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Dia-BEAT-it:
An online game for children and teenagers with type 1 diabetes

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Honors Thesis

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Introduction

Type 1 diabetes is a disease that affects three million Americans and each year approximately 30,000 children and adults are newly diagnosed (Juvenile Diabetes Research Foundation (JDRF), n.d.). This chronic illness, while treatable, is incredibly difficult to control due to the numerous environmental and physiological factors which affect blood sugar levels. Because of this, there are many psychological complications that arise in adolescents attempting to manage type 1 diabetes. With increased rates of depression, anxiety, and eating disorders, it is clear that a need exists for new products that alleviate the stress associated with diabetes management.

Over the past twenty years, technology has been advancing to meet these market needs, creating new treatment devices and electronic data-entry tools to track health and progress. While helpful, these technologies still place a burden upon children. Managing diabetes can feel like a chore and adolescents often become exhausted by repeating the same tedious and painful tasks each day, often with limited positive results. For this reason, a demand exists for a new product that combines managing type1 diabetes with an interactive and motivational game. Dia-BEAT-it is a product concept for an electronic app that allows children and teenagers with type 1 diabetes to take care of themselves while having fun and playing against other kids their age with the same disease. After conducting extensive primary and secondary research, the demand for such a product has been confirmed and upon analysis, a product design and marketing plan have been created to reach this targeted niche market.

Type 1 Diabetes

Type 1 diabetes is an **autoimmune disease** in which a person's **pancreas** stops producing the hormone **insulin**. This happens when "the immune system attacks and destroys the insulin-producing cells in the pancreas, called **beta cells**," (JDRF, n.d.). The exact cause of type 1 diabetes is still unknown, but scientists believe it is a combination of genetic factors and environmental factors, such as childhood disease. There is no way to prevent the onset of type 1 diabetes and it is not related in any way to diet or lifestyle. There is currently no cure for this chronic illness, but new technologies have developed in the past twenty years to make management and control of the disease much easier than before.

Up until 1923, a diagnosis of type 1 diabetes was a death sentence. Doctors knew little about the disease except that consuming sugars made patients more ill. Because of this, the only treatment was a very strict diet which contained no sugar or carbohydrates, but unfortunately this still only bought patients a few years. Luckily, in the early twenties a doctor, Frederick Banting, and a medical student, Charles Best, discovered that insulin was the key component missing in type 1 diabetics ("Discovery of Insulin, The", n.d.). Insulin is a hormone which opens up cells to glucose and fructose molecules, allowing the body to use these nutrients for energy. Without insulin, sugars would build up in patients' blood and would eventually turn into **ketones**, acidic components which disrupt the ph level of the blood and essentially poison the body. Once insulin and its purpose was discovered, Banting and Best were able to extract insulin from the pancreases of animals such as cows and pigs and inject the hormone via syringe into diabetic patients. Thus, **insulin therapy** was created and the life expectancy of type 1 diabetics increased drastically.

Today, insulin is no longer taken from animals but is instead made in a chemical laboratory. Patients can then inject insulin via syringe two to eight times a day, or can administer doses via an **insulin pump**, which is a medical device connected to the body by tubes and administers insulin just like a pancreas would. In order to determine the proper insulin dosage to take, type 1 diabetics must check their **blood glucose**, or **blood sugar**, with a **blood glucose monitor**. A **glucose strip** is inserted into the monitor, or **meter**, and the patient pricks his or her finger with a **lancet** until blood is drawn. The blood is then placed on the strip and the meter produces a reading of the milligrams per deciliter of sugar in the blood. Once this number is obtained, type 1 diabetics go through a series of calculations to determine how much insulin they must take to bring their blood sugar into their target range and how many units they must take to cover the amount of carbohydrates they are consuming.

While a pancreas does all these calculations automatically, a person with type 1 diabetes needs to do them all manually or through different ratio calculators. Unfortunately, there are many other factors that contribute to blood sugar levels other than food. Exercise decreases blood glucose levels because the body is burning sugar to produce the energy required for the activity. Illness, such as the flu or a common cold, will often increase blood glucose levels because the body is under stress while fighting off the virus. Emotions also play a large part, such as anxiety, fear, anger, or excitement as well as temperature levels, such as extreme heat (American Diabetes Association (ADA), n.d.). A functioning pancreas would automatically adjust insulin levels to correct for these factors, but it is impossible for a diabetic to compensate and maintain total control. Because of this, two common issues occur with diabetes: **hyperglycemia**, a blood sugar above target (apx. >170 mg/dl), and **hypoglycemia**, a blood sugar

below target (apx. <70mg/dl) (JDRF, n.d.). Hyperglycemia must be treated with additional insulin and hypoglycemia must be treated with glucose.

