Nutrition is a peer-reviewed journal that publishes original research in basic nutritional science and its clinical applications. Its variety of articles provides a multidisciplinary framework valuable internationally to both practitioners and researchers exploring the key role of nutrition in disease management.

It is our hope that the image of our planet will serve as a reminder that our scientific progress will mold the future of our home planet earth, in vital and perhaps unimagined ways.
Introduction ........................................................................................................... S1
Halit Tanju Besler and Mehmet Uyar

Why aren't we making progress in promoting healthy lifestyles? .......................... S2
James O. Hill, Ph.D.

Drivers of food choice: A cognitive structure approach to the determinants of food choice and implications for affecting behavior change ........................................ S4
Klaus G. Grunert

The chemical senses and nutrition ................................................................. S6
Richard D. Mattes, M.P.H., Ph.D., R.D.

Gastrophysics: The lens of psychological and sensory research ........................ S8
Charles Spence

Food habits and cancer prevention ................................................................. S11
Omer Kucuk, M.D.

Ethical issues in health communication: Health-related news sourcing practices. S14
Bulent Capli, Sule Karatas Ozaydin and Serife Ozturk

Today's food landscape: Not a pretty picture ................................................. S16
Sylvia B. Rowe

Implementation of a “balanced nutrition education program” among primary school children in turkey .......... S18
Halit Tanju Besler, Recl Meseri, Özge Kυçukerdöñmez, et al.

The balanced nutrition test: An online dietary assessment tool adapted from the self check program for use in turkey ................................................................. S22
Burcu Aksoy, Deniz Miray Arca and Halit Tanju Besler
INTRODUCTION

Eating habits are linked to patterns of behavior, which differ across countries, cultures, ethnic and religious groups. Our eating habits also change over time and across generations.

Considerable learning about food and eating behaviors takes place during the transition from exclusive breastfeeding to the diet established in the early stages of childhood. Food preferences are also developed at this early age. At this point parents can influence children’s food preferences for certain tastes. This can lead to balanced eating behaviors or unhealthy habits such as compulsive overeating and dysfunctional eating. In an obesogenic environment these may result in obesity and the health challenges associated with it.

At a later age, cognition plays a prominent role in food choices. However, possible predictors such as consumer behaviors have been shown not to be good indicators of diet quality. In addition, consumer demand is becoming more fragmented. The most significant factors influencing food choice include consumer trust, convenience, nutritional quality, and cost. The role of cognitive factors such as psychology should also be taken into consideration as well as the cultural factors listed above.

The Sabri Ulker Foundation organizes a Nutrition and Healthy Lifestyles Summit biennially in May, bringing together colleagues from academia, industry, government and the media as well as healthcare professionals and key opinion leaders. The Foundation’s 4th Nutrition and Healthy Lifestyles Summit focused on the factors influencing eating behavior. "The Effects of Eating Behavior on Health" was the main theme of the 2017 Summit, building on the outcomes of previous summits on "New Approaches to Optimal Nutrition," "Understanding the Psychology of Food Intake and the Impact of Physical Activity on Health," and "The Past, Present and Future of Nutrition."

These proceedings document the key points of the 2017 Summit. The respective roles of cognition, environment, and parental intervention on eating behavior are discussed. Areas where evidence is lacking are also highlighted, suggesting targets for future research. It is hoped that the data summarized in this supplemental issue will help provide an update as to our current understanding about nutrition and healthy lifestyles, inspiring future initiatives in this important area.

Acknowledgement

These proceedings were supported by the speakers of 4th Nutrition and Healthy Lifestyle Summit, held May 4, 2017 in Istanbul, Turkey with the theme “The Effects of Eating Behavior on Health” and hosted by Sabri Ulker Food Research Foundation. We thank the speakers James O. Hill, Klaus G. Grunert, Richard D. Mattes, Charles Spence, Omer Kucuk, Bulent Capli, and Sylvia B. Rowe, who provided insights and expertise that greatly contributed to the proceedings. Appreciation should also be expressed in this regard to the Sabri Ulker Food Research Foundation Scientific Board.

We would like to express our gratitude to Prof. Julian Stowell for such comments and wisdom as greatly improved the manuscript, and also to, last but not least, guest editors Professors Halit, Tanju Besler, and Mehmet Uyar, and Editor in Chief Professor Alessandro Laviano, for their careful reading and suggestions.
WHY AREN'T WE MAKING PROGRESS IN PROMOTING HEALTHY LIFESTYLES?

Prof. James O. Hill Ph.D.

University of Colorado, Denver, Colorado, USA

Obesity is considered to be one of the most prevalent non-communicable chronic diseases that manifests as a symptom of and a marker for unhealthy lifestyles including physical inactivity, poor diets, ineffective sleep and ineffective stress management [1-3].

In recent years, obesity has become a truly global epidemic that affects over 1.9 billion people worldwide along with an increasing trend in prevalence in many countries in nearly all continents [2-5].

Maintenance of energy balance has been postulated to be better in individuals with a high rate of energy flow through the body (i.e., high intake matched by high expenditure) than in those with a low rate of energy expenditure [6]. A low energy flux refers to an unregulated zone with poor match between energy intake and expenditure and thus higher likelihood of a positive energy balance [7,8].

For most of mankind’s history, the primary challenge to the physiological system for body weight control has been to obtain sufficient energy intake to prevent negative energy balance and body energy loss. However, within the current environment, where minimal physical activity is needed for daily life and the food is widely available and high in energy density, the challenge to the control system becomes to increase physical activity sufficiently to prevent positive energy balance. Accordingly, the prevailing conditions in the modern environment constitute a constant background pressure that promotes weight gain and a transition in body weight control from an instinctual (unconscious) process to the one that requires substantial cognitive effort. Hence, the global obesity epidemic is considered to be driven in large part by a mismatch between our environment and metabolism with limited ability to maintain healthy dietary and physical activity patterns under conditions that discourages physical activity and encourages excessive energy intake [9-11].

