

# Use of Multimedia or Mobile Devices By Adolescents for Health Promotion And Disease Prevention: A Literature Review

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The mobile cellphone ownership rate among the United States adolescent population is 78%, and this increases to 84% by age 17 (Madden, Lenhart, Duggan, Cortesi, & Gasser, 2013). Internet access for adolescents in the United States is 97% (Madden et al., 2013). Older adolescents ages 14 to 17 years now send an average of 181 SMS texts daily (Lenhart, 2012). The use of text messaging is steadily increasing, and 94% of adolescents use social network sites (Facebook®) (Madden et al., 2013). These statistics continue to increase as mobile technology becomes more readily available. Even in emerging and developing countries, mobile devices and the Internet are increasingly available; countries such as South Africa currently have cell phone owning rates of 91% (Pew Research, 2014). In general, adolescents embrace these technologies, and it has become part of their daily norm.

Adolescents and young adults have a tendency for unhealthy lifestyles and risky behaviors because of peer and social pressure, impulses, and their maturing brain (American Psychological Association [APA], 2002). Risky behaviors are the leading cause of unintentional injury and death in this age group. Adolescents are emerging toward independence, but their psychosocial development is not fully mature. Adolescents lack healthcare knowledge, and therefore, health promotion and disease prevention behaviors are limited (Malbon, Oxnard, Linares, & Nucci-Sack, 2012). Adolescents with hemophilia, for example,

The purpose of this literature review is to summarize studies of the use of multimedia technology by adolescents to engage in their healthcare promotion and disease prevention. A systematic literature review of relevant peer-reviewed research published between 2009 and 2014 was performed. The 16 articles reviewed were a combination of quantitative and mixed-method methodology based on the efficacy of multimedia, mobile technology, Short Messaging Services (SMS) texting, and social networking (e.g., Facebook®), to engage adolescents ages 10 to 20 years in health promotion and disease prevention. Although adolescents have high attrition rates in the studies, they demonstrated advantages in using SMS texting features and social networking, especially the chat function, in relation to health promotion and disease prevention. Some small gains were noticed in health promotion and disease prevention in the majority of the studies, though some were not significant due to attrition. Additional research, especially nursing research, is necessary. Mobile and multimedia technology allows for a promising correlation between adolescents and increased healthcare knowledge, health promotion, and disease prevention.

often feel alienated from other young hemophilia patients and suggest they would like more information and social support (Khair, Holland, & Carrington, 2012).

Healthcare professionals' usual engagements with adolescents are in schools, clinics, and emergency rooms (Jones, Baldwin, & Lewis, 2012; Suffoletto et al., 2013; Whittaker et al., 2012), which means that follow up is not always efficient, cost effective, or all encompassing. Healthcare professionals have begun novel attempts to engage adolescents in their healthcare and disease prevention. One way may be using mobile technology; social networking and SMS use between adolescents and clinic nurses may be the stop-gap in health knowledge deficits (Khair et al., 2012). The purpose of this literature review is to assess the feasibility of establishing Short Messaging Services (SMS) (text messaging) and/or web-based network healthcare protocols. This information will allow healthcare providers, including nurses, to appraise valid ways to engage

adolescents in health promotion and disease prevention. The ultimate goal is promoting healthy behavior and decreasing healthcare deficits in this population.

## Description of Terms

Several ambiguous terms are used throughout this literature review. The terms are defined to establish a clear uniform understanding. *Adolescents* are children averaging in age from 10 to 19 years. The *SMS* is a type of text messaging used among mobile phones to send short messages to other mobile phone owners. *Texting* is interchangeable with SMS. *Cell phone* or *mobile phone* terms are also used interchangeably, and refer to portable phones using cell towers to transfer voice, text, and video data to another phone. *Smartphone* is a mobile phone with Internet capabilities. *Mobile technology* means cell or mobile phones, or smartphones. *Social network sites (SNS)* are online websites where a person can be a member. On these sites, indi-

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viduals can sign up and “share” personal information with other members. Facebook is the major social networking site discussed in all the literature reviewed here. *Multimedia technology* is technology such as the Internet, email, and web-based sites. *Health promotion* refers to any information that enables one to understand, control, and improve one’s own health (World Health Organization [WHO], 2014). Lastly, *disease prevention* is defined as actions taken prevent diseases from occurring (Mosby’s Medical Dictionary, 2012).

