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Characteristics of and Factors Influencing College Nursing Students' Willingness to Utilize mHealth for Health Promotion

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Abstract

More than half of practicing nurses have suboptimal physical or mental health. Impaired health is associated with a 76% higher likelihood that nurses will make medical errors. Improving the health habits of nursing students is essential to shaping and sustaining health prior to joining the workforce. Technology such as mobile health applications holds great promise in facilitating behavioral change and encouraging healthy habits in nursing students. Identifying the predictors of willingness to use mobile health is essential to creating mobile health applications that will engage nursing students and promote sustainable usage. Evaluation of psychological, attitudinal, and health-related correlates of mobile health can highlight predictors of willingness to use mobile health, which can influence nursing students' utilization and long-term engagement with mobile health applications. Analysis of these correlates shows that psychological attributes, such as hope, play a role in the willingness to use and may facilitate engagement in the utilization of a mobile health application. Development of a mobile health application that increases hope and helps establish healthy habits may enable nursing students to remain healthy throughout their lives, creating a new generation of happier, healthier nurses and, ultimately, improving safety for patients under their care.

Keywords

mHealth; Nursing students; Positive psychology; Willingness

Nursing represents the largest workforce in healthcare delivery with nearly 3 million nurses working in the US as of May 2017.¹ Nurses are prepared to care for others but receive little preparation to care for themselves, often neglecting their own mental and physical health.² This is especially concerning since a recent study of 1790 nurses in the US revealed that

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more than half the participants reported suboptimal physical and mental health.² Additionally, nurses in poor health are up to 76% more likely to make medical errors than those in better health.² A 2016 study estimates that medical errors result in at least 250 000 deaths each year; medical error is the third leading cause of death, following heart disease and cancer.³ Educators have the potential to affect the physical and mental health of nursing students during their academic careers. Indeed, focusing on promotion of healthy lifestyle behaviors in nursing students prior to entry into the workforce may create an overall happier, healthier generation of nurses and could enhance the longevity of their careers. Improving the mental and physical health of practicing nurses may also decrease the occurrence of medical errors, making patient care safer.

The demands of nursing school often bring a great deal of stress into the lives of nursing students, because they experience stress and anxiety in the classroom and clinical settings.⁴ It is suggested that nursing students also exhibit poor coping mechanisms, which can lead to worry, increased alcohol consumption, depression, and feelings of inadequacy.⁵ In a study of traditional and nontraditional nursing students (N = 143), participants reported struggling with stress management, physical activity, interpersonal relations, and spiritual growth and self-actualization.⁶ Moreover, many healthcare environments are often stressful, with rapid change and continual turnover.⁷ Thus, improving nursing students' ability to manage stress by being able to practice physical activity, positive mental health behaviors, and overall self-care may improve the trajectory of health and wellness while in school as well as into the future as these students graduate and enter the workforce as professional nurses.

Mobile health (mHealth) applications (apps), which are portable digital health tools, represent a novel avenue for helping students manage the stress of nursing school. Indeed, several studies have found that individuals are capable of making healthier eating and exercise decisions with the help of mHealth apps.^{8,9} Moreover, mHealth apps are an excellent fit with younger generations, and many nursing students are already using mHealth apps as resources during clinical activities (e.g., an app to look up information on patient medications).¹⁰

Although nursing students may be likely to encounter mHealth apps in their clinical education, particularly with respect to patient care, comparatively few studies have explored nursing students' intent to use mHealth apps for their own health and well-being.^{11,12} Likewise, researchers have yet to examine the health and behavioral correlates of mHealth app use for personal utility in a nursing student sample. Therefore, in order to design mHealth apps that harness the correct predictors of willingness to use mHealth and steer nursing students toward utilization of this health technology, it is first critical to understand the psychological, attitudinal, and health-related factor correlates of mHealth use in this population.

