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Challenge Competition: Using Technology to Prevent Childhood Obesity in Low-Income Families and Communities

Executive summary

Childhood obesity rates are still rising! The etiology of childhood obesity is multifactorial; the most common cause is due to energy imbalance between nutrition and physical activity and there is a link between mental health and obesity. The advancements of technology for entertainment have contributed to decreased physical activity. There are also community and social barriers which prevent healthier lifestyles.

My mobile application *MedMindMe* attempts to improve mental health by recording and graphing and individuals emotions; individuals can maintain a written, voice or video journal. Promote physical well-being by increasing physical fitness and healthier eating. Individuals and families will have the option of creating, recording, sharing and viewing exercise videos; they will also have access to food recipes based on budget, complexity and preparation time.   The information recorded can be shared with their healthcare provider during either in-office or web-based consultations. Advancements in HIPPA compliant web and mobile communication technologies allow for remote delivery of healthcare services.

We may not be able to readily change or remove barriers in our community. We can, better utilize our home environment to improve of our physical, and mental health.

Background information linking the evidence to support the intervention

The etiology of childhood obesity is multifactorial, which include genetic disorders, hormonal disorders and most commonly due to energy imbalance between nutrition and physical activity; there is also an association with mental health and obesity. Despite increased public awareness and public policy, obesity rates continue to rise in children between the ages of 2 – 19 years.[18]

Extensive research demonstrates that physical activity and nutrition are the hallmarks of a healthy lifestyle. Physical activity, allows for energy expenditure and is important in preventing and managing obesity. However, there are community and social barriers to engaging in a regular physical activity program. Community barriers include unsafe neighborhoods and the lack of public parks and playgrounds. Studies have demonstrated that children and adolescents get most of their exercise in parks and playgrounds.[1] Social factors to consider are children whose parents work schedules which are asynchronous with the children's school hours. Many teens are home alone and unattended by parental supervision for hours. A subset of these children watch television and play video games.

There is strong evidence that supports the consumption of healthy foods, such as fruits and vegetables, can promote health and prevent obesity and lower risk for heart disease, stroke, type 2 diabetes, and cancer. [2, 3] According to a study done by the CDC (Center for Disease Control) Morbidity and Mortality Weekly Report, 1 in 10 adults meet the federal fruit and vegetable recommendations. [7] Several studies assessing fruit and vegetable consumption identified common causes associated with low consumption (1) taste, (2) food preparation, (3) cost and (4) access. [4]

Addressing mental health is essential in managing obesity as it influences both nutrition choices and portion size. Discerning if mental health issues cause obesity, or obesity causes mental health issues is difficult but obesity and mental health issues in childhood often coincide.

Individuals need a private manner to express their thoughts and there is extensive research on writing diaries to decrease stress; according to the American Psychologist Association writing about stressful events has long been known to cause improvements in health and psychological well-being.[13]

Research published in the *Journal of Experimental Psychology,* indicates that expressive writing reduces intrusive and avoidant thoughts about negative events and improves working memory. These improvements, researchers believe, may in turn free up our cognitive resources for other mental activities, including our ability to cope more effectively with stress.[14] Journaling helps control an individuals' symptoms and improve mood by (1) prioritizing problems (2) tracking any symptoms day-to-day so that you can recognize triggers and learn ways to better control them, and (3) providing an opportunity for positive self-talk and identifying negative thoughts and behaviors. Maintaining a diary is a personal experience and can assist one in continued awareness so as not to ignore their mental health issues.[15]

Technological advances have changed how we communicate; texting, voice-messages, video-chat, emoji's, animated GIFs and memes are commons forms one may use when communicating. *Emoji's* are images, symbols, or icons to express an attitude or convey information without the use of words.[10] Memes are an amusing or interesting item (such as a captioned picture or video) or genre of items that is spread widely online especially through social media.[8] Animated GIFs are a moving picture in GIF format.[8]

In a survey conducted by Harris Poll and commissioned by GIF platform Tenor, 36% of millennials ages 18 to 34 who use "visual expressions" such as emoji's, GIFs and stickers say that those images better communicate their thoughts and feelings than words do. That is more than twice the amount of people over the age of 65 who say the same. Rephrase this: This statistic is double the percentage of people over the age of 65.   Roughly a quarter of people in the age groups between those two demographics feel that images can paint a clearer picture than words.[9]

Healthcare providers use The Faces Pain Scale (FPS), which has been used in assessing pain in patient with physical pain. There is emerging research in the use of emoticons and emoji's in expressing emotions.

The concept for the app is to motivate individuals and families to lead healthy lifestyles by removing some of the mental and physical barriers. People can be empowered in their different living environments

A descriptive analysis of how the applicant arrived at the idea

"Technology should be a source of connection rather than disconnection in families," [5]

One report found the average US consumer spends 5 hours a day on their mobile device. By age 17 the ownership of mobile cellphones is approximately 84%. Internet access for adolescent in the US in approximately 91%. 7 in 10 Americans use social media to connect with one another, engage in news content and share information and entertain themselves.[16] The Pew Internet Project found that nearly two thirds of online teens are content creators - in the form of artwork, photos, stories or videos. Most teen content creators are posting material for their network of friends on a social networking site. Leveraging our technology and social media can encourage healthy eating and exercise to promote health. [16]

The advancements made in technology for mobile devices and excessive gaming contributes to the sedentary lifestyle of children and adolescents. Children are spending hours of non-education activities on their mobile and gaming devices. Two excerpts from the American Academy of Pediatrics recommendation on 'Children and Media' are (1) For children ages 6 and older, place consistent limits on the time spent using media, and the types of media, and make sure media does not take the place of adequate sleep, physical activity and other behaviors essential to health and (2) Don't use technology as an emotional pacifier. Media can be very effective in keeping kids calm and quiet, but it should not be the only way they learn to calm down. Children need to be taught how to identify and handle strong emotions, invent activities to manage boredom, or calm down through breathing, talking about ways to solve the problem, and finding other strategies for channeling emotions.

