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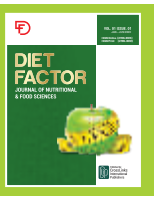

Original Article

Role of Advanced Tools and Technologies (M-Health Apps & Fitness Watches) in Affecting the Nutritional Wellness and Lifestyle Behaviors of University Students

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ABSTRACT

A huge increase in mobile health applications and wearable technologies has been seen in young individuals to track the records of progress in healthy lifestyle adaptation. **Objective:** To determine the role of advanced technologies and tools in affecting the nutritional wellness and lifestyle behaviors among university students. **Methods:** A cross sectional study was done at University of Lahore, Lahore Campus for duration of 4 months, using convenient sampling technique. Data were collected from 100 university students by a self-governing questionnaire. Different statistical tools were applied using SPSS version 21.0 software to analyze the data which included descriptive statistics and cross tabulation. **Results:** Out of 100 participants, 56% used wearable technology and 32% did not use while 12% used it in the past. On the contrary, 36% maintained weight and 27% did not maintain. 33% used this technology for awareness against diseases and 36% found no use in awareness out of 100. 52% got help in choosing portion sizes, 48% maintained hydration and joined exercise programs. 40% participants reduced interactions with their doctors due to this technology. 26% participants found that it reduces public health cost while 26%used it for detection of drug cravings. **Conclusions:** The results of this research conclude that there were a large number of participants use fitness apps and watches. Individuals mostly use these technologies for weight loss tracking and to improve their health. A positive impact of these tools and technologies is hence found upon healthy lifestyle adaptation among university students.

INTRODUCTION

Obesity is a disease comprising of multiple etiologies, in which body deposits abnormal amount of fat. According to WHO BMI of overweight and obese person will be that of 25.0 to 29.9 and ≥ 30.0 respectively. Further obesity is classified into three categories, obese-I from (30.0 to 34.9), obese-II (35.0 to 39.9) and obese-III will be ≥ 40.0 [1]. Excess deposition of fat in lower belly region is termed as abdominal obesity and this type of obesity is linked with severe health risks [2]. Since 1980 percentage of overweight has been doubled throughout the world and one third of world population has been considered as obese [3]. Different studies have identified the significant increase of obesity mostly among children which comprises 43 percent of the total population of Pakistan [4]. The factors which cause obesity include psychological factors, history of family and lifestyle [5]. The probability of becoming fat can enhanced by heredity, accumulation of fat in body and lifestyle (poor diet or less exercise) [6, 7]. Various interventions like modification in lifestyle, daily exercise habit and weight reduction drugs are effective in both treatment and prevention for obesity. Time consumption and great financial burden are two major cons of the above-mentioned procedures [8]. Recently, many smartphone apps and nutrition gadgets have demonstrated at least partial efficacy in promoting successful weight reduction [9]. These apps often provide information related to one's

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diet, energy consumption, energy expenditure, nutrition value and other anthropometric measurements. Sometimes, it also connects you to other groups of people having familiar health targets [10]. Many of these gadgets have similar functions, such as counting calories, step counting, heart rate monitoring, water consumption tracking, food planning, and sleep tracking. Since the release of first smartphone in 2008, people have been using these devices to improve their health habits [11]. Certain brands have recently launched many mHealth apps and fitness gadgets to help people improve their wellbeing. These include — Fitbit — which introduced an app known as sleep tracker. The purpose of this was to measure the duration as well as the quality of sleep of individual [12]. Daily allowance of fluid can be estimated by iDrated app which helps to calculate your daily fluid requirements by the input of water consumed throughout the day. For this purpose, Fitbit and Apple watch were introduced [13]. For weight reduction, one of the most widely used app is —MyFitnessPal‖, used by approximately 50 million individuals. In order to estimate individual's nutrient needs, these fitness apps help analyze food consumption and prepare customized meal plans. They also help individuals compare their calories consumed with their estimated kcal requirement [14]. Nowadays, walking steps can also be measured with the help of Fitness trackers such as—Step counter. Measurement of individual steps is also done by wearing fitness watches containing step counter [15]. Metabolites in the human sweat can now be analyzed to detect individual's physiological condition, drug addiction and measurement of energy expenditure during strenuous physical activity. Detectors such as —Lumee‖ are developed by Profusa company can be used to assess the composition of electrolytes in an individual's serum [16, 17]. To improve an individua's health and nutrition related behavior, —wrist-worn devices are popular nowadays. Fitness coaches, athletes and the general population commonly use them for wellness purposes [18]. Three recently released wrist-worn devices (Apple Watch 6, Polar Vantage V and Fitbit Sense) are used to assess heart rate, energy expenditure during sitting, walking, running, resistance exercises and cycling are popular nowadays [19]. The aim of study was thus to investigate the knowledge of people regarding m-health apps and wearable trackers in the management of obesity, their usage as well as the effectiveness of these wearable gadgets and healthcare applications in healthy lifestyle and dietary adaptation.

