

CHAPTER 7

Technological Applications in Health Promotion

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Introduction

In 1986, The concept of health as a resource or asset was introduced at the First International Conference on Health Promotion. Health includes economic and social opportunities and resources, living and working conditions in homes and communities, medical care and personal behaviors (Figure 1) . We can change health behaviors to be healthy. The process of gaining health behaviors includes social practices as well as individuals. Health promotion is the most important focus in the provision of primary health care services in our country. Health promotion programs are established taking into account the population and possible health risk in each region. Health promotion as a concept includes some core principles (Table 1).

Figure 1

Upstream and Downstream Determinants of Health (Pender et., 2015; Braveman et.al., 2001)



Table 1*Core Principles of Health Promotion (Pender et., 2015; Rootman et.al., 2001)*

Principle	Explanation
Participation	Involve the stakeholders at all stages of the Project
Empowerment	Enable individuals and communities to take control over the personal, socio-economic, and environmental factors that affect their health.
Holism	Consider all health components; physical, mental, social, and spiritual
Intersectoral	Ensure collaboration from all the disciplines and areas concerned.
Equity	Seek fairness in health and social justice
Sustainability	Implement changes that can be maintained after programs have ended.
Multiple strategies	Rely on several approaches in combination.

Individuals need to have a healthy lifestyle in order to be healthy. The acquisition of healthy lifestyle behaviors varies according to each age group and special needs. Different theories and models are used in the process of gaining health behaviors. Theories and models of health behavior to promote health behavior are Health Belief Model, Theory of Reasoned Action, Theory of Planned Behaviour, Health Promotion Model, Social Cognitive Model.

Technological applications for Healthy Lifestyle Behaviors

Health promotion is expressed as a combination of health education, prevention services (primary, secondary and tertiary) and policies aimed at protecting health (Evans et al. 2017). Improvement of health provides an increase in the level of well-being of the individual (Pender, 2015). Healthy Lifestyle Behaviors Scale II (HLBS) was developed by Walker et al in 1987 and amended in 1996 (Walker et al., 1987). This scale includes nutrition, health responsibility, physical activity, interpersonal relationship, spiritual development and stress management subscales. Turkish validity and reliability study was conducted by Bahar et al. (Bahar et al, 2008). Gaining healthy Lifestyle behaviors requires a process. In this process, technological applications help us to promote health.

Ehealth is widely used in the development of health, especially in the process of gaining health behaviors. E-health is the application of new information and communication technologies, particularly the internet, to enhance or facilitate health. Information technology is very important for health promotion practice. “ePromotion of Health” or “Health ePromotion” would come closer to describing the instrumental role of information technology in health promotion work (Lintonen, Konu, Seedhouse, 2008). On the other hand, web-based interventions are more successful at affecting health behavior change when using theory (Webb, Joseph, Yardley & Michie, 2010). M-health is basically applications where mobile and wireless Technologies are used to support the achievement of health goals. M-health consists of content, context and technical features (Değerli, 2021). The mHealth services have often been used for health promotion,

increasing health awareness and information access.

Nutrition

Nutrition is the use of nutrients for growth, maintenance of life and maintenance of health. Nutrition is at the forefront of human needs (Pender, 2015) In the literature, infant mortality rates are high in malnourished societies; It was determined that infant growth rate was slow and intelligence scores were low. Nutrition is affected by many factors such as the cultural characteristics of the individual, economic conditions and the society in which they live. It is among the causes of many chronic diseases and cancers (T.R. Ministry of Health Türkiye Nutrition Guide, 2019; Aykut, 2011).

The WHO's "Global Action Plan for the Control and Prevention of Non-Communicable Diseases 2013-2020" emphasizes the global significance of non-communicable diseases such as diabetes, cancer, chronic respiratory diseases, and cardiovascular disorders. One of the 9 targets set to prevent the formation of these diseases and to improve health is to reduce the dietary salt/sodium intake by 30% (WHO, 2013a; WHO, 2013b). Nutrition plays an important role in reducing the incidence of diseases. Two different artificial intelligence applications are used in the evaluation of food consumption: the use of the image of the food and the use of wearable devices (Ji et al., 2020; Lu et al., 2020; Sundaravadivel et al., 2018).