To date, existing policies and interventions have not reversed these trends, suggesting that new innovative approaches are needed to transform obesity prevention and control [12,13]. On the basis of its global scope, heterogeneous patterns, wide-ranging impacts, lack of a single cause, and the failure of single solutions; the obesity epidemic is considered to be a systems problem, as opposed to a simple problem with linear cause-and-effect relationships [13-15]. Therefore, implementation of a systems approach is suggested to address obesity that involves multiple contributory factors acting at different levels, including genetics, biology (physiologic processes such as leptin sensitivity and individual metabolism), individual behaviors (dietary and physical activity choices), social network dynamics (connections to family and friends, individual behaviors), the environment (food availability, green spaces for physical activity, and neighborhood safety) and the larger societal forces (economics, policy, education, health awareness, and culture) [13] (Fig. 1).

Looking at reducing obesity through the lens of the energy balance framework provides the opportunity to recommend specific strategies to reduce obesity. These include: increasing physical activity levels in populations to get more people in the regulated zone of energy balance, maximizing the intrinsic biological mechanisms for managing energy balance and focusing on promoting smarter eating without dramatic food restriction [16]. We are biased towards energy conservation and predisposed to acquire more energy and to not expending physical or cognitive energy without a good reason [11]. Therefore, in our current environment, maintaining a healthy body weight for most people requires using conscious effort and cognitive skills to help match energy intake with energy expenditure and to overcome biological and environmental pressures to overeat and under-exercise [16].

This emphasizes the need for focusing our efforts on providing the knowledge, cognitive skills and incentives for controlling body weight and at the same time begin creating a supportive environment to allow better management of body weight [11].

For weight loss, we provide specific recommendations for behavior change (i.e. changing diet and physical activity). In this regard, we have focused on the WHAT to do and less on the science of behavior change (HOW) and motivation (WHY). Our work suggests that combining the WHAT, HOW and WHY is necessary to create transformation in the person, which can support the new behaviors and a new way of life at all levels (Fig. 2).

The WHY is particularly important. People have not been given a good enough reason for behavior change that is salient in the present moment on a day to day basis. The social and economic framework in most countries has not incorporated the real value of good health and disease prevention into the paradigm. Health may not provide a compelling enough “WHY” and we should strive to identify other sources of motivation, including social justice, global competitiveness, academic and work productivity/performance, national security and climate change.
In conclusion, to reverse obesity we need to think about the problem in a new way including to identify a compelling WHY that can drive a cause, to work with the biology, to align individual and collective purpose and to align behavioral purpose and motivational context [11]. To really lower obesity rates, we need innovative thinking, recognition that both food and physical activity are important, and open minds about how to engage all of society in making changes [17].

References

Three factors are considered of critical importance in changing consumer behaviors towards healthier choices: providing healthier alternatives to the consumer by introducing healthier reformulations of existing products, providing people with more knowledge on the intricate relationship between food and health and the motivation of the consumer to make healthier choices. Ultimately, for a behavioral change to occur, all three factors need to be present. People can be very well informed about the consequences of their choices, but if they are not motivated to make healthy choices, this information will have no effect. Therefore, the first step is to understand how consumers’ knowledge and motivation drive their choices among the available choice options.

Means-end-chain theory is an approach based on personal construct psychology. It looks at the mental links that people construct between the attributes of the product they buy and what they think are the consequences for themselves. This is a mental chain in which somebody links the attributes of a product to direct consequences for him- or herself. The basic idea is that exploring the way in which people combine product knowledge and self-knowledge may lead to an understanding of the drivers and motives of the choices that they make. According to means-end-chain theory, a person buys a food product not because of its characteristics as such, but because of the consequences the person believes these characteristics will have for him-/herself, and what these consequences will mean for the attainment of his/her life values [1-3] (Fig. 1).

The link between product-related knowledge (easy to change) and self-related knowledge (difficult to change) provides the motivation for choice. Consumer perception and choice of food products can be analyzed through the pathway from the individual perception of food product attributes to self-relevant consequences and life values. From a behavior change perspective, this cognitive structure approach to the determinants of food choice provides important insights regarding the basic motivational structure governing food choice (stable over time, not subject to short-term changes) and the consumer knowledge about product attributes and their consequences (amenable to change by information and product experience). This perspective therefore allows a realistic assessment of the potential for behavioral change, whether it is based on providing information, new choice alternatives, or on changes in the choice environment [1,2].

Employing the means-end-chain approach, we have investigated drivers of food choice for 6 product categories (breakfast cereals, ready meals, yoghurt, sweet snacks, biscuits, cold drinks) in five European countries (UK, Italy, Poland, France and Turkey) using the laddering technique in semi-structured in-depth interviews. The laddering method led to a mapping of linkages between product attributes, self-relevant consequences and values through hierarchical value maps (Fig. 2).

Our findings revealed that for breakfast cereals the two themes were reasonably balanced in terms of health and enjoyment. Biscuits were mainly related to enjoyment and indulgence, yoghurt was mainly a health-related product and sweet snacks were mainly about indulgence, while ready meals were about convenience and cold drinks were mainly about enjoyment. Health and enjoyment emerged as the two dominant themes in food choice across all the countries investigated in our study. Enjoyment and indulgence were
related to attributes like happiness, comfort, relaxation, wellness and well-being, while the health aspect was related to subjective theories of health (i.e. feeling at ease, more relaxed and more comfortable).

Our findings revealed that health and indulgence emerge as the main drivers of food choice, while considerable differences were noted in the drivers of choice both across product categories and across countries. In the UK, the health aspects of food products are more dominant than in other countries, whereas in the French data enjoyment was a much bigger theme when it comes to talking about food. In Italy, the importance of brands was considered, whereas in Poland, the theme was food being viewed as something that supports your ability to perform, function and achieve results in your work life. What was really special about the Turkish results compared to the other countries in the study was the complexity of food-related knowledge, with more attributes and more relevant consequences, ultimately creating a more complex pattern linking consequences and values in the food choices which may be related to a high degree of involvement with food [1] as well as being a less individualistic country leading to more holistic thinking, more processing of context, and a more complex perception of causality [3] (Fig. 3).

In conclusion, understanding main drivers of food choice can facilitate promotion of healthier choices through well-communicated product reformulation and product development. We can supplement these approaches through non-informational, non-product-related initiatives like nudging.

References

THE CHEMICAL SENSES AND NUTRITION

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The chemical senses are comprised of the senses of taste, smell and chemical irritation. They are often referred to as the minor senses though considerable evidence documents their vital roles in human health, reproduction and the quality of life. In addition to being the primary driver of food choice, the chemical senses also serve as signaling systems that modulate appetite, digestion, metabolism, energy balance and body weight [1,2].