Overall diabetes control is measured by a patients' **HbA1C** level, or **hemoglobin A1C**. This blood test gives a number which relates to an average blood sugar level over the past three months. While non-diabetics have an A1C between 5.0-6.0 (equivalent to blood sugar of 80mg/dl-120mg/dl), type 1 diabetics are judged on a different scale with 6.0-7.0 being excellent, 7.0-8.0 being good, 8.0-9.0 being fair, and >9.0 being poor (A1C). Patients who have A1C levels above 8.0 for an extended period of time often experience long term complications, such as **neuropathy**, **glaucoma**, heart disease, kidney failure, and premature death. For this reason, type 1 diabetes is nicknamed the "silent killer" because if poorly controlled it deteriorates the body's organs at a slow but serious pace.

To help in understanding diabetes-related terminology, a glossary is located in this document's appendices.

Initial Product Concept and Design

Before conducting any market research, an initial product design was created based on the researcher's preexisting knowledge about type 1 diabetes and the gaming preferences of adolescents and young adults ages twelve to thirty. This initial product concept was an online video game that rewards patients for taking the correct steps to manage their type 1 diabetes. Just like a "FarmVille" style game, players would earn points, trophies, or awards for checking blood sugars, using **sensitivity factors** and **insulin-to-carbohydrate ratios** to determining insulin dosages, changing tubing, rotating injection sites, lowering A1C levels, and completing other healthy achievements. Players would be able to compete against other users and in doing so would meet other patients their age with the same illness. A chat-room function would be implemented for certain age groups in which users could communicate while playing and interact with other type 1 diabetics. The game would be adapted for different ages and experience levels and would be trademarked under the brand, "Dia-BEAT-it."

Secondary Research

Gamification

Gamification is a growing trend in the marketing and business world. It involves "applying game design thinking to non-game applications in order to make them fun, engaging, or rewarding" ("Gamification," n.d.). It is a growing technological trend and can be applied to many industries. Companies have been implementing gamification to increase customer retention rates and many education companies have been utilizing this technology to encourage learning. Gamification has become incredibly popular lately due to the increase in users playing online "app" based games. Over 50% of Americans currently own smartphones, increasing from only 35% in 2011 (Stern, 2013). Consumers love their phones and love the games they play on them. Nearly 2 billion users have downloaded "Angry Birds," a game where you launch birds to knock over blocks (Lloyd, 2013), and Temple Run, a game where you race through a jungle, has more than 15 million players access the app each day (Lynley, 2013). Marketers are also drawn to gamification because it offers an opportunity to market to consumers without them noticing it. Brand images and marketing visuals can be placed throughout a game, causing users to gain a much deeper brand association than through traditional marketing methods (Cong, 2013). The identity associated with the brands marketing through gamification are often more positive because the consumer is viewing the advertising during an enjoyable experience rather than feeling like an advertising campaign is being forced upon them as they might in a normal marketing setting.

Several studies have been conducted to analyze the use of gamification in helping youth with type 1 diabetes manage their disease. In 2004, a trial was conducted in which forty 8-18 year old type 1 diabetics were separated into two groups, a "Game" group and a "Control" group

(Kumar et al., 2004). Both groups were instructed to perform blood glucose monitoring four times a day and transmit the data to a central server via a wireless modem. While the Control group received only the technology for transferring blood glucose data, the Game group also received an integrated motivational game in which participants would guess their blood sugar level following the collection of three earlier readings. The results of this study showed that participants in the Game group transferred significantly more blood sugar values than the Control group and had significantly lower frequency of hyperglycemia. Over an extended period of time, Game group participants also demonstrated a greater increase in diabetes knowledge as well as lower A1C levels. This study concluded that motivational games increase adolescents' with diabetes involvement in and care of their diseases' management.

