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Nutritional Assessment of Female Yoga Practitioners with Different Levels of Experience

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Abstract

Yoga includes many components for a healthy lifestyle such as physical exercises, abstaining from tobacco, stress management and a low-fat diet. The aim of this study was to assess the nutrition of yoga practitioners and to compare it with international guidelines for a healthy diet. This study comprised 89 female yoga practitioners from Bulgaria. The nutrient intake was assessed by using a food frequency questionnaire based on the USDA National Nutrient Database. The relative intake of proteins, carbohydrates, fats, energy contribution of each nutrient, and the total daily energy intake and relative energy intake were calculated. The BMI of the yoga practitioners was near the lower normal limit (18.5 kg/m²). Only 3 practitioners were overweight. The yoga practitioners consumed small amounts of pork and beef and ~60% did not consume any meat at all. They consumed an average of 600 g of fruits and vegetables per day, which complies with the 400 g recommended by the WHO. Practising yoga helps to maintain normal weight which is one of the prerequisites for a healthy lifestyle. The nutritional assessment of the yoga participants corresponded with the recommendations of the WHO and the American Cancer Society Guidelines for a healthy diet.

Keywords: *yoga, nutrition, diet, assessment, energy*

Introduction

Yoga has become increasingly popular in many parts of the world as a means of exercise and physical training. It is a comprehensive life discipline which originated in ancient India and has the capacity to harmonize body, mind, and spirit (Prathikanti et al., 2017). Yoga includes many components for a healthy lifestyle, such as physical exercises, abstinence from tobacco, stress management and a low fat diet (Manchanda, 2011).

Several scientific studies have shown that yoga may have beneficial effects on the treatment of various medical conditions such as hypertension (Awdish, Small, & Cajigas, 2015; Murugesan, Govindarajulu, & Bera, 2000; Patil, Dhanakshirur, Aithala, Naregal, & Das, 2014; Selvamurthy et al., 1998), depression (Prathikanti et al., 2017; Streeter et al., 2017), and coronary artery disease (Manchanda, 2011; Manchanda et al., 2000; Sivasankaran et al., 2006).

Nutrition plays a significant role among yoga participants.

A healthy diet is of particular importance in order to prevent diseases and make progress in yoga (Desai, 1990). Yoga practices can be implemented as part of a therapy in the treatment of eating disorders as indicated by Hall, Ofei-Tenkorang, Machan and Gordon (2016). Moreover, improvements in body image, body satisfaction, and alleviating eating disorders were reported in women practising yoga (Dittmann & Freedman, 2009). Yoga-based interventions were also shown to reduce oxidative stress (Bhattacharya, Pandey, & Verma, 2002; Yadav, Ray, Vempati, & Bijlani, 2005).

The aim of this study was to assess the nutrition of yoga practitioners with different levels of experience in yoga, and compare it with international official guidelines for a healthy diet.

Methods

The study was performed in accordance with the Declaration of Helsinki for Human Research (WMA, 2013).



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Institutional ethics approval was granted by the National Sports Academy, Sofia, Bulgaria, and informed consent was obtained from all participants.

Participants

This study consisted of 89 female yoga practitioners from Bulgaria, who were divided into 2 groups: Intermediate Yoga with 2 to 5 years of experience (n=31) with a mean age of 39.4±7.57 years and a mean sports experience of 45.7±13.67 months, and Advanced Yoga greater than 5 years of experience (n=58) with a mean age of 41.3±8.15 years and a mean sports experience of 139.3±88.03 months.

The participants were enrolled in a postgraduate education course, consisting of 646 hours in duration between the period of January 2018 - June 2019. The participants achieved the qualification of "Yoga Teacher," organized by the Bulgarian Yoga Federation (BYF) and the National Sports Academy (NSA), Sofia, Bulgaria. All participants had a minimum of 2 years of yoga practice prior to the teaching yoga course.

The participants were taught integrated hatha yoga following the Sivananda system. The hatha yoga practices included asanas (poses), pranayama (breathing exercises), meditation techniques, relaxation mantras, a calm and concentrated mind, contentment and inner harmony.

Anthropometry

The height of the participants was measured to the nearest 0.1 cm, body weight was recorded to within an accuracy of 0.1 kg, and body mass index (BMI) was calculated as: body weight (kg) divided by height in metres squared (m²).