To address these gaps in the literature, the current study was designed to investigate nursing students' willingness to use an mHealth app to assist in improving their physical and mental health while in nursing school. Specifically, understanding which behavioral and positive psychology characteristics (i.e., positive traits one possesses that contribute to strengths as opposed to weaknesses)¹³ influence the utilization and long-term engagement of mHealth

apps is critical to sustain behavioral change, such as improvements in self-efficacy, mental health, physical health, and overall wellness. Understanding these characteristics of nursing students would hopefully inform the development of an mHealth app to promote healthy lifestyle behaviors during the nursing education program, ultimately improving the health of nursing students and thus future nurses. Additionally, improving the health of nurses can potentially lead to better outcomes for future patients.

MOBILE HEALTH AND NURSING STUDENTS

Interest in mHealth technology and usage is growing rapidly due to the increase in ownership of mobile devices. In the United States, ownership of smartphones is at 77%, but it is nearly ubiquitous among young adults (18- to 20-year-olds) with 92% ownership.¹⁴ Modern smartphones have powerful computing and communications capabilities with high-resolution color displays, and the phones can store substantial amounts of all types of data, including multimedia. In addition to smartphones, highly portable wearable devices (wearables), such as smart watches and activity and physiological sensors, including FitBits, have steadily increased in popularity.¹⁵ This technology allows for the development of mHealth apps that maximize the use of traditional behavior-change theories to deliver the right information, such as nudging, cue to action, and tailoring at the right time to inspire action.¹⁶

Nurses and nursing students alike are under a tremendous amount of stress, are in demanding clinical environments, and are required to work or study long hours, all creating barriers for face-to-face, synchronous interventions to promote health.¹⁷ Recent research on mHealth apps has been conducted with nursing students to examine learning motivation, social interaction, and study performance.¹⁸ However, this research did not specifically address the characteristics and influencing factors of college nursing students' willingness to utilize mHealth apps to improve their own overall states of wellness. In addition, commercial mHealth apps focusing on overall wellness and weight management still lack evidence-based features, behavior change theory, and healthcare expertise.¹⁹ This presents a need to translate proven and validated face-to-face or synchronous health promotion interventions into digital health tools (i.e., mHealth apps for smartphones and/or wearables) to increase permeation of these successful interventions to nursing students via a more accessible delivery method. With the evolution of mHealth, we hope to break down the traditional barriers to engaging nursing students in health promotion through theoretical constructs, such as persuasive technology, which allow for continuous access to educational material and frameworks guided by behavior change theory.²⁰

INTENT TO USE MOBILE HEALTH

Although mHealth apps have shown great promise in changing behavior and improving healthy lifestyles, high attrition rates have been noted in studies examining mHealth use, suggesting commitment to mHealth app use may be low.²¹ Although understanding the willingness, or lack thereof, to use an mHealth app has been studied in college students, nursing students have not been the direct focus.^{22,23} Perceived usefulness of mHealth apps had a negative relationship ($\beta = -.132$, $P = .003$) with health consciousness, or the degree to

which a person takes care of himself/herself, according to a study of US college students (N = 422).²² These findings suggest that students who are already health conscious have regular health and wellness habits and do not have a need for an app. In a subsequent study, researchers found the perceived credibility of mHealth apps based on exposure by media (both mass media and social media) predicted college students' use of mHealth apps (N = 408).²³ In the same study, the authors noted that students may use apps for fitness, calorie counting, and heart rate monitoring, with higher levels of use related to customizable apps.²³

Taken together, the meager literature examining predictors of mHealth app use suggests that individuals who are already healthy may not see a need to use an app; however, participants who hold more favorable attitudes toward certain aspects of mHealth apps may be more likely to use one. Thus, the initial research literature suggests that innate characteristics and perceptions toward mHealth apps are important factors to consider in terms of understanding who is using an mHealth app and who may be willing to use such technology. To date, however, we were unable to find any published studies examining the relative contributions of participant characteristics (e.g., psychological, attitudinal, or health-related) to current mHealth use or willingness to use an mHealth app to increase one's well-being among nursing students.²⁴ Recent research showcases the traditional predictors of willingness to use and adopt mHealth such as trust, usefulness, and perceived ease of use; however, mHealth app intervention studies continue to struggle with attrition rates.^{25,26} This indicates that previously researched predictors are not the only predictors or do have the strongest correlations to willingness to use mHealth apps. Through the evaluation of previous research and literature, the research team believes that the influencing factors of positive psychology, motivation, and text nudging are key aspects in the willingness to use mHealth in nursing students. Triangulating these factors in a distinct and complementary way is necessary in making these determinations.