Current Products

There are several games on the market today that teach adolescents about diabetes. Some of these are computer or console games such as Packy and Marlin (discussed in the Focus Group section of this paper) and Captain Novolin, a Super NES game starring a superhero with type 1 diabetes (Bell, 2003). These games were designed purely for the purpose of diabetes education and took children through adventures in which they learned about diabetes management. Several diabetes organization websites also host computer games with a diabetes theme such as Ketone Attack and Diabetes Dash, hosted by the Juvenile Diabetes Research Foundation (JDRF, n.d.), and Shredding Diabetes, hosted by Lilly ("Type 1 Diabetes Game," n.d.). While these games also have an educational element, they are more focused on being a fun activity for children while having a diabetes-theme to teach them that diabetes is a normal part of everyday life.

There are also a number of diabetes websites that house various printable diabetes games ("Board Games," n.d.), although these websites tend to be outdated for today's users.

Many apps and websites already exist for logging and tracking blood glucose levels. The most popular of these are Glucose Buddy, Diabetes Assistant, and mySugr Companion (University of Florida, n.d.). Each of these can be found in the Apple app store. Blood sugars, insulin dosages, and carbohydrate counts can be manually entered into the app and each program produces a variety of charts and graphs to track the users' management abilities and progress. Diabetes Companion is currently the most innovative of these logbooks, featuring a "diabetes monster," a small, green creature that can be "cheeky and defiant" or "gentle and tame" depending on how well the user is managing their disease ("Companion App," n.d.). The app's goal is to tame the monster each day by checking blood sugars and correcting out of range numbers. The mySugr website also claims that the app features "Challenges" and "Prizes" to make the program more "playful" and "rewarding," and the company recently launched a "Junior" version of the app to target younger type 1 diabetics specifically.

Diabetes Companion is the most similar product on the market to Dia-BEAT-it. Because of this, a product test was conducted in order to gain unbiased feedback about the app from a market user ("Companian App," n.d.). Max, a 25-year-old type 1 diabetic, was asked to download the Diabetes Companion app and test it for a few days. After this, Max was asked his opinion of the app, including features he did and did not like. He responded, "Diabetes Companion is basically like any other logbook, except for the monster. I thought it was pretty cool how the monster changed attitudes and made logging my numbers more entertaining," (personal communication, November 5, 2013). In general though, Max felt like Diabetes Companion was just a "money sucker." "The free app doesn't have a lot of basic features, like

being able to set blood sugar reminder alarms. They try to get you to pay $13 a month for the 'Pro' version. Why would I do that when I can get other logbooks with those 'pro' features for free?" Additionally, Max was disappointed by the challenges. "I thought they would be more fun, but they were all logging related things like, 'log your blood sugar for seven days in a row.' If you met the challenge, you would win a 'prize' of a three-day trial of the 'pro' version of the app." Overall, Max felt that the product had the right idea with adding challenges and prizes to the logbook, but did not think it met the potential to make it worth purchasing. Upon further investigation of the mySugr "Junior" app, this product was found to be simply a more kid-friendly logger which then transfers blood sugars to the original mySugr app on a parent or caretaker's phone.

Diabetes Burnout and Psychological Complications

Type 1 diabetes is an incredibly difficult disease to control due to the numerous environmental factors which affect blood sugar levels. These include food, exercise, temperature, emotions, viruses, and hormones. Because of this, there are many psychological complications that arise in adolescents attempting to manage type 1 diabetes. One of the most common is **diabetes burnout**, a state in which "patients grow tired of managing their disease and then simply ignore it for a period of time, or forever" (Joslin Diabetes Center, n.d.). Many mistake burnout for clinical depression, but it is a completely different issue. While depression is defined as, "persistent feelings of sadness and loss of interest" (Mayo Clinic, n.d.), diabetes burnout takes place when "a person is either unwilling to change, or simply tired of the endless attention diabetes care requires," ("Coping with Diabetes Burnout," n.d.). The Joslin Diabetes Center, one of the leading type 1 diabetes research facilities, reports that the best ways to avoid diabetes

burnout are to “stay motivated, not perfect” and “identify barriers to good diabetes care” (Joslin Diabetes Center, n.d.). Because it is impossible for diabetics to always have blood sugars in range, patients who try to constantly have “perfect” numbers often experience diabetes burnout more frequently due to the frustrations they experience over their inability to control the disease. It is important though that patients stay positively motivated so that they do not give up and ignore the disease. Removing barriers to good diabetes care can help decrease the stress diabetes puts on patients. For example, patients who have trouble remembering to check their blood sugar at a certain time can set daily alarm reminders or patients who struggle at calculating insulin dosages in their head can use an insulin pump that contains a ratio calculator to make treatment more accurate and less time consuming.

