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The benefit of the Mediterranean diet Considerations to modify German food patterns

■ **Summary** *Background* In the early 1960s the occurrence of coronary heart diseases and cancer in Mediterranean countries was much lower than in other industrialised countries. The life expectancy of the Mediterranean population was higher, although medical care did not meet western standards. Studies showed that those findings were due to the Mediterranean diet and life style [1, 2]. *Aim of the study* is

to investigate whether these findings are transferable to the present German diet and life style in order to take advantage of the positive effects of the Mediterranean diet and life style against the background of the still present high rate of coronary heart diseases and cancer in Germany. *Method* Regarding the aim of the study we compared food consumption data from different years between 1961 and 1999 of four Mediterranean countries and Germany. The data for this comparison were taken from data of DATA Food NETWORKING (DAFNE) based on Household Budget Surveys (HBS), and data of Food Balance Sheets (FBS). *Results* Compared to Mediterranean residents Germans eat less plant food, especially vegetables, cereals and pulses were consumed in lower amounts, whereas animal products were consumed in higher amounts at each

meal. *Conclusion* A transformation of components of the Mediterranean diet to the German diet is theoretically possible considering the availability of food. Nutrition has to be seen holistically and therefore the lifestyle, cultural and social aspects have to be taken into account. These aspects can help prevent the occurrence of coronary heart diseases and cancer. From a scientific point of view there is a further need of research focused on lifestyle in the context of food patterns in different European countries.

■ **Key words** Mediterranean diet – Mediterranean life style – DATA Food NETWORKING (DAFNE) – Household Budget Surveys (HBS) – Food Balance Sheets (FBS) – consumption patterns – longevity – well being

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Introduction

The Mediterranean diet could be described as the dietary pattern found in the olive oil growing areas of the Mediterranean region in the late 1950s and early 1960s, before the fast food culture began influencing the nutritional habits. Beyond olives and olive oil it is also characterised by the consumption of fruits, vegetables, fish and seafood, pulses and cereals [3]. In order to find out if it is possible to implement a few characteristics of the Mediterranean diet into the present German diet this

study analyses data concerning typical food categories of the Mediterranean diet.

Method

In our study we compared food consumption data of four Mediterranean countries (Greece, Italy, France and Spain) and Germany. The data for this comparison were taken from two different sources: data of the DATA Food NETWORKING (DAFNE) based on Household Budget Surveys (HBS) (1988, 1990/91 and 1994), and data of Food

Balance Sheets (FBS) (1961, 1980 and 1999) [4–7]. We chose 1961 as the reference year, because at that time the original Mediterranean diet was practised, which was not yet modified by western influences like in recent years.

DAFNE data are based on HBS data of ten European countries and were initiated and co-ordinated by the Greek Antonia Trichopoulou in 1987. This DATA Food NETWORKING provides comparable data regarding food and socio-demographic information to enable intra-country and intercountry comparisons of nutritional habits among these countries [5, 8, 9]. HBS are regularly conducted surveys, which collect information concerning nutrition in most European countries. They are undertaken by the National Statistical Services at regular intervals, e.g. in Germany every five years and in other countries between one and seven years. These different intervals explain why we could only refer to the selected years. They cover food purchase of private households varying from one week to a few months. The purpose of HBS is to ascertain trends in food consumption and their economic implications. They are also useful for the derivation of price indices [8, 10]. The HBS provide an important background for the conduct of a wide range of nutritional analyses and an affordable alternative to most Mediterranean and Central/Eastern European countries because the cost is moderate compared to individual nutrition surveys. Issues such as differences in dietary pattern among countries, high-risk population groups on account of their nutritional behaviour, relationship between diet and morbidity/mortality data as well as dietary intake of additives and contaminants can be identified. They are representative samples of private households (e.g. in Germany $n = 45,085$ and Greece $n = 6,489$ [11]) and generate several information on food and socio-demographic issues, hence they are more relevant than the FBS. HBS data can also be important for different purposes such as nutrition and agricultural strategy planning and marketing purposes of food industries. Thus there are several limitations of the HBS data. The data refer to food availability and not food consumed, in most countries there is no information on waste of food, food offered to guests and food given to pets. The number of food items and the type of information provided differ from one country to another [8, 11].