Nutritional assessment

The nutrient intake of the participants was assessed by using a food frequency questionnaire (FFQ), as applied in previous nutritional surveys (Kolimechkov, Petrov, Alexandrova, & Atanasov, 2016; Kolimechkov et al., 2019; Miteva et al., 2020). The FFQ queried the weekly consumption of 25 basic groups of food, sports experience and the number of yoga sessions per week. The composition and energy value of different groups of food were calculated based on the USDA National Nutrient Database - Release 28 (US Department of Agriculture, 2015). The FFQ and the data

tables utilized for calculations are available on the internet (STK-SPORT, 2020).

Based on the results from the FFQ, the relative intake (per kg body weight) of proteins (RPI), carbohydrates (RCI), and fats (RFI), the energy contribution of each nutrient (E%), the total daily energy intake (DEI) and relative energy intake (REN), were calculated. The percentages of proteins and fats, which come from animal sources, were also calculated.

The Harris-Benedict equation (Harris & Benedict, 1919) was used to calculate the basal metabolic rate (BMR kcal/24h) and the estimated daily energy needs (kcal/24h) for the yoga practitioners were derived by the formula based on Harris-Benedict (Harris & Benedict, 1919): BMR kcal/24h x (1.2 + 0.03 x number of yoga sessions).

The international guidelines for a healthy diet as indicated by the World Health Organisation (WHO, 2018) and the American Cancer Society (Kushi et al., 2012) were applied to assess the nutrition of the yoga practitioners in this study.

Statistical analyses

The statistical analyses were conducted with GraphPad Prism 7.04 software, using descriptive statistics and the Shapiro-Wilk test of normality. The data with normal distribution for both groups was compared with unpaired t-test, and data without normal distribution were compared with the non-parametric Mann-Whitney U test. The differences in the frequency of food consumption by participants within the different groups who did not consume certain foods were determined by using Fisher's Exact Test. The data in the text and the tables are presented as mean ± SD.

Results

The anthropometric parameters of the practitioners in this study are presented in Table 1. The yoga experience of the Intermediate Yoga group was 45.7±13.67 months on average, and was significantly lower than the Advanced Yoga group (139.3±88.03 months on average). The age and the anthropometric parameters did not differ significantly between the two yoga groups (Table 1). Fifteen yoga practitioners had a BMI value of 16.6 kg/m² (lower than the normal limit) and three had BMI values of 26.2 kg/m², 26.4 kg/m² and 26.7 kg/m² (higher than >25 kg/m²) which is overweight.

Table 1. Anthropometric parameters of the yoga practitioners (mean±SD)

	Intermediate Yoga (n=31)	Advanced Yoga (n=58)
Age (years)	39.4±7.57	41.3±8.15
Yoga experience (months)	45.7±13.67	139.3±88.03 ***
Height (cm)	165.4±5.85	167.2±6.24
Weight (kg)	56.9±6.74	57.2±8.12
BMI (kg/m ²)	20.9±2.62	20.4±2.09

Legend: *** – p<0.001 vs Intermediate Yoga

The data from the nutritional survey for all yoga practitioners are presented in Table 2. Based on nutritional intake, it was calculated that a single yoga session increased the daily energy consumption by only 3%, in contrast with the 8% originally suggested by Harris Benedict for one average sports session. No significant differences were found in the daily intake of macronutrients and energy contribution of each nutrient

between the two yoga groups.

The calculated energy intake responded to the energy needs of the yoga practitioners, and this ratio was almost nearly 1 (Table 2). The energy contribution from proteins (16%), fats (29%) and carbohydrates (55%) towards the daily energy intake was within the recommended 15%, 30% and 55%, respectively (WHO, 2003).

Table 2. Daily intake of macronutrients and energy contribution of each nutrient (E%) in the diet of the yoga practitioners (mean \pm SD)

