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BEST PRACTICES FOR USING HEALTH EDUCATION TO CHANGE BEHAVIOR

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Abstract

Background

Noncommunicable diseases (NCDs), such as cardiovascular disease, diabetes, and chronic respiratory diseases, account for over 85% of all deaths in the United States.¹ Two NCDs in particular, obesity and asthma, are among the leading causes of preventable deaths in the United States.^{2,3} Studies have shown that preventative measures taken during childhood may reduce the incidence of these diseases in adulthood. Moreover, obesity and asthma in childhood is associated with increased spending on annual prescription drugs, emergency rooms, and outpatient costs. Unfortunately, obesity directly affects over one-sixth of all children in the United States, with nearly 17% of all children aged 2 to 19 classified as obese in 2012.⁴ In addition, over 7 million children have been diagnosed with asthma as of 2010, which can have significant consequences on their quality of life; approximately 640,000 asthma-related emergency room.^{5,6} The morbidity and mortality associated with these diseases can be addressed by developing programs that incorporate effective health education geared toward behavior change.^{7,8} Information related to health communication and health behavior change is extensive and is based on many behavioral change theories such as the transtheoretical model (TTM), health belief model (HBM), theory of reasoned action (TRA), theory of planned behavior (TPB), and social cognitive theory (SCT).⁹ These theories have been integrated into various health education programs with varying degrees of impact.^{10,11,12}

Methods

A systematic literature review examining the most effective use of health education geared toward behavior change was conducted. Inclusion criteria for search results were: 1) topic, i.e., used health education to change behavior, or addressed best practices for health education development, 2) disease focus, i.e., target of intervention was asthma or obesity, and 3) population, i.e., interventions were targeted toward children or adolescents. There were 6,128 articles that met the inclusion criteria. We then excluded articles based on the following: 1) written in a language other than English, 2) provided only vague descriptions of intervention, 3) primarily surgical or medical intervention, rather than educational, and 4) did not characterize results. Using the exclusion criteria, our results narrowed to 102 articles. We divided them into

three categories: 1) asthma-related interventions, 2) obesity-related interventions, and 3) general health education. Articles pertaining to general health education were then narrowed to those that focused specifically on the development of general health education materials.

Results

The review yielded several consistent themes. First, health materials should be appropriate and understandable by the target population.¹³ Second, communications are considered more effective if they are personally relevant,¹⁴ tailored to the audience's needs and interests,¹⁵ and match their current level of reading comprehension.¹⁶ Finally, development and implementation of health education should be based on the behavioral change theory most appropriate for the target population and the desired intervention outcomes.^{17,18} These criteria should be considered when developing health materials, as studies have shown that tailoring communication is more effective than generic messages in changing behaviors.^{19,20,21}

Conclusion

Health education can very effectively inspire behavior change if the education utilizes proven behavioral change theories, and is tailored toward the target population. In order to be effective, health materials should be appropriate and understandable by the target population.²² In addition, development and implementation of health education should be based on the behavioral change theory most appropriate for the target population and the desired intervention outcomes.^{23,24} Therefore, prior to program implementation, researchers should have a strong understanding of this population in order to determine the best behavioral change theory to use during health education development. This in turn, along with researchers' understanding of the target population, should strongly influence what and how information should be presented. By taking the proper steps to develop and present relevant health information effectively, individuals may be more inclined to make healthier decisions.²⁵ If individuals are empowered to make the health behavior changes necessary to avoid premature death and chronic diseases, such as obesity and asthma, they could extend their lifespan and improve their quality of life, which ultimately can lead to reduced health care costs.²⁶

Introduction

Noncommunicable diseases (NCDs) account for over 85% of all deaths in the United States, with more than 40% of these deaths due to a combination of cardiovascular diseases, diabetes, and chronic respiratory diseases.²⁷ Studies have shown that preventative measures taken during childhood may reduce the incidence of these diseases in adulthood.^{28,29,30} The prevalence and impact of NCDs is significant, but changing individual health behaviors can impact prevention, management, and reduction of risk factors, which can reduce the incidence and morbidity and mortality of these diseases.³¹ Children have an increased susceptibility to change, therefore child-directed interventions have demonstrated a positive impact on NCD-related health outcomes.^{32,33,34} For example, some obesity interventions directly targeting children are considered the most effective, and have the most significant overall benefits.³⁵ A broad range of potential health issues can be considered when discussing health behavior. In this review, we focus on two common noncommunicable diseases, obesity and asthma, which both have significant morbidity and mortality for adults and for which interventions targeting children have successfully reduced the impact in adulthood.^{36,37,38}

Obesity is a leading public health concern with significant consequences. Many of the negative physical consequences of obesity, such as an increased risk for impaired glucose tolerance, type 2 diabetes, hypertension, and obstructive sleep apnea are well-known.^{39,40} However, obesity can also negatively affect school performance, school attendance, and general well-being.^{41,42,43,44,45,46} Further, there are significant economic costs for the community at large due to obesity-related health spending. Elevated body mass index (BMI), one method of measuring obesity, is correlated with over \$14.1 billion in annual spending for prescription drugs, emergency rooms, and outpatient costs for children alone.⁴⁷ The cost of inpatient care for children has also increased: between 2001 and 2005, spending on hospitalizations with a childhood obesity diagnosis nearly doubled from about \$126 million to almost \$238 million.⁴⁸ High economic costs extend to obese adults as well, with estimated annual costs of treating adult obesity-related illnesses at \$147 billion.⁴⁹ A decrease in the number of obese children and adolescents, even slightly, could have a significant impact on future health care spending. It is estimated that a 1% reduction of overweight and obese adolescents could reduce medical costs

by over \$586 million.⁵⁰ The key risk factors for obesity—unhealthy diet and lack of physical activity—are modifiable behaviors that can be addressed through effective, relevant health information.⁵¹

Asthma also presents a serious health concern. Though its cause is still considered unclear, asthma affects a significant portion of the population—almost 19 million adults and 7 million children have been diagnosed as of 2010.⁵² Asthma attacks range in severity from mild to life-threatening,⁵³ and these episodes can have a significant effect on morbidity and mortality. In 2010, children had approximately 640,000 asthma-related emergency room visits.⁵⁴ Nine people are estimated to die daily from asthma, and almost 3,400 asthma-related deaths were reported in 2009.⁵⁵ Asthma is also a serious economic concern, costing the United States about \$56 billion annually and causing a decrease in both school and work attendance.⁵⁶ In 2008, asthma caused over 14 million missed days of work and 10.5 million missed days of school.⁵⁷ In addition, nearly 480,000 hospitalizations, 1.9 million emergency room visits, and 8.9 million doctor visits were asthma-related in 2009.⁵⁸ While there is no cure, people with asthma can manage the disease with proper medical care and by avoiding potential triggers, such as air pollution, exercise, and tobacco smoke.⁵⁹ The Centers for Disease Control and Prevention has reported that teaching people how to independently manage asthma is one of the most important aspects of controlling this disease.⁶⁰ In particular, asthma education programs targeting children and adolescents can have a significant impact on health-related outcomes, such as improved lung function, decreased number of days with restricted activity, and increased feelings of self-control.^{61,62} By providing proper education, the number of asthma-related deaths, hospitalizations, emergency room visits, missed days of work, and missed days of school can be reduced.^{63,64,65}