Psychological Factors

Several psychological factors warrant consideration as potential predictors of mHealth use or willingness to use an mHealth app among nursing students. Specifically, because using an mHealth app is a form of personal health promotion, the present study revolves around three distinct but related character traits: hope, flourishing, and self-efficacy. Hope and flourishing are characteristics that are considered positive psychology.¹³ Broadly defined, positive psychology suggests that mental health is not simply the opposite of mental illness. Instead, positive psychology encompasses subjective, personality, group, and institutional factors related to how individuals thrive in different conditions.

Hope—The construct of hope is related to engaging in positive healthy behaviors and avoiding unhealthy behaviors.²⁷ Hope is often conceptualized as a positive, future-focused orientation evident by the belief that an individual can meet one's goals (agency thinking), as well as develop routes around obstacles to goals (pathways thinking).²⁸ Although hope in relation to mHealth use or willingness to use an mHealth app has not been explored directly, several studies suggest that it could be a robust predictor. For example, hope was related to engaging in positive academic goal attainment among college students.²⁹ Likewise, individuals with higher levels of hope were most likely to engage in personal health

promotion behaviors such as willingness to seek psychological help or to seek out medical knowledge about their physical health problems.^{27,30} Moreover, college-based interventions that promote and develop hope can play a role in increased engagement in health-promoting behaviors and decreased involvement in unhealthy behaviors.³¹ Thus, the construct of hope may hold promise for the encouragement of health-promoting behaviors, such as use of an mHealth app by nursing students.

Flourishing—In addition to hope, nursing students who report that they are thriving interpersonally and psychologically (i.e., flourishing) may be likely to report employing mHealth apps for their personal health promotion. Specifically, nursing students' flourishing might be related to their use of an mHealth app because they are currently experiencing the psychological and physical benefits of engaging in their own health promotion. Alternatively, nursing students who are flourishing may utilize mHealth apps because they are simply more likely (in general) to engage in personal health promotion behaviors.

Self-efficacy—Perceived self-efficacy is essentially a belief that an individual can accomplish one or more tasks to produce a given outcome. Self-efficacy determines the performance of many behaviors, especially behaviors that are complex or difficult in nature.³² A key feature to improving self-efficacy is improving physical and emotional states of the individual. Improving physical and emotional states requires ensuring that people are relaxed and in a stress-free environment prior to attempting a new behavior change.³² Self-efficacy has been targeted to promote student behavior change, athletic functioning, phobias, and career development; however, it is also used to change behavior in healthcare.³³ Higher baseline self-efficacy scores have been identified as predictors to weight-loss success, and increased self-efficacy during the intervention was linked to greater weight-loss maintenance.³⁴ In addition, research has shown that self-efficacy in college students was a predictor of alcohol and smoking behavior, physical activity, and nutritional habits.³⁵ Does the construct of self-efficacy extend beyond its typical association, and can it predict willingness to use mHealth apps?

Attitudinal Factors

Attitudinal factors such as motivation, intent to use mHealth apps for improving overall wellness, and opinion on text nudging are important user characteristics to understand when trying to predict overall willingness to use mHealth. Motivation has played a role in the acceptance (continued use) of digital health technology such as mHealth apps and is a construct of the Unified Theory of Acceptance and Use Technology model.³⁶ Text nudging (cue to action) has primarily been used to deliver specific content at the right time to elicit a particular action, facilitating behavioral change.³⁷ A recent study indicated a need for text nudging when examining the effect of mindfulness-based text messages on college students' weight loss and stress management.³⁸ The constructs of motivation and text nudging need further exploration to determine if they are key predictors of willingness to use mHealth apps, particularly in college nursing students, since the apps have been historically used for continual engagement and delivery of crucial information to facilitate cues to action.