## Method

A systematic review of relevant, peer-reviewed research literature published between 2009 and 2014 was conducted, originally using CINAHL, MEDLINE, and Health Source: Nursing/Academic Edition (EBSCO). Although the original search was in nursing databases, only six relevant studies were found, and only one non-qualitative nursing research study met the inclusion criteria; therefore, a larger search outside of nursing was necessary. The database was then expanded to include PubMed, Google Scholar, PsychARTICLES, and Computer and Mass Media Complete (EBSCO) databases. The number was then expanded to 116. These articles were searched to determine which of those met all inclusion criteria. Article references were hand-searched for related/relevant articles. The 16 articles reviewed were a combination of solely quantitative and mixed-method research studies. Other inclusion criteria included healthcare relating to adolescents, studies relating to multimedia technology and healthcare, and articles written in the English language.

Exclusion criteria were any study that did not include adolescents; health promotion or disease prevention; multimedia or mobile technology of SMS texting, social networking, or web application of e-Diary; or quantitative or mixed-method research. The original keywords used in the literature search were adolescents, mobile technology, SMS, social networking, and health. These keywords were expanded when only a limited number of hits occurred. Telehealth and video conferencing were also added to increase the pool of research articles. From these inclusion and exclusion criteria, a solid sampling of adolescents, multimedia technology,

health promotion, and disease prevention research articles were obtained.

## Review of the Literature

Sixteen research articles were synthesized into two main points of interest: 1) health promotion and 2) disease prevention with adolescents using mobile technology. Disease prevention was divided into primary, secondary, and tertiary preventative measures.

### Health Promotion

The rate of sexual activity in adolescents in the United States is 47.4% of high school students (Centers for Disease Control and Prevention [CDC], 2013), with 48% of sexual activity among Latino adolescent students. Of these 47.4%, condom or other birth control use was less than 63%. In Australia, adolescents are also about 50% sexually active by 12th grade (Muir et al., 2009). Several research studies (Castano, Bynum, Andres, Lara, & Westhoff, 2012; Hall, Westhoff, & Castano, 2013; Lim et al., 2012; Malbon et al., 2012; Vyas, Landry, Schnider, Rojas, & Wood, 2012) focused on adolescents’ sexual health promotion, along with their use of text messages and/or another form of contact through either social media or email messaging. Malbon et al. (2012) attempted to determine if the use of text messaging for birth control reminders, health education, and related “chat features” would increase contraception compliance in female adolescents. Malbon et al. (2012) used an “opt-in” method by allowing adolescents to send a text to the opt-in number for this information. Castano et al. (2012) and Hall et al. (2013) used a random-controlled trial (RCT) with the intervention group of female adolescents receiving regular care and sent daily text message reminders for oral contraceptive pill (OCP). The three studies were conducted in large populations of adolescents in New York, and all three saw an increase in OCP intake. Mixed-method results in a study by Vyas et al. (2012) concluded that adolescents were likely to use SMS and social media to increase their public health programs. Lim et al. (2012) also used a randomized study using email and text messaging in Australia’s adolescent population to increase sexual health promotion. Lim et al. (2012) reported improved

sexually transmitted infection knowledge among male and females, but only women returned for sexually transmitted infection (STI) testing, and there was no significant improvement in condom use among participants. Adolescents in the study by Malbon et al. (2012) stated they liked the “chat” feature of the program because questions on birth control and sexual health were quickly answered.

Physical activity is another important factor for a healthy lifestyle and health promotion. Most adolescents do not actively engage in optimal recommended physical activity. “U.S. Department of Health and Human Services (DHHS) recommend young people aged 6 to 17 participate in at least 60 minutes of physical activity daily” (CDC, 2014). In 2013, only 27% of High School students surveyed met this goal (CDC, 2014). Lau et al. (2012) applied a quasi-experimental design to evaluate if text and Internet intervention would increase the physical activity stage of motivational readiness (SMR) in adolescents in China. The use of SMS motivational texting intervention increased physical activity SMR in the intervention group. Interestingly, the adolescents used the SMS feature more frequently than the Internet site. Lau et al. (2012) determined 79% of the intervention group read more than one SMS weekly, and 47% replied to the text. By contrast, only 66% of participants went to the Internet site every other week. At the end of the study, 81% of the intervention group requested a continuation of SMS motivator texts.