FBS are provided by the Food and Agriculture Organization (FAO) and are the only intercountry comparison on food provision [11–13]. They are based on agricultural data on specific commodities present in the food supply from one year to the next, therefore they are very current, but they are different from data that describe dietary intake. The FBS data show the amount of a specific food produced in a country in a given year plus imports less exports. They are only an indirect estimate of dietary intake per capita and often overestimate di-

etary intake. Some food is produced but then wasted, fed to animals or used for non-food purposes and is therefore not actually consumed. The FBS provide only data for a whole country and not a region within the country or special groups within a population. The calculation of the real nutrient intake per every single person in a household based on these data is not possible. Despite these limitations FBS data sometimes are the best and only available data to estimate trends in dietary patterns. A comparison between different countries is possible and the cost is very low as agricultural data are used [2, 6, 11].

Results

In the following we give an overview about the different consumption habits regarding typical Mediterranean food groups and the change in consumption of these food groups in Germany and in the different Mediterranean countries.

Meat consumption shows an increasing tendency in all Mediterranean countries (Fig. 1). According to the Food Balance Sheets, meat consumption in Greece and Italy increased within the last forty years nearly by the factor four and in Spain even by the factor five. In France and Germany the meat consumption increased less, but those countries already had a high level of consumption in 1961. The meat intake in France rose from 77 kg per capita in 1961 to 100 kg per capita in 1999. Mainly beef, veal and pork were consumed [6]. In Germany the distribution of different meat was about the same as in France, whereas in 1961 the level of consumption was about 13 kg lower than in France. In 1961 sheep and goat played an important role in Spain and especially in Greece. The increase in total meat consumption in these countries between 1961 and 1999 was due to an increase in pork and beef [6].

In all Mediterranean countries the *fish consumption*

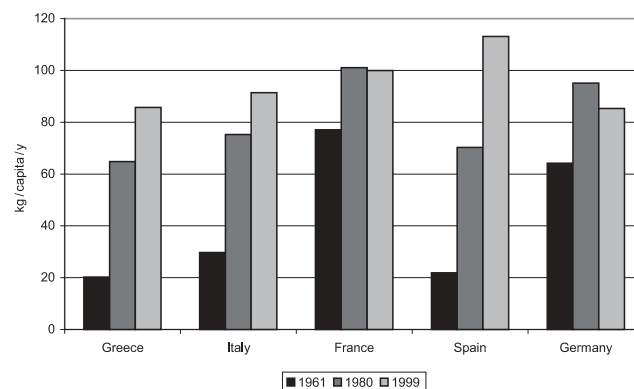


Fig. 1 Consumption of meat in Mediterranean countries compared to Germany in 1961, 1980 and 1999 [6]

was higher than in Germany (Fig. 2). The highest consumption of fish (34 kg per capita per year) could be found in Spain in the year 1961 and this high level stayed stable until 1999. Compared to Germany, fish consumption in Spain was three times higher. In all examined countries salt water fish played a more important role than fish from fresh water. Compared to the Mediterranean countries seafood plays almost no role in Germany. Therefore the consumption of seafood was extremely low. In 1999 Germans consumed only 2 kg seafood per capita, whereas Spaniards consumed 14 kg per capita [6].