In addition to the value of health education in managing and preventing disease, properly educating people about the inappropriate utilization of hospital emergency rooms can result in fewer nonemergency ER visits.⁶⁶ Literature has shown that using the emergency room for nonemergency health concerns poses a serious problem within the health care community, and this is influenced by the lack of adequate information available to parents, especially those classified as “low-literate, inner city parents.”^{67,68} Parents bring their children to the emergency

room for common childhood illnesses that could be effectively treated and managed at home.^{69,70} Providing parents with information about how to administer nonemergency care to their children and make better decisions about emergency services significantly decreases inappropriate emergency room use.⁷¹ One study examining physician visits for minor respiratory illnesses found that self-care instructions combined with an educational packet on proper care were possible methods for reducing health care costs.⁷² While basic parenting skills and actions such as recognizing, identifying, and distinguishing symptoms of children's common illnesses from those that need medical attention are often overlooked by educators, a health promotion project focusing on low-cost and effective health communication could contribute to a solution.⁷³

Health education can have a major impact on the health and well-being of those affected by NCDs, as well as decrease health care costs through encouraging appropriate utilization of ERs. However, health education geared toward changing health-related behavior requires more than the development of accurate, relevant information. While there is a large amount of health information currently available to the public, a gap still exists in connecting those at risk to the information they need in a way that will positively influence their everyday decisions.^{74,75,76} In this paper, we discuss common themes in the literature that have demonstrated success in behavioral change—highlighting the most successful studies—identify gaps in the literature, and make policy recommendations to support the further development and advancement of health education.

Methods

We performed a literature review on health education to change health behavior. The terms health/education, health/behavior, best/practices, asthma, obesity/prevention, obesity/intervention, school, and children/pediatric were entered into the PubMed database. Inclusion criteria for search results were: 1) topic, i.e., “used health education to change behavior” or “addressed best practices for health education development,” 2) disease focus, i.e., target of intervention was asthma or obesity, and 3) population, i.e., interventions were targeted toward children or adolescents. Our search yielded 6, 128 articles meeting inclusion criteria. We then excluded articles based on the following: 1) written in a language other than English, 2)

provided only vague descriptions of intervention, 3) a primarily surgical or medical intervention, rather than educational, and 4) did not characterize results. Using the exclusion criteria, our results narrowed to 102 articles.

Following an in-depth review of the articles, we divided them into three categories: 1) asthma-related interventions, 2) obesity-related interventions, and 3) general health education. We then applied additional inclusion and exclusion criteria. There was a focus on articles that clearly described the health program and specific results on health outcomes of interest—increased asthma control and decreased ER visits. Obesity-related studies were identified and included if they reported an obesity intervention program evaluating BMI, nutrition behavior, or physical activity behavior. Studies were excluded if they were based on surgery as a method of weight loss. General health education results were further divided into those that focused specifically on the development of health education materials.

The flow diagram below (Figure 1) depicts the literature search results. The final 102 literature search results include articles addressing health behavior change through education. These search results were narrowed to those specifically targeting asthma management (35), obesity intervention/prevention (50), and general health education (17). General health education results were then narrowed to articles focused on the development of health education materials (8).

Results

Health Behavior Change Theories

Information related to health communication and health behavior change is extensive and is based on many behavioral change theories such as the transtheoretical model (TTM), health belief model (HBM), theory of reasoned action (TRA), theory of planned behavior (TPB), and social cognitive theory (SCT).⁷⁷ These theories aim to describe, predict, or explain a behavior through the use of behavioral constructs—the “building blocks” of a particular theory.^{78,79} Self-efficacy, perceived susceptibility, and outcome expectancies are a few examples of theory constructs, and examples of their use within behavior change interventions will be addressed later in this paper. Though behavioral change theories operate at many levels (individual,

interpersonal, group, and community), they all involve the use of effective health communication.⁸⁰ Therefore, encouraging positive behavior change depends not only on the health information content, but also how the information is communicated. Understanding the components and applications of these theories allows for a research-based approach to addressing the multiple influences of health behavior. Further, behavioral change theories have been incorporated in numerous studies focused on obesity and asthma-related disease management and/or prevention.^{81,82,83,84,85,86}

The transtheoretical model (TTM) presents an important theoretical perspective in tailoring health messages to individuals.^{87,88} This theory suggests that individuals progress through five different stages on their way toward changing a specific health behavior. These stages include pre-contemplation (not intending to change), contemplation (intending to change in the foreseeable future), preparation (planning to change very soon and taking steps to change), action (have changed behavior in the past six months), and maintenance (changed and sustained their behavior change for at least six months).⁸⁹ Factors that encourage individuals to move forward in this process include increasing positive perceptions and decreasing negative perceptions of making the behavior change,⁹⁰ in addition to increasing self-efficacy.⁹¹ According to TTM, health education should account for where individuals are in the change process to be most effective in moving them forward.^{92,93}

The health belief model (HBM) suggests that an individual's perceived threat of disease or negative outcome is a key determinant of whether he or she adopts a healthy behavior.^{94,95} The perceived threat is composed of perceived susceptibility and perceived severity, meaning that individuals must understand that they are at risk and that the potential health outcome is severe enough to promote positive action.⁹⁶ The HBM also suggests that the benefits and barriers of changing health behavior must be taken into consideration, as those who perceive more benefits than barriers are more likely to take action.⁹⁷ In addition, self-efficacy, or the belief in one's ability to achieve a desired result, has recently been added to the HBM, as a significant amount of literature posits that individuals with higher self-efficacy are more likely to incorporate health behavior changes.^{98,99}

The theory of reasoned action (TRA)¹⁰⁰ and the theory of planned behavior (TPB)¹⁰¹ suggest that behavioral intention, or the perceived likelihood of engaging in a behavior, is the most significant predictor of health behavior. Furthermore, the TRA posits that this behavioral intention is influenced by an individual's attitude and his or her perception of social pressure to engage in the behavior.¹⁰² The TPB presents perceived behavioral control as an additional factor, which refers to the extent to which an individual believes he or she has control over the behavior in question.¹⁰³ According to these theories, those with perceived behavioral control, perceived normative pressure, and more positive attitudes are more likely to develop strong behavioral intentions and therefore engage in a particular behavior.¹⁰⁴

Finally, the social cognitive theory (SCT) suggests that an individual's characteristics, his or her environment, and the behavior itself interact and determine whether a behavioral change will occur.¹⁰⁵ However, according to SCT, the most important determinant of health behavior change is self-efficacy, which has been noted within a number of health behavior theories.¹⁰⁶ In addition to self-efficacy, SCT posits that individuals must believe that engaging in a specific behavior will yield the desired outcome, which is referred to as "outcome expectancies."¹⁰⁷ Individuals with positive outcome expectancies and higher self-efficacy are therefore more likely to engage in a health behavior.¹⁰⁸

The TTM, HBM, TRA, TPB, and SCT are just some examples of the many health behavior theories incorporated in efforts to change individual health behavior. For example, tailored health education that incorporates behavioral constructs can change physical activity, dietary habits, and intentions, which are all strongly correlated with obesity.¹⁰⁹ While some of these theories are more widely used than others, there is limited evidence supporting the use of one theory over the other.¹¹⁰ Therefore, selection should be based on an assessment of each theory, including its appropriateness for addressing specific questions as well as empirical support for the theories' constructs in changing a specific behavior within the target population.¹¹¹ However, incorporating at least one of these theories in the development of an intervention is critical, as evidenced by the success of interventions that integrate theory to encourage behavioral change.¹¹²