There has been considerable research attempting to link sensory responses to specific nutrients and health outcomes (e.g., salt taste and hypertension, sweet taste and diabetes, fat taste and obesity, bitter taste and thyroid disease, sour taste and renal dysfunction), but this has been largely “unsuccessful,” due, in part, to the fact that a particular flavor principle is only one facet of the totality of the meaning of a particular food. Additionally, there are a number of steps in the pathway between sensory responsiveness and ultimate behavior. The Thresholds (the lowest concentration of a stimulus that can be detected or recognized), intensity and quality (descriptive stimulus attributes of sensation) are just the substrates upon which hedonic judgements are made. Hedonics then provides input that allows decisions regarding type, quantity and brand of “food,” leading to performance of a behavior (consume or reject) and then ultimately determines the total energy consumption and body composition. Moreover, each of these steps is modified by epigenetics, culture, social context, recent diet, and lifestyle (Fig. 1).

The health effects of sweetness and fattiness are examples of areas with a good deal of misinformation. The common hypothesis states that, in the case of sweetness/fattiness, there is something about the sensation of sweetness/fattiness, sweeteners/fatty acids, or the palatability of these compounds that promotes excess consumption leading to a positive energy balance, weight gain and the onset and complications of various chronic disorders (e.g., dental caries, obesity, diabetes, cardiovascular disease, fatty liver, etc.). However, the overwhelming preponderance of evidence does not support a role for sweetness, sweeteners, or palatability as triggers for excess consumption and people with obesity do not differ in their sensory worlds with respect to these chemo-sensory sensations. Meta-analyses have consistently shown that the use of low-calorie sweeteners is associated with lower BMI and when they are substituted for other energy sources in the diet, they can maintain the palatability of the diet and thus result in lesser total energy intake and BMI. An analysis of taste intensity ratings of edible taste strips impregnated with varying concentrations (%v/v) of linoleic acid (LA) by 735 visitors to the Denver Museum of Nature & Science, noted that children rated all concentrations as more intense than adults, while women and girls rated the highest concentration as more intense than men and boys. However, percent body fat was not correlated with fat taste intensity ratings. Factors other than simple adiposity status influence fat taste intensity ratings [2].

Additionally, there is a similar growth of palatability with concentration in normal-weight individuals and those with obesity. Moreover, there is higher intra-group than inter-group variability (i.e. more diversity within normal weight or individuals with obesity than the diversity between the two) in responses to fat. It should also be noted that dietary fats are consumed primarily in the form of triacylglycerol which provides an appetitive signal. In contrast, most evidence indicates humans can only “taste” non-esterified fatty acids and these molecules are typically aversive to humans. Consequently, in humans, fat taste likely functions as a warning system to discourage fat ingestion.

Recent advances in research methodologies (e.g., neural imaging, assessment of the gut microbiome) have raised new questions about potential adverse physiological effects of selected sensory stimuli. In accordance with concerns about global obesity trends, hypotheses have been suggested that sensory-active compounds in the food supply may stimulate brain reward systems leading to addictive behaviors and alter the gut microbiome to enhance the efficiency of energy extraction from food, both leading to positive energy balance.

Study of appetite, feeding and energy balance has transitioned over time. During the 1960’s and 1970’s, metabolic signaling theories (such as glucostatic, aminostatic, and lipostatic theories) predominated. With their weak predictive power for feeding and discovery of gut peptides (e.g., CCK, GLP-1 and PYY) associated with appetitive sensations, attention turned to gut-endocrine systems during the 1980s to 2010s. While illuminating, findings from this work also did not reveal clear endocrine-based interventions to manage body weight. Thus, this too gave way to the present focus on brain reward systems as drivers of over-consumption of foods.

A current popular view holds that there is a dual system composed of a homeostatically controlled appetite center in the hypothalamus and various non-homeostatically controlled reward centers in the brain. However, this view of competing control...
centers may not faithfully characterize the system since both of these centers are activated by the same exogenous factors, are responsive to the same endocrine signaling molecules and there are extensive neural connections between the two centers. As a result, an integrated modulation of eating behavior rather than a control through a dual system seems more likely.

Advances in understanding of processes occurring in the GI tract have spawned interest in how nutrient signaling influences gut peptide secretion and glucose transport. Though effects have been documented in cell culture and animal models, these have not consistently translated to humans trials. For example, low calorie sweeteners have been associated with all possible variations of glucose, GLP-1 and insulin responses (i.e., no response or elevations). Thus, no compelling link between low calorie sweetener use and these outcomes is presently supported by the data. Similarly, based on animal models, there is considerable interest in how the colonic microbiota may influence glucose and insulin tolerance as well as energy harvesting for the host. Again, in humans the effects are not robust.

We have the opportunity to manipulate ingestive behavior to improve health but we have to do it based on science rather than on passion and on false assumptions. We have to be critical when we read the literature and design good quality science if we are to move forward.

References


GASTROPHYSICS: THE LENS OF PSYCHOLOGICAL AND SENSORY RESEARCH

Prof. Charles Spence
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The perfect meal may be something as simple as a picnic in a summer meadow or a once in a lifetime trip to one of the world's top Michelin-starred restaurants. But a great eating experience depends on not just the food but far more on 'the everything else' that surrounds the meal such as the mood we are in through to the company we keep, the environment and the plating, plateware, and cutlery [1–4].

The emerging body of research from the new field of gastrophysics (gastro from gastronomy and physics from psychophysics) is helping to isolate just how important these various factors are to our perception and enjoyment of food [3]. The pleasures of the table reside far more in the mind than we realize and perhaps even more in the mind than in the mouth. Gastrophysics is the new area of research that takes us away from three decades of the molecular gastronomy approach (science in the kitchen) to the neglected area of mental processes regarding the perception and enjoyment of food (scientific study of dining).

Hence, the role of the senses is considered of critical importance in gastrophysics, including the appearance of food, the sound of food, forgotten flavor senses, the smell, the taste, the touch, the texture as well as all the other oral and sensory inputs that surround the food. Some of the most exciting recent examples of the dynamic interplay between chefs, designers, and sensory scientists give rise to exciting new immersive, experiential and most definitely multisensory, dining experiences including how taste is influenced by sight, sound, and touch.

