Using mHealth Apps in Health Education of Schoolchildren with Chronic Disease During COVID-19 Pandemic Era

Abdulaziz Mansoor Al Raimi, Chan Mei Chong, Li Yoong Tang, Yan Piaw Chua, and Latifa Yahya Al Ajeel

Abstract  COVID-19 significantly affects all our normal life daily especially health care services, so it’s important to find and implement innovative approaches to help individuals at a high risk to resume normal life daily. The usage of digital technologies and social networking has grown rapidly over the last decades, and these technologies are increasingly being incorporated into health education. In this study, we discussed the importance of using the mHealth technology for schoolchildren with chronic disease during the COVID-19 era, and we have used Social Learning Theory and Technology Acceptance Model from the Theory of Reasoned Action (TRA) as the theoretical framework for the present study. The previous study concluded the mobile device being studied is a reliable way of helping schoolchildren increase awareness their disease, but further research efforts should assess the impact of application usage on disease outcomes over a more extended follow-up period as compared to traditional care.

Keywords  mHealth · Mobile apps · Health education · COVID-19
1 Introduction

Electronic Health (eHealth) refers to “health services and information delivered or enhanced through the internet and related technologies” [1], while mobile health (mHealth) is a subbranch of eHealth and can be defined as “the use of mobile computing and communication technologies in health care and public health” [2]. So Mobile Apps “It’s software Apps specifically designed for and available on smartphones and tablets, have been cheerfully adopted by users of smartphones and tablets and proposed as a delivery mechanism for self-management health experimental” [3].

The mobile phone is one of the most rapid developing sectors in the information technology and its resulting can impact in medicine, it’s the one of the most of communication system all over the place and it has dynamic trends, it also can be utilized for communication, surfing internet, and utilizing concrete Apps [4].

Digital methods use technology to enhance adherence have been rapidly created and validated over the past decade, including instant messages, smart wellness devices, and immersive websites. Digital approaches are successful in growing awareness of different disease, minimizing limitations of movement, enhancing self-management such use of action plans to improving quality of life and maximizing drug usage [5].

Smartphones are used and used by about 50% of ages 12–17 and 75% of adults aged 30–49 years of age, so there is a strong need for an intervention in mHealth directed at supportive family assistance as early adolescents with chronic disease move to take more responsibility for their treatment [6].

Mobile health (mHealth) apps have the ability to promote self-management of patients by incorporating prescription reminders, facilitating symptom self-monitoring, enhancing access to and accuracy of knowledge shared with physicians, and supplying patients and parents with educational tools [7].

The use of mobile apps for prevention and improvement of health care is also known as mHealth. These resources include text messaging, exercise machines, and smartphone apps—the most common features used in smartphone mHealth. Conscious of the promise of mHealth in disease prevention, the number of health-related apps has gradually grown [8]. Mobile health Apps can promote disease prevention and can be a highly useful method for providing successful mental health services to encourage supportive family support as early teens develop and learn self-management habits [6].

Smartphones have been commonly deployed around the world over the past few decades but have recently seen several therapeutic uses during the COVID-19 pandemic. These new technologies help to avoid face-to-face interactions with the patients by the healthcare provider, thereby maintaining social distance and preventing virus transmission. Such phones are useful for clinical assessment, diagnosis, prompt referral, prescription and also for tracking patients from home and distant areas [9].
The increasing importance of mobile Health globally has led to a significant effort by official health organizations such as World Health Organization (WHO) which has been publishing every year since 2009 on a reports which covering initiatives in electronic and mobile health [10].

In particular, few studies are available evaluating the effectiveness of smartphone use in children’s health education and how health education can improving patient specially schoolchildren with chronic disease [11], So Schneider et al. [8] recommended in their study future studies should be focused to examine the impact of device usage on chronic disease results over a longer follow-up time and relative to standard treatment.

The remainder of the paper is organized as follows: Sect. 2: Health Education via mobile app describes the using of mHelath apps as new methods for delivering health education, Sect. 3: Role of mHelath apps during COVID-19 era in health education of schoolchildren which concluded the recent articles and research emerging during the COVID-19 regarding using mHelath apps for health delivering education and Sect. 4: Theoretical Framework, which de the theorical framework used in this study.

2 Health Education via Mobile App

Education is a main key to improving health knowledge, skill and compliance especially for the patient with poor knowledge and compliance [12]. Therefore, we need to develop educational strategies that will motivate patients and increase health knowledge and skills for self-management after setting individual education needs [11].

Health education vis mobile app can potentially mitigate the adverse effects of diseases by helping users detect and treat early symptoms prior to moving to a poorly controlled state [13]. These education methods will make users aware of symptoms and causes and allow them to take prompt and effective action to resolve symptoms or avoid further worsening of symptoms [13].