Development of Health Education Materials

Behavioral change theories play an important role in developing effective health education.^{113,114} Health education is any learning experience designed to help individuals improve their health by increasing knowledge or influencing attitudes, and can take on many forms.¹¹⁵ An important consideration when presenting health education is health communication, or the use of communication strategies to inform and influence health decisions.^{116,117} In short, health education is what a health message says, and health communication is how the message is delivered.^{118,119,120} Health communications are considered more effective if they are personally relevant,¹²¹ tailored to audience's needs and interests,¹²² and fit into their current level of understanding.¹²³ There are various methods for incorporating these principles into the development of health education materials. For example, cognitive interview testing is a useful approach for asking individuals their thoughts, feelings, ideas, and suggestions regarding specific health materials to improve message clarity.¹²⁴ This method can be particularly useful in the field of nutrition.¹²⁵ Additional methods for developing tailored health education materials include focus groups,¹²⁶ pilot testing,¹²⁷ and collaborative advisory boards.¹²⁸

Once feedback is obtained from the target population, the feedback can be used to tailor the health information to the desired health behavior change. This is a promising method within the field of public health, as interventions with tailored health messages have been shown to not only be effective but, depending on the delivery methods used, to also have the potential to reach thousands of individuals.^{129, 130} Therefore, the ultimate impact of such interventions could be great.¹³¹

Health education delivery methods include brochures, videos, posters, one-on-one teaching, group classes, and demonstrations.¹³² For written health education materials, input from the targeted community and the incorporation of effective communication principles are critical to the effectiveness of the health education intervention. Further, accurate content, design, and format can significantly impact the material's effectiveness. Written materials for adults should be maintained at a 6th to 8th grade reading level, with a glossary of difficult terms and consistent word use.¹³³ In addition, use of the word "you" helps to create a conversational writing style, as well as increases the personalization of materials. The information should also be easy to read

and messages kept clear and concise; a limit of 10 words per sentence and three to five sentences per paragraph is recommended.¹³⁴ Visuals, if incorporated, are also an important aspect of health information. Each picture or photo should have a concise caption and be associated with one message only. Any unnecessary visuals should be avoided.¹³⁵ These guidelines, though focused on creating written materials, are concepts that take the audience's needs into consideration and aim to present health information effectively.

Children are a unique audience whose needs should be carefully considered during development of health education materials. These materials should match their particular education and reading level,¹³⁶ as well as address their health beliefs and understanding of the topic.¹³⁷ For example, adolescents may feel immune to chronic diseases¹³⁸ such as asthma and obesity.

However, much of the research regarding health literacy—or the degree to which individuals are able to obtain, process, and understand health information and make suitable health decisions¹³⁹—has focused on adults.¹⁴⁰ Further research is needed to address the health literacy needs of adolescents. Understanding the literacy of adolescents is an important component in developing health materials that positively affect health behavior and outcomes.¹⁴¹ Furthermore, while there are a number of studies examining the incorporation of existing recommendations in the development of health education,^{142,143,144,145} studies comparing the outcomes of using materials that follow recommendations versus those that do not are very limited. Further research in this area could improve our understanding of the impact of these recommendations on health behavior and health outcomes.

Characteristics of Effective Health Communication

As previously noted, literature has shown that effective health communication should be appropriate,¹⁴⁶ understandable,¹⁴⁷ personally relevant,¹⁴⁸ tailored to the audience's needs and interests,¹⁴⁹ and fit into their current level of understanding.¹⁵⁰ One asthma education program conducted in Canada focused on incorporating many of these concepts in order to educate students and staff about asthma, with a focus on communication that was appropriate, personally relevant, tailored to student needs, and fit into each student's current level of understanding.¹⁵¹ In addition to the over 1,300 students with asthma, the program also targeted all students and staff members across the 130 schools involved.¹⁵² Six 45-minute sessions focused on several different

areas, with an initial session assessing their educational needs, developing personal goals, and encouraging use of a diary to keep track of symptoms.¹⁵³ The subsequent sessions included the following topics: 1) trigger identification, control, and avoidance, 2) proper use of inhaler and medications, 3) symptom recognition, need for an asthma action plan, and how to prevent/manage an asthma episode, and 4) how asthma affects student confidence and how to manage situations that could trigger an asthmatic episode.¹⁵⁴ The sixth and final program session was an opportunity for students to present what they learned to parents and teachers.¹⁵⁵ The educational and environmental aspects of this program resulted in students in the intervention group exhibiting significantly better inhaler techniques one year post-intervention, as well as less urgent care visits compared to the control group.¹⁵⁶ Additionally, fewer intervention participants experienced an asthma-related absence compared to control group participants.¹⁵⁷

It is important to note that prior to the educational sessions, an assessment was done in order to develop an understanding of students' individual needs and current understanding. Baseline assessments allow for researchers to tailor information to the audience in a way that encourages retention and behavior change. Furthermore, the program incorporated games such as "Asthma Jeopardy" as well as educational "raps" to convert information that may otherwise seem "boring" into a fun, creative learning experience for the students.¹⁵⁸ This program put a strong emphasis on developing educational materials that were interesting, effective, and personally tailored. As a result, it reported many positive health outcomes for their target population.¹⁵⁹ In contrast, failure to develop health education materials around the target population can potentially inhibit the success of a program. One study, using the transtheoretical model (TTM), evaluated the effectiveness of a computer-tailored education program regarding the dietary fat intake of 7th graders.¹⁶⁰ A 50-minute theory-based intervention was used to encourage those who did not meet guidelines for dietary fat intake to reduce their intake, and to encourage those who did to maintain their healthy habits.¹⁶¹ Students independently completed the program, which involved a food frequency questionnaire completed before and after the intervention, a diagnostic tool, and tailored messages developed through the use of the diagnostic tool.¹⁶²

The diagnostic tool took many psychosocial determinants of dietary fat intake into consideration, including attitudes, self-efficacy, social support, perceived benefits, and perceived barriers.¹⁶³

However, the intervention was an adaptation of an adult program, and modified for use with students. Results of this study showed that most of the students did not perceive the intervention messages as interesting, personally relevant, new, or accurate.¹⁶⁴ Also, half of the participating students reported that the intervention messages were too long—the tailored information was up to six A4-sized pages in length. In addition, one-fourth of the adolescents reported that they did not read the tailored feedback provided through the intervention. Overall, no intervention effects were reported for the total student sample.¹⁶⁵

The study recommended adjusting the intervention to improve their results, particularly by shortening the length of the diagnostic tool and intervention messages.¹⁶⁶ Tailoring the health messages to the target audience, i.e., the students, is more effective than non-tailored messages in encouraging the students to read, process, and retain the information presented. This study also suggested conducting focus groups with students to gather feedback and test their computer-based program before implementation,¹⁶⁷ which are methods similar to those used during the development of the Challenge! obesity prevention program¹⁶⁸ described in the following section. Despite its limitations, the study reported that its computer-based dietary fat intake education has the capability of reaching a large audience quickly and at low cost.¹⁶⁹

Incorporating Health Communication Concepts in Health Programs

Integrating effective communication concepts into health materials and targeted programs can result in significant, positive changes in health behavior, as seen in the Challenge! obesity prevention program.¹⁷⁰ The Challenge! program targeted 235 African-Americans between the ages of 11 and 16, and is based on the social cognitive theory (SCT).¹⁷¹ This 12-session program focused on changing adolescents' Body Mass Index (BMI), body composition, physical activity levels, and diet.¹⁷² The Challenge! program was developed with the involvement of an advisory board of African-American adolescents, which facilitated the incorporation of the perceptions and needs of the target population.¹⁷³ The advisory board made it possible to tailor the program to their targeted population, therefore increasing its potential effectiveness.