It has been determined that artificial intelligence applications in the field of nutrition have high accuracy in evaluating nutrient intake, diet planning, determining the relationship between diet and disease and obtaining anthropometric measurements. Evaluation of food consumption of the individual or society plays an important role in understanding the relationship between diet and diseases and producing solutions. With this artificial intelligence technology model, users can access the nutritional content when they enter the name and portions of the meals they consume (Figure 2) (Lee et al., 2022). With artificial intelligence technology, it also helps to eliminate limitations such as difficulty in remembering, illiteracy, lack of motivation, under- or over-declaration, and cost (Zepeda et al., 2008; Ji et al., 2020).

Figure 2

Outline of the Medipiatto System <https://www.semanticscholar.org/paper/Assessing-Mediterranean-Diet-Adherence-with-the-The-Vasiloglou-Lu/07ed50aa613abcb13ef3bc385b76582f037b8477>

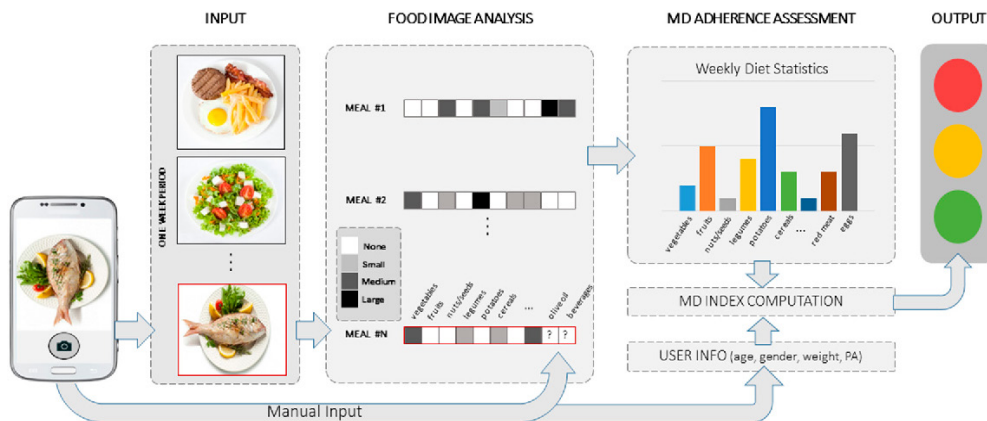


Figure 1. Outline of the medipiatto system.

Despite its limited use in the clinical setting, wearable diet monitoring tools

are being developed as a new method for passively capturing food intake. The most promising wearable dietary intake sensors researched recently are sound, image and/or motion (Vu et al., 2017). Acoustic-based wearables use microphones to detect chewing and/or swallowing behavior to provide insight into the type and estimated amount of food consumed (Figure 3) (Amft and Troster, 2009; Dong et al., 2012).

Figure 3

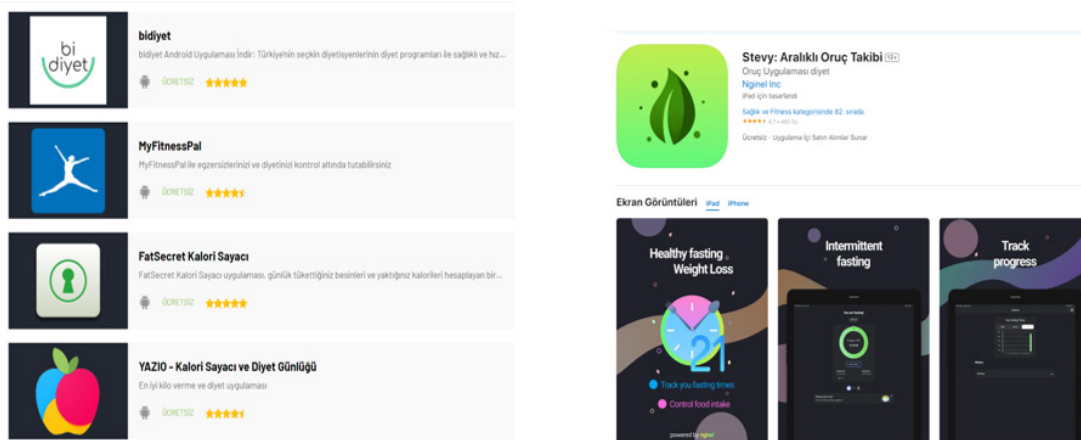
Wearable Devices that Assess Movement-Based Food Consumption (Dong et al., 2012).



