

# Medical Students' Views on M-Health Applications and Devices

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**Abstract.** This article aims to present medical students' attitude towards m-health applications and devices. The current COVID-19 pandemic underlined once again the crucial role m-health applications and devices can play in delivering health services even under such extreme circumstances. The survey was conducted among first academic year foreign medical students in the Faculty of Medicine from Medical University – Sofia in Bulgaria. A web-based questionnaire was used in order to achieve the purpose of the study. Herein, we include survey results information, covering medical students' attitude towards m-health applications and their socio-demographic characteristics. Analysis of the data demonstrates a positive attitude towards m-health applications. Meanwhile approximately half of the students reported that such applications could benefit health-promoting behavior (8% much better and 39% better). The results are convincing for the need for more in-depth study in student programs of the reliability of the application of digital technologies in medical practice.

**Keywords:** E-Health, M-Health Apps, Health-Promoting Behavior.

## 1 Introduction

For the World Health Organization (WHO) the electronic health (e-Health) has been a priority since 2005, when the World Health Assembly resolution WHA58.28 adopted: “eHealth is the cost-effective and secure use of information communication technologies (ICT) in support of health and health related fields, including health-care services, health surveillance, health literature, and health education, knowledge and research” [1]. Mobile Health (m-Health) is one of the four distinct, but related components that are included in e-Health. Health information systems, telemedicine, and distance learning are the other three components [2]. The role of m-health has shown to be very important in health systems worldwide as it contributes to a patient-focused healthcare. In this direction, the delivery of the effective services is improved and the global health is protected.

The current pandemic has shown the significant role of these m-health applications. In response to COVID-19 contact tracing applications, symptoms monitoring applications, as well as applications for enforcing quarantine have been developed [3]. Nowadays there are available applications aimed at helping people manage their health conditions. This includes smartphone applications for alcohol reduction [4] and opportunity to choose from numerous types of supports. Further, applications to manage chronic conditions, applications for medication adherence [5], and smartphone smoking cessation applications [6], diet-tracking applications to lose weight [7], applications to improve physical activity, as physical activity seems to help many groups of patients [8], and many others.

A wide variety of m-health applications provides the opportunity for promoting health-related behavior. Health promotion behaviors entail a positive approach to living and a means of increasing wellbeing and self-actualization. Thus, health-promoting behaviors prevent diseases, decrease morbidities, improve the quality of life, and decrease healthcare costs [9]. Developments, like the ones in the field of cloud infrastructure provide even more advanced applications [10], in addition combined with modern trends in cloud federation [11]. No less important is the usage of big data technologies, which allow the analysis of all those data collected with various m-health applications. The developments in the health care sector, majorly based on Big Data analytics are focused on improving the public health policies, the clinical research and the care provided to patients. However, although we see many successful projects, applying different technologies in healthcare in analyzing Big Data, there is a lag between those projects and their real application in medical practice [12]. Several studies evaluated m-health applications for health behavior change.

Herein we explore medical students' attitude towards all the above-mentioned m-health applications and devices in general. In addition, students' socio-demographic characteristics are included.

## **2 Methodology**

In this article, we intend to explore medical students' perception on m-health applications, as the results of a pilot study. A web-based questionnaire was distributed among first academic year foreign students in the Faculty of Medicine from Medical University – Sofia in Bulgaria. The data was collected from January to February 2021 by the department of Bioethics. Completed questionnaires were received from 133 students. All of them participated anonymously and voluntarily.

The questionnaire has 15 questions. It is structured in four parts. The first part gathered information on students' attitude towards m-Health applications; the second reviewed the relation of m-health applications and students' sports activity. The third part was related to students' intention to use m-health applica-

tions into their future medical practice and the last one included data about students' socio-demographic characteristics. The data collected was analyzed using a descriptive statistical method.

All the questions were formulated as closed and if only they answered "other" in a question, students had to specify their answer. Statements related to closed questions were given a range for the answer like:

- Yes / No
- Yes, No, "I cannot evaluate"
- "very motivated", "motivated", "neutral", "not motivated", and "not at all motivated".