In accordance with the SCT, this study focused on overcoming barriers, particularly those that interfered with success during previous adolescent obesity prevention trials. Personal challenges

and goals related to diet and physical activity were also identified using SCT and motivational interviewing.¹⁷⁴ In addition, this intervention incorporated the use of culturally sensitive methods to communicate health information to the target audience. A rap music video was used to promote healthy eating and physical activity, and college students were involved as mentors who accompanied the adolescents to their neighborhood convenience stores and playgrounds to promote healthy dietary choices and physical activity. The involvement of college students as mentors successfully influenced the target population's social norms related to diet and physical activity. The adolescents in the control group did not receive a mentor.

The Challenge! program effectively prevented an increase in BMI, reduced the intake of snacks and desserts, and prevented a decline in physical activity among the heaviest adolescents compared to adolescents in the control group.¹⁷⁵ Interestingly, all of the changes were retained for one year after intervention implementation, although the initial differences in physical activity for the heaviest intervention adolescents compared to the control adolescents decreased.¹⁷⁶ The Challenge! obesity prevention program's success is likely due to its heavy focus on tailoring the intervention to the target population throughout the program, including during program development, and the use of culturally sensitive education materials.

Targeting At-Risk Populations

While the effectiveness of tailored communication within health programs has been reported,¹⁷⁷ particular groups may benefit more than others. One example of a population that would particularly benefit from effective, tailored health information is low-literacy, minority populations. Considering the many challenges that these individuals face regarding their health and well-being, there is a significant need to effectively increase efforts to inform these and other at-risk populations.¹⁷⁸ One study examined the impact of Choice, Control, and Change (C3), a curriculum intervention, on health behaviors such as decreasing the consumption of sweetened drinks, packaged snacks, and fast food as well as the amount of sedentary screen time, and increasing the intake of water, fruits, and vegetables as well as the amount of time spent on physical activity.¹⁷⁹ The intervention targeted 7th graders in 10 middle schools in low-income New York neighborhoods. Youth, especially the underserved, need a strong sense of self-efficacy to act within a challenging environment.¹⁸⁰ The 24 Choice, Control, and Change lessons

focused on increasing personal motivation through the social cognitive theory (SCT) and self-determination theories.¹⁸¹ Instead of presenting the information as facts to be learned, the C3 lessons were based on a decision-making tool for adolescents: Questioning, Experimenting, Searching, Theorizing, and Applying to Life (QuESTA).^{182,183} The goal was to link students' health-related actions to their consequences, and was used in combination with guided goal-setting.¹⁸⁴

The intervention successfully decreased the consumption and size of sweetened beverages and packaged snacks, and the size of fast food items chosen, as well as the amount of sedentary screen time; it also increased the amount of time spent on exercise, including intentional walking and taking the stairs.¹⁸⁵ In addition, the intervention had a significant positive effect on students' outcome expectations and self-efficacy, which are two psychosocial mediators that have been found to be most predictive of behavior change.¹⁸⁶ These mediators likely had a positive influence on the adolescents' ability to make good decisions related to physical activity and diet, in addition to setting personal goals and following through with them. The results of this study support the theory that self-efficacy and positive outcome expectations are important components of health education programs, and are correlated with positive behavior change.

Tailored health communication targeting at-risk youth is also used in asthma education programs. One study evaluated the effectiveness of a Web-based education program targeting inner-city African-American teenagers by applying concepts of the transtheoretical model (TTM) and the health-belief model (HBM).¹⁸⁷ Of the 422 students that qualified and participated in the study, roughly two-thirds had been diagnosed with asthma, while the remaining one-third were undiagnosed but reported related symptoms.¹⁸⁸ The four 30-minute education sessions included topics such as controller medication adherence, inhaler technique, trigger avoidance, and asthma fundamentals geared toward the target population.¹⁸⁹ Tailored sessions included an African-American DJ who communicated learning objectives through trendy, interactive animations and videos. In addition, website content was individually tailored from responses to questions gauging views on emotional support, resistance to change, motivation, and "rebelliousness." Depending on each participant's score in these areas, they were directed to the appropriate module. For example, those who reported a low value of perceived emotional support were

provided information encouraging the student to look at existing relationships and offering suggestions for developing support.¹⁹⁰

This Web-based asthma education program utilized personally tailored information, including participant understanding levels, which increased receptivity of health information and ultimately resulted in significantly fewer days of reported asthma symptoms for the intervention group.¹⁹¹ In addition, the intervention students experiencing “moderate to severe” symptoms at baseline reported significantly fewer missed school days and fewer days of restricted activity due to asthma.¹⁹²

In addition to these studies addressing at-risk school-aged children, other studies have focused on health information for another at-risk population: low-literacy parents. Students at the University of California, Los Angeles, School of Public Health examined literature targeting low-literacy parents and parent guides on how to respond to a child’s illness.¹⁹³ Their review showed that these existing sources of health information are often inaccessible to parents.¹⁹⁴ However, studies have shown that an innovative and appropriate method for assisting parents in health care decision-making is through the distribution of simple, informative, and durable reference guides written at a low-literacy level.^{195,196,197} Development of health materials at this literacy level takes population needs into account, and tailors information to the target audience. Unfortunately, most health-related books contain complicated structure and flow charts for decision-making, which are difficult for low-literacy adults to follow, as well as costly to publish.¹⁹⁸ In addition, long publications with small print and general instructions are ineffective as a form of health communication.¹⁹⁹ If parents are unable to comprehend or follow information designed to help parents make better decisions, the information is ineffective and will not have the desired result. Thus, targeted population views and needs must be incorporated into the development of health information materials in order to effectively educate and encourage health behavior changes.

Accurate, tailored health education geared toward behavior change can have a significant, positive outcome on NCD morbidity. Consideration and involvement of the target population throughout the development and presentation of health materials encourage sustained retention

of valuable information. Health education materials should take the current needs of the target population into account, and should be engaging, creative, relevant, culturally appropriate, understandable, and widely distributed.²⁰⁰ Additional focus on the use of tailored communication should include the use of behavioral change theories, particularly the use of the self-regulation, self-efficacy, and outcome expectancies constructs.²⁰¹ These concepts, in addition to the incorporation of accurate health information, are crucial to the development of effective health education geared toward behavior change.