The recent interest in trying to understand eating experiences through the lens of psychological and sensory research is increasingly highlighting the fact that the pleasure and enjoyment of food does not depend solely on the edible elements laid out on the plate. Our food experiences are multisensory and integrated at perceptual and semantic levels [5–10]. Therefore, the atmosphere or the environment in which the food is consumed, the visual and structural arrangement of the elements on the plate, the weight of utensils that we use to eat with, the color and material of the cutlery significantly affect the diner’s perception of a dish including the perceived taste and flavor of the food [5–10].

For instance, in one study conducted in a realistic dining environment, two groups of diners were served the same three-course meal while the presentation of the starter (centred vs. offset plating), the type of cutlery (light vs. heavy), and the shape and colour of the plate on which that dessert was served were varied [5]. The results revealed that the diners’ appreciation of the food was affected by the presentation of the starter (centred vs. offset plating), the weight and type of the cutlery used to eat, the shape and colour of the plate in terms of liking, aesthetic value and willingness to pay for the food, thus supporting a growing body of gastrophysics research highlighting the importance of a host of food-extrinsic factors in modulating the diner’s opinion of the meal that they have been served [5] (Fig. 1).

In another study, we assessed whether placing the culinary elements of a dish in an art-inspired manner would modify the diners’ expectations and hence their experience of food using three different presentations of the dish [6]. One was simply plated (with all of the elements of the salad tossed together), another with the elements arranged to look like one of Kandinsky’s paintings, and a third arrangement in which the elements were organized in a neat (but non-artistic) manner [6]. The Kandinsky-inspired plating was rated more artistic, more complex, and more liked and people were willing to pay more for before consumption, while higher tastiness ratings after consumption. These results support the idea that presenting food in an aesthetically pleasing manner can enhance the experience of a dish, and the use of artistic (visual) influences can enhance diner’s expectations and subsequent experience of a dish [6] (Fig. 2).

In the hospital sector, data from Salisbury district hospital in the South of England showed that plate color really matters to patients with simply changing the colour from white to a high-contrast blue or red resulting in a 30% increase in consumption, which is something of the utmost importance, as it may help to reduce the length of stay for these patients.

In addition, renaming the “Patagonian tooth fish” on the menu as “Chilean Sea Bass” led to an increase in sales of more than 1200% in North America, the UK, Australasia, and beyond. Furthermore, given the predominant role of olfaction in what we think we taste, designing cans, bottles and lids differently seems important to enhance the ability to orthonasally sniff the aroma. In terms of the use of technology at the table, the idea of sonic seasoning is a really exciting area building on the documented existence of crossmodal correspondences between, for instance, sweet tastes and high-pitched sounds and between bitter tastes and low-pitched sounds as well as other crossmodal correspondences between
various parameters of musical composition and specific taste/flavor attributes [11-14].

In conclusion, gastrophysics represents an exciting new area of science where the focus shifts from the food to the mind of the diner who is consuming that food (and drink). The search for the perfect meal can lead to interventions that may potentially help to tackle the growing obesity crisis, and may also provide some intriguing ideas about how to get us all to shift to a rather more sustainable diet in the decades ahead [15].

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FOOD HABITS AND CANCER PREVENTION

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Physical activity, healthy nutrition and lack of stress are the three most important components of health. Adequate levels of physical activity, obesity, unhealthy diet and chronic stress (e.g. tobacco, excessive alcohol and other harmful physical, chemical, biological, psychological and social stress) can induce an unhealthy and unhappy life that leads to chronic diseases such as hypertension, diabetes and cardiovascular disease, cancer and Alzheimer’s and to premature death. The mechanisms are generally thought to involve increased oxidative stress, inflammation, epigenetic changes and metabolic changes.

Recently, integrative medicine has become a very important area of medicine, which focuses on the entire patient, their family and environment and healthy lifestyle rather than on a diagnosis and treatment of a particular disease. Integrative medicine targets healthy lifestyle focusing on physical activity, diet (vegetables, fruit), botanicals (lycopene, genistein) and other natural compounds, mind-body approaches, stress reduction (meditation, yoga), sleep hygiene (stress, BMI), acupuncture (pain control) and other methods such as massage, music, and thermal spa.

The US National Centre for Complementary and Integrative Health (NCCIH)’s programs and organization incorporate three long-range goals that are to advance the science and practice of symptom management, to develop effective, practical, personalized strategies for promoting health and well-being and to enable better evidence-based decision making regarding complementary and integrative health approaches and their integration into health care and health promotion. NCCIH supports research that looks into healthy lifestyles and other complementary and integrative approaches, while publishes guidelines for physical activity, exercise and botanicals.

Food habits are also very important in cancer risk as dietary factors are responsible for a third of all cancers [1-5]. A diet rich in sugar and saturated fat as well as processed meat products is considered to be a cancer promoting diet. To the contrary, a diet rich in vegetables and fruit is generally associated with reduction in the risk of many types of cancer [6,7] (Table 1). Mediterranean diet (lots of vegetables, fruit, fish, olives and olive oil, nuts, seeds, herbs, spices and whole grain foods) has consistently been shown to be beneficial in preventing cardiovascular disease as well as cancer, while not just diet but high levels of physical activity, social activity, mindfulness, love and compassion among the Mediterranean population seem also play a role in this benefit. Thus, integrative medicine is part of the Mediterranean lifestyle.

While epidemiological studies indicate association of the consumption of vegetable and fruit with decreased risk for many types of cancer, data from well-designed, cohort or interventional studies failed to demonstrate the impact of reduced fat intake on postmenopausal breast cancer risk as well as no association between colon cancer and the consumption of fruit and vegetables in men and women [8-13]. However, while no significant decrease in the cancer risk difference in cardiovascular risk was noted with a prudent diet that involved eating more vegetables and less fat [14] (Fig. 1). Therefore, we need to carry out better designed and better controlled studies with different end points. Notably, increased body mass index and obesity and lack of regular physical activity have been associated with increased cancer risk for most cancers [15].

Population studies have shown that high intake of dietary lycopene is inversely associated with the incidence of certain types of cancers, including those of the digestive tract, prostate, and cervix [1,16]. Epidemiological studies show an inverse association between dietary soy consumption and the risk of prostate, breast, and endometrial cancers [1]. Genistein is the most active and abundant isoflavone in soybeans with activity against a variety of cancer cells as associated with anti-oxidant, anti-inflammatory, anti-viral and anti-bacterial activities, induction of DNA demethylation and histone acetylation and inhibition of nuclear factor kappa-B, receptor activator of nuclear factor kappa-B ligand, vascular endothelial growth factor, matrix metalloprotease and epithelial mesenchymal transition, enhanced chemo/radiotherapy, reduced toxicities of chemo/radiotherapy and immune function potentiation as well as enhancing effects on exercise mimetics and exercise endurance [17-20].