Health-Related Factors

The use of mHealth apps for health promotion and health behavior change is well documented.^{39–41} The portability and variability of mHealth apps allow them to serve as effective tools for health behavior change. In a recent study, participants most desired mHealth apps that can track dietary intake, manage weight, and record physical activity, which are three self-care practices that nurses find difficult to manage.²⁰ These practices, when taken together, contribute to fluctuations in body mass index (BMI), a biometric measurement based on an individual's height and weight often used as a health indicator.⁴² Individuals who have a BMI in the obese category ($\geq 30 \text{ kg/m}^2$)⁴² have been more likely to use mHealth apps to achieve health behavior goals.⁴³ The reasoning behind this is unclear, but it is important to note, as the diseases of overweight and obesity are substantial concerns among the nursing population in our nation.⁴⁴ It is possible nursing students with a higher BMI might respond more favorably toward an mHealth app for behavior change, particularly if the app helps target self-care strategies that are typically neglected.

While mHealth apps are versatile and have the potential to meet the diverse needs of users, their effectiveness in terms of creating and maintaining behavior change is variable.^{39,40,45} Because behavioral change is multifaceted and complex, it is essential that mHealth apps utilize behavior change theory in order to elicit changes in physical and mental health. Employing mHealth apps for health promotion and behavioral change has the ability to empower the individual, as many apps require user engagement on a frequent basis, holding the user accountable for inputting and tracking progress toward goals.

PURPOSE

The purpose of this study was to evaluate the characteristics of and factors influencing college nursing students' willingness to utilize mHealth for health promotion. We hope by identifying predictors of willingness to use mHealth apps we can increase engagement and improvement, and reduce attrition rates in mHealth interventions targeting health promotion in nursing students.

The research questions included the following:

1. What are the associations between user characteristics and mHealth use?
2. What are the potential health, psychological, and behavioral correlates of nursing students' dispositions toward using mHealth apps for their own health promotion?

METHODS

Sample

The research team sought a purposive convenience sample of undergraduate (BSN) and graduate (MSN and DNP) students enrolled at a university along the Gulf Coast. The graduate programs are offered in an online format only, so students are dispersed throughout the US and some foreign countries. The inclusion criterion was enrollment in a graduate nursing program at the university or in the professional component of an undergraduate

nursing program (junior and senior years), as students taking nursing prerequisites are not classified as nursing students. Institutional review board approval was granted through the university to conduct this study. A total of 513 participants completed the survey. The mean age of the study population was 30 years with a gender differential of 91% female and 9% male. In addition, 254 of the respondents were enrolled in an undergraduate program, and 259 were enrolled in a graduate program. Ninety-nine percent of the respondents stated that they owned a smartphone and had access to wireless networks daily.

Study Design

Because little is known about the characteristics and factors that influence mHealth utilization in college nursing students, this descriptive, cross-sectional study was designed to contribute to knowledge and to guide future interventional studies with this population. Surveys were administered via Qualtrics (Qualtrics, Provo, UT). Institutional review board approval was noted in the introduction, as well as the implication of consent by completion and submission of the anonymous survey. No names or identification numbers were collected.

Measures

The online survey contained a variety of validated instruments as well as original questions with dichotomous and Likert-type scoring. All items that were not derived from previously validated scales were developed through consensus among the primary researchers, an interdisciplinary team of health informatics; nursing; health, kinesiology, and sport; and psychology faculty to measure participant intention to use mHealth apps for personal health promotion.

Hope—Hope was measured utilizing the Adult Trait Hope Scale (ATHS), which consists of eight items assessing hope in two cognitive domains: agency (four items; e.g., “I’ve been pretty successful in life”) and pathways (four items; e.g., “There are lots of ways around any problem”).⁴⁶ Participants were asked to indicate their agreement with each of the eight items using an 8-point Likert-type scale ranging from 1 (*definitely false*) to 8 (*definitely true*). Items on each component (agency and pathways) are added together and then averaged to calculate the total hope score. A meta-analysis of the reliability of the ATHS produced acceptable internal consistency scores, finding a mean estimate of 0.82 for the total scale across 16 studies.⁴⁷