Discussion

Health education is a cost-effective intervention aimed at reducing the incidence, morbidity and mortality of chronic conditions such as obesity and asthma. However, to achieve positive health outcomes, the development of health education programs or materials must be thoughtful, sensitive to the needs of the targeted community, and evidence-based. Incorporation of behavioral change theories into health education is crucial to achieving the desired behavioral changes that will lead to positive health outcomes.^{202,203} Additionally, the behavioral change theory utilized should be selected based on its appropriateness for the target population and desired intervention outcomes.^{204,205} Therefore, prior to program implementation, researchers should have a strong understanding of the targeted population to determine the best behavioral change theory to use during health education development. This, in turn, should strongly influence what and how information should be presented.

Once the behavioral theory is selected based on an understanding of the needs of the targeted community, conveyance of the health information in a manner that is appropriate and understandable by the target population is important.²⁰⁶ Many adults have low literacy levels, and the literacy of adolescents is largely unknown. Therefore, to reach a diverse group, multiple modalities—such as text, images, and art— should be employed. Further, health messages should be engaging, creative, relevant, culturally appropriate, and widely distributed.

By taking the proper steps to develop and present relevant health information effectively, individuals will be inclined to make healthier decisions.²⁰⁷ If individuals are empowered to make

the health behavior changes necessary to avoid premature death and chronic diseases such as obesity and asthma, they could extend their life span and improve their quality of life.²⁰⁸ Moreover, the costs related to NCDs could decrease. The benefits of health education warrant an investment of resources into additional research and the development of more health education interventions.

Future Research and Policy Recommendations

More research should be conducted regarding the health literacy needs of children to ensure health education efforts aimed at children are properly tailored. Existing research has focused on adults,²⁰⁹ but a greater understanding of the literacy levels of children and adolescents could increase the effectiveness of health education materials targeting this population. Targeting children is especially important since studies have demonstrated this group's potential for sustained behavioral changes, which can lead to significant changes in health outcomes. Addressing obesity and asthma in childhood will reduce the incidence of co-morbidities in adults, thus reducing health care costs.

There is also a need for more rigorous studies comparing the effects of health education materials that incorporate best practices to health education materials that do not. Based on the success of studies we evaluated, the potential for health impact is great. Additional research with more rigorous methodology would provide further support for a more widespread use of health education interventions to address NCDs. Also, a validated needs assessment should be developed to provide a systematic method for evaluating the needs of target populations prior to the development of a health education intervention. Having a readily available needs assessment would facilitate the collection of critical information from communities, which would be incorporated in the intervention.

Funding and reimbursement for health education is crucial to the integration of health education into our health care system. Currently, there is no consistent, systematic method by which people are educated about their health. Although the Affordable Care Act aims to compensate physicians for providing more preventative services, pressure to see more patients and reduced office visit times hinder a widespread commitment to the incorporation of health education in

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medical practice. Some public health campaigns, such as tobacco cessation and some obesity programs have been successfully integrated into the clinic, but those efforts cost millions of dollars and now have the support of health insurance companies. Developing interventions that empower people to make the necessary changes to address chronic conditions can alleviate some of the burdens on our already overburdened health care system. However, in order for these interventions to be effective, they must engage and receive input from the target community early on so that a tailored health education intervention may be developed.

Notes

1. Ala Alwan, Timothy Armstrong, Melanie Cowan, and Leanne Riley, "Noncommunicable Diseases Country Profiles 2011," World Health Organization: 1-209.
2. Ibid.
3. Leanne Riley and Melanie Cowan, "Noncommunicable Diseases Country Profiles 2014," World Health Organization: 1-210.
4. Cynthia L. Ogden, Margaret D. Carroll, Brian K. Kit, and Katherine M. Flegal, "Prevalence of Childhood and Adult Obesity in the United States, 2011-2012," *Journal of American Medical Association* 311 (2014): 806-814, doi:10.1001/jama.2014.732.
5. "Asthma's Impact on the Nation," Centers for Disease Control and Prevention, http://www.cdc.gov/asthma/impacts_nation/asthmafactsheet.pdf.
6. "National Hospital Ambulatory Medical Care Survey, 2010," Centers for Disease Control and Prevention: National Center for Health Statistics.
7. Nancy D. Berkman, Darren A. DeWalt, Michael P. Pignone, Stacey L. Sheridan, Kathleen N. Lohr, Linda Lux, Sonya F. Sutton, Tammeka Swinson, Arthur J. Bonito, *Literacy and Health Outcomes* (Rockville, MD: Agency for Healthcare Research and Quality, 2004), <http://archive.ahrq.gov/downloads/pub/evidence/pdf/literacy/literacy.pdf>.
8. Seth M. Noar, Christina N. Benac, and Melissa S. Harris, "Does Tailoring Matter? Meta-Analytic Review of Tailored Print Health Behavior Change Interventions," *Psychological Bulletin* (2007), doi:10.1037/0033-2909.133.4.673.
9. Ibid.
10. Karen Glanz and Donald B. Bishop, "The Role of Behavioral Science Theory in Development and Implementation of Public Health Interventions," *Annual Review of Public Health* 31 (2010): 399-418, doi:10.1146/annurev.publhealth.012809.103604.
11. Tom Baranowski, Karen W. Cullen, Theresa Nicklas, Deborah Thompson, and Janice Baranowski, "Are Current Health Behavioral Change Models Helpful in Guiding Prevention of Weight Gain Efforts?" *Obesity* 11 (2003): 23S-43S, doi:10.1038/oby.2003.222.

12. Thomas L. Webb, Judith Joseph, Lucy Yardley, and Susan Michie, "Using the Internet to Promote Health Behavior Change: A Systematic Review and Meta-analysis of the Impact of Theoretical Basis, Use of Behavior Change Techniques, and Mode of Delivery on Efficacy," *Journal of Medical Internet Research* 12, no. 1 (January/February 2010): e4, doi:10.2196/jmir.1376.

13. Elena T. Carbone, Marci K. Campbell, and Lauren Honess-Morreale, "Use of Cognitive Interview Techniques in the Development of Nutrition Surveys and Interactive Nutrition Messages for Low-income Populations," *Journal of The American Dietetic Association* 102 (2002): 690-696, doi:10.1016/S0002-8223(02)90156-2.

14. Richard E. Petty, and John T. Cacioppo, *Attitudes and Persuasion—Classic and Contemporary Approaches* (Dubuque, Iowa: W.C. Brown Co. Publishers, 1981).

15. Edward Maibach and Roxanne Parrott, "Fishing for Success: Using the Persuasive Health Message Framework to Generate Effective Campaign Messages," in *Designing Health Messages Approaches from Communication Theory and Public Health Practice* (Thousand Oaks, Calif: Sage Publications, 1995), <http://site.ebrary.com/id/10582069>.

16. Frank Biocca. "Viewer's Mental Models of Political Commercials: Toward a Theory of the Semantic Processing of Television," in *Television and Political Advertising, Vol 1* (Hillsdale, N.J.: L. Erlbaum Associates, 1991).

17. Noar, "Does Tailoring Matter?"

18. Karen Glanz, Barbara K. Rimer, and K. Viswanath, *Health Behavior and Health Education Theory, Research, and Practice*, 4th ed. (Hoboken: John Wiley & Sons, 2008), http://www.123library.org/book_details/?id=4644.

19. Johannes Brug, Marci Campbell, and Patricia V. Assema, "The Application and Impact of Computer-generated Personalized Nutrition Education: A Review of the Literature," *Patient Education and Counseling* 36 (1999): 181-192, doi:10.1016/S0738-3991(98)00131-1.