The particular questions comprising the questionnaire were composed flowing logically from one to the next, from the more general to the more specific question. In order to achieve the best response rates from the participants the questions flowed from the least sensitive to the most sensitive, from the behavioral to the attitudinal.

In this paper analysis, we will present partially the results from the first part, related to students' attitude towards m-Health applications and the last part, covering students' socio-demographic characteristics.

### 3 Results

The total number of respondents in this pilot survey was 133 foreign students in faculty of medicine in Medical University – Sofia in Bulgaria.

The answers received are presented in two sections, namely attitude towards m-Health applications, and socio-demographic characteristics of the participants.

#### 3.1. Attitude towards m-Health applications

The answer to the question "do you have any m-health applications installed on your devices?" shows that the majority of the students (67%) have installed such an application on their devices (see Fig. 1).

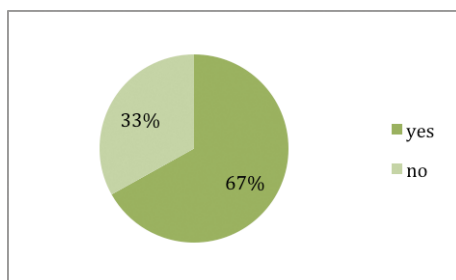
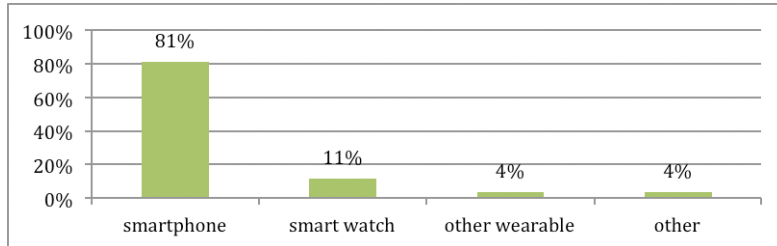


Fig. 1. Do you have any m-Health applications installed on your device?

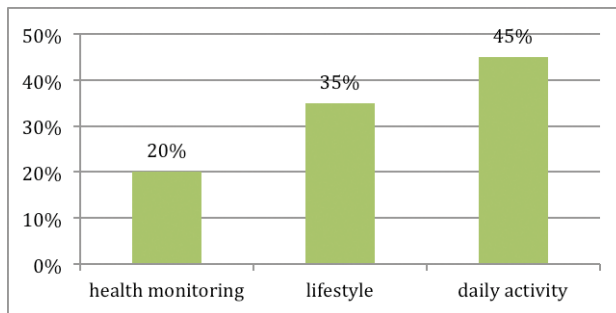
The next question was related to the kind of the device they use, given to the participants as “what kind of device do you use?”.

Among the participants, the smartphone users were (81%), smart watch users (11%), other wearable users (4%), as well as (4%) of the respondents use other device (see Fig. 2).



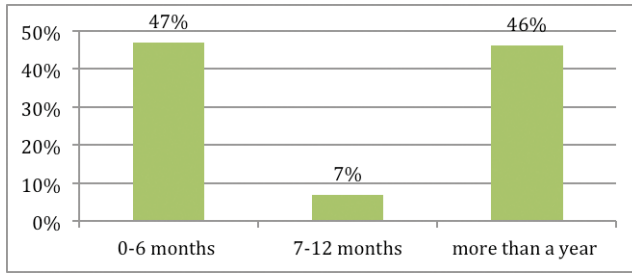
**Fig. 2.** What kind of device do you use?

It is worth mentioning that regarding the answer to the question “what do you use the device for?” most of the students use it for monitoring their daily activity (45%), for lifestyle (35%) and (20%) for health monitoring (see Fig. 3).