Mobile Apps to provide teens agers with knowledge about how well their disease is managed, though, will be focused about proven evidence-based guidance because many of the existing mHealth Apps not align with the evidence-based guidelines [14].

More and more mobile health apps have been created in the past few years to help empower the patient to properly track and treat their disease. There is no question that patients who take control of their disease and stay committed to treatment will have decreased complications, increased quality of life and lowered cost of health care [15].

Face-to-face, health education was designed to facilitate commitment and self-management for chronic disease affected young people. Such measures showed effectiveness by increasing adherence to treatment, lung capacity, self-efficacy and
attendance at school as well as reducing movement restrictions and visits to emergency departments.

However, the implementation of these face-to-face interventions often presents significant barriers. Several barriers to adherence to patient medication are also barriers to patient and family involvement, and involvement in disease management interventions in the individual. Transportation hurdles, for example, may prohibit a family from receiving refills, which can also find it impossible to attend appointments [5].

Mobile phones are one of E-learning tools used recently, it’s unlike desktop computers or even laptops, which are nearly always with the person. Many of people are rarely leave away from his mobile phones for a while, and it in our hand or in our pocket or purse [16]. Mobile applications and other social networking services like Facebook, google plus are becoming more widespread in educational environments, with educators exploring how such tools can be used for teaching and learning [17].

A systematic analysis research conducted to assess digital interventions for pediatric treatment found that all results indicate that electronic interventions aimed at improving adherence are positive, as well as enhancing safety outcomes in addition to adherence to medicine, suggested that future studies explore specific digital intervention platforms (apps, social networking, text messages) to examine the efficacy and participation of young people with chronic disease in evaluating the degree of care and human activity necessary and appropriate for better long-term adherence [5].

Also Schneider et al. [8] found in their study results that the mobile device being studied is a reliable way of helping teenagers control their disease. They recommend further study actions would further evaluate the influence of technology usage on patient effects over a longer follow-up period compared to conventional treatment.

3 Role of mHelath During COVID-19 Era in Health Education of Schoolchildren

On 30 January 2020 the spread of a new coronavirus strain was identified by the World Health Organization (WHO) as a “public health emergency of international significance.” It was declared a “pandemic” on 11 March. COVID-19 spread to 187 countries according to World Health Organisation (WHO) statistics. The virus continues to influence large populations from many different ways including psychological, emotional, political, and cultural [18].

According to WHO last survey released on 1st June 2020 found in many countries the public health systems have been partly or entirely compromised. More than half (53%) of the countries surveyed have partially or completely disrupted hypertension treatment services; 49% for diabetes and complications due to
diabetes; 42% for cancer diagnosis and 31% for cardiovascular disease emergencies, rehabilitation programs have also been affected for about two-thirds (63%) of countries, while rehabilitation is essential to a successful recovery following a severe COVID-19 illness [19].

The health condition of schoolchildren in the same manner generally affected, generally the teenagers are less severe COVID-19 cases than those of adult patients, but some research found both ages tended to be vulnerable to COVID-19, although there was no major sex disparity [18, 20].

Parents of children with some chronic disease may have raised worries regarding disease management during a respiratory disease pandemic, and may improve attention to their children health status [21]. A such cases a child or youth with COVID-19 infected may experience serious morbidity due to combined effects on the respiratory tract [22], so poor of disease control is a contributing factor for enhanced virus-induced exacerbation of severity [23]. Since all methods of disease control optimization, have been shown to significantly reduce the risk of complications, most of which are virus-induced [24].

Using mHealth care can reach to the places where poor or no healthcare is available and can also allow people to access some healthcare services where is difficult to reach them [25]. One of the main benefits of wireless networking technologies is progress through cost savings, more productive procedures and fulfilling some of healthcare professionals’ workload needs. The main challenges facing any wireless networking technologies can also be caused by both the lack of network coverage and system malfunctions and infrastructure part failures [26].

School-based disease prevention programs provide an opportunity to meet children at risk for inadequate management of disease while they are well [27]. Influenza epidemic results show that school suspensions have some advantages in high-transmissibility outbreaks, as with COVID-19 [28].

During school closing due to COVID-19 outbreak there is less people crowded and less vehicles on the street and children spending more time indoors, they should be less vulnerable to air pollution in outdoors with a resulting increase in air quality, both combined with a reduction in childhood referrals to emergency departments (ED). From the onset of the COVID-19 pandemic, air quality has already changed, and this change will lead to better health in a good way [21]. At the same time, being indoors that’s make children become more vulnerable to indoor conditions that may worsen of some allergies disease, including secondary sensitivity to cigarette smoke and occupational allergens such as molds, rodents and roaches [21].