METHODS

This was a Cross-sectional study conducted at The University of Lahore Defense Road Campus. The duration of the study was 4 months. Sample size was n=100. Non-probability convenient sampling was done. Inclusion Criteria: Only university students of age 18-26years of allied health sciences regardless of race or gender participated in the survey. Exclusion Criteria: 1. The students below 18 and above 26 years. 2. The students other than allied health sciences were not eligible to participate in the study. 3. University students other than University of Lahore. 4. Non cooperative students were excluded from the sample. In this study, all data were collected randomly through a survey using a detailed self-constructed questionnaire after approval from experts. All the questions were based on different sections including demographic information, anthropometric measurements, fitness apps usage, health impact using fitness gadgets, physical activity, and lifestyle modification. The ethical approval was signed by the ethical committee, Head of the department of the University Institute of Diet and Nutritional Sciences. The consent was taken from the participants before data collection. Questionnaires were distributed among participants, and they were asked to fill them. The rules and regulations set by the ethical committee of university of Lahore were followed while conducting the research and the rights of the research participants were respected. After taking informed written consent, data were collected by the researchers with the help of attached pre-tested data collection tool (questionnaire). Data were collected according to the variables of the questionnaire which were as follows: Demographic data and anthropometric measurements were asked from the participants. Questions were directly asked from participants. SPSS version 21.0 was used to tabulate and analyze the data. The qualitative variables such as gender, type of fitness tools etc. were reported in the form of percentages and frequencies. The association between the variables was found by using chi-square.

RESULTS

Table 1 shows characteristics of participants according to different categories. 67% participants were of normal weight while 14% and 18% were underweight and overweight respectively and only 1% was obese. 64% were females and 36% were male. 40% were at intermediate level while 33% graduated, 21% in matriculation, 4% in masters and 2% were at PHD level. 78% participants were aware of nutritional education while 22% were not. On the other hand, 60% had no genetic history and 40% participants had family history of obesity/overweight. 67% belonged to upper middle class and 7% belonged to low class while 15% were lower middle class and 11% belonged to high socioeconomic class. 62% had optimal health status, 8% had very poor health. 14% had poor and 16%

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were very healthy. However, 38% participants were liked eating out with friends, 34% liked eating alone and 29% with family. On the other hand, 35% participants did 30 minutes physical activity,30% for 60 minutes, 28% for more than one hour and 7% not at all.

Variables	Frequency (%)
BMI Categories	
Underweight	14 (14%)
Normal Weight	67 (67%)
Overweight	18 (18%)
Obese	1 (1%)
Gender Categories	
Male	36 (36%)
Female	64 (64%)
Qualification Level	
Matric	21 (21%)
Intermediate	40 (40%)
Graduation	33 (33%)
Masters	4 (4%)
PhD or Higher	2 (2%)
Nutritional Education	
Yes	78 (78%)
No	22 (22%)
Family History of Obesity/ Overweight	
Yes	40 (40%)
No	60 (60%)
Socioeconomic Status	
Lower class	7 (7%)
Lower middle class	15 (15%)
Upper middle class	67 (67%)
High/ elite class	11 (11%)
Nutritional Status	
Very poor	8 (8%)
Poor	14 (14%)
Optimal	62 (62%)
Very Healthy	16 (16%)
Food preferences	
Eating alone	34 (34%)
Eating with friends outside	38 (38%)
Eating on table with family	29 (29%)
Duration of physical activity per day	
30 minutes	35 (35%)
60 minutes	30 (30%)
More than one hour	28 (28%)
Never	7 (7%)
Total	100(100%)

Table 1: Distribution of participants according to different categories

Out of 100 participants, 29% did not used mhealth apps, 17% used apple heart, 16% used Samsung health, 6% used google fit, 4% used fitbit and 20% used other apps (Figure 1).