There are many mobile phone applications on topics such as health, nutrition and weight loss. Some of these applications, which can be easily downloaded to mobile phones, are paid and some are free. These applications provide personal nutrition plan and recommendations based on the information provided by the individual (height, weight, target weight). Some of these applications include different diet models, while others serve individuals as calorie counters (Figure 4).

Figure 4

Mobile Phone Application



There are many studies in the literature that evaluate the effectiveness of web-based applications to gain healthy eating behavior. However, the effectiveness of mobile health apps has not been adequately proven (Mckay et al., 2019; Han et al., 2018; Zhao et al., 2016). Moderately strong evidence supporting its effectiveness in modifying certain target behaviors, such as healthy food choices (6/8, 75%), number of steps (5/7, 71%) and reducing sedentary behavior (3/3, 100%) in a systematic review found (Milne-Ives et al., 2020).

Telemedicine, Telehealth and Telenutrition applications have come to the fore and started to be used in many areas, especially with the increase of social isolation and limitations in accessing health services due to the COVID-19 pandemic (Shah et al., 2021). Telenutrition is defined as the effective use of electronic information and telecommunication technologies by dietitians in the process of medical nutrition therapy with the licenses given by the relevant authorities. In this process, all steps of medical

nutrition therapy such as taking anamnesis, determining the nutritional status of patients, evaluation of anthropometric, laboratory and physical findings, planning and monitoring of medical nutrition therapy can be managed by licensed dietitians (Academy of Nutrition and Dietetics, 2021). The Health Insurance Portability and Accountability Act (HIPAA) of 1996 applies to telehealth procedures in the US.

The practices approved by the American Academy of Nutrition and Dietetics for Telenutrition (HIPAA compliant Telehealth practices) are given in Table 2.

Table 2

Applications Used for Telehealth Management (Muslu, 2022)

Telehealth applications that are HIPAA compliant and approved	Skype for Business/Microsoft Teams
	Updox
	VSee
	Zoom for Healthcare
	Doxy.me
	Google G Suite Hangouts Meet
	Cisco Webex Meetings/Webex Teams
	Amazon Chime
	GoToMeeting
	Spruce Health Care Messenger
	Tabibonline.com
Telehealth applications commonly used for video conferencing	Apple FaceTime
	Facebook Messenger video chat
	Google Hangouts video
	WhatsApp video chat
	Zoom
	Skype

Health Responsibility

Health responsibility; It refers to the fulfillment of the duties of individuals in order to protect their physical, psychological and social well-being (Bahar et. al., 2008). According to another definition, in order to maintain the state of health, individuals should exercise, maintain weight control and perform behaviors such as staying away from smoking, and apply the doctor's recommendations by having periodic health-related examinations; Thus, individuals feel better and spend less on health. Health behaviors are affected by the sociodemographic characteristics of the individual such as age, gender, marital status, educational status, diet, as well as by the culture, income level and health policies of the society in which they live. (Pender, 2015).

Health responsibility and health promotion are two interrelated concepts. Individuals with high health responsibility strive to improve their health. For this reason, if it is aimed to improve the health of the individual, training to increase health responsibility should be planned. Health responsibility is also emphasized in the "Multisectoral Health Responsibility Collaboration 2023" program prepared by WHO and the Ministry of Health. (Ministry of Health, 2019).

In order to increase the health responsibility of individuals, it is necessary to

improve the level of health literacy. Health literacy is the ability of people to read, understand and use basic health information in line with their needs. The concept of e-health literacy has also entered the literature in order to understand the transforming health information with the developing world. (Ministry of Health, 2019; Pender, 2015). In the Strategic Plans of the Ministry of Health (2013-2017), it is aimed to improve health literacy in order to increase the responsibility of individuals on their own health. Another policy that addresses health responsibility is the Multi-Sector Health Responsibility Development Program, prepared in line with the 2020 Health Goals of the Ministry of Health and the World Health Organization. In this program, it is aimed to increase the capacity of education, infrastructure and technology so that people take more responsibility for their health. (Ministry of Health, 2019).

Analysts have calculated that as of 2013, there are more than 17,000 medical mobile apps, the vast majority of which are free to consumers. 31% of mobile phone owners and 52% of smartphone owners use their phones to search for health or medical information and 19% of smartphone owners download an app specifically to track or manage their health (Dicianno, Parmanto et al. 2015).