20. Johannes Brug, Ingrid Steenhuis, Patricia V. Assema, and Hein D. Vries, "The Impact of a Computer-Tailored Nutrition Intervention," *Preventive Medicine* 25 (1996): 236-242, doi:10.1006/pmed.1996.0052.

21. Celette S. Skinner, Marci K. Campbell, Barbara K. Rimer, Susan Curry, and James O. Prochaska, "How Effective is Tailored Print Communication?" *Annals of Behavioral Medicine* 21 (1999): 290-298, doi:10.1007/BF02895960.
22. Carbone, "Use of Cognitive Interview."
23. Noar, "Does Tailoring Matter?"
24. Glanz, *Health Behavior*.
25. Berkman, *Literacy and Health*.
26. Noar, "Does Tailoring Matter?"
27. Alwan, "Noncommunicable Diseases."
28. Paul J. Veugeliers and Angela L. Fitzgerald, "Effectiveness of School Programs in Preventing Childhood Obesity: A Multilevel Comparison," *American Journal of Public Health* 95, no. 3 (March 2005): 432-435.
29. Colin Boreham and Chris Riddoch, "The Physical Activity, Fitness and Health of Children," *Journal of Sports Sciences* 13, no. 12 (2001): 915-929, doi:10.1080/026404101317108426.
30. Christopher B. Forrest and Anne W. Riley, "Childhood Origins Of Adult Health: A Basis For Life-Course Health Policy," *Health Affairs* 23, no. 5 (2004): 155-164, doi:10.1377/hlthaff.23.5.155.
31. Noar, "Does Tailoring Matter?"
32. James P. Guevara, Fredric M. Wolf, Cyril M. Grum, and Noreen M. Clark, "Effects of Educational Interventions for Self Management of Asthma in Children and Adolescents: Systematic Review and Meta-analysis," *British Medical Journal* 326 (June 2003): 1-6, doi:10.1136/bmj.326.7402.1308.
33. Fredic Wolf, James P. Guevara, Cyril M. Grum, Noreen M. Clark, and Christopher J. Cates, "Educational Interventions for Asthma in Children," *Cochrane Database System Rev.* 1 (October 2003), doi:10.1002/14651858.CD000326.
34. Michele Cecchini, Franco Sassi, Jeremy A. Lauer, Yong Y. Lee, Veronica Guajardo-Barron, and Daniel Chisholm, "Tackling of Unhealthy Diets, Physical Inactivity, and Obesity: Health Effects and Cost-effectiveness." *Lancet* 376, no. 9754 (November 2010): 1775-1784, doi:10.1016/S0140-6736(10)61514-0.

35. Ibid.
36. Veugelers, "Effectiveness of School."
37. Boreham, "The Physical Activity."
38. Forrest, "Childhood Origins."
39. Ogden, "Prevalence of Childhood."
40. Anju Seth and Rajni Sharma, "Childhood Obesity," *The Indian Journal of Pediatrics* 80 (April 2013): 309-317, doi: 10.1007/s12098-012-0931-5.
41. Ibid.
42. Liping Pan, Bettylou Sherry, Sohyun Park, and Heidi M. Blanck, "The Association of Obesity and School Absenteeism Attributed to Illness or Injury Among Adolescents in the United States, 2009," *Journal of Adolescent Health* 52, no. 1 (January 2013): 64-69, doi:10.1016/j.jadohealth.2012.04.003.
43. Rebecca Krukowski, Delia S. West, Amanda P. Perez, Zoran Bursac, Martha Phillips, and James Raczynski, "Overweight Children, Weight-based Teasing and Academic Performance," *International Journal of Pediatric Obesity* 4 (2009): 274-280, doi:10.1080/17477160902846203.
44. Robert Cornette, "The Emotional Impact of Obesity on Children," *Worldviews on Evidence-based Nursing* 5, no. 3 (2008): 136-141, doi:10.1111/j.1741-6787.2008.00127.
45. Nora Wille, Michael Erhart, Christiane Petersen, and Ulrike Ravens-Sieberer, "The Impact of Overweight and Obesity on Health-related Quality of Life in Childhood—Results from an Intervention Study," *BMC Public Health* 8, no. 421 (2008), doi:10.1186/1471-2458-8-421.
46. David M. Janicke, Jeffrey S. Harman, Kelly J. Kelleher, and Jianyi Zhang, "Psychiatric Diagnosis in Children and Adolescents with Obesity-Related Health Conditions," *Journal of Developmental and Behavioral Pediatrics* 29, no. 4 (2008): 276-284, doi:10.1097/DBP.0b013e31817102f8.
47. Leonardo Trasande and Samprit Chatterjee, "The Impact of Obesity on Health Service Utilization and Costs in Childhood," *Obesity* 17 (2009): 1749-1754, doi:10.1038/oby.2009.67.

48. L. Trasande, Y. Liu, G. Fryer, and M. Weitzman, "Effects Of Childhood Obesity On Hospital Care And Costs, 1999-2005," *Health Affairs* 28, no. 4 (2009): w751-60, doi:10.1377/hlthaff.28.4.w751.

49. E. A. Finkelstein, J. G. Trogon, J. W. Cohen, and W. Dietz, "Annual Medical Spending Attributable To Obesity: Payer-And Service-Specific Estimates." *Health Affairs* 28, no. 5 (2009): w822-831, doi:10.1377/hlthaff.28.5.w822.

50. Li Y. Wang, Maxine Denniston, Sarah Lee, Deborah Galuska, and Richard Lowry, "Long-term Health and Economic Impact of Preventing and Reducing Overweight and Obesity in Adolescence," *Journal of Adolescent Health* 46 (2010): 467-473, doi:10.1016/j.jadohealth.2009.11.204.

51. Noar, "Does Tailoring Matter?"

52. CDC, "Asthma's Impact."

53. Ibid.

54. CDC, "National Hospital Ambulatory."

55. CDC, "Asthma's Impact."

56. Ibid.

57. Ibid.

58. Ibid.

59. Ibid.

60. Ibid.

61. Guevara, "Effects of Educational."

62. Wolf, "Educational Interventions."

63. CDC, "Asthma's Impact."

64. Guevara, "Effects of Educational."

65. Wolf, "Educational Interventions."

66. Robert Wood Johnson, "Quality Field Notes. Aligning Forces for Quality 2013."

67. Shelley I. White-Means and Michael C. Thornton, "Nonemergency Visits to Hospital Emergency Rooms: A Comparison of Blacks and Whites," *The Milbank Quarterly* 67 (1989): 35-57.