Social media is seen as an important channel for promoting risk communication during previous epidemics such as Zika and Ebola. Similarly, in the COVID-19 outbreak, students who use social media effectively to acquire health information [29].

The current data is consistent with a wide variety of impacts of school closing, ranging from no benefit to transmission declines to more significant consequences, school closing has very high economic costs and possible damages [28]. Despite the lack of evidence, the experts strongly agree that all children and adolescents with
chronic disease will stay on their treatment schedule throughout without any change during the COVID-19 outbreak to be safe [30].

Mobile learning has traditionally been developed more strongly within the field of informal education, this trend is attributed partly to the fact that mHealth requires learning in a more subjective, individualized and placed manner. Integrating informal education systems and services into formal education may lead to providing educational alternatives to help schools respond to the demands of an ever-changing environment that calls for more responsive and individualized instruction, and to place students at the center of the teaching-learning process and provide them with more power. As a result, there is a increasing number of observations about the use of mHealth as a bridge between informal and formal schooling [31].

Due to the broad using of mobile phone technology, health applications may be able to reach a large people, particularly in settings where are poor infrastructure and lack to access printed materials or face-to-face consultations [32].

4 Theoretical Framework

In this study we used two learning theories as the theoretical framework for the present study, which is Social Learning Theory [33–35] and Technology Acceptance Model from the Theory of Reasoned Action (TRA) (Vygotsky 1978).

4.1 Social Learning Theory

Social cognitive theory indicates that people are not only responding to external stimuli but are consciously finding and processing information [36]. Individuals “function as contributors to their own motivation, behavior, and development within a network of reciprocally interacting influences” [34]. While social cognitive theory encompasses many issues such as moral judgement and physiological anticipation, research has concentrated mainly on self-efficacy, or the assumptions about one’s abilities to effectively achieve tasks or goals [37].

Social cognitive theory, according to [35], takes on an agent-like perspective for transition, development, and adaptation. Bandura defines an agent as someone who deliberately affects one’s working and living circumstances; “In this view, people are self-organizing, proactive, self-regulating, and self-reflecting. They are contributors to their life circumstances not just products of them” [38].

Self-Efficacy Theory is component of Bandura’s social cognitive theory, which she suggested that an individual’s action, atmosphere and cognitive factors are all connected. Bandura proposed Social Cognitive Theory in reaction to his frustration with the clinical and psychoanalytical concepts.
The role of perception in motivation and the role of the condition was largely neglected in those two hypotheses [33]. “Unidirectional environmental determinism is carried to its extreme in the more radical forms of behaviorism” but humanists and existentialists, who emphasize human ability for moral thinking and deliberate intervention, contend that people decide what they are through their own free will.

Bandura [39] define the self-efficacy as: “People’s judgments of their capabilities to organize and execute courses of action required to attain designated types of performance. It is not with the skills one has but with judgments of what one could do with whatever skills one possesses.”

Self-efficacy is a person’s prudence of their own ability to plan and take a course of action in order to achieve a goal. It is the natural belief of capability to doing a particular task to achieve a set goal [40].

Bandura [33] suggested the one’s self-efficacy can be judgment based on four sources: mastery experiences, vicarious experiences, social persuasion, and physiological responses.

In this study we incorporate variables self-efficacy from Bandura’s self-efficacy theory to help us understand the predict factors of behavioral intention for the school children to use mobile phones to promote their health outcome., then the study finally will examines the link between behavioral intention BI and actual using of technology.

Mastery experiences are is the first and most important sources of efficacy in Bandura theory. Which explained the source of information comes from the of past performance result interpretation.

Vicarious experiences: which is the second source of self-efficacy, this information comes and gained by observing others performance skills. The other meaning of this topic it’s comes by observing the successes and failures of others.

Verbal Persuasion: This source of efficacy may be can effect in short time so it can’t to be stay long time, so the Bandura stated in this point “the potency of the persuasion depends on the credibility, trustworthiness, and expertise of the persuader” [33].

Emotional and physiological states: this is States also from the sources of efficacy information. Anxiety, stress and other powerful emotional arousal can effectively change individuals’ beliefs about their capabilities.

Bandura’s four principles of learning process provide a suitable framework for this current study. The study implemented health education by mobile app that were attended by schoolchildren with chronic disease. They could learn from.

Thus, this framework may be utilized to (a) conceptualize the relationship among the individual’s self-efficacy, consequences (response), and behavior, and (b) understand how an individual’s self-efficacy may be influenced. Thus, acknowledging that there are several sources of influence on self-efficacy provided evidence regarding the complexity of the variables that can affect one’s behavior and the need to control for potentially confounding variables within this study.
4.2 Technology Acceptance Model (TAM)

On 1989 Dr. Fred Davis has applied the Technology Acceptance Model (TAM) which adapted from Theory of Reasoned Action (TRA). The TRA originated ten years prior to the TAM and concentrated primarily on the perspective of the computer consumer postulating that one’s values and behaviors influence the probability that they will either adopt or oppose technology [41]. Theory of Reasoned action (TRA) hypothesis, born in the field of social psychology, aims to forecast the actions of a person by means of their behavioral expectations, interpreted as the statistical likelihood of an individual committing a given action, rather than their attitudes, which reflect “the general feeling of favorability or unfavourability of a person” [31].