Telehealth applications are applications that improve the health responsibility of individuals. Telehealth applications such as MHRS (Central Physician Appointment System) and e-Nabız are among the most frequently used telehealth applications in our country. It is expected that the individual's health literacy will be developed in order to choose an outpatient clinic suitable for their symptoms with the MHRS application. Applications such as e-Nabız, individuals can follow their medical analysis, doctor's appointments. These applications can improve the health responsibility of individuals.

Physical Activity

Physical activity includes all kinds of movements that require energy expenditure by using the muscles in the tempo of daily life. Exercise, on the other hand, refers to the whole of regular, programmed and repetitive physical activities aimed at maintaining or improving one or more components of physical fitness, unlike physical activity (T.R. Ministry of Health Turkish Public Health Institution, 2014). There are many studies that show that lack of physical activity is an important determinant in the emergence and prognosis of some diseases. One of the first studies on this subject was made in London in 1864. In the study, the causes of death belonging to two different occupational groups were examined and mortality rates due to coronary heart diseases were found to be higher among tailors than among farmers. The researchers attributed this result to the fact that the tailors had a more sedentary lifestyle than the farmers (MacAuley, 1994). With the developing technology, the level of physical activity has decreased to a great extent. The physical activity level of individuals is gradually decreasing due to the fact that many lines of work require sitting down and the use of technology increases. (Boyce et al., 2008). According to the Turkey Nutrition and Health Survey, the rate of men who do not exercise at all is 69.5% in the 19-30 age group and 73.2% in the 31-50 age group. While the proportion of women who do not exercise at all, similar to men, increases with age, it was determined as 76.6% in the 19-30 age group and 88% in the 75 and over age group (Hacettepe University, 2014). According to the Chronic Diseases Risk Factors Survey, in Turkey; It was determined that 87% of women and 77% of men had insufficient physical activity levels (Ünal et al., 2013). It is possible to examine the effects of physical activity on human health under two headings: physical health and mental health. Physical activity has positive effects on metabolic functions of the body,

especially on the musculoskeletal system.

Most of the wearable technologies are fitness trackers, smartwatches and smart glasses. Fitness trackers, smart watches, and smart glasses generally measure heart rate, steps taken, and sleep patterns.

There are many different applications in Web 2.0 technologies in general. Some of the most used applications are Facebook, YouTube, MySpace, Linkedin, Twitter, Google, Wikipedia blog pages (Kekeç Morkoç & Erdönmez, 2015). In the process of staying at home created by the epidemic, people have turned to the internet and technology more. The increase in the duration of staying at home can lead to an inactive life and cause individuals to experience negative emotional states physically and mentally. Local governments continued to reach people by creating sports and physical activity activity programs with the Web 2.0 tools they used in this process (Atalı, Altuntaş ve Tarım, 2020).

Wearable technologies are also used in the treatment of posture disorders. With the help of the developed sensor devices, it is aimed to gain the correct posture. Finger-sized new generation devices connect to smartphones and analyze users' postures. These devices are a training wearable device worn on a person's upper or lower back to correct their posture (Figure 5).

Figure 5

Wearable Technologies for Posture (<https://www.uprightpose.com/>)



The use of smart watches as integrated into a phone has brought many conveniences to the users. For example; Without the need to carry the phone, adding many important information and performing transactions can be carried out with the smart watch. An individual with a smartwatch can easily have scores such as steps, number of stairs climbed, distance walked, standing hours, estimated energy expenditure (EE) and HR. You can get this information from Apple Watch, Fitbit, Samsung and Garmin etc. can be accessed through many smart watch manufacturers devices (Massoomi ve Handberg, 2019:182). In addition to smart watches, smart wristbands are often used for tracking physical activity (Figure 6).

Figure 6

Smartwatches and Smart Wristbands (<https://shiftdelete.net/akilli-bileklik-vs-akilli-saat/>)



Interpersonal relationship

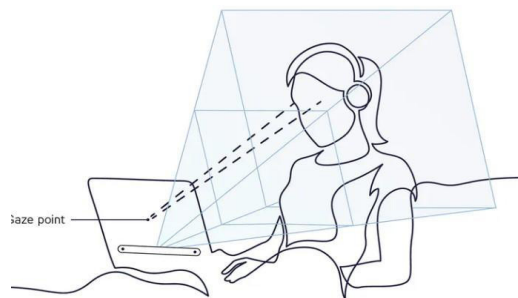
Especially during the Covid 19 Pandemic process, technological applications have been used to strengthen interpersonal relations. Facebook, whatsapp, Instagram, twitter applications create an opportunity for interpersonal communication by reminding people of their special days and providing the opportunity to see daily shares. Disadvantaged groups in the society (visually, hearing impaired and orthopedically impaired, bedridden patients, individuals from different ethnic groups, the elderly, the homeless, etc.) may experience difficulties in interpersonal relations. Interpersonal relations have an important place in reaching social resources as well as the socialization of individuals.

