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Health and Internet: mHealth

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What is eHealth and mHealth?

Definition eHealth

“A new term needed to describe the combined use of electronic communication and information technology in the health sector. The use in the health sector of digital data – transmitted, stored and retrieved electronically – for clinical, educational and administrative purposes, both at the local site and at a distance.” (Mitchell, 1999)

Mitchell, J. (1999). From telehealth to e-health: The unstoppable rise of e-health. Canberra, Australia: Commonwealth Department of Communications. Information Technology and the Arts (DOCITA)

Definition eHealth

“E-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology.” (Eysenbach, 2001)

Eysenbach, G. (2001). What is e-health? Journal of Medical Internet Research.
<http://www.jmir.org/2001/2/e20/>

Definition mHealth

“medical and public health practice supported by mobile devices, such as mobile phones, patient monitoring devices, personal digital assistants (PDAs), and other wireless devices” (World Health Organization, 2011, p.6).

“mHealth is a term that refers to the provision of medical services through the use of portable devices with the capability to create, store, retrieve, and transmit data via mobile communications” (European Commission, 2010)

mHealth communication channels

- *Text messaging*. This typically entails sending SMS messages to users for the purpose of increasing awareness about certain health issues.
- *Videoconferencing*, which is used in various mHealth-based services, such as telemedicine.
- *Communication directly with the **mHealth app***
- *Remote device monitoring*

(Olla & Shimskey, 2014)

Types of mHealth tools

- *Wellness apps* support the user's quest for a healthy lifestyle by discussing, for example, healthy dieting and sports.
- *Instructional apps* provide health-related education for patients or healthcare workers.
- *Efficiency and productivity apps* help healthcare professionals to perform specific tasks more effectively.
- *Patient monitoring apps* can be used both within conventional clinical settings and outside them.
- *Compliance or adherence apps* support patient efforts to follow a particular medical healthcare plan.
- *Behavior modification apps* are focused on behavioral change among users, typically with the goal of modify and improving the health status of users by delivering communication and messages concerning certain topics.
- *Environmental health apps* provide users with information about environmental factors relating to community health.

(Olla & Shimskey, 2014)

mHealth tools in developing countries

- *Education and awareness* mHealth tools are used typically for educational purposes and can be used also for awareness campaigns
- *Remote data collection* can be used for collecting data about patients to enhance the effectiveness of healthcare programs and the allocation of financial sources.
- *Remote monitoring* mHealth tools provide information about the health conditions of patients.
- mHealth tools for *communication and training* help and support healthcare workers, for instance by provision of fresh information sources, by allowing easier communication with hospitals, etc.
- *Disease and epidemic outbreak tracking* mHealth tools allow real-time detection or particular the diseases and possible epidemics.
- *Diagnostic and treatment support* mHealth tools provide diagnostic and treatment support in the homes of patients who lack access to hospitals, such as in villages in developing countries.

Who are users of mHealth apps?

- 20 – 56% of population in Euro-American countries
 - mHealth app users tend to be younger and have higher education
 - Some studies did not find gender differences, some did
 - Some studies also uncovered that mHealth users are healthier (Bhunyan et al, 2016), but in other study they had more chronic conditions (Ernsting et al, 2017)
 - One study - mHealth app were more obese (Krebs & Duncan, 2015)
- > mixed findings on different samples!
- > different results in different cultures

(Krebs & Duncan, 2015; Ernsting et al, 2017; Bhunyan et al, 2016; Carrol et al, 2017)

mHealth apps in the Czech Republic

- Our study sample of users aged 13 to 39 years who were recruited from websites oriented toward healthy eating habits, exercise, dieting, and weight loss (N = 1000+)
- Majority of the sample females – 84%
- Most people used smartphones on daily basis – 80%
- mHealth app users: 60% of this specific sample
- App users had lower BMI than non users
- App-users reported a higher tendency for excessive exercise and obsession with thinness
- No significant differences according to the age, income, and education

(Elavsky, Smahel, & Machackova, 2017)