### Disease Prevention

Disease prevention is “a general term for any manoeuver intended to minimize the incidence or effects of disease” (Mosby’s Medical Dictionary, 2012, para. 1). Disease prevention is divided into three subsets: primary, secondary, and tertiary. Primary prevention aims at keeping any disease process from occurring. Getting regular check-ups, eating healthy, and smoking cessation are examples of primary prevention. Secondary prevention is used after a disease is present, but there are no sequelae at that point in health. The goal is to prevent the disease from progressing. Tertiary prevention is when the disease is present and active. Pain control and slowing down the disease process are part of tertiary prevention. Hemophilia is

an example of tertiary disease prevention (CDC, 2013).

**Primary disease prevention and health promotion for adolescents with risky sexual behaviors.** Risky sexual behaviors, such as unprotected sex, multiple partners, and alcohol or drug use, are paired with sexual encounters; therefore, primary prevention is a goal. Evidence-based pilot studies by Jones et al. (2012) and Suffoletto et al. (2013) set out to determine if risky sexual behaviors can be decreased in adolescents with text message or social media programs. Jones et al. (2012) found a self-reported 54% decrease in chlamydia cases and a 23% increase in condom use among the pilot study participants when using the “Caryn Forya” Facebook site. Caryn Forya is a Facebook site developed by healthcare nurses at a Midwestern university to provide sexual health and sexual disease prevention information. “Seventy-four percent of participants reported that Caryn Forya site impacted their decision to reduce the number of sexual partners” (Jones et al., 2012, p. 117). Suffoletto et al. (2013), who conducted a pilot study of at-risk young female patients from an emergency department, also found an increase in condom use in the SMS text intervention group, but at different intervals and with no significant difference from the control group; this could be due to of the small numbers of participants. The 15 participants in the intervention group, however, all self-reported “the SMS information was very informative and useful” (Suffoletto et al., 2013, p. 390).

**Primary disease prevention in adolescents.** Smoking cigarettes, obesity, and illicit drug use all possess the potential for long-term secondary disease occurrence, such as lung cancer, diabetes, HIV, or hepatitis C. Therefore, primary prevention, such as smoking cessation, weight-loss, or drug use rehabilitation/cessation, is a goal especially for adolescents (Gonzales, Ang, Murphy, Glik, & Anglin, 2014; Haug, Schaub, Venzin, Meyer, & John, 2013; Nguyen, et al., 2013; Whittaker et al., 2011). Haug et al. (2013) found that although there was no increase in overall smoking cessation, the intervention group who received SMS-tailored messages smoked fewer cigarettes and increased their attempts at smoking cessation. Whittaker et al. (2011) found no significant smoking cessation between the control group

and intervention group using complex video messaging. However, more than 26% of participants ceased smoking at six months in both groups compared to the average New Zealand’s quit rate of 10% for 18- to 24-year-olds.

Weight loss maintenance is important disease prevention. The Loozit group program for adolescents (Nguyen et al., 2013) provides such disease prevention. The study consisted of obese 13- to 16-year-olds enrolled for 12 months in the Loozit weight loss program in Sydney, Australia. Adolescents in the study had already proven weight loss before the additional therapeutic coaching (ATC), SMS, or email communication every two weeks (Nguyen et al., 2013). This study wanted to assess if any of these communication interventions would assist in maintaining further behavioral lifestyle interventions. Nguyen et al. (2013) surprisingly found that there was no significant impact on overall participation at 24 months with ATC, text messaging, or email intervention. The study noted, however, that the low frequency communication of every two weeks might need further research.