Flourishing—The Flourishing Scale (FS), an eight-item measure of self-perceived success, was administered to address concepts such as relationships, self-esteem, purpose, and optimism.⁴⁸ Participants were asked to indicate their agreement with each of the eight items (e.g., “I am optimistic about my future”) using a 1 (*strongly disagree*) to 7 (*strongly agree*) Likert-type scale. Higher scores are indicative of having many psychological resources and strengths. Internal consistency coefficient α for FS was .87 (N = 689).⁴⁸

Self-efficacy—The General Self-efficacy Scale, a 10-item measure, assessed the general sense of perceived self-efficacy focused on coping and adaptation to daily hassles and stressful life events.⁴⁹ Participants were asked to indicate their agreement with each of the 10

items (e.g., “It is easy for me to stick to my aims and accomplish my goals”) using a 1 (*not at all true*) to 4 (*exactly true*) Likert-type scale. Higher scores represent higher perceived self-efficacy. In a multicultural 23-nation study, Cronbach’s α ranged from .76 to .90, with the majority in the high .80s.⁴⁹

Willingness to Use mHealth—Willingness to use mHealth was measured using questions developed by the research team informed by the literature and previous research. These questions were dichotomous in nature and measured the participants’ willingness to use an mHealth app for general and specific reasons related to overall physical and mental health. General willingness to use an mHealth app was measured using questions such as “Would you be willing to use an mHealth app to help you improve your overall health?” To measure willingness to use mHealth for healthy meals, questions such as the following were composed: “Would you be willing to use an mHealth app that provides suggestions for planning healthy meals and snacks?” Willingness to use mHealth for mental health was measured using the following question: “Would you be willing to use a healthcare app on your smart phone to help you with mental health concerns such as depression, anxiety, and stress?” Finally, text nudging was measured using the following types of question: “Would it be helpful for you to receive text messages to help you stay on track with exercise, diet, sleep, or any other health improvement goals?”

Analysis Plan

The present study used two complementary analysis procedures to identify the potential health, psychological, and behavioral correlates of nursing students’ dispositions toward using mHealth apps for their own health promotion. First, a series of bivariate correlations were used to identify the associations between all measures of interest without covariates. Second, a linear regression was performed to determine how nursing students’ typical use of mHealth apps was predicted by their willingness to use an mHealth app, desire for text nudging, positive psychology variables, BMI classification, and demographic characteristics.

RESULTS

Preliminary Analyses

As a preliminary step, data were screened for missing values, univariate outliers, violations of normality, and other assumptions of the primary analyses. Of the 513 respondents, 25 were removed because they failed to complete the survey. Of the 488 participants who completed the survey, less than 1% had missing values on any given survey item. Additionally, univariate outliers were minimal (1.2% of the sample). Only one univariate outlier, with evidence of inattentive responding, was removed.

Regarding normality assumptions, only the positive psychology variables were modestly, negatively skewed. Collinearity diagnostics indicated there was a potential for multicollinearity between some of the items assessing willingness to use an mHealth app. However, variance inflation and tolerance values were within normal ranges.

Primary Analyses

Correlates of Willingness to Use mHealth—Bivariate correlations (Table 1) indicated BMI category was a statistically significant correlate of willingness to use an mHealth app, although the effect size was small. Specifically, nursing students who self-reported a BMI in the overweight (25–29.9 kg/m²) or obese (≥ 30 kg/m²) categories⁴² reported they were also willing to use an mHealth app to improve their overall health ($P < .05$), plan healthy meals ($P < .01$), or manage their weight ($P < .01$). Body mass index was not associated with mHealth use. Neither any of the positive psychology variables nor self-efficacy emerged as significant correlates of willingness to use an mHealth app, although there was a modest positive association between hope and greater mHealth use. Higher scores on each of the willingness to use mHealth items were positively associated with perceptions that text nudging would be helpful ($P < .01$ for each). However, text nudging was not significantly associated with mHealth use at the bivariate level.