68. Melissa Ahern and H. Virginia McCoy, "Emergency Room Admissions: Changes During the Financial Tightening of the 1980's," *Inquiry* 29 (1992): 67-79.
69. White-Means, "Nonemergency Visits."
70. Ahern, "Emergency Room Admissions."
71. Stuart J. Yoffe, Robert W. Moore, John O. Gibson, Nemat M. Dadfar, Rebecca L. McKay, David A. McClellan, Tse-Yang Huang, "A Reduction in Emergency Department Use by Children From a Parent Educational Intervention," *Family Medicine* 43 (February 2011): 106-111.
72. C. R. Roberts, "Reducing Physician Visits for Colds Through Consumer Education," *Journal of the American Medical Association* 250 (October 1983): 1986-1989, doi:10.1001/jama.250.15.1986.
73. David Berger, Moira Inkelas, Sonya Myhre, and Alanina Mishler, "Developing Health Education Materials for Inner-City Low Literacy Parents," *Public Health Reports* 109 (Mar-April 1994): 168-172.
74. Lynn Nielsen-Bohlman, Allison M. Panzer, and David A. Kindig, *Health Literacy: A Prescription to End Confusion* (Washington, D.C.: National Academies Press, 2004).
75. Mark A. Kutner, E. Greenburg, Y. Jin, and C. Paulsen, *The Health Literacy of America's Adults Results from the 2003 National Assessment of Adult Literacy* (Washington, D.C.: U.S. Dept. of Education, National Center for Education Statistics, 2006).
76. John P. Comings, Barbara Garner, and Cristine A. Smith, "Health Literacy: An Update of Public Health and Medical Literature," in *Review of Adult Learning and Literacy*, Vol. 7 (Mahwah, NJ: Lawrence Erlbaum Associates, 2007).
77. Noar, "Does Tailoring Matter?"
78. Glanz, *Health Behavior*.
79. A.C. Gielen, "Application of Behavior-Change Theories and Methods to Injury Prevention," *Epidemiologic Reviews* 25, no. 1 (2003): 65-76, doi:10.1093/epirev/mxg004.
80. Noar, "Does Tailoring Matter?"
81. Ibid.

82. M.M. Black, E.R. Hager, K. Le, J. Anliker, S.S. Arteaga, C. DiClemente, J. Gittelsohn, et al., "Challenge! Health Promotion/Obesity Prevention Mentorship Model Among Urban, Black Adolescents," *Pediatrics* 126, no. 2 (August 2010): 280-288, doi: 10.1542/peds.2009-1832.
83. Shawna McGhan, "Roaring Adventures of Puff Instructor's Guide: A Childhood Asthma Education Program," Alberta Asthma Centre (2006), www.educationforasthma.com.
84. Leen Haerens, Benedicte Deforche, Lea Maes, Johannes Brug, Corneel Vandelanotte, and Ilse D. Bourdeaudhuij, "A Computer-tailored Dietary Fat Intake Intervention for Adolescents: Results of a Randomized Controlled Trial," *Annals of Behavioral Medicine* 34, no. 4 (2007): 253-262, doi:10.1007/BF02874550.
85. Isobel R. Contento, Pamela A. Koch, Heewon Lee, and Angela Calabrese-Barton, "Adolescents Demonstrate Improvement in Obesity Risk Behaviors After Completion of Choice, Control & Change, a Curriculum Addressing Personal Agency and Autonomous Motivation," *Journal of The American Dietetic Association* 110, no. 12 (December 2010): 1830-1839, doi:10.1016/j.jada.2010.09.015.
86. Christine L. Joseph, Edward Peterson, Suzanne Havstad, Christine C. Johnson, Sarah Hoerauf, Sonja Stringer, Wanda Gibson-Scipio, et al., "Evaluation of a Web-based, Tailored Asthma Management Program for Urban Teenagers: Reaching the Hard to Reach," *Journal of Adolescent Health* 52, no. 4 (2013): 419-426.
87. James O. Prochaska and Carlo C. DiClemente, "Stages and Processes of Self-change of Smoking: Toward an Integrative Model of Change," *Journal of Consulting and Clinical Psychology* (1983): 30-395, doi:10.1037/0022-006X.51.3.390.
88. James O. Prochaska, Carlo C. DiClemente, and John C. Norcross, "In Search of How People Change: Applications to Addictive Behaviors," *American Psychologist* 47 (1992): 1102-1114, doi:10.1037//0003-066X.47.9.1102.
89. Noar, "Does Tailoring Matter?"
90. James O. Prochaska, Wayne F. Velicer, Joseph S. Rossi, and Michael G. Goldstein, "Stages of Change and Decisional Balance for 12 Problem Behaviors," *Health Psychology* 13 (1994): 39-46, doi:10.1037//0278-6133.13.1.39.

91. James O. Prochaska, C.A. Redding, K. Evers, "The transtheoretical model and stages of change," in *Health Behavior and Health Education Theory, Research, and Practice*, 4th ed. (Hoboken: John Wiley & Sons, 2008).
92. James O. Prochaska, Carlo C. DiClemente, Wayne F. Velicer, and Joseph S. Rossi, "Standardized, Individualized, Interactive, and Personalized Self-help Programs for Smoking Cessation," *Health Psychology* 12 (1993): 399-405, doi:10.1037//0278-6133.12.5.399.
93. Wayne F. Velicer and James O. Prochaska, "An Expert System Intervention for Smoking Cessation," *Patient Education and Counseling* 13 (1999): 269-290, doi:10.1016/S0738-3991(98)00129-3.
94. Marshall H. Becker, *The Health Belief Model and Personal Health Behavior* (Thorofare, N.J.: C.B. Slack, 1974).
95. Nancy K. Janz and Marshall H. Becker, "The Health Belief Model: A Decade Later," *Health Education & Behavior* 11 (1984): 1-47, doi:10.1177/109019818401100101.
96. Noar, "Does Tailoring Matter?"
97. Ibid.
98. Albert Bandura, "Health Promotion from the Perspective of Social Cognitive Theory," *Psychology & Health* 13 (1998): 623-649, doi:10.1080/08870449808407422.
99. V.J. Stretcher, M. Kreuter, D.J.D. Boer, S. Kobrin, H.J. Hospers, and C.S. Skinner, "The Effects of Computer-tailored Smoking Cessation Messages in Family Practice Settings," *Journal of Family Practice* 39 (1994): 262-268.
100. Martin Fishbein, and Icek Ajzen, *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research* (Reading, Mass: Addison-Wesley Pub. Co. 1975).
101. I. Ajzen and T.J. Madden, "Prediction of Goal-directed Behavior: Attitudes, Intentions, and Perceived Behavioral Control," *Journal of Experimental Social Psychology* 22 (1986): 453-474, doi:10.1016/0022-1031(86)90045-4.
102. Noar, "Does Tailoring Matter?"
103. Ibid.
104. Ibid.
105. Albert Bandura, *Social Foundations of Thought and Action A Social Cognitive Theory* (New Jersey: Prentice Hall, 1986).

106. Noar, "Does Tailoring Matter?"
107. Ibid.
108. Ibid.
109. Matthew W. Kreuter and Victor J. Strecher, "Do Tailored Behavior Change Messages Enhance the Effectiveness of Health Risk Appraisal? Results from a Randomized Trial," *Health Education Research* 11 (1996): 97-105, doi:10.1093/her/11.1.97.
110. Glanz, *Health Behavior*.
111. Ibid.
112. Ibid.
113. Ibid.
114. Noar, "Does Tailoring Matter?"
115. World Health Organization, "Health Education, Health Topics," http://www.who.int/topics/health_education/en/.
116. Ibid.
117. Health.gov, "Health Communication, What is Health Communication?" <http://www.health.gov/communication/resources/#overview>.
118. Ibid.
119. Julie A. Gazmararian, James W. Curran, Ruth M. Parker, Jay M. Bernhardt, and Barbara A. DeBuono, "Public Health Literacy in America An Ethical Imperative," *American Journal of Preventative Medicine* 28, no. 3 (2005): 317-322.
120. W. Mitic, F.B. Abdelaziz, and H. Madi, "Health Education: Theoretical Concepts, Effective Strategies, and Core Competencies," *World Health Organization* (2012): 1-82.
121. Petty, *Attitudes and Persuasion*.
122. Maibach, "Fishing for Success."
123. Biocca, "Viewer's Mental Models."
124. Carbone, "Use of Cognitive Interview."
125. Ibid.
126. Haerens, "A Computer Tailored."
127. Black, "Challenge!: A Mentorship Model."
128. Ibid.