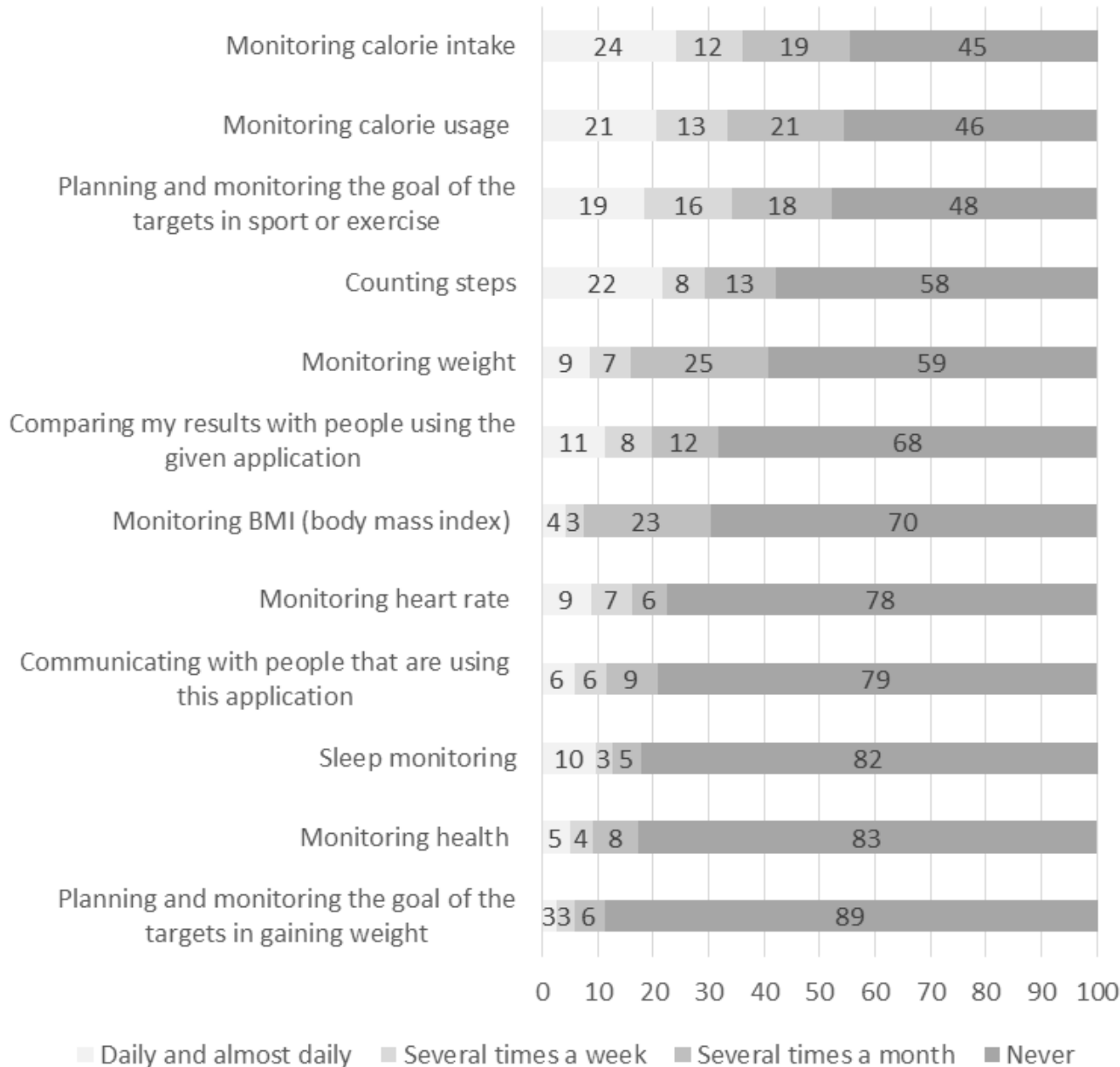
Which functions of mHealth apps do you know?