Fig. 3 shows the comparison of the *consumption of fruit* in Mediterranean countries and in Germany. By far the Greeks have the highest intake of fruit over all compared years of all countries. In 1999 they even consumed 175 kg per capita. This is a daily average of almost 500 g fruits per capita. The classical Italian dessert is fresh fruit [14] and this is reflected in a relatively high yearly consumption. Since 1961 the yearly Italian consumption of fruit continuously increased from 95 kg to 134 kg per capita. Surprisingly the fruit consumption in 1961 and

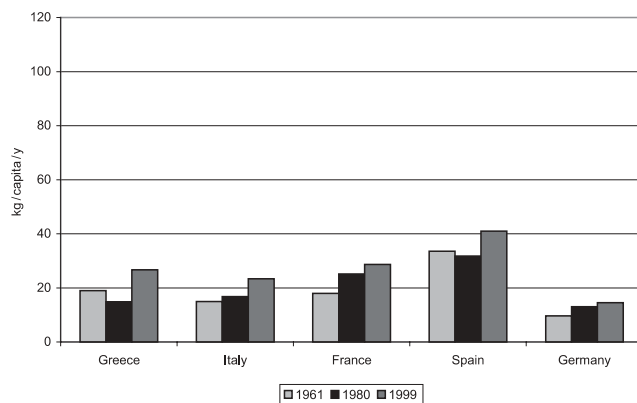


Fig. 2 Consumption of fish in Mediterranean countries compared to Germany in 1961, 1980 and 1999 [6]

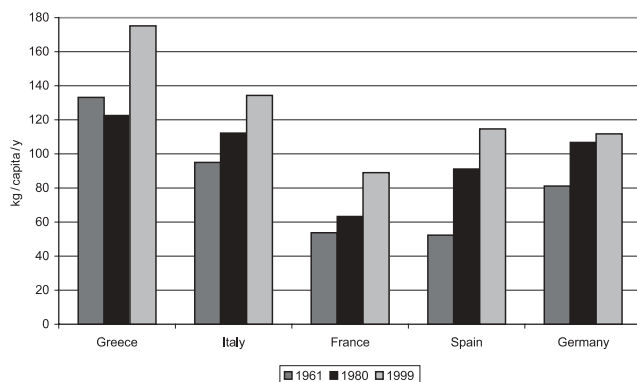


Fig. 3 Consumption of fruit in Mediterranean countries compared to Germany in 1961, 1980 and 1999 [6]

1980 in Germany was higher than in France and Spain, whereas in 1999 the consumption was nearly the same. In 1999 Spanish people ate slightly more fruit than the Germans and 16 kg more than the Frenchmen. But compared to the Greeks Germans ate just 64 % of the Greek fruit consumption. Due to their geographical position the Mediterranean countries consume mainly citrus fruits whereas Germans prefer apples [6].

The difference between Germany and the Mediterranean countries is very high in terms of *consumption of vegetable*. In the last 40 years the Greeks, Italians, Frenchmen and Spaniards bought twice to thrice as much vegetables as the Germans. Though the Germans increased their yearly consumption from 1961 to 1999 from 50 kg to 74 kg per capita, they are still far from the yearly vegetable consumptions of the Greeks who in 1999 consumed 281 kg vegetables per capita [6]. As the data of the HBS are more detailed than the data of the FBS, the proposition of data is more differentiated as can be seen in Fig. 4 [5]. Germans ate much less vegetable than the Greeks and the Spaniards. Especially the intake of tomatoes and leafy vegetables, which are relatively rich in vitamins, minerals and other bioactive compounds (influencing factors e.g. for cancer and cardiovascular diseases [15]) is much lower in Germany than in Greece. In 1994 the Greeks consumed daily about 80 g tomatoes per person whereas Germans ate not even a sixth part of that amount. In Germany the consumption of processed vegetable is remarkable higher compared to the Mediterranean countries. Germans consumed about 60 g per day and person whereas Greeks and Spaniards ate one third of it [5].

