considered to be a pathogenetic principle in the development of obesity. It is interesting, however, that similar results have been reported by Jahnke (1964), Hesse & Döll (1965) and Kaeding & Rohmann (1967). It is, of course, entirely possible that some of those who were interviewed—overweight and normal-weight persons—gave a veiled and false picture of the actual situation, which they did either intentionally or unintentionally. In general, however, we believe that the methods and dietary anamneses used by the author and his associates are well suited for reliably assessing the kind

and amount of food consumed. A certain error rate, the magnitude of which is not known, must always be anticipated in investigations of this type.

Various explanations of non-polyphagia in obese persons may be given. It is quite possible that a number of the persons weighing more than normal ate too much and grew stout in earlier years. Eating to excess, therefore, belonged to an earlier period in life, so that dietary analyses no longer reflect any signs of polyphagia. This makes it absolutely necessary to determine whether an overweight person is in a state of dynamic or static obesity.

Another explanation could be that some of those persons weighing more than normal have grown stout from a diet similar in composition to that consumed by normal-weight persons. That would mean that the eating habits of these persons are, or were, comparable to what may be called relative polyphagia. However, the reasons cannot be discussed here in detail. Familial 'taints' as well as endocrine and metabolic dysfunctions, with the special involvement of adipose tissue, are doubtless important in this particular respect. These and other harmful factors are the actual causes of adiposity in such instances and result in some people growing stouter than others without polyphagia being primarily responsible. They live beyond their biological means, so to speak.

The question should also be raised as to whether obese persons take inadequate rather than excessive nourishment, so that, with respect to development of overweight, the fault may be not the amount of food consumed, but rather the composition of the daily diet. There are many reports of excessively high fat content of the daily diet of persons weighing more than normal. This is confirmed by the results obtained by the author and his associates. Fig. 3 shows that the percentages of fat in the diet of overweight persons included in this investigation were very high. All mean values for fat content clearly differed from the ideal composition of diet for middle-aged persons doing moderately heavy work recommended by Pose *et al.* (1970). Indeed, this is also true of the normal-weight persons included in our investigation (see Fig. 3), although there are certain differences between normal-weight and overweight persons with respect to the preference given to certain foodstuffs (Table 1). For example, a higher consumption by stout men of alcoholic beverages, especially beer, was found, but also a smaller fruit consumption by overweight persons. However, if we assume that a relatively fat-rich diet will inevitably lead to overweight, then the normal-weight persons included in this investigation should, after all, be subject to the same development. Of course, prognostic results cannot be given on this point. Apparently, therefore, different processes were responsible for the development of overweight in the obese persons included in this investigation. Therefore, it certainly is not appropriate to consider obesity to be a consistent phenomenon. The extent to which the determination of dietary anamneses may contribute to a classification of certain forms of obesity cannot be decided on the basis of the results obtained so far. The proposed distinction between dynamic and static forms would perhaps be a first important step in this respect.

Finally, we analyzed the daily number of meals. It was found that the daily

Table 1. *Amounts of certain articles of food determined for normal-weight and overweight persons*

	Daily food intake (g)									
	Margarine, salad oil	Meat	Sausage	Bread	Cake	Fruit	Sugar	Beer	Alcoholic drinks	Water
♂										
Normal-weights	16	89	119	267	69	132	36	311	28	320
Over-weights	18	98	128	263	52	106	34	419	36	421
♀										
Normal-weights	11	72	76	177	72	139	27	53	18	270
Over-weights	14	86	83	190	54	118	24	43	14	273

average was four for normal-weight persons, while the mean values determined for overweight men and women were 3·7 and 3·6, respectively. Similar results were reported by Kaeding & Rohmann (1967). These authors also studied the distribution of amounts of food eaten during the day. They found that normal-weight persons took 68% of their nourishment in the first half of the day, while overweight persons took 66% of their nourishment during the second half of the day. Therefore, there are certain differences in eating habits, to which further attention should be given.

To summarize it can be said that dietary anamneses determined for 253 normal-weight persons and 916 overweight persons showed no significant differences in the daily energy consumption, although total values are, on average, somewhat higher for overweight persons, particularly for men. From this it should be concluded that there are different conditions under which overweight may develop. It is believed that for a number of obese persons the phase of polyphagia belonged to an earlier period in life, so that dietary analyses no longer reflect any signs of polyphagia. Also, it is considered that certain persons are, or were, suffering from pathophysiological disorders that may trigger the development of overweight without absolute polyphagia being responsible for this process. In such instances it is necessary to speak of what is called relative polyphagia. The extent to which an increase of body-weight may be the result of the inadequate composition of diet cannot be decided on the basis of the results obtained so far. The compositions of daily diets of normal-weight and overweight persons were almost the same, the percentages of fat being very high in both groups.

Therefore, the results show that the persons included in our investigation took, irrespective of their body-weight, a kind of nourishment that does not measure up to the demands made by an optimum diet. This finding clearly underlines the need for a systematic nutritional prophylaxis.

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