129. David B. Abrams, Sherry Mills, and David Bulger, "Challenges and Future Directions for Tailored Communication Research," *Annals of Behavioral Medicine* 21 (1999): 299-306, doi:10.1007/BF02895961.

130. James O. Prochaska, Wayne F. Velicer, Joseph L. Fava, Joseph S. Rossi, and Janice Y. Tsoh, "Evaluating a Population-based Recruitment Approach and a Stage-based Expert System Intervention for Smoking Cessation," *Addictive Behaviors* 26 (2001): 583-602, doi:10.1016/S0306-4603(00)00151-9.

131. David R. Lairson, Georgina R. Newmark, William Rakowski, Jasmin A. Tiro, and Sally W. Vernon, "Development Costs of a Computer-generated Tailored Intervention," *Evaluation and Program Planning* 27 (2004): 161-169, doi:10.1016/j.evalprogplan.2004.01.004.

132. Donna R. Falvo, *Effective Patient Education: A Guide to Increased Adherence* (Sudbury, Mass: Jones and Bartlett, 2011).

133. "How to Create Effective Written Patient Learning Materials," Jewish General Hospital, 2008.

134. Ibid.

135. Ibid.

136. Glanz, *Health Behavior*.

137. J. Mishra, *Scope and Categories of Human Rights* (Isha Books, 2006).

138. Ibid.

139. Catherine Selden, M. Zorn, and S.C. Ratzan, *Health Literacy* (Bethesda, Md.: U.S. Dept. of Health and Human Services, Public Health Service, National Institutes of Health, National Library of Medicine, 2000), <http://www.nlm.nih.gov/archive//20061214/pubs/cbm/hliteracy.html>.

140. J. A. Manganello, "Health Literacy and Adolescents: A Framework and Agenda for Future Research," *Health Education Research* 23, no. 5 (November 2007): 840-847, doi:10.1093/her/cym069.

141. Ibid.

142. Saulet Jahan, Abdullah M. Al-Saigul, Ali M. Alharbi, and Muzamil H. Abdelgadir, "Suitability Assessment of Health Education Brochures in Qassim Province, Kingdom of Saudi Arabia," *Journal of Family Community Medicine* 21, no. 3 (September 2014): 186-192, doi:10.4103/2230-8229.142974.

143. Shelya C. De Oliveira, Marcos V. De Oliveira Lopes, and Ana F. Carvalho Fernandes, "Development and Validation of an Educational Booklet for Healthy Eating During Pregnancy," *Revista Latino-Americana de Enfermagem* 22, no. 4 (July/August 2014): 611-620, doi:10.1590/0104-1169.3313.2459.

144. Tammy Hoffmann and Linda Worrall, "Designing Effective Written Health Education Materials: Considerations for Health Professionals," *Disability and Rehabilitation* 26, no. 19 (2004): 1166-1173, doi:10.1080/09638280410001724816.

145. Matthew W. Kreuter, Debra L. Oswald, Fiona C. Bull, and Eddie M. Clark, "Are Tailored Health Education Materials Always More Effective Than Non-tailored Materials?" *Health Education Research* 15, no. 3 (2000): 305-315, doi:10.1093/her/15.3.305.

146. Carbone, "Use of Cognitive Interview."

147. Ibid.

148. Petty, *Attitudes and Persuasion*.

149. Maibach, "Fishing for Success."

150. Biocca, "Viewer's Mental Models."

151. McGhan, "Roaring Adventures"

152. Ibid.

153. Ibid.

154. Ibid.

155. Ibid.

156. Ibid.

157. Ibid.

158. Ibid.

159. Ibid.

160. Haerens, "A Computer Tailored."

161. Ibid.

162. Ibid.
163. Ibid.
164. Ibid.
165. Ibid.
166. Ibid.
167. Ibid.
168. Black, "Challenge!: A Mentorship Model."
169. Haerens, "A Computer Tailored."
170. Black, "Challenge!: A Mentorship Model."
171. Ibid.
172. Ibid.
173. Ibid.
174. Ibid.
175. Ibid.
176. Ibid.
177. Noar, "Does Tailoring Matter?"
178. Berger, "Developing Health Education."
179. Contento, "Adolescents Demonstrate."
180. Ibid.
181. Ibid.
182. Ibid.
183. Pamela Koch, Angela C. Barton, Rabi Whitaker, and Isobel Contento, "Choice, Control and Change: Using Scientific Evidence to Promote Healthful Food and Activity Choices," *Science Scope* 31, no. 3 (November 2007): 16-19.
184. Contento, "Adolescents Demonstrate."
185. Ibid.
186. Noar, "Does Tailoring Matter?"
187. Joseph, "Evaluation of a Web-Based."
188. Ibid.
189. Ibid.

190. Ibid.
191. Ibid.
192. Ibid.
193. Berger, "Developing Health Education."
194. Ibid.
195. Deborah A. Roskamp, *Comparison of the Reading Levels of a Homeless Population and the Reading Levels of Printed Self-care Instructions Sheets* (Berkeley, CA: University of California, 1987).
196. D. C. Spadero, "Assessing Readability of Patient Information Materials," *Pediatric Nursing* 9 (July/August 1983): 274-278.
197. Cathy D. Meade and Cyrus F. Smith, "Readability Formulas: Cautions and Criteria," *Patient Education and Counseling* 17 (1991): 153-158, doi:10.1016/0738-3991(91)90017-Y.
198. Berger, "Developing health education."
199. Ibid.
200. Carmen Pérez-Rodrigo and Javier Aranceta, "School-based Nutrition Education: Lessons Learned and New Perspectives," *Public Health Nutrition* 4, no. 1 (2001): 131-139, doi:10.1079/PHN2000108.
201. Heather L. Gainforth, Carolyn J. Barg, Amy E. Latimer, Kristina L. Schmid, Deborah O'Malley, and Peter Salovey, "An Investigation of the Theoretical Content of Physical Activity Brochures," *Psychology of Sport and Exercise* 12, no. 6 (2011): 615-620, doi:10.1016/j.psychsport.2011.06.002.
202. Noar, "Does Tailoring Matter?"
203. Black, "Challenge! A Mentorship Model."
204. Noar, "Does Tailoring Matter?"
205. Glanz, *Health Behavior*.
206. Carbone, "Use of Cognitive Interview."
207. Berkman, Literacy and Health.
208. Noar, "Does Tailoring Matter?"
209. Jennifer A. Manganello, "Health Literacy and Adolescents: a Framework and Agenda for Future Research," *Health Education Research* 23, no. 5 (November 2007): 840-847.

Appendix

Figure 1. Literature Search Results