Within 1961 to 1999 the *consumption of cereal products* was higher in Mediterranean countries than in Germany (on average about 35 kg/capita and year higher). In Germany the consumption of cereal products was nearly constant from 1961 to 1999: the yearly consumption persisted around 100 kg cereals per capita [6]. The HBS Data [5] allow a closer view on how cereal products

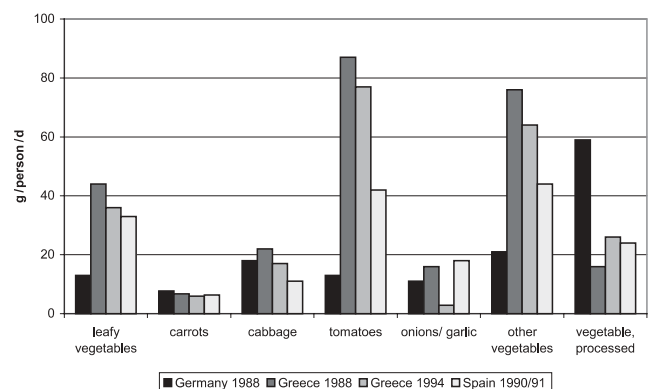


Fig. 4 Consumption of vegetables in Germany compared to Mediterranean countries [5, 9]

are assembled. Fig. 5 gives an overview on how cereals were used. The Mediterranean countries consumed primarily bread (and buns), because bread is a typical component of each of their meals [3, 16, 17]. Whereas Germans preferred bread and buns mainly for breakfast and dinner [18]. Very interesting is the fact that Germans consumed almost 60 kg bakery products per person in 1988. Whereas Greeks and Spaniards ate in average about 15 kg bakery products per capita and year. In Germany, there is a higher consumption of these products because of the trend to eat snacks in the form of bakery products at lunchtime instead of a wholesome meal [6, 18].

Figs. 6–8 display a comparison of Mediterranean countries to Germany regarding the percentage of energy, fat and carbohydrates contributed by major food groups [4]. With the PC program “DGE-PC professional” the mean values of energy, fat and carbohydrates of the major food groups were calculated (e. g. mean values of all consumed vegetables). These data were related to the consumption data of the FBS. Thereby we received the yearly energy, fat and carbohydrate value per capita and per consumed food group. Afterwards each food group was converted proportionally into the total food consumption in order to obtain the percentage of energy, fat and carbohydrates contributed by the different food groups.

For the evaluation, the data of Germany were taken from the FBS of 1999 and for the Mediterranean countries the data were taken from the FBS of 1961. We compared the data of 1961 with the data of 1999, because at that time the Mediterranean diet was practised in its original style in the context of healthy living conditions, which was not yet modified by western influences like in recent years.

Fig. 6 reveals the percentage of *energy* contributed by major food groups. As can be seen, the Mediterranean countries received their energy mainly from cereal products and vegetable oils. The Greeks and the Italians



Fig. 5 Consumption of cereal products in Germany compared to Mediterranean countries [5, 9]

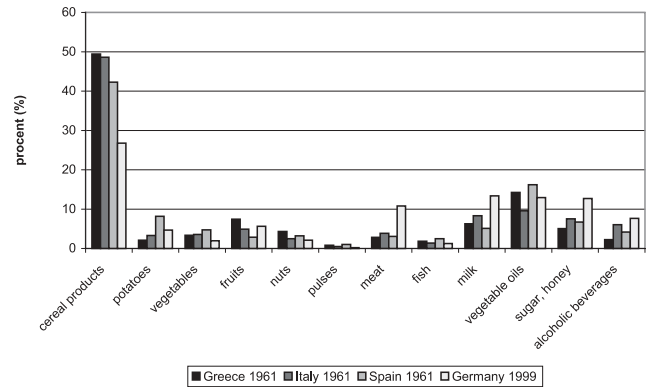


Fig. 6 Percentage of energy contributed by major food groups in the diet of Mediterranean countries in comparison to Germany [4]

received almost half of their energy from cereal products, while Spaniards still received more than 40 % of their energy from this product group. On average the Mediterranean countries took in 13 % of their energy in the form of vegetable oils (mainly as olive oil) [2, 3, 6]. Although in Germany the main energy suppliers also are cereal products and vegetable oils, the rate is much lower. Germans received 27 % of their energy from cereal products and 13 % from vegetable oils (mainly as rapeseed and as soy bean oil) [6]. The difference compared to the Mediterranean countries is a higher intake in animal products (milk: 13 % of energy intake, meat: 11 % of energy intake), a twice as high intake of sugar and honey (13 %), a higher intake of alcoholic beverages – although in Mediterranean countries a glass of wine belongs to principal meals [2, 3] – and a lower intake in vegetable, fruits and nuts.