The TAM advanced to the TRA, which was more comprehensive, and was originally designed to measure the computer-related experience of the new user in the workplace. These models are focused on psychological science, focusing on beliefs, behaviors and expectations, and their relationship to adoptive behaviour. Likewise, while the TAM is asking acceptance, it also contemplates denial [41].

TAM was initially developed with a focus on device architecture uses and refuses to take into consideration other popular aspects on social media [42]. Initially, TAM assumed that information systems were used in organizational settings to improve the employee efficiency. TAM omitted the possibility that individual users may use the information system outside of the corporate environments, and this usage could even include an “entertainment” aspect for these uses [43].

The TAM measured two psychological constructs: perceived usefulness (PU) and perceived ease of use (PEU). Davis [44] defines perceived usefulness (PU) as, “the degree to which a person believes that using a particular system would enhance his or her job performance”, Also he defines, perceived ease of use (PEU) is understood in this model as “the degree to which a person believes that using a particular system would be free from effort.”

The key factor deciding the use and eventual implementation of technologies was PU, or the degree to which a modern method claimed its work efficiency would increase [45, 46]. A secondary determinant was the expected degree of mental and/or physical commitment in ease of use (PEU) imposed upon one’s job by the proposed technique. The TAM posits a greater ease of use that specifically affects expected usefulness. A total of 15 accepted Likert scaled questions have been commonly updated and added to technology-specific acceptance research [47].

4.3 Research Model Development

In this study we will incorporate variables self-efficacy from Bandura’s self-efficacy theory and Technology Acceptance Model (TAM) to help understand the predict factors of behavioral intention for the schoolchildren to use mobile phones to
promote their health outcome; knowledge, self-care, and the quality of life level among schoolchildren. There are two types of variables in this study, dependent and independent variables. The dependent variables are patient knowledge, self-care and quality of life. The independent variables are demographic factors (age, gender and ethnic). The impact of mobile apps health education on the dependent variables is shown in Fig. 1.

## 5 Discussion and Conclusion

Smartphone applications are receiving rapid acceptance and wide distribution with the release of radically increasing number of smartphones and respective platforms [48]. This event makes mobile technology more attractive for new and further penetration into e-Health and Medical Informatics [49].

mHealth apps can help their users track themselves and inspire them to change their lifestyle in the short and long term. In fact, mHealth apps have the ability to solve adherence problems by communicating with the patient at a high level and by executing the action. Behavioral improvement treatments implemented by health apps reduce the need for face-to-face experiences and thereby improve cost efficiency via universal and lasting connectivity. An even higher return on investment from workplace health promotion services can also be expected if such technologies are successfully enforced [50].

The limit progress obtained by conventional health educational methods, along with insufficient clinic-time committed to implementing such initiatives, indicates the need for interesting ways to provide teenage health care. As indicated by teens and healthcare professionals, the use of mobile devices is one potential alternative that could satisfy the required elements of patient-centered treatment mentioned above. Mobile technology is on the rise, particularly among teenagers [8].
5.1 Practical Implications

Mobile applications for health education are valuable assets for patients and caregivers like each other, providing patients with immediate communication and those responsible for meeting their needs. There were 325,000 mobile health apps licensed to smartphone owners worldwide for early 2018, with a further 200 mobile new apps released daily [51].

The Web resources and mobile health (mHealth) software (apps) are regularly used by people to access information about their health. Past research showed that less than half of the mHealth applications available contained evidence-based guidelines, and none provided accurate knowledge and self-management supportive resources [52]. In comparison, the majority of health education-related applications currently on the market rely on patient self-monitoring and self-assessment, which could be less successful for caregivers [53].

5.2 Future Research

The World Health Organization (WHO) emphasized many challenges face the mobile health area such as the dominant form of mobile health today is isolated, small-scale pilot projects that determine the specific issues of information accessing and sharing [10].

Unluckily, there aren’t a lot of information has been published regarding the integration of smartphone technology into patient care. Most of healthcare applications consumers focus on how to monitoring their own condition rather than to improving knowledge or how to deal effectively with disease [54].

In fact, there are differences in mHealth applications that address teenage demographics or are specifically targeted to other user groups’ tastes. Moreover, research evaluating the acceptability, efficacy and impact of mHealth among teenagers as a model of intervention for diseases are scarce [8].

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