Dr. Sarah Armstrong, Director of the Duke University Lifestyles Program, acknowledged that people are aware of the health implications of obesity. While progress has been made in addressing the issues, changing the habits is more difficult to achieve. She says, "we need to be more *disruptive* in our thinking if we want to see a statistical improvement move on a national scale." [6]

Access to technology has become omnipresent and has become affordable at all socioeconomic levels. Youth have also become vulnerable to the effects of technology being used and consumed for no profit.

I propose a disruptive method by utilizing technology to increase physical activity, improve nutrition and address mental health. We can teach and mentor children and adolescents to use technology to benefit their lives by making affordable and accessible services including mobile and web applications for individuals and families that will allow them to succeed in building a healthy lifestyle. The web and/or mobile application will promote increased movement and creative healthy recipes using the foods the family has in their home

Along with limiting the overuse of technology, we will teach individuals and families how to use their personal technology to make every day healthy choices.

The following section will describe the sections of the *MedMindMe* Application

1. **Physical activity:**
   a. Individuals or families will have the option of:
      i. Creating a 2 minute video of an activity or exercise
      ii. Viewing an activity or exercise another individual or family has created
   b. The activity or video will be categorized based on
      i. Place – apartment, townhome, single family home, park, gym
      ii. Number of people needed to perform the activity or exercise
      iii. The complexity of the activity or exercise (Level 1 – 5)
   c. The video can be posted to the application and social media (Facebook, Twitter, Instagram, Snapchat).

Teens can contribute positive and educational content to influence the health of others by creating and sharing exercise videos. The hypothesis is, if children, adolescents and families are able to observe others in a similar environment and performing healthy activities this will increase activity level of individuals in their social network.

2. **Nutrition:**
   a. Adolescents and Parents can create and share recipes
   b. Recipes will be categorized
      i. Budget
      ii. Complexity based on:
         1. Number of ingredients
         2. Preparation time

Parental stress can affect eating behaviors in children. Understanding there are limitations and barriers that families have; my hypothesis is that if adolescents and parents have a library of accessible recipes which is compatible to their food budget and the food they have accessible, this may improve eating habits and decrease stress. For those families who only have access to can vegetables they will be able to finds health recipes.

3. **Mental Health**
   a. Daily tracking of emotional state

i. In the morning and afternoon, an individual will be prompted to select from a list of words or emoji's which best expresses their present emotional state

b. Daily journal entries
1. Written, voice or audio recorded journals expressing how they feel
2. The diary can be shared with a parent or healthcare professional at the individual's discretion
3. Diary can be time based or event based
a. Time based- diary can be recorded at a specific time daily
b. Event based – diary recorded at the time of an event which negatively or positively affects the emotional state of an individual

By tracking and charting one's emotional state over time will give them a direct visualization how they have felt over a given time period. This visualization will provide data from which they may recognize patterns and gain insight that promotes change or seek mental health professional if necessary.

In this rapidly changing world of technology, we often forget to acknowledge or minimize our emotions. As stated previously, maintaining a diary is a personal experience and can assist one in continued awareness so as not to ignore their mental health issues.[15]

The different aspects of this application regarding physical activity, nutrition and mental health address the common causes of obesity and is not designed to treat with people with severe mental health issues. However, it is important to identify individuals who are in need of these services prior to addressing physical fitness and exercise.

Description of the methods and technologies involved in implementation of the intervention

I have a pediatric cardiology practice with locations in Virginia and Maryland. My offices are located in communities with low-socioeconomic status and a large minority population. More than 40% of patient referrals, from general pediatricians, are for obesity (BMI > 95th percentile) and associated comorbidities of hypertension, hyperlipidemia, and prediabetes. I also have relationships with other medical practices and schools. My goal is to have 200 families enrolled in the program and I and my colleagues will follow the families on a bi-weekly basis.

I will also utilize telemedicine applications which are HIPPA compliant, to provide consultations with mobile devices (smartphone or tablet). The utilization of telemedicine will have added value for individuals or families who have difficulty with biweekly or monthly in-office appointments. Individuals and families should not be kept in isolation for their journey of healthier lifestyle changes.

The application will be for mobile smartphones and tablets and will be written in Javascript using the React Native framework. React-Native, a framework developed by Facebook, used to build mobile applications on iOS and Android.

The application will use Firebase for storage of recipes and exercise videos. Firebase is optimized offline use; when the use is offline local cache is used to serve and store data and is automatically synchronized when user is back online. The storage of written, audio and video journals will be stored on HIPPA compliant database.

An assessment describing the applicant's ability to execute the proposed solution

Wali Gauvin – Team Leader, Pediatric Cardiology, Web and Mobile Application Developer
I am a preventive pediatric cardiologist with over 10 years of experience in preventive cardiology, research, project implementation and execution. I also have experience in web development include client-side HTML, CSS and Javascript and frameworks, such as React and React-Native. I also have experience in with Node.js (javascript framework used for writing server-side applications) and NoSQL database (mLab).

Aferdita Muriqi – Senior Software Engineer
She is a senior mobile engineer with experience in iOS and Android Mobile Development. She worked at New York Univesrsity as an adjunct professor teaching courses on Advanced Android Application Development and iOS App Development from Concept to App Store. She has worked on and launched the mobile app for the New York Public Library.

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