As the data show the mean *fat* intake in Germany during one year was higher than in Greece or Italy [6]. In 1999 the mean fat intake in Germany was 35 kg per year whereas in Greece and Italy the amount of fat was 10 kg lower. Also the total amount of fat intake in these countries was lower. A large fraction of dietary fat is vegetable oil; it made up 55 % of total fat consumption in Greece and even 60 % in Spain (Fig. 7). In addition vegetable oil fat originating from cereal products and nuts played an important role. In Germany the contribution of milk and meat to the total fat consumption was of major importance compared to the Mediterranean countries.

The source of fat is very important for health aspects. Plant foods contain mainly unsaturated fatty acid whereas food from animal source contains a higher proportion of saturated fatty acids, which promote coronary heart diseases and strokes. In Greece the proportion of fat derived from animal source compared to the amount of fat from plant food was much lower than in Germany [19, 20]. This is an important difference because vegetable oil contains less cholesterol and saturated fatty acids.

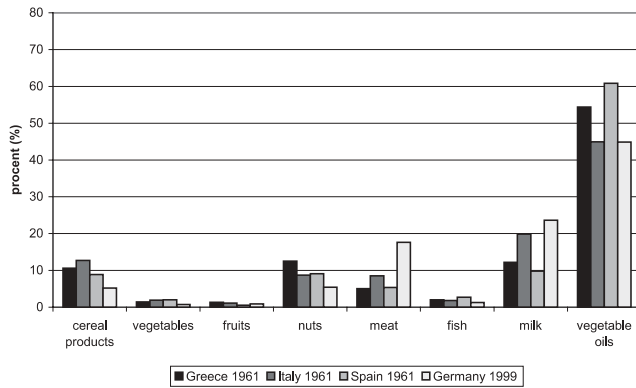


Fig. 7 Percentage of fat contributed by major food groups in the diet of Mediterranean countries in comparison to Germany [4]

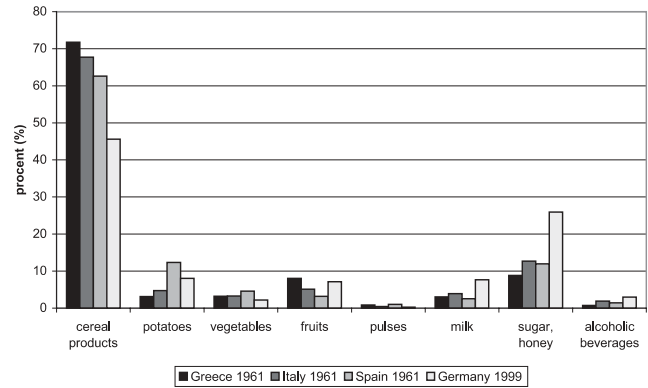


Fig. 8 Percentage of carbohydrates contributed by major food groups in the diet of Mediterranean countries in comparison to Germany [4]

People in the Mediterranean countries consumed about 10 to 30 kg more *carbohydrates* than Germans in 1999. Especially cereals contributed to supply this nutrient (Fig. 8). In Greece and Italy the amount of carbohydrates derived from cereals was 70 %, whereas in Germany the amount was only 45 %. In Germany sugar/honey (26 %) and potatoes (8 %) contributed to the carbohydrate intake. The contribution of sugar and honey to the carbohydrate intake was three times higher compared to Greece and two times higher compared to Italy [6].