Several studies have revealed that people with type 1 diabetes are more likely to have mental health problems, such as depression and anxiety. Depression occurs twice as often in type 1 diabetics than in those without the disease and anxiety disorders are 20% more common (Romaithi, 2013). According to one researcher, this is because, “diabetes must be actively managed, like a to-do list that rewrites itself every day. There is never a gold star for good performance, never an ‘okay, that’s that,’ where you can dust off your hands and turn away from a task well done. The task is never done, and often it seems no matter how hard you try, the task is never done well,” (von Wartburg, 2007). Rates of anxiety disorders increase even more drastically in patients who have experienced hypoglycemia-related complications, such as seizure or loss of consciousness, while working or driving a car (Romaithi, 2013).

In a recent study conducted by the American Diabetes Association, researchers also found that type 1 diabetics who experience depression tend to have higher A1C results (ADA, n.d). This creates an unhealthy cycle, with the stress of diabetes causing depression and

depression causing patients to be less motivated in their diabetes care. This lack of motivation results in higher blood glucose levels which then causes depression to an even greater extent.

As well as depression and anxiety, research has found that women with type 1 diabetes are more than twice as likely to develop an eating disorder than age-matched women without diabetes (Joslin Diabetes Center, n.d.). A patient with type 1 diabetes must constantly be aware of what they are eating, and for a child, this extreme focus on food can be too much to handle. As patients move into their teens and early twenties, many experience traditional eating disorders such as anorexia, binge eating, and bulimia, but lots of patients also experience an eating disorder unique to diabetes: **diabulimia**. Diabulimia is defined as, "the act of deliberately manipulating, or completely withholding insulin, as a means to control weight" (Vavrosky, 2013). When a type 1 diabetic does not receive the insulin they need, their body goes into a state of starvation. In order to continue to produce energy, the body of this diabetic breaks down muscle and fat into ketone bodies, which then become dangerous ketoacids. "The body of a diabulimic becomes unable to process or utilize sugars, so rather than being used by the body for energy or stored fat, sugars are excreted in urine. As a result, the diabulimic loses a great deal of body weight and is at risk of diabetic **ketoacidosis**, a life threatening disease" (Vavrosky, 2013). While all eating disorders are incredibly dangerous, diabulimia is even more so. Even if the patient does not go into diabetic ketoacidosis (DKA), which often results in coma and death, denying the body insulin for an extended period of time significantly increases blood glucose and A1C levels, increasing the risk of long-term complications such as neuropathy, glaucoma, heart disease, and kidney failure.

Primary Research

Depth Interviews

Throughout the primary research process, three depth interviews were conducted. The first interview was held with Katherine Wentzell, M.S.N., a pediatric nurse specialist at the Joslin Diabetes Center in Boston, MA. Having worked specifically with children and teenagers with type 1 diabetes for several years, Wentzell was able to offer significant insight into the effects of diabetes burnout as well as how to best motivate diabetics within this age group. When asked how often she sees patients with diabetes burnout, Wentzell replied, "Everyday! It is rare that a patient doesn't experience diabetes burnout because the disease is so exhausting," (personal communication, October 3, 2013). Wentzell believes the best way for patients to manage and prevent diabetes burnout is through positive communication and using technology to reduce the burden of management. New technology such as insulin pumps and **continuous glucose monitors** can reduce burnout by decreasing the amount of times a patient needs to inject a needle or check their blood sugar. Both devices can often make patients more aware of what is going on in their body as well, and therefore reduces the amount of hyperglycemic and hypoglycemic incidences. Wentzell expressed a strong opinion against placing "blame" on anyone when these incidents do occur though. "Diabetes cannot be perfect," she said. This can be a difficult concept for many patients and parents to comprehend, as many people struggle mentally and emotionally with managing something that is often out of their control. For this reason Wentzell suggests many patients work with a mental health team to remain healthy emotionally as well as physically.