Predictors of mHealth Use—A hierarchical regression model with demographic variables and BMI category entered at the first step; willingness to use an mHealth app and attitudes toward text nudging entered at the second step; and hope, flourishing, and self-efficacy entered at the third step revealed several significant predictors (Table 2). At the first step, however, the model was not significant, $F_{5,458} = 0.36$, $P = .875$. By contrast, the model was significant at the second step, $F_{11,452} = 3.94$, $P < .001$, as well as the third step, $F_{14,449} = 16.44$, $P < .001$. Moreover, the addition of variables at each of these steps significantly improved the overall prediction of mHealth, with the final model accounting for 11% of the variation in mHealth use.

Greater mHealth use was predicated by a combination of more willingness to use an mHealth app to improve one's general and mental health and less favorable perceptions of text nudging at the second step. At the third step, greater willingness to use an mHealth app to address general health, find healthy foods, and improve one's mental health emerged as positive predictors, but the addition of hope, flourishing, and self-efficacy explained unique variation in mHealth use above and beyond willingness to use an mHealth app. Of note, hope was the only psychological variable to emerge as a significant predictor at the last step of the model, with higher levels of hope positively associated with greater mHealth use, even when controlling for one's willingness to use an mHealth app.

DISCUSSION

The purpose of this study was to evaluate the characteristics of and factors influencing participant willingness to utilize mHealth for personal health promotion.

User Characteristics and mHealth Use

Understanding user characteristics and factors influencing engagement in mHealth are essential to creating mHealth apps that will sustain long-term behavioral change. Overall, participants in this study reported they were willing to use an mHealth app to improve their overall health, plan healthy meals, or manage their weight. Specifically, participants who self-reported a BMI in the overweight (25–29.9 kg/m²) or obese (≥ 30 kg/m²) categories

were more likely to use an mHealth app to improve their overall health, plan healthy meals, or manage their weight than those in the normal (18.5–24.9 kg/m²) and underweight (<18.5 kg/m²) BMI categories. Interestingly, overall BMI was not directly associated with willingness to use an mHealth app to improve overall health or wellness. This hints that the participants in overweight and obese categories feel a stronger connection to using an mHealth app that can assist with improvement in overall health. The strongest connection to willingness to use an mHealth app still appears to be the end-user's desire for an outcome and the potential deliverable of the mHealth app.

There was a modest positive association between hope and greater mHealth use; however, there was not a significant correlation. There were no notable associations between flourishing or self-efficacy and willingness to use an mHealth app.

Use of mHealth Apps for Personal Health Promotion

This study found that hope was the only positive psychology variable to emerge as a significant predictor, with higher levels of hope positively associated with greater mHealth use, even when controlling for willingness to use an mHealth app. This is an important finding as hope, flourishing, and self-efficacy were not significantly associated with the willingness to use an mHealth app in this population. This illustrates the importance of promoting and building hope in students to encourage engagement in behaviors that lead to positive health outcomes. When students have higher levels of hope, they demonstrate more goal-directed thinking, increased self-efficacy, and motivation. Designing appropriate nudging techniques that center around hope will be essential to engagement as well.

Perhaps an mHealth intervention can focus on strategic ways to build hope in college students related to setting reasonable yet challenging health-related goals. It is also helpful to identify specific strategies to reach each goal. One strategy to increase hope is to encourage individuals to take large goals and break them down. Hope increases as success is attained with achieving small goals. Another strategy is to help individuals identify obstacles as well as strategies to overcome the obstacles. Also, it is important to teach individuals to recognize and celebrate accomplishments.

We can think of hope as a persuasive component keeping the user engaged without technically knowing it. For example, we can send push messages (nudges) through an mHealth app in the form of text, short videos, or images that depict individuals similar to the end-user engaged in healthy eating and exercising. This would be a simple yet effective strategy of focusing on hope while still incorporating validated clinical and theoretically grounded behavioral change educational components for positive psychology and health promotion via the mHealth app.

Another finding at the multivariate level was the significant relationship between text nudging and willingness to use mHealth. This is an important finding as it shows not only do participants want to use an mHealth app, but they also want to be cued or nudged to initiate a targeted behavior. When developing mHealth apps, it might be beneficial to concentrate efforts on empowering hope through nudging coupled with consistent reinforcement in order to increase the user's engagement and motivation to persist in the mHealth intervention.