In regard to our aim whether a transformation of the present German diet into a Mediterranean diet (on basis of the original from 1961) theoretically is possible, we compared these diets (Table 1). Table 1 shows the percentage of deviation of major food groups consumed by Germans and by Mediterranean residents [4]. These calculated data are based on the data of the FBS. For this purpose the consumption data of three Mediterranean

countries (Greece, Italy and Spain) were converted to obtain a Mediterranean mean intake of each food group per g and day (first and second column). We equated these mean values with 100 %. To obtain the percentage of Germany compared to the Mediterranean countries the relation between the German and the Mediterranean consumption was calculated (last column). Therefore, a shifting of food groups would be necessary, i. e. the high portions of animal compounds have to be reduced and the low portions of plant compounds have to be increased. Thus Germans would have to double their portions of cereals, vegetables and nuts to obtain that of the Mediterranean residents, while fish would have to be increased by about one third and pulses about two-thirds. They would have to reduce the portions of meat about 2.5-times, milk, sugar and honey and alcoholic beverages about half the amount.

Table 1 Consumption of major food groups in Mediterranean countries (1961) compared to Germany (1999) and the percentage of deviation (Germany compared to Mediterranean countries) [4]

Food groups	Greece, Spain and Italy Ø 1961 (g/d)	Percentage (%)	Germany 1999 (g/d)	Percentage (%)	Percentage of Germany compared to Mediterranean countries (%)
cereals	445.6	21.8	273.9	10.8	61.5
potatoes	193.5	9.5	214.0	8.5	110.6
vegetables	373.4	18.3	202.2	8.0	54.2
fruits	256.9	12.6	307.1	12.2	119.6
nuts	17.9	0.9	12.1	0.5	67.3
pulses	20.6	1.0	5.5	0.2	26.7
meat	65.8	3.2	234.3	9.3	356.4
fish	54.8	2.7	40.1	1.6	73.2
milk	301.1	14.7	656.9	26.0	218.2
vegetable oils	46.1	2.3	48.4	1.9	105.0
sugar, honey	55.4	2.7	116.8	4.6	210.7
alcoholic beverages	212.5	10.4	415.1	16.4	195.4

Discussion

Beside the methodology of the different surveys and their time of investigation we can identify main differences: in the Mediterranean countries more plant food especially vegetables, cereals and pulses was consumed, whereas animal products were consumed in moderate amounts at each meal.

In this context meat consumption could be interpreted as a welfare indicator. Socio-economic theories implement that with higher welfare the rate of starchy food decreases and animal products become more relevant until they make up 33–40% of the diet in western industrialised countries [21]. There is a need of further investigations because neither price nor income disparities can explain the demand of product groups. It seems that preferences play an important role [22].

Food preferences may be explained by changing food habits in the examined countries. The predominant lunch pattern in Germany is “meat-potato-vegetable” and may also explain the relative high meat consumption in 1961 and 1980 [23, 24].

In contrast to the Mediterranean countries the meat consumption in 1999 compared to the decades before slightly decreased. Reasons for this consumption behaviour could be the consumer uncertainty and ethical aspects regarding meat products, which are caused in part by the BSE crises [7]. Beside the reasons for the mentioned trend the decrease in meat consumption can be seen as a positive effect, because it is one of the risk factors of coronary heart diseases.

Studies among the elderly in Greece, Denmark, Australia, Spain and China have shown that the overall Mediterranean dietary pattern had a higher influence on longevity than single nutrients. These results suggest therefore that a Mediterranean diet is associated with longer survival. One essential question should be addressed at this time: Is the Mediterranean diet or are its major components transferable to populations living far from the Mediterranean area? To discuss this question would be important for scientific and policy reasons [25].

As shown in Table 1 it is theoretically possible to transform the Mediterranean diet to the food habits of the German population by the available food on the market. We are conscious of the fact that in this calculation only food groups and neither specific food nor nutrients and bioactive compounds were analysed. We only wanted to show that the Germans would have to increase their cereal, vegetable, pulses, nut and fish-consumption and decrease their meat, milk, sugar/honey and alcohol consumption.