Eye-tracking Technology

One or more cameras, certain light sources, and processing power make up an eye tracking system. The camera stream is converted into data points by algorithms using machine learning and advanced image processing (Figure 7).

Figure 7

Basic Principles of eye-tracking technology (<https://www.tobii.com/learn-and-support/get-started/what-is-eye-tracking>)

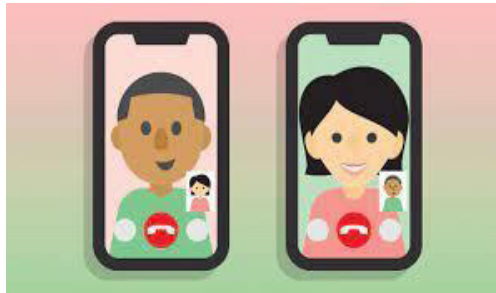


Video Calling

Video calling is an important tool for mutual communication from long distances.

Figure 8

Video calling (By David,Lynch, <https://www.payetteforward.com/what-is-video-calling-how-to-make-video-calls-on-iphone-android/>)



Spiritual Development

Spirituality is a medium through which people seek information to life's challenges, establish their own individuality, find meaning and significance, and know the difference between right and wrong. Spirituality, in this aspect, can be very personalized and can assist in the development of a person's belief structure. Smartphones, meditation, mindfulness mobile applications are commonly used in the development of spiritual health.

Stress Management

Stress is one of the main causes of many diseases. In order to be successful in stress management, it is necessary to focus on approaches to stress management.

Approaches to stress management;

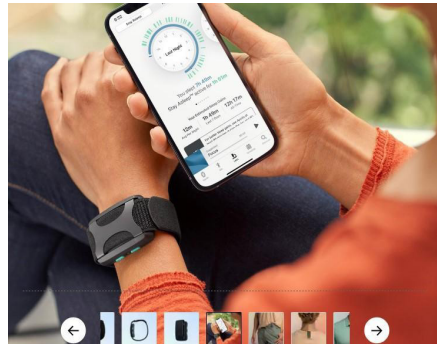
1. Interventions to minimize the frequency of stress-inducing situations
2. Interventions to increase resistance to stress

Technological devices are very important in stress management. Such as;

1. **Stress Sensor Patch** : Patch tapes showing the release of cortisol in the body during stress have been produced (Büyükgöze, 2019). It helps people to evaluate their stress situations and manage stress.
2. **Time Planners**: Time reminder clocks and mobile applications are available to help with time planning in stress management. There are embossed and talking clocks for visually impaired students and vibrating clocks for hearing impaired students.
3. **Touch Therapy (Apollo Wearable)** : Therapeutic touch is a holistic therapy that promotes healing and reduce pain and anxiety. The Apollo device does this with vibrational pads (Grantham, 2022).

Figure 9

Apolla Wearable (APOLLO 2023 <https://apolloneuro.com/products/apollo-wearable>)



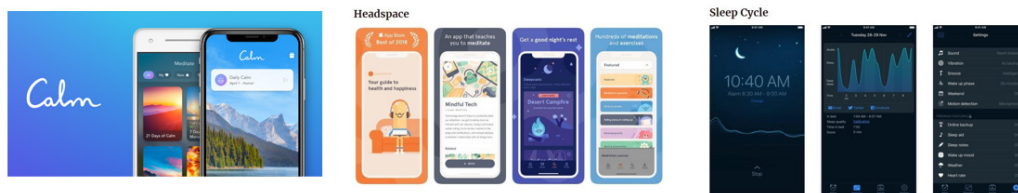
4. Meditation Applications

5. Yoga Applications

6. **Healthy sleep applications :** A healthy sleep has an important place in the process of coping with stress. Some applications make it easier to fall asleep (Calm etc.) some applications include sleep training (Headspace etc.),and some applications; It allows monitoring sleep process (Sleep cycle etc)

Figure 10

Some examples of Healthy Sleep Applications (<https://listelist.com/uyku-uygulamalari>)



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