In conclusion, modification of food habits may prevent many cancers and result in a healthier population and significant savings in healthcare expenditures.

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Table 1
Proportion of cancer deaths attributed to various different factors [6] and role of certain foods in cancer risk reduction [7]

<table>
<thead>
<tr>
<th>Factor or class of factors</th>
<th>Percent of all cancer deaths</th>
<th>Range of acceptable estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tobacco</td>
<td>30</td>
<td>25-40</td>
</tr>
<tr>
<td>Alcohol</td>
<td>3</td>
<td>2-4</td>
</tr>
<tr>
<td>Diet</td>
<td>35</td>
<td>10-70</td>
</tr>
<tr>
<td>Food Additives</td>
<td>&lt;1</td>
<td>-5-2</td>
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<tr>
<td>Reproductive &amp; sexual behavior</td>
<td>7</td>
<td>1-13</td>
</tr>
<tr>
<td>Occupation</td>
<td>4</td>
<td>2-8</td>
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<tr>
<td>Pollution</td>
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<td>&lt;1-5</td>
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<tr>
<td>Industrial products</td>
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<td>&lt;1-2</td>
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<tr>
<td>Medicine &amp; medicinal procedures</td>
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<td>Geophysical factors</td>
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<tr>
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<th>Fruits</th>
<th>Carotenoids</th>
<th>Vitamin C</th>
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<td>Oesophagus</td>
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<td>Bladder</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
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</tbody>
</table>

*3=Decreases risk convincing, 2=Decreases risk probable, 1=Decreases risk possible

Fig 1. Fruit and vegetable consumption and the risk of cancer and cardiovascular disease.
References

ETHICAL ISSUES IN HEALTH COMMUNICATION: HEALTH-RELATED NEWS SOURCING PRACTICES

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The field of health science communication (HSC) has multiple stakeholders including researchers, scientific societies and organizations, government agencies, universities, news and media organizations and public information officers [1,2]. The optimization of HSC between researchers and the public is crucial in terms of its impact on governmental decision-making, health policies, health promotion, disease prevention and self-care [1,3]. Health communication should adhere to the principles of beneficence, non-maleficence, respect for personal autonomy, and justice [4].

The process of conveying scientific information through the media has been linked to a “communications chain” which has the scientist and the journalist at the ends and in between is several key players such as editors, public relations and public affairs professionals, special-interest groups, and representatives of the food, pharmaceutical, or supplement industries [5,6]. Media misinformation is considered to be driven by several factors, such as an unqualified spokesperson, a lack of context, or an inexperienced reporter. It can also be biased to sell products or services, to discredit other sources or products, or to promote a particular agenda [5–7].

The Internet provides an easy vehicle for the transmission of misinformation. Consumers who seek health information through an online search may get millions of results which are unfiltered or unrated in terms of the quality of the source [6–9]. The disparity between information and misinformation results in part from the conflicting goals, perspectives, biases, and agendas of the involved parties [8,9]. The media strives for scares, scandals, conflicts, and sensational headlines which are considered to be more exciting, compelling, and profitable to report than substantiated science by the media, while industry-sponsored information may be scientifically accurate but present only one perspective [7,9].

In this regard, sourcing of the news is important as it helps the news consumer to determine the credibility of the information provided. It is expected that news people should give as much context and detail as possible about sources (the number, transparency, credibility and variety), whether named or anonymous, to verify information provided. The number of sources cited in the story reflects the reliability of the stories. A story which does not have many sources could be under reported and single source stories are often not reliable. Transparency of sourcing helps the consumer to determine whether it is fact based reporting or rumor presented as news. Hence, it is important that the reporter tells where the information comes from and the report makes clear what the sources of the information are.

Authority and credibility of the sources (being in a position to comment on the subject, knowing the subject well, motives of sources, and trust of reader) can be tough to judge for an outsider. Variety of sources is more than numbers; multiple sources help reports make sure that they get things right and provide different angles. Using a variety of sources and perspectives helps reporters provide information that is accurate and fair.

When it comes to the health-related news, the sourcing issue becomes much more critical, as generally people rely on news to obtain information. The media offer many powerful channels for communicating health information to the public. Consumers rank magazines, newspapers, television, and the Internet among their top sources of health information. The general public is not well educated about science or the scientific process. Therefore it is essential to analyze how the sourcing is presented in the news. Scientists are among the most qualified and credible sources of comment about nutrition research, but they have slipped from the top spot on reporters’ speed dials. Reporters usually are under tremendous time pressure to “get the story” and meet their deadlines.

In order to understand the sourcing practices of health-related news in Turkish internet news media, a total of 285 health-related news items which had appeared in three most popular internet news websites, in the period between 8th and 17th August 2017, were selected and analyzed. The focus of the study was to find out the number, variety and transparency of the sources used in the news and to see whether different angles and perspectives are provided in the news. According to the findings, the type of news included slider galleries with images or photographs (59.4%) and text based stories (40.6%). Whilst only 53% of stories listed an author, the source of the information was provided in 59.6% of the articles (sources named in 10.2%, multi-source in 10.5%), while different perspectives and angles were provided only in 2.0% of news (Table 1).
As the findings illustrated in Table 1, the sources of the health-related news have been mainly based on anonymous sources which means the credibility of sources is controversial. Besides, this research covering the analyses of 285 health-related news from the websites of three mainstream media of Turkey reveals discredited sources account for 40.4% range. In other words, approximately half of this health-related news was written without referencing any health-related scientific study or source.

In another study regarding exploratory analysis of authorship and information sourcing for health news on local TV websites in US, authors noted that regarding the authorship of the (health) articles, 23.7% listed no author, while 76.3% of the stories listed an author, 23.7% of the news were attributed to multiple sources and 61.9% attributed to single source with no attribution in 14.4% of news [10]. On comparing the US case to the Turkish one in the context of health-related news’ sourcing practices, it is found out that the use of single source in health news is common and widespread. This practice discourages readers and/or viewers in conducting further investigations for validating the authenticity of the news.