After hearing about the initial product design, Wentzell felt that this new product would be beneficial in reducing the rate of diabetes burnout, especially for patients ages 7-12. When

asked what some negative aspects of the game's design could be, she advised against a few concepts that might have an unfavorable psychological impact on users. "The game should refer to blood sugar levels as 'high' blood sugars and 'low' blood sugars, not 'good' or 'bad' blood sugars." When children associate a certain number as being "bad" they often develop ideas that they themselves are bad. By referring to glucose levels as high or low, this emphasizes the fact that they are "just numbers within a range and can be adjusted." She also encouraged against pushing for perfection. "Focus on praise for completing the task like, 'Thanks for checking, great job! It looks like your blood sugar is high, maybe it could be time for a correction.' or 'Great job logging your food today. This must have taken some hard work!' Focus on the task, not the result." On a final note, Wentzell emphasized the burdensome task that logging data can become. The intense repetition of recording blood sugars, insulin dosages, and carbohydrate counts quickly becomes tedious, especially because it is something that should be done for the rest of the patient's life. "Having the game be adaptive and different as you progress through levels will be critical to keeping users engaged," says Wentzell. Emphasizing specific tasks one day and switching it up a different day will be helpful in this, as well as continuously changing goals and rewards.

Wentzell's favorite part about the product's design was the social aspect a chat function would offer users. Many young diabetics don't know anyone else with type 1 diabets, and by putting them in contact with others they might be encouraged to better manage their disease. Throughout the 80's and 90's, several studies were conducted to understand the psychological impact summer camps had on children with chronic diseases, specifically pediatric cancer. These studies found that children who attended camps designed specifically for children with their disease experienced reduced levels of disease-related anxiety, an increased sense of normalcy,

and a more positive perception of themselves and their abilities (Winfree, 2013). These psychological changes are a product of interacting with other adolescents in similar situations, and by offering a social aspect within Dia-BEAT-it, users may experience the same benefits. Wentzell suggested taking the chat function a step further by including communication functions into existing social media sites such as Facebook or Twitter for older users. “However, there needs to be a balance of power,” said Wentzell. “You do not want the competition to become unhealthy.” The chat feature is intended to allow users to challenge each other and share positive communication, rather than encourage them to be a “better diabetic” than someone else. The tone of the game will need to encourage positivity throughout all features.

After speaking with Wentzell, a second depth interview was conducted with Kristen Rice, RN, a diabetes nurse educator at Children’s Hospital in Boston, MA. Kristen offered specific feedback about past diabetes gaming products she has come in contact with throughout her eighteen years of nursing. When asked about games, Rice said, “There have been games in the past, but in the way past. MiniMed had one about an ‘adventuring’ kid and you had to set him up for his day so he could climb a mountain or something. You got points for packing a healthy lunch, bringing your meter, carrying glucose, checking your blood sugar, etc. It was pretty fun but *old.* I’m talking 15-18 years old,” (personal communication, October 9, 2013). As far as more recent games go, Rice said Medtronic now has a “Lenny the Lion” app that teaches patients how to count carbohydrates. To her knowledge though, no product exists that connects users’ actual blood sugars and data with gaming features.

Rice had only positive feedback about the product’s initial design. “I think it’s a really cool idea to do a fun game that gets points. Anything that gets kids engaged and learning is awesome. Even if they only use a game like this during their first year of diagnosis, it sets a

foundation and builds a baseline of knowledge." Rice felt that this game would be easiest to target towards younger users, but depending on the way levels were adapted, teenagers and young adults could utilize it as well. "This game could also be a cool way to give siblings and friends some knowledge too," Rice said. She often sees parents of her younger patients bring siblings to appointments, usually because there is nowhere else for these other kids to go during that time. Siblings often struggle understanding about their brother or sister's disease, and playing a version of Dia-BEAT-it might help them become more involved.