The low consumption of vegetables is confirmed in our national Nutrition Survey (1998). The recommendation of World Health Organisation (WHO) and World Cancer Research Fund (WCRF) to eat 400 to 800 g of veg-

etables and fruit is only achieved by 25 to 40% of the German population. Especially in the youngest age group this amount is far below the recommendation [26]. During the summer time the higher vegetable and fruit consumption could easily be reached by seasonal food from German regions, during the other seasons the consumers have to resort especially to imported vegetable and fruit.

The German consumption of pulses is less than one third (26.7%) of the Mediterranean consumption (Table 1). To strengthen the demand of pulses their attractiveness and health value has to be more communicated to the consumers (targeted at private and institutional households, restaurants). The fish consumption in Germany compared to the Mediterranean diet shows a positive trend, but the proportion of fish and seafood is still very low (Fig. 2). Due to the fact that Germany is an iodine deficient region, especially the consumption of salt water fish should be increased because it contains high levels of iodine [27].

Considering the consumption of vegetable oils the level of consumption of the Germans is nearly the same as the consumption of the Mediterranean residents (Table 1). The distribution of the different kinds of oil differs in the examined countries. The Mediterranean countries use mainly olive oil (except Spain where olive and sunflower oil is consumed at almost the same rate), whereas in Germany many different kinds of oils are used. The fatty acid composition of these oils is not adequate to the composition of olive oil, which includes mainly monounsaturated fatty acids. The only comparable oil is the rapeseed oil, which is frequently consumed in German households. The recommendations for Germans should be an increase in either rapeseed or olive oil to reduce the risk especially of coronary heart diseases.

Several publications (e.g. [2, 28, 29]) document that the relatively good health of Mediterranean people is not only based on the diet but also on their culture, history and lifestyle. As Trichopoulou remarked some scientists “have argued that the relaxing psychosocial environment, mild climatic conditions, preservation of the extended-family structure, and even the afternoon siesta habit in the Mediterranean region may play contributory roles” [3].

Due to globalisation and social change the original Mediterranean lifestyle explored in the early 1960s [2, 3] does not exist any more in the Mediterranean countries. Recent information from DAFNE shows that Spaniards and Greeks residing in urban areas tend to put less emphasis on their diet than those living in rural areas [30].

The European time budget study [31] reveals a new distribution of time for European residents. The time for basic needs especially for meals became less important from the 1960s to the 1990s. The time for meals at home has been reduced from 1.3 hours in the 1960s to 1.1

hours in the 1980s and stayed stable at that level until the 1990s. This European trend can be explained by the fact of an increasing employment of men and women, which leads to increased eating out, especially at fast-food restaurants. For example in Spain fast food replaced the traditional "tapas", especially at lunch time [31].

Despite this trend many Spanish families – considerably more than other European families – still meet at lunchtime at home and use this time for social contact. This shows that the common meal is of prime importance for family communication and regeneration [31].

Another form of regeneration is the siesta in Mediterranean countries. Almost 20 % of Spaniards rest and sleep daily in the afternoon during the week, but only 8 % of Germans do so [31]. Sleeping or resting during the day has positive effects on physical and mental health, e.g. increasing concentration, productivity and ability [17].

Despite of globalisation and social change some typical characteristics of Mediterranean lifestyle could be taken over into our German lifestyle and could influence physical and mental health. Therefore it is necessary:

- To give the employees the leisure time and the opportunity to rest and regenerate during working day;
- To implement the impacts of health promotion of Mediterranean diet into meal plans of restaurants, cafeterias and institutional households (e.g. hospitals, residential homes for the elderly);
- That nutrition education and marketing strategies should communicate the Mediterranean diet, which enjoys all the advantages of a healthy and enjoyable lifestyle and well-being.

Reflecting all presented scientific data there is a further need of research focused on lifestyle in the context of food patterns in different European countries.

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