In conclusion, the media is the consumers’ main source of health information. News consumers should be more critical about the sources of the news. Some stories included no attribution (i.e., in-text reference of where the health information originated or was first published) or direct quotes from health sources. From a journalistic perspective, it is troubling to find stories that lacked any type of attribution because, ethically and legally, attributing information to a source contributes to the separation of fact from opinion and allows a reader to understand from where, or from whom, the information originates. From a health communication standpoint, stories lacking attribution may leave a health consumer wondering where to turn for additional information.

References


| Table 1 Characteristics of health-related news in Turkish internet news media (n=285) |
|-------------------------------------|-----|
| Type of news                        | %   |
| Slider galleries with images or photographs | 59.4 |
| Text based stories                  | 40.6 |
| The authorship of the news          | %   |
| Stories listed an author             | 5.3  |
| Stories listed no author             | 94.7 |
| The source of the information       | %   |
| Provided                            |     |
| total                               | 59.6 |
| sources named                       | 10.2 |
| anonymous sources                   | 49.4 |
| single source stories               | 49.1 |
| multi source stories                | 10.5 |
| national sources                    | 31.9 |
| international sources               | 15.8 |
| Mixed sources                       | 3.2  |
| Not provided                        |   40.4 |
| Different perspectives and angles    | % 2.0 |
| Provided                            | 98.0 |

Food has emerged globally in the last decade as a very hot topic for the media, government, opinion leaders and the public. This is driven in large part both by heightened interest in health and well-being and by concerns about obesity and chronic disease. A convergence of issues around food and food systems lead to a complex and challenging environment.

Trust and transparency are fundamental to today’s dialogue. According to the 2016 Edelman Public Relations Trust Barometer, for the first time in thirty years of research, a decline in trust was found in all four of our major institutions at the NGOs, industry, government and the media (Fig. 1)[1].

We have two escalating realities - changing science and changing communications. While science and research still drive both media and policy, science today requires consideration of practice-based evidence as well as evidence-based practice due to multi-factorial issues like obesity and climate change. These complex issues necessitate a transdisciplinary or multidisciplinary approach. Also, currently there is a very quick transition from science to communications to policy. This sits alongside a fundamental tension between the scientific community looking for consensus and journalists looking for conflict. There is a difference in perspective amongst the different stakeholders. Scientists are driven by the discovery, journalists by the story, and policy makers by the decision. All are considering the same information [2]. Further tension is anticipated based on the current status of media coverage. We are in a rapidly changing environment with increasing background noise. The intersection of a nearly instantaneous accessibility of information (as well as misand dis-information) and a global, 24-hour news cycle has created an attention-deficit-disordered news consumer, who spends his/her day ‘multi-tasking,’ by checking e-mail, Web surfing, texting, twittering, blogging, and engaging in mobile phone conversations while attending meetings, meals, parties, etc.

The public dialogue includes a consideration of food as fuel, medicine, ethics/values and risk. During the last ten year period we have moved further towards looking at the whole food system in the broadest context rather than at individual foods or nutrients. A global convergence is emerging in the dialogue around many of these issues (Fig. 2).

In terms of food as fuel, there is a focus on oils and sugars for renewable energy and the competition that this will then have with food. There is much promising research underway in the field of food as medicine. One example is our increasing knowledge of the role of the microbiome in health and disease. The really intriguing concept of personalized nutrition has attracted considerable attention recently and there are many other things on the list. Ethical considerations around food have become prominent during the last decade. These include consideration of sustainability. Whole foods, clean foods, animal welfare and social justice. Food as risk is an aspect that we read much about in the media. Many nutrition issues today are viewed through the eyes of obesity. Food insecurity and food safety issues are still very much on the agenda. The link between added sugars in the diet and chronic disease remains a hot topic and the move towards more and more processed and ultra-processed food is the subject of intense debate. It can be said that obesity changed everything. This will attract more and more attention as the true cost of obesity and chronic disease becomes better understood. According to recent McKinsey research, obesity and chronic disease have overtaken tobacco and violence in terms of healthcare cost and loss of GDP on a global basis. Many of us live in a culture of overconsumption with negative effects on people, pets and the environment. In response, the concept of ‘one health’ is now emerging. This encompasses a healthy environment, the health of animals and the health of people. Many global activities and national initiatives reflect the ‘one health’ concept.

A widespread assumption within the scientific community has been that if science communication were only done “better”, people would make choices more consistent with the scientific evidence. However, this widely held, simple model of what people need from science communication (known as the deficit model) is wrong. Although people may indeed need more information or to have information presented more clearly, a focus on knowledge alone often is not sufficient for achieving communication goals. People rarely make decisions based only on science. They do, however, process scientific information taking into account their own goals and needs, knowledge and skills, values and beliefs. When scientific facts provoke fear or make people feel like they have no control over a situation, it becomes essential to have genuine, respectful dialogues with people [3]. The US National Academies of Sciences, Engineering and Medicine published a report on Communicating Science Effectively which highlights the need to develop a research agenda for science communication [4]. This acknowledges that society’s need for science communication has never been greater. Effective science communication is aimed at helping
people to understand the science and its relevance to a particular decision. It should recognize that other factors will also affect their actions. Examples of current contentious issues related to science include climate change, stem cells, nanotechnology, vaccines, hydraulic fracturing, nutrition, genetically modified organisms, nuclear energy, education policy and obesity [5].

In conclusion, the current extreme gap between knowledge and behavior, means that the challenges of communication are becoming increasingly acute. Today we must become more sophisticated with regards to the narrative around science-related contentious issues. We must also show empathy for the people that are receiving the narrative and get a better understanding of what is really going to make a positive difference in their lives.

References

IMPLEMENTATION OF A “BALANCED NUTRITION EDUCATION PROGRAM” AMONG PRIMARY SCHOOL CHILDREN IN TURKEY

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1 Eastern Mediterranean University, Faculty of Health Sciences, Department of Nutrition and Dietetics, Famagusta, North Cyprus.
2 Ege University, Turkey
3 Erciyes University, Turkey
4 Marmara University
5 Sabri Ulker Food Research Foundation, Turkey

Key nutritional concerns in Turkey include excessive salt consumption (14.5 grams per day in 2012 against a WHO recommendation of 5 g/d) [1,2], iodine deficiency (27.8% of the population in 2009) [3], low fruit intake with only 53% of females and 51% of males consuming fruit on a daily basis, low vegetable consumption with only 63% of females and 60% of males consuming vegetables on a daily basis, [4], low iron status (anemia in 21% of female and 19% of male school children in 1993) [5], and potential high energy intake (3500 Kcal/day available in the food chain against a requirement of 1800-2500 Kcal/d) [5]. Sugar(s) consumption is not considered to be an issue at 35.4 g/d in 2014 compared to the WHO recommendation of 25-50 g/d [5] (Fig. 1).