By understanding these user characteristics, we can create mHealth apps that will keep the end-users (e.g., nursing students) engaged and utilizing the mHealth app for longer periods of time. We can then utilize theoretical principles such as persuasive technology to deliver relevant positive psychology, motivation, and hope feedback in an effort to promote user engagement, improve motivation, and bolster an individual's self-efficacy through nudging.⁵⁰ This will hopefully result in sustained new behaviors leading to healthy lifestyles for nursing students and, eventually, practicing nurses, resulting in safer patient care.

LIMITATIONS AND FUTURE DIRECTIONS

The applicability of this study was limited because the participants were all enrolled in the same nursing college in the Southeastern US, although graduate students are situated throughout the US and in some foreign countries. However, the results may not be generalizable to the broader population of undergraduate nursing students.

Future work should focus on designing a framework of hope constructs to ensure that nudging messages have the desired outcome. This would also allow for replication by simply changing out the educational content to make this platform applicable across populations and health-related or medical concentrations. For example, health promotion information could be exchanged for information regarding postbirth warning signs for an mHealth app on postpartum care while still maintaining the validated hope constructs of the message. Additional research should investigate whether improving hope leads to increased short- and long-term mHealth engagement. In addition, mHealth research focused on hope should evaluate the effectiveness of enhancing hope as a driving factor to improve health promotion and positive mental health.

CONCLUSIONS

This study illustrates the role of hope in the willingness to use an mHealth app from a college nursing student perspective. Increasing a college nursing student's hope and consistently providing them with positive hope constructs through nudging may facilitate their willingness to utilize an mHealth app to improve their overall health. This illustrates the importance of promoting and building positive psychology characteristics in college nursing students to encourage adherence to healthy behaviors. Focus on physical attributes or disease processes might help to convince nursing students to try an mHealth app, but some positive psychology variables, such as hope, can influence continued use and engagement, resulting in lifelong adoption and practice of healthy habits.

Strategic ways to build hope in college nursing students might focus on setting reasonable yet challenging health-related goals. Implementation of an mHealth app that increases hope and helps establish healthy behaviors may positively affect these nursing students, leading the way to a new generation of happier, healthier nurses, ultimately increasing the safety for patients under their care.

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Table 1.

Bivariate Correlations Between All Study Variables Among Participants

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Class level	1.00	-0.15 ^a	-0.69 ^a	-0.11 ^b	0.03	0.05	0.03	0.13 ^a	0.11 ^b	0.12 ^a	-0.03	-0.03	-0.15 ^a	-0.17 ^a	-0.15 ^a
2. Race		1.00	0.14 ^a	0.02	0.02	0.00	-0.02	-0.06	0.04	0.04	0.04	0.06	0.01	0.01	-0.13 ^a
3. Age			1.00	0.07	-0.09	-0.08	-0.07	-0.19 ^a	-0.09 ^b	-0.08	0.00	0.06	0.14 ^a	0.11 ^b	0.21 ^a
4. Gender				1.00	0.11 ^b	0.08	0.15 ^a	0.12 ^a	0.16 ^a	0.10 ^b	-0.01	0.08	0.04	0.05	-0.12 ^a
5. W-overall health					1.00	0.67 ^a	0.73 ^a	0.52 ^a	0.37 ^a	0.41 ^a	0.23 ^a	0.07	-0.04	-0.08	0.12 ^b
6. W-healthy meals						1.00	0.62 ^a	0.57 ^a	0.42 ^a	0.38 ^a	0.15 ^a	0.05	-0.04	-0.08	0.13 ^a
7. W-weight control							1.00	0.57 ^a	0.39 ^a	0.41 ^a	0.20 ^a	0.04	-0.03	-0.04	0.15 ^a
8. W-find healthy foods								1.00	0.35 ^a	0.37 ^a	0.19 ^a	0.03	-0.03	0.01	0.03
9. W-mental health									1.00	0.37 ^a	0.16 ^a	-0.02	-0.02	-0.08	0.04
10. Text nudging										1.00	0.04	0.07	-0.01	-0.05	0.04
11. mHealth use											1.00	0.07	0.14 ^a	0.05	0.01
12. Flourishing												1.00	0.63 ^a	0.45 ^a	-0.05
13. Hope													1.00	0.63 ^a	-0.07
14. General self-efficacy														1.00	-0.06
15. BMI															1.00

Abbreviation: W, willingness to use an mHealth application for specific health goals.