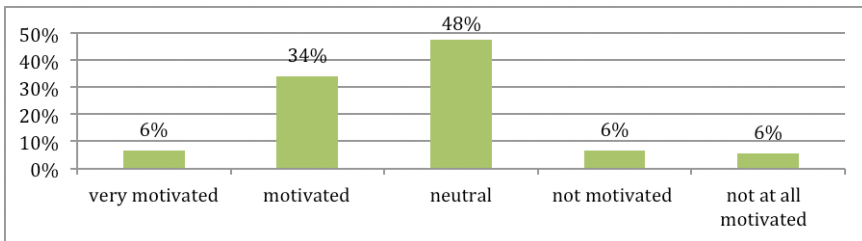
**Fig. 3.** What do you use the device for?

The next figure shows the percentage distribution to the question “when did you start using the m-health application?”. Among students (47%) started using an m-Health application 0-6 months ago, (7%) between 7-12 months ago, and (46%) used them more than a year (see Fig. 4).



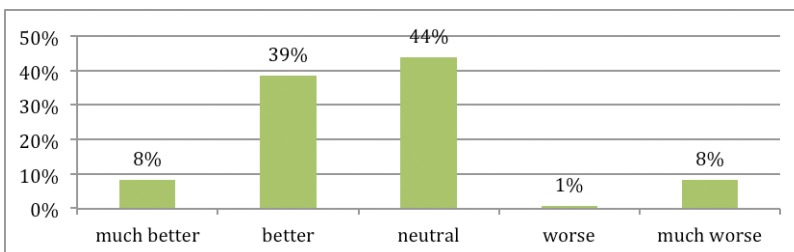
**Fig. 4.** When did you start using the m-health application?

To the question “do you find yourself motivated by m-Health applications, (6%) of the application users were very motivated, (34%) find themselves motivated, while (48%) were neutral and (6%) were not motivated and (6%) were not at all motivated by these applications (see Fig. 5).



**Fig. 5.** Do you find yourself motivated by m-Health applications?

The answer to the question related to m-health applications and how they have affected students health-promoting behavior, data from the responders demonstrated that to (8%) of the students have been affected much better, (39%) better, (44%) answered neutral, only (1%) worse, and (8%) responded much worse (see Fig. 6).



**Fig. 6.** How m-Health applications have affected your health-promoting behavior?

### 3.2. Socio-demographic characteristics

Data collected from 133 participants demonstrates that the majority of them were (39%) female below 20 years old, (32%) male below 20 years old, (15%) were female between 21 and 25 years old, (7%) were male between 21 and 25, (5%) answered other and only (2%) preferred not to say (see Fig. 7).

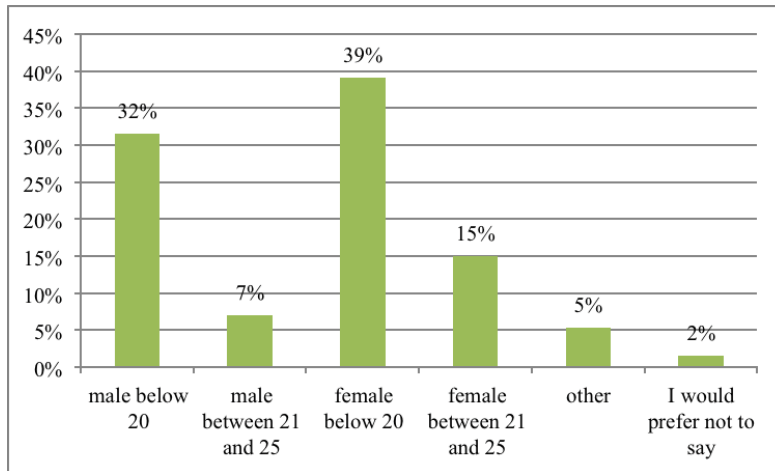


Fig. 7. Students' socio-demographic characteristics.

## 4 Conclusions

The aim of this pilot survey was to present medical students' attitude towards m-health applications and devices. From data obtained, a positive attitude towards m-health applications is supported by the respondents. Meanwhile approximately half of the students reported that such applications could benefit health-promoting behavior (8% much better and 39% better). This supports the opinion that there is a need for more in-depth study in student programs of the reliability of the application of digital technologies in medical practice. The Covid-19 pandemic proved m-Health applications and devices importance, and this addresses the necessity of this further efforts.

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