According to the Turkey Demographic and Health Survey of 2013 (TDHS-2013) [6], by age five 10% of children (11% for males and 8% for females) are stunted (short for their age), whereas wasting is a less serious problem with 2% of children (no gender difference) being underweight for their age.

The Sabri Ulker Food Research Foundation was established in 2009 in Turkey with the objective of enhancing nutrition science and knowledge, with a special focus on the Turkish population and regional neighbors. The Sabri Ulker Food Research Foundation is a member of the European Nutrition Foundations Network and key areas of activities include to encourage healthy living by promoting healthy eating and a balanced diet, to support and encourage new research, education and other initiatives in the field of food and nutrition and to present the public with useful information derived from a variety of reliable sources, both nationally and internationally.

The Balanced Nutrition Education Program is a school-based nutritional intervention program developed under the direction of the Sabri Ulker Food Research Foundation and the Ministry of Education in Turkey to promote a healthy lifestyle in primary school children. The program has been implemented since 2011, so far involving 1.5 million children from 500 primary schools across Turkey. Material from the British Nutrition Foundation (BNF) has been adapted for local use [7]. The main theme of the program is “You can eat anything - as long as you keep it balanced. All you have to do is learn how to achieve a balance”. Intended for children aged 7-9 years, the program focuses on the food groups, ways to establish a balanced diet, and the benefits of exercise, hygiene, and drinking water, being offered in weekly 2 hour lessons for 38 weeks throughout the academic year at selected primary schools (Fig 2).

A preliminary questionnaire survey was conducted between 2014 and 2015 among 618 primary school (2nd to 4th grade) students (52% females) at four provinces in Turkey, including Istanbul (n=190, 32%), Izmir (n=210, 33%) and Kayseri (n=218, 35%) to evaluate the impact of the ‘Balanced Nutrition Education Program’ on food intake, anthropometrics and physical activity levels of primary school children.

A food frequency questionnaire and 3-day dietary recall were applied before and after the program in order to examine the amount and frequency of food intake (dairy, meats and legumes, cereals, fruits and vegetables, fats, sugars and other foods) to estimate daily energy and nutrient intake. Weight and height were measured and weight according to age, height according to age and BMI according to age were estimated according to WHO standards (http://www.who.int/childgrowth/standards/en/). The participants of the impact evaluation were given a physical activity questionnaire covered intensity, duration, and frequency of physical activities. The physical activity levels (PAL) were calculated by dividing physical activity ratio (PAR; expressed as a multiple of basal metabolic rate as multiplied for each activity and the energy in calories spent) by duration of day in minutes (24 hour=1440 minutes). PAL values between 1.40-1.69 are classified as sedentary or light activity lifestyle; 1.70-1.99 as active or moderately active lifestyle; and 2.00-2.40 were classified as vigorous or vigorously active lifestyle. Data from questionnaires and daily forms were entered in BEBIS program (a program for

HTB conceived the original idea, designed and directed (with BM) the project. RM, OK, HS, BC, EG, SA performed the data collection. RM and HTB analysed the data. RM, BA drafted the manuscript and designed the figures in consultation with HTB. All authors have evaluated and approved the final version submitted for publication.

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energy and nutrient analysis of food and beverages based on USDA database) and converted to Statistical Package for the Social Sciences (SPSS) to be coded and analyzed. The survey results revealed that the “Balanced Nutrition Education Program” was associated with a significant decrease in total energy (p<0.001), carbohydrate (p<0.001), fat (p=0.003 in males,
p=0.001 in females) and animal protein (p<0.001) intake and a significant increase in PAL (p<0.001) among all students, whereas significant decrease in age-based BMI values (p<0.001) was noted only in females (Table 1, Fig. 3).

In a cross-sectional study of 2519 students, aged 13–14 years, from 79 schools in Spain, students were asked to report their food intake and physical activity over one week through the CAL-TAS platform from Alicia Foundation [8]. Authors noted failure to adhere the recommendations provided by the Spanish Society of Community Nutrition in adolescents in general, presence of overweight or obesity in 20% of students and the higher likelihood of poor eating habits and inactivity in those with higher body mass index [8]. Given the consideration of early adolescence to be associated with acquiring more independence and making own food choices and thus as a critical period to determine the state of health in the adult period [8], the positive impact of Balanced Nutrition Education Project on eating habits and the physical activity in Turkish school children of 2nd to 4th grades seems notable to indicate the likelihood of early adoption of healthy dietary habits and of a correct physical activity before the critical adolescence period.

In conclusion, the Balanced Nutrition Education Project has shown significant improvements in a range of parameters in school children. These findings highlight the importance of implementing such educational programs in early adolescence to foster healthy dietary habits and active lifestyles, thereby potentially influencing long-term health outcomes in adulthood.
children of 2nd to 4th grades. Preschoolers and primary school 1st grade students have been included in an extension of the program from the 2016-2017 academic years onwards.

Overall, the Balanced Nutrition education project has helped students to improve their dairy product and green vegetable intakes. It has also encouraged increases in physical activity and has helped to regulate energy intake and expenditure. Future objectives include integrating the Balanced Nutrition Project into the school curriculum throughout Turkey. In addition it is intended to regularly measure students' weights and heights, and monitor their health status. Schools will be encouraged to provide nutritious food and allocate sufficient space for physical activity. The program will continue to focus on managing sugar, salt and fat intake, and increasing fruit and vegetable intake, thus enhancing dietary fibre. A certified education program will also be developed for teachers.