Note: Class level (0 = graduate, 1 = undergraduate); race (0 = majority, 1 = minority); Gender = (1 = male, 2 = female); text nudging (0 = would not be helpful, 1 = would be helpful). Missing values were excluded pairwise, and thus the sample for each bivariate correlation ranged from 461 to 491.

^a $P < .01$.^b $P < .01$.

Table 2.
Predictors of Typical mHealth Use for Personal Health Promotion Among Participants

Step Entered	B	SE	β	t	P	Low CI	High CI
Step 1							
Gender	-0.08	0.33	-.01	-0.23	.816	-0.72	0.58
Age	0.00	0.01	-.02	-0.31	.753	-0.03	0.02
Race	0.12	0.24	.02	0.51	.611	-0.30	0.65
Class level	-0.22	0.27	-.05	-0.81	.416	-0.72	0.36
BMI	0.01	0.02	.03	0.64	.520	-0.38	0.42
Step 2 ($r^2 = .08$)							
Gender	-0.46	0.33	-.07	-1.41	.159	-1.13	0.16
Age	0.01	0.01	.03	0.45	.650	-0.02	0.04
Race	0.13	0.23	.03	0.55	.583	-0.27	0.64
Class level	-0.20	0.27	-.05	-0.76	.446	-0.68	0.38
BMI	0.00	0.02	.00	0.07	.944	-0.55	0.25
Willap-general health	1.31	0.49	.19	2.66	.008	0.17	2.14
Willap-healthy meals	-0.61	0.42	-.10	-1.45	.148	-1.35	0.34
Willap-control weight	0.35	0.41	.06	0.86	.392	-0.40	1.23
Willap-find healthy foods	0.80	0.37	.13	2.15	.032	0.00	1.47
Willap-mental health	0.64	0.25	.13	2.58	.010	0.19	1.17
Text nudging	-0.58	0.23	-.13	-2.49	.013	-1.05	-0.12
Step 3 ($r^2 = 0.02$)							
Gender	-0.46	0.32	-.07	-1.42	.158	-1.11	0.17
Age	0.00	0.01	.02	0.32	.747	-0.02	0.03
Race	0.14	0.23	.03	0.62	.538	-0.27	0.64
Class level	-0.12	0.27	-.03	-0.45	.656	-0.61	0.45
BMI	0.00	0.02	.01	0.19	.851	-0.50	0.29
W-general health	1.36	0.49	.20	2.77	.006	0.22	2.18
W-healthy meals and snacks	-0.58	0.41	-.09	-1.39	.164	-1.32	0.36
W-control weight	0.36	0.41	.06	0.88	.379	-0.39	1.23
W-find healthy foods	0.81	0.37	.13	2.19	.029	0.03	1.49

Step Entered	B	SE	β	<i>t</i>	<i>P</i>	Low CI	High CI
W-mental health	0.60	0.25	.13	2.42	.016	0.16	1.14
Text nudging	-0.59	0.23	-.13	-2.53	.012	-1.06	-0.14
Hope	0.58	0.18	.21	3.16	.002	0.16	0.89
Flourishing	-0.20	0.20	-.06	-1.00	.318	-0.57	0.21
General self-efficacy	-0.19	0.29	-.04	-0.66	.509	-0.76	0.38

Abbreviations: B, unstandardized regression coefficient; β , standardized regression coefficient; CI, 95% confidence interval of the unstandardized regression coefficient B; SE, unstandardized standard error; W, willingness to use an mHealth application.

Note: Class level (0 = undergraduate, 1 = graduate); race (0 = majority, 1 = minority). Missing values were excluded listwise for a sample of 464. Statistically significant predictors are displayed in bold. Willap is a dichotomous (yes/no) survey questions based on the participants willingness to use an mHealth application for a specific healthcare reason (i.e. to find healthy meals).