The final depth interview conducted was with a caregiver of a child with type 1 diabetes. Susan is a mother of four whose daughter was diagnosed with diabetes at age 6. Susan was asked several questions about the difficulties of being the primary caregiver for a type 1 diabetic, her and her daughters' experiences with diabetes burnout, and her opinion of the initial product design for Dia-BEAT-it. Susan felt that the biggest challenges of caring for a child with diabetes are making her feel "normal" and encouraging her to check her blood sugar. "My husband and I didn't want her to grow up with the belief that there were certain things she could and could not do. We wanted to protect that normalcy as much as possible. We also wanted to make sure that she didn't feel sorry for herself," (personal communication, October 10, 2013). It was sometimes difficult for Susan to make her daughter feel normal and at the same time encourage her to do all the "abnormal" functions of a healthy type 1 diabetic. "When she was first diagnosed, she hated taking injections. We had to get really creative to encourage her to get used to this everyday necessity. We bought her a stuffed cat and told her the cat had diabetes. My daughter would have to take care of the cat and give him his injection first, and then I would take care of her and give her injection. It seems silly, but it helped a lot."

Both Susan and her daughter have experienced diabetes burnout. While it might seem strange that Susan feels burnout, it is actually very common for the caregivers to feel these effects. Although Susan did not have the disease, as a parent she was performing all the tasks that an adult type 1 diabetic would do themselves. “When my daughter was young and my husband and I handled all her diabetes management, like every six months we would just get so tired of it. When she got older and started venturing away from home more, that burden fell onto her. It takes constant vigilance. There was always that concern she would have a seizure or go into ketoacidosis. That’s an overwhelming thing for a teenager to have to deal with 24 hours a day.”

After having the initial product concept explained to her, Susan thought the game would be extremely beneficial. “I would absolutely purchase that product for my daughter, especially if it would allow her to interface with other diabetics her age.” Susan’s daughter already engages in online apps and loves to play games such as Candy Crush. Susan thought if there could be a game that was just as fun and addicting to play, but helped her be aware of and manage her disease, control would be tighter and burnout less frequent. She felt that the most positive impact of the game would be offering positive feedback or rewards for taking the right management steps. “Even if her blood sugar is high, applauding the fact that she checked would encourage her to check more frequently.” Like many other children with diabetes, Susan’s daughter has struggled with depression and feelings of failure associated with her diabetes management. “Having a game like that would help her visualize success. If you’re playing a game and winning, it makes you feel like you can win at life too.” The only feature of the game Susan was hesitant about was the competitive aspect between users. She was afraid that the concept could backfire and if a friend was beating a player, that player might feel worse about herself and lose

hope that they could succeed. Susan believed that if the competition were based on doing the right things and not on the results (example: checking your blood sugar, not whether your blood sugar is in range or not) would prevent this issue from occurring.

Focus Group

After the depth interviews were complete, a focus group was held to test one of the target markets, young adults with type 1 diabetes. Ten diabetics (four male, six female) between the ages of 21 and 30 participated in this 90 minutes focus group session. The focus group was held in the home of a participant and pizza and soda were provided as an incentive. Questions were asked in two segments, starting with participants' personal experiences as an adolescent with diabetes followed by their opinions and suggestions for Dia-BEAT-it. Although eight of the ten participants said they had experienced diabetes burnout in the past, the group chose to focus more on discussing the long-term complications of diabetes and other psychological impacts of the disease. When asked what motivates or de-motivates them from taking proper care of their disease, one participant mentioned that the fear of blindness and neuropathy was a major concern for her. This participant, age 30, said she has already begun to experience some neuropathy in her fingertips and she is afraid of losing her limbs if her blood sugars remain out of control for an extended number of years. Another participant, age 22, said that she thought long-term complications were not a sincere threat though, and that "doctors just hype it up to convince you to check your blood sugars more often." In a follow up interview question with Katherine Wentzell, Wentzell said most adolescents cannot comprehend the full extent of long term complications as they are still in a mentality of being invincible (personal communication, October 3, 2013). For this reason, long-term complications are often only a motivator for older diabetics.