The pilot study by Gonzales et al. (2014) regarding youth substance abuse recovery and text messaging transitional after-care found that drug recovery participation was higher in adolescents in the pilot SMS intervention group. Younger participants had higher relapse tendencies than older participants. The Global Appraisal Inventory of Needs (GAIN) substance severity scales were measured before, during, and after the study. This scale assesses “the severity of substance use, mental health and criminal areas” (Gonzales et al., 2014, p. 4). The SMS texting intervention group had lower severity scores over time than those in the control group. “This mobile texting after care pilot program demonstrated promise for reducing relapse risk and promoting recovery behavior engagement among substance-abusing youth after treatment” (Gonzales et al., 2014, p. 5). The researchers also found the intervention adolescents were less likely to relapse, but if relapse occurred, drug severity was reduced (Gonzales et al., 2014).

**Secondary and tertiary disease prevention in adolescents.** Mental health is also an important part of disease prevention. Mental illness and depression affect adolescents’ lives

and those of their families (Whittaker et al. 2012). Depression in adolescents can lead to “social dysfunction, drug use and teenage pregnancy, and mental health issues in adulthood” (Whittaker et al., 2012, p. e13). Whittaker and colleagues found that cognitive behavior therapy (CBT) messages delivered via SMS, video, and cartoon messages significantly helped the intervention adolescents “be more positive” and get “rid of negative thoughts” (Whittaker et al., 2012, para. 4). These adolescents also shared these messages, spreading the benefits to others (Whittaker et al., 2012).

Adolescents with asthma, hemophilia, and sickle cell disease are a sampling of those needing tertiary disease prevention. Three pilot studies researched to determine if multimedia and/or mobile technologies could assist adolescents and control their disease processes (Jacob et al, 2012; Khair et al., 2012; Seid et al., 2012). Jacob et al. (2012) discovered that a web-based e-Diary was successful in allowing adolescents to record their pain assessments and symptom management via a smartphone. Adolescent hemophilia patients also enjoyed using web-based social networks to talk peer-to-peer with other hemophilia patients (Khair et al., 2012). Sixty-two percent of hemophilia participants also stated they would like to use text messaging and photo features to send a picture of their bleed to a clinic nurse (Khair et al., 2011). SixVibe, an online social networking site, was launched after this study for hemophilia patients, thereby meeting their needs discovered in this pilot study (Khair et al., 2012). A pilot study of low-income and minority adolescents with asthma used tailored weekly SMS text messages and demonstrated increased self-adherence and less frequent symptoms for the intervention group (Seid et al., 2012). Many of these teens wanted to continue to receive the text messages after the pilot study ended.

## Discussion

The literature review demonstrated a wide range of geographic and socioeconomic populations studied using multimedia/mobile technology. Six different countries were represented, with 10 studies from the U.S. Due to the emerging technology arena, the majority of studies were either pilot studies, quasi-experimental, or survey

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#### Learning Outcome

After completing this learning activity, the learner will be able to summarize studies of adolescents' use of multimedia technology to engage in their healthcare promotion and disease prevention.

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method. There were seven non-pilot random controlled trials (RCTs) and one mixed-method study.

Limitations included high attrition rates, more young women than men in the majority of the studies, and a high level of self-reporting. Cultural impact and reactivity response may have played a role in the 100% response rate in the study from China (Lau et al., 2012). Overall, SMS text messaging and video messaging had a higher response rate than email. The Caryn Forya social network site had difficulty in follow up due to Facebook's privacy rules; therefore impact was difficult to ascertain. Application (app) usage, as in eDiary, shows promising results for future sickle cell disease studies.

#### Conclusion and Implications for Nursing

The reviewed literature indicates mobile and multimedia technologies are viable adjuvants to engage adolescents in health promotion and/or disease prevention. Nursing is the front-line profession that interacts with many different populations, and therefore, the dearth of nursing research in this field needs to be addressed and rectified. More in-depth research, especially nursing research, of larger, more random and diverse populations need to be performed. Qualitative research on attrition of adolescents would also be a

benefit to future studies. As technology use continues to grow, so should research into other types of multimedia, such as blog use, Twitter®, and additional applications for smartphones. Additionally, behavior-changing techniques with multimedia and mobile technologies, as noted in studies by Lau et al. (2012), Gonzales et al. (2014), and Whittaker et al. (2012), reinforce health promotion and disease prevention. Overall, mobile and multimedia technologies show a promising correlation between adolescents and increased healthcare knowledge, health promotion, and disease prevention. ■

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