	Intermediate Yoga (n=31)	Advanced Yoga (n=58)
Energy needs (kcal/24h)	1786.0 \pm 149.7	1801.0 \pm 172.6
Relative energy needs ^T (REN) (kcal/kg/24h)	31.6 \pm 2.80	31.7 \pm 2.60
Energy intake (kcal/24h)	1797.0 \pm 631.7	1782.0 \pm 542.4
Relative energy intake (REI) (kcal/kg/24h)	31.8 \pm 11.40	31.6 \pm 9.91
Energy needs/Energy intake	1.01 \pm 0.35	0.99 \pm 0.30
Relative protein intake (RPI) (g/kg/24h)	1.25 \pm 0.41	1.23 \pm 0.42
Protein (E%)	16.4 \pm 2.42	16.0 \pm 2.78
Relative fat intake (RFI) (g/kg/24h)	1.01 \pm 0.43	1.01 \pm 0.43
Fat (E%)	28.8 \pm 6.04	28.9 \pm 7.57
Relative carbohydrates intake (RCI), (g/kg/24h)	4.26 \pm 1.67	4.24 \pm 1.44
Carbohydrates ^T (E%)	54.8 \pm 6.82	55.2 \pm 9.23
Animal Protein ^T (%)	45.4 \pm 12.96	41.7 \pm 17.62
Animal Fat (%) ^T	59.9 \pm 14.47	57.1 \pm 16.00

Legend: ^T – variables with normal distribution for both groups, compared with unpaired t-test

The mean amounts of food groups consumed by the yoga practitioners are presented in Table 3. There were no statistically significant differences between the two yoga groups. On a weekly basis, the mean amount of beef, pork and chicken

consumed was considerably low. Weekly milk consumption was only about 1 cup (150-200 ml), but other dairy products, yogurt and cheese, were more widely consumed.

Table 4 presents the percentage frequency and the num-

Table 3. Weekly consumption of the types of food included in the FFQ, reported by the yoga practitioners (mean \pm SD)

	Intermediate Yoga (n=31)	Advanced Yoga (n=58)
Fruits [g]	2380.6 \pm 1487.82	2394.8 \pm 1657.03
Vegetables [g]	1851.6 \pm 1061.41	2027.6 \pm 1312.00
Beans [g]	250.0 \pm 226.94	287.5 \pm 195.97
Nuts [g]	185.5 \pm 171.00	186.6 \pm 114.44
Fish [g]	155.4 \pm 120.27	133.2 \pm 126.28
Chicken [g]	90.7 \pm 131.97	75.0 \pm 166.23
Pork [g]	49.6 \pm 178.90	42.0 \pm 92.14
Beef [g]	15.6 \pm 48.13	22.6 \pm 59.58
Eggs [g]	226.5 \pm 222.19	243.1 \pm 201.03
Milk [ml]	206.5 \pm 295.45	153.3 \pm 338.77
Yogurt [g]	767.7 \pm 570.61	854.1 \pm 835.96
Cheese [g]	296.8 \pm 199.56	268.0 \pm 252.39
Curd Cheese [g]	61.0 \pm 115.15	51.7 \pm 100.42
Yellow Cheese [g]	165.3 \pm 149.54	157.7 \pm 191.22
Butter [g]	62.3 \pm 65.51	64.7 \pm 49.92
Bread [g/24h]	258.3 \pm 248.09	330.5 \pm 312.05
Rice [g]	240.3 \pm 240.98	238.8 \pm 162.77
Potatoes ^T [g]	435.5 \pm 255.01	531.0 \pm 283.74
Pasta [g]	400.0 \pm 280.48	305.2 \pm 266.34
Baked Products [g]	60.5 \pm 84.60	68.5 \pm 115.90
Muesli & Cereals [g]	268.5 \pm 208.56	200.0 \pm 191.26
Sweets [g]	84.7 \pm 71.50	103.0 \pm 136.38
Chocolates [g]	91.5 \pm 87.32	110.8 \pm 96.61
Juice & Drinks [L]	3.9 \pm 6.18	3.1 \pm 5.12

ber of participants who do not consume foods from animal origin. About 60% of the yoga practitioners in the Advanced

and Intermediate groups did not consume any meat. In the Intermediate Yoga group, 50% did not consume milk, and in

the Advanced Yoga group the percentage was 60%. There were no statistically significant differences in the participants who

were vegans and those who did not consume eggs, milk, fish or meat (Table 4).