As far as motivation, a few participants noted that their Continuous Glucose Monitors (CGM) encourage them to check blood sugars more frequently and track progress. The device, which when inserted under the skin tracks trends in blood sugar levels, has a chart that graphs a

patient's blood sugar level throughout the day. Others noted that A1C levels are a motivator because when their number decreases from a previous visit, they feel empowered and like they are on the right track. "Anything that helps me track progress motivates me." one participant said. "I'm very competitive and like to win at everything; sports, school, whatever. If I can see that I'm doing a good job, I'm motivated to continue and if I'm not doing a good job, I like to see that so I can pump myself up to do better." A final motivational factor mentioned was hanging out with other people with diabetes. Several of the focus group participants attended summer camps for children with diabetes and still have friends from these camps. When participants were with their other diabetic friends, they remembered to check blood sugars more often.

When asked what the most difficult part of living with diabetes is, many respondents agreed that the inability to control the disease can be extremely frustrating. "It's not just about correcting things in the moment," one participant said. "You have to constantly be two steps ahead." Another participant noted, "Even if I'm doing everything right, my blood sugar can still go high or low. I'll have a perfect blood sugar in the morning and count all my carbohydrates and take the right insulin dosage at breakfast. Once I start facing the day though, all bets are off. If I have an exam and it's more difficult than I expected, I'll get anxious and my blood sugar will spike. If I grab a coffee and order it with cream and sugar, but they put Splenda in by accident, my blood sugar will go low. There are just so many unforeseeable factors that occur every day and it's impossible to have total control." Other topics of frustration common throughout the focus group were having to explain their disease to others and the common misconceptions people have about type 1 versus **type 2 diabetes**. "If I have one more person ask me if I got this from being fat, I'm going to punch them," one participant declared. Many respondents felt that

the lack of public knowledge about type 1 diabetes increases diabetes burnout levels because they grew tired of constantly explaining the disease, correcting false information, and especially defending themselves whenever they ate anything with sugar in it.

All of the female participants and one male participant mentioned eating-related issues associated with their diabetes. “Since I was diagnosed at age 7, I have always had to count every single carbohydrate I consume,” one participant said. This is an overwhelming focus on food and can cause a negative psychological impact for many children. Another participant mentioned how before she was on an insulin pump, she needed to eat a specific amount of food at a specific time every day. “I couldn’t just eat when I was hungry and not eat if I wasn’t. Food wasn’t associated with hunger for me, so I have a hard time associating it that way now.” A few of the female participants also mentioned the difficulties of dieting as a type 1 diabetic. Low-carb diets tend to be out of the question because if hypoglycemia occurs, the diabetic must eat sugar which contains carbohydrates. “It got to the point where I would stop treating my low blood sugars because I didn’t want to mess up my diet for the day. I was in high school and my dad made me go see a therapist and a nutritionist. I wasn’t being healthy, but I was just so frustrated.” On the flipside, one of the male participants confessed that he sometimes used low blood sugars to eat more. “I was kind of a skinny kid, and I wanted to bulk up. When your blood sugar goes low, you get the munchies. I’d purposefully take too much insulin so I would go low and want to eat more.”

After discussing some other personal accounts and frustrations related to diabetes, the focus group topics turned to Dia-BEAT-it’s design and functions. All participants felt that the product concept was a great idea and that they would purchase it. They reflected positively on the chat function, thinking this would be a great idea to help younger children interact with more

kids like them. Another favorite feature of the game was the "inadvertent accountability" it created. "The kids are taking care of themselves and getting positive feedback, but it wouldn't feel as much like work. If managing diabetes can be fun, kids are going to be so much healthier!" Participants also felt that it was very important for users to be rewarded for taking the right steps, and not for their actual blood sugars. "Things will sometimes be all over the place. It's not all about the number. You shouldn't be penalized for something you can't change." The group felt that positive progress based off an average of numbers could be rewarded though, such as lowering one's A1C. Because the A1C is a three month average of blood sugars, in most cases it should be improved if blood sugars are tested more often.

The focus group was very excited about the product and had strong opinions about features that should or should not be offered. The first was that the blood sugars should not be inputted manually into the game, but that a Bluetooth-type technology should exist so the numbers automatically transfer from meter to game. "If I was a kid playing this game, I would totally lie about my how often I checked my blood sugar to look better and win more points. That's not helpful. It's too tempting to let the kids enter the numbers themselves, the game needs to do it automatically." Other participants agreed that this would be a necessary feature and would also make users more likely to play since it meant less work on their part and would not make the game feel as much like a logbook.