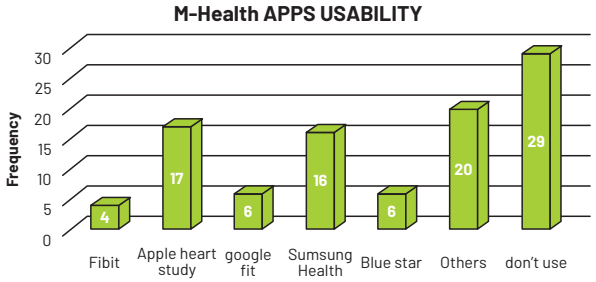

Figure 1: Distribution of M-Health apps usability by participants

Out of 100 participants, 56% used wearable technology and 32% did not use while 12% used it in the past. On the contrary, 36% maintained weight and 27% did not maintain. 33% used this technology for awareness against diseases and 36% found no use in awareness out of 100. So more, 52% got help in choosing portion sizes, 48% maintained hydration and joined exercise programs. 40% participants reduced interactions with their doctors due to this technology (Table 2).

Perceptions	Frequency (%)			
	Yes	No	Maybe	Total
Apps Currently being used	56	32	12	100.0
Role in weight maintenance	36	27	37	100.0
Awareness against diseases	33	36	31	100.0
Impact on eating habits	50	50	0	100.0
Impact on food choices	56	44	0	100.0
Impact on portion sizes	52	43	5	100.0
Help in eating less	51	42	7	100.0
Hydration alerts	48	35	20	100.0
Exercise programs	48	23	29	100.0
Health improvement	38	27	35	100.0
Decreased Doctor-patients' interactions	40	29	31	100.0

Table 2: Distribution of perception of participants regarding wearable technology

Table 2: Distribution of perception of participants regarding wearable technology

Reduce Public Health Costs	Frequency (%)
Yes	37 (37%)
No	29 (29%)
Maybe	34 (34%)
Total	100 (100%)

Table 3: Distribution of health apps usefulness in reducing public health costs

Out of 100 participants, only 26% used apps for detection of drug cravings, 60% did not find apps useful while 14% had benefit sometimes (Table 4).

Detection of drug craving	Frequency (%)
Yes	26 (26%)
No	60 (60%)
Sometimes	14 (14%)
Total	100 (100%)

Table 4: Distribution of health apps usefulness in detection of drug craving

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Out of 100 participants, 20% used all of the indicators of apps, 19% for physical activity, 13% for workout improvement, 16% to lose weight 7% and 8% to monitor health and heart rate respectively (Figure 2).

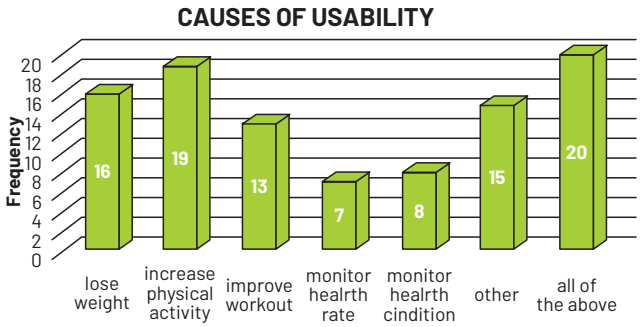

Figure 2: Distribution of causes of wearable fitness trackers/M-Health apps usability

Out of 100 participants, 22% found no need to use, 18% had other reasons, 13% for their non accuracy, 14% non-useful and 4% find them difficult to use (Figure 3).