References

THE BALANCED NUTRITION TEST: AN ONLINE DIETARY ASSESSMENT TOOL ADAPTED FROM THE SELF CHECK PROGRAM FOR USE IN TURKEY

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1 Sabri Ulker Food Research Foundation, Turkey
2 Eastern Mediterranean University, Faculty of Health Sciences, Department of Nutrition and Dietetics, Famagusta, North Cyprus

Novel technologies to assess dietary intake are designed to aid consumers in measuring their individual dietary intakes. Assessing their eating habits and nutritional status in this way can help researchers and policy makers to better elucidate how diet influences public health and well-being. As a novel tool, the Self Check Program is a scientifically based online questionnaire developed by the Institut für Ernährung und Prävention and Hohenheim University to assess nutritional status. It provides insight regarding individual's eating habits and unique requirements based on dietary consumption, food preferences and lifestyle characteristics such as smoking and physical activity status [1-3].

The Self Check Program [4] was adapted as the “Balanced Nutrition Test” for use in Turkey in accordance with cuisine and nutrition habits specific to Turkey. This involved collaboration between the Hohenheim University Department of Nutrition and Biochemistry and the Science Committee of the Sabri Ulker Food Research Foundation. The first Turkish adaptation of the Self Check Program was developed in 2011. Subsequently a more user friendly version was created in 2017 with the inclusion of traditional Turkish foods in the program and this updated version was named as the Balanced Nutrition Test.

The test includes items on demographic characteristics (age, gender, height, weight), the frequency of consumption of certain foods (several times a day, 1 per day, 4-6 per week, 1-3 per week, 1-3 per month, less than 1 per month, never) and certain beverages (more than 4 glasses per day, 4 glasses per day, 3 glasses per day, 2 glasses per day, 1 glass per day, less than 1 glass per day, never), lifestyle determinants including smoking status [non-smoker, former-smoker, active smoker (less than 20 cigarettes per day, more than 20 cigarettes per day)] and physical activity (none, 0.5-2 hours per week, 3-5 hours per week, more than 5 hours per week) and generates a score and messages regarding the present nutrition status and ways to improve it. The program’s score assessment is based on the results of many epidemiological studies (such as the INTERHEART Study and the Framingham Study), current score systems (such as the PROCAM Score) and the studies of national and international professional bodies. The final score ranges from 0 (the worst possible outcome) to 100 (best possible outcome) with scores of ≥80 indicating a very good condition, scores of 60-80 a relatively good condition, scores of 40-60 an average condition, scores of 20-40 a bad condition and scores <20 a very bad condition (Table 1).

A study was undertaken to assess the nutritional status of participants who accessed the Sabri Ulker Food Research Foundation website and completed the “Balanced Nutrition Test” online between January 2015 and December 2016. Data from 1241 adults who completed the Balanced Nutrition Test within the study period were analyzed. Nutrition scores revealed an average condition in 54% of adults. Overall, 30% of adults were noted to consume fresh fruits, only 10% to drink milk regularly, only 24% to consume raw or cooked vegetables once a day and 17% to consume whole grains at least one time per day. Most adults did not adhere to recommended intake of fish as 2 times per week as well as to daily vegetable and fruit consumption recommendations. Overall, 54% of adults have physical activity less than 1 hour per week, while only 19% of participants were active more than 1-3 h per week (Table 2).

Table 1

<table>
<thead>
<tr>
<th>Balanced Nutrition Test Lifestyle Score Categories</th>
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<tbody>
<tr>
<td>Test score</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>Score ≥80</td>
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<td>Score 60-80</td>
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<tr>
<td>Score 40-60</td>
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<tr>
<td>Score 20-40</td>
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<tr>
<td>Score &lt;20</td>
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Table 2

<table>
<thead>
<tr>
<th>Nutrition Test Results</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adequate energy intake (≥80% of RNI)</td>
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</tr>
<tr>
<td>Recommended fat intake (≤30% of energy)</td>
<td>54</td>
</tr>
<tr>
<td>Fruits and vegetables (≥4 servings per day)</td>
<td>54</td>
</tr>
<tr>
<td>Whole grains (≥1 serving per day)</td>
<td>54</td>
</tr>
<tr>
<td>Total sugars (≤10% of energy)</td>
<td>54</td>
</tr>
<tr>
<td>Sodium intake (≤2300 mg/day)</td>
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<tr>
<td>Physical activity (≥150 min/week)</td>
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<tr>
<td>Smoking status (non-smoker)</td>
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<td>BMI (18.5-24.9)</td>
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The Balanced Nutrition Test scores highlight the role that this program plays in terms of providing an insight into consumer eating habits and ways in which they could improve their health and nutritional status.

In conclusion, the Balanced Nutrition Test encourages consumers to be more aware of their eating habits and health status. In this way it is hoped that it will provide the necessary incentives to encourage positive behavior changes.

The Balanced Nutrition Test findings also support the need for improvements in nutrition and health in Turkey.

### References


### Table 2
Balanced Nutrition Test Scores of Participants (n=1241)

<table>
<thead>
<tr>
<th>Test score</th>
<th>n(%)</th>
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<tr>
<td>&gt;80: Very good condition</td>
<td>26(2.1)</td>
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<tr>
<td>60-80: Relatively good condition</td>
<td>487(39.2)</td>
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<tr>
<td>40-60: Average condition</td>
<td>670(54.0)</td>
</tr>
<tr>
<td>20-40: Bad condition</td>
<td>58(4.7)</td>
</tr>
<tr>
<td>&lt;20: Very bad condition</td>
<td>0(0)</td>
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**Physical activity status**

<table>
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<tr>
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<tr>
<td>Less than 1 h per week</td>
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<tr>
<td>1-3 h per week</td>
<td>27.6</td>
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<tr>
<td>More than 3 h per week</td>
<td>18.9</td>
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### Type of food

<table>
<thead>
<tr>
<th>Type of food</th>
<th>Frequency of consumption (%)</th>
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<tr>
<td>Fruits</td>
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<td>Vegetables</td>
<td>0.3</td>
</tr>
<tr>
<td>Milk</td>
<td>9.8</td>
</tr>
<tr>
<td>Yogurt</td>
<td>1.0</td>
</tr>
<tr>
<td>Egg</td>
<td>2.5</td>
</tr>
<tr>
<td>Fish</td>
<td>3.8</td>
</tr>
<tr>
<td>Meats</td>
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</tr>
<tr>
<td>Legumes</td>
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<td>Whole wheat bread</td>
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</table>

### Frequency of consumption (%)

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<tr>
<th>Frequency of consumption (%)</th>
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<tbody>
<tr>
<td>Never</td>
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<tr>
<td>Fruits</td>
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<td>Legumes</td>
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<td>Whole wheat bread</td>
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