Table 4. Percentage of vegans and different types of vegetarians, who do not consume specific foods from animal origin, in the yoga practitioners

	Intermediate Yoga (n=31)	Advanced Yoga (n=58)
Vegans	0.0% (n=0)	6.9% (n=4)
Fish	12.9% (n=4)	29.3% (n=17)
Meat	58.1% (n=18)	60.3% (n=35)
Eggs	16.1% (n=5)	6.9% (n=4)
Milk	51.6% (n=16)	60.3% (n=35)

Discussion

A healthy weight depends on a person’s height, and, therefore, the recommendations for this weight are often expressed in terms of BMI (Kushi et al., 2012). BMI is normally expected to rise with age, however both yoga groups in our study showed a mean BMI, which was near the lower normal limit for healthy adults (18.5 kg/m²), with a slightly lower BMI for the Advanced Yoga group (Table 1). Moreover, none of the yoga practitioners in our study showed a BMI>30 kg/m² (obese), and only three of 89 practitioners had a BMI>25 kg/m² (overweight). The results indicate that practising yoga helps to maintain normal weight as one prerequisite for a healthy life. Taking into consideration the low energy expenditure during yoga practice, it can be observed that diet plays a crucial role in maintaining a healthy weight.

According to the WHO, a healthy diet helps to protect against the development of non-communicable diseases, such as diabetes, heart disease, stroke and cancer. Energy intake of calories should balance with energy expenditure. In order to avoid unhealthy weight gain, total fat should not exceed 30% of total energy intake (WHO, 2003, 2018). In our study, the total fat for both yoga groups did not exceed the recommended limit of 30% (28.8% for the Intermediate Yoga and 28.9% for the Advanced Yoga group). WHO recommends that saturated fat intake should be less than 10% of total energy intake (WHO, 2018). Saturated fats are mainly those fats derived from animal sources. Based on the data for animal fat consumption, it was calculated that 16.5% of the total energy intake was from saturated fat for the Advanced Yoga group, and 17.3% for the Intermediate Yoga group. These values were higher than the WHO recommendation.

According to the WHO, people should consume at least 400 g of fruit and vegetables daily (WHO, 2003). It is recommended to include fruits, vegetables, legumes, nuts and whole grains (unprocessed oats, wheat and brown rice) as part of a healthy diet (WHO, 2018). Dietary intervention studies have suggested that fruit and vegetable intake may be an effective strategy for maintaining a healthy body weight, especially when consumption replaces more calorie-dense foods (Smiciklas-Wright, Mitchell, Mickle, Goldman, & Cook, 2003). Moreover, there is ongoing research on the potential cancer chemo-preventive properties of fruits and vegetables, such as dark green and orange vegetables, cruciferous vegetables (cabbage, broccoli, cauliflower, brussels sprouts), soy products, legumes, allium vegetables (onions and garlic), and tomato products (Kushi et al., 2012). The

yoga practitioners from our study consumed an average of 600 g of fruits and vegetables per day, which complies with the minimum recommendation of 400 g.

A body of research supports the importance for consuming whole-grain foods in reducing cancer of the gastrointestinal tract (Chan & Giovannucci, 2010; Schatzkin et al., 2007; Schatzkin, Park, Leitzmann, Hollenbeck, & Cross, 2008). The yoga practitioners in our study consumed sufficient amounts of nuts and beans as outlined in Table 3. This consumption is in line with the American Cancer Society Guidelines on nutrition and physical activity for cancer prevention, which states that fish, poultry, or beans should be consumed as an alternative to red meat (beef, pork, and lamb) (Kushi et al., 2012). Moreover, the yoga practitioners in our study consumed significantly smaller amounts of pork and 60% did not consume any meat (Table 4).

The reduced consumption of meat is in accordance with the conceptions of yoga practitioners following the Sivananda yoga system (International Sivananda Yoga Vedanta Centres, 2020). The weekly consumption of some dairy products, such as yogurt and cheese, were more widely consumed. However, it was not clear why milk intake was low considering that Swami Sivananda described milk as a ‘perfect food which contains all nutritious principles in proper well-balanced proportions’ (The Divine Life Society, 2020). Additionally, interviews with the yoga practitioners in our study revealed that lower milk consumption was most likely due to recommendations received from other health information sources promoting a whole food, plant-based diet.

The yoga practitioners from both groups consumed on average 28.5 g/day of sweets and/or chocolates, which contributed to only 6.35% of their total energy intake. This is in line with the WHO recommendations for limiting the intake of free sugars to less than 10% of the total energy intake as part of a healthy diet (WHO, 2003).

Conclusions

The nutritional assessment of the yoga participants in both groups corresponded with the recommendations of the WHO and the American Cancer Society Guidelines for a healthy diet. This is due to the positive contribution of yoga, which is associated with multiple beneficial health outcomes. Therefore, participation in yoga should be widely recommended as a practice for an even greater number of people. More detailed research with a larger number of participants is needed in order to reveal the effects of practising yoga on body composition and nutritional habits.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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