Functions of mHealth apps

- Two types of studies: (a) based on existing mHealth apps and analysing the apps (b) based on surveys with apps users
- Analyzes of apps for physical activity – functions: instruction on how to perform exercises, modeling how to perform exercises, providing feedback on performance, goal-setting, planning, social support, and information about others' approval (Conroy, Yang, & Maher, 2014).
- Functions of apps for weight management: self-monitoring, physical activity support, weight assessment, healthy eating support, and goal-setting, informing, advising, communicating, measuring, monitoring, and motivating users (Rivera et al, 2016; Bhargava & Tanghetti, 2016)

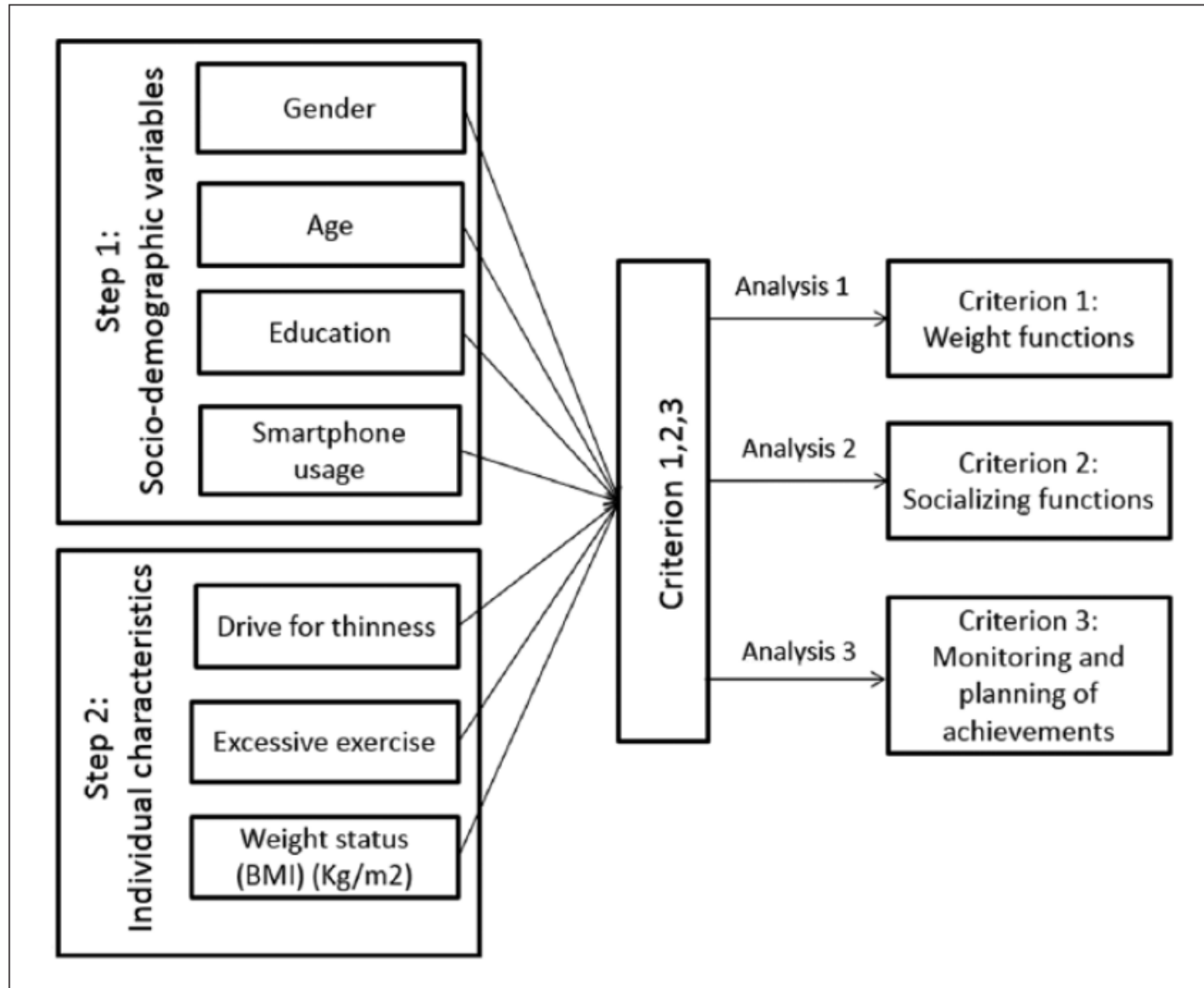
(Elavsky, Smahel, & Machackova, 2017)

Functions of mHealth apps: the Czech study



(Smahel, Elavsky & Machackova, 2017)

Functions of mHealth apps: the Czech study



(Smahel, Elavsky & Machackova, 2017)

Functions of mHealth apps: the Czech study

Functions for monitoring weight. Items monitoring weight, monitoring BMI, monitoring calorie usage, and monitoring calorie intake: **71% users utilize at least one of functions**

Functions for monitoring health features - counting steps, sleep monitoring, monitoring heart rate, and monitoring health status: **55% users**

Functions for planning and monitoring of goals: **61% users**

Socializing functions: communicating with people who are using this application and comparing my results: **37% users**

Functions of mHealth apps: the Czech study

Table 2. Hierarchical linear regression predicting functions of mHealth apps: weight monitoring functions, socializing functions, functions for planning and monitoring of goals.