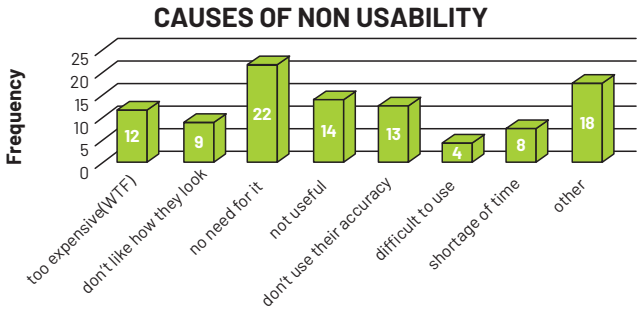

Figure 3: Distribution of causes of wearable fitness trackers/M-Health apps non usability

Out of 100 participants, 39% used wearable technology for step counting, 17% for calorie counting, 11% for physical activity, 7% and 8% for monitoring menstrual cycle and heart rate while 7% for kcal burnt (Figure 4).

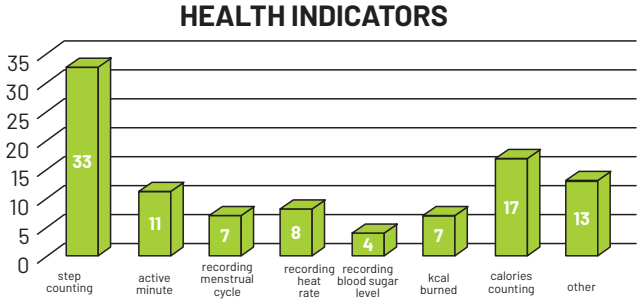

Figure 4: Distribution of indicators frequently used in health and fitness wearable technology

DISCUSSION

Present study found that out of 100 participants, 37% were somewhat motivated, while 30% were a little bit motivated to perform physical activity after using mHealth apps. Similar findings were deduced by Cho *et al.*, that the oriental behavior of college students towards fitness was increased after using fitness/health apps [20]. Findings of our study indicated the role of fitness apps and trackers in kcal control. Out of 100 participants, 58% think that fitness apps encourage to eat less and aids in kcal control, while 36 out of 100 individuals experienced weight loss using these apps. Similar study conducted by Miller *et al.*, showed that Wearable trackers helped in improving caloric intake from 3500/day to suggested 2500 calories/day [21]. Our study concludes that 48 out of 100 individuals found these fitness apps helpful in exercise programs and fitness goals. Similar findings given by Gowin *et al.*, indicate that students downloaded the m Health apps to get particular goals as for exercise routines and to improve eating habits [22]. Another study conducted by Seiler *et al.*, to assess the use of E-health, fitness trackers and wearables among swiss students found the similar positive effect on exercise due to these apps or devices [23]. Present study found that out of 100 participants, 29% did not used mhealth apps, 17% used apple heart, 16% used Samsung health, 6% used google fit, 4% used fitbit and 20% used other apps. Similar results were drawn by André *et al.*, according to which every year, new fitness trackers and smartwatches are introduced to the consumer market [24]. Fitbit, Garmin, Misfit, Apple, and Polar are the five most popular brands now available in research initiatives. Findings of current study show that using these fitness apps and trackers, weakens doctor-patient interactions as 40 out of 100 participants believe so. A similar conclusion was drawn by Decker, according to which Scientific and technological advancements have underlined the significance of comprehensive healthcare, lifestyle services, and individualized suggestions [12]. Results of present study indicate that m-Health apps and fitness trackers help reduce the public health costs as 37 out of 100 participants believe the same. Similar findings were given by Khan *et al.*, that Digital health has quickly emerged as a technology that has the ability to bridge the gap in self-management of cardiovascular disease [25].

CONCLUSIONS

The results of this research conclude that majority of participants use fitness apps and watches. Individuals mostly use these technologies for weight tracking and to improve their health. Although, fitness tracker is mostly used for step counting, recording steps and to count kcals lost after exercise. A positive impact of these tools and technologies is hence found upon healthy lifestyle adaptation among university students. Increasing trends of using wearable technologies show that may be in future proper professional medical and nutritional help which require physically visiting a health- care center will be

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replaced by these apps and trackers.

Conflicts of Interest

The authors declare no conflict of interest.

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