	Weight monitoring functions	Socializing functions	Planning and monitoring of goals
Block 1: Socio-demographic variables			
Gender	0.000	-0.041	-0.006
Age	-0.150**	-0.031	-0.071
Education	-0.097	-0.059	-0.026
Smartphone usage	0.019	-0.134*	-0.099
Advanced usage of smartphone	0.089	0.131*	0.019
Block 1 R ²	0.054	0.048	0.021
Block 2: Individual characteristics			
Drive for thinness	0.255***	0.018	0.134*
Excessive exercise	0.124*	0.163**	0.247***
Weight status (BMI) (kg/m ²)	0.090	0.019	0.121*
R ² change	0.091	0.027	0.092
Total R ²	0.145	0.075	0.113

BMI: body mass index.

Standardized coefficients (betas) are presented; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

(Smahel, Elavsky & Machackova, 2017)

Functions of mHealth apps: the Czech study

Recommendations for designers of mHealth apps?

Functions of mHealth apps: the Czech study

Recommendations for designers of mHealth apps?

- High risk of usage of some functions could be problematic for some people
- Designer should care about this problem!
- Designer should create individually tailored apps with respect to these risks
- New app features should be evidence-based and consistent with public health standards
- Designer should develop warnings for maladaptive users of mHealth apps

Impact of mHealth tools on users

- Several theories are basic of this research, such as Health Belief Model, Theory of Planned Behavior, Social Cognitive Theory, and Self-Determination Theory.
- Behavioral change techniques:
 - instruction on how to perform behavior,
 - model/demonstrate the behavior
 - feedback on performance
 - plan for social support/change
 - information about others' approval
 - review of outcome goals
 - set graded tasks
 - provide rewards
 - information on consequences of behavior
 - stimulate anticipation of future rewards
 - and many others ...

Impact of mHealth tools on weight loss, diet, and physical activity

- Khokhar et al. (2014) provided a systematic search of the literature and reviewed six studies – all were randomized control trials.
- The studies used SMS, MMS, PDAs and, in one case, smartphones for interventions.
- All studies demonstrated weight loss as a result of a mHealth intervention
- Siopis, Chey, and Allman-Farinelli (2015) conducted a systematic review of 14 studies on weight management
- Participants using text messaging intervention lost on average of seven times more weight than participants without the text messaging (2.6kg versus 0.4kg)
- Studies on adolescents did not confirm advantages of the SMS interventions (Hebden et al, 2014)

Impact of mHealth tools on eating disorders

- We currently lack randomized trial studies
- Analyses of mHealth apps: up-to-date mHealth apps have very limited functionality for eating disorders interventions and that researchers and app designers should work on new apps which include theoretically-driven interventions for treatment of eating disorders (Juarascio et al, 2015)
- A Singapore study on 55 persons who participated the “Eating Disorders Program” at a hospital:
 - 42% of them reported that apps helped them in continuing their eating disorder
 - 38% of the participants said that mHealth apps were helpful in the recovery from eating disorders

Impact of mHealth tools on smoking cessation and disease management

- Smoking cessation: Smokers who received support of mHealth apps were around 1.7 times more likely to quit smoking than smokers without the mHealth intervention – analyses of 12 studies (Whittaker et al, 2016)
- Impact of mHealth on disease management – 27 studies that used randomized clinical trials (Hamine et al, 2015):
- Significant improvement in disease management was reported in 15 studies (56%).
- Conclusion: there is potential for mHealth tools to improve disease management, but further research is needed

Conclusions

- We need more research
 - Majority of clinical studies have focused only on the overall effect of mHealth tools
 - More insight is needed into the individual differences in mHealth usage and its efficacy
 - Such research would support development of individually tailored mHealth apps
- **chance for people who understand social science and informatics!**