As far as the actual game portion of the product, participants discussed some games they enjoyed in the past and agreed upon a design they liked best. Several participants had played a game as a child called "Packy and Marlon." The game was produced by Nintendo and focused on the life of a diabetic elephant. Players had to take the elephant through different levels such as a park, underwater, or a haunted house ("Packy & Marlon," n.d.). The elephant would run

through the levels and different tokens would appear, such as food or insulin. A blood sugar meter was located on the side of the screen showing the elephant's blood sugar and based upon the number, players had to make decisions about which tokens to collect. For example, if the elephant's blood sugar was high, players would want to collect insulin and not food. After each level there would be diabetes-related trivia questions which players could earn points for if they answered correctly ("Packy & Marlon," n.d.). Each participant who had played the game had thoroughly enjoyed it as a child and thought it would still be a relevant design for today's gamers. A two-player function was also available for "Packy and Marlon" and participants felt this might be a good feature to include so you could play online against a friend.

While focus group participants agreed that the best target market to direct the product at would be middle-schoolers, they said that they would also purchase the game if features were adjusted for their age group. "As a 25-year-old, I wouldn't care as much about the game part but would want to track my progress and still be able to compete against friends. Our generation loves statistics and competition, just look at fantasy football! If I was competing against a different diabetic friend every week, I'd be much more motivated to take care of myself."

As a final peek into the psychological association type 1 diabetics have with their disease, a word association and drawing projective technique were conducted during the focus group. See appendix C for these results.

Survey

After launching the Dia-BEAT-it survey, participants were recruited through social media and e-mail. Over 60 potential respondents were contacted based off an American Diabetes Association e-mail mailing list, members of a diabetes-awareness Facebook group, and some personal connections of the researcher. The criteria for taking the survey was that the respondent must be between the age of 12-30, have type 1 diabetes, and give consent that their responses could be recorded in this document. Twenty-eight valid participants' answers were recorded and analyzed to gain a deeper understanding of the target market and their opinion on different game features.

Of these 28 participants, 80% actively engaged in app-based games through an iPhone, Android, Kindle, or tablet. When asked which games were the most enjoyable based on a scale of 1-5 (with 5 being the most enjoyable and 1 being the least enjoyable), Candy Crush was most popular with a mean score of 4.75. Following Candy Crush were Temple Run, with a mean of 4.38, and Fruit Ninja, with a score of 4.13. When asked about any other apps participants favored, several respondents said they played Tiny Tower as well as Minecraft and Subway Surfer.

Participants were then asked if they had ever played a game related to diabetes care, 79% responded that they had. Twenty-one had played a diabetes-related game at a summer camp or support group and seven had played a computer game. When asked what they liked most about these diabetes games, several common responses were, "playing it with friends," "learning new facts about diabetes," "playing against other people," and "relating to other people with diabetes." When asked what they liked least about the games the most common responses were

that the game asked questions that were too easy or “dumb” like, “Can diabetics eat sugar?” and that some games gave too much educational information and were more of a quiz than a game.

After a brief explanation of the initial product design was given to survey participants, 63% said they were either likely or very likely to purchase the game. Six participants responded that they were unsure if they would purchase the game and only four said they were unlikely to purchase it. Of those respondents that said they were unlikely to play, three were high school age and one was an undergraduate college student. 100% of middle school and elementary school respondents said they would play the game (see Cross Tabulation A). Gender appeared to have an impact on respondents’ likeliness to purchase the game also, with three of the four “unlikely” respondents being male. Twice as many females than males responded that they would be “very likely” to play as opposed to only “likely” to play (Cross Tabulation B). When asked about specific game features, all participants “liked” or were “unsure” about the chat feature (Cross Tabulation C) and all but one respondent “liked” or was “unsure” about the competition function and ability to play against other users (Cross Tabulation D).

When asked what the most difficult part of diabetes care was, most participants listed checking their blood sugar. Other difficult tasks appeared to be “determining the correct insulin dosage” and “changing/rotating insulin pump sites often.” The least difficult parts of diabetes care were “treating low blood sugars” and “telling others about [their] disease.” Although only 59% of respondents were aware of the term “diabetes burnout,” after learning its definition, 75% reported that they had experienced it in the past.

Towards the end of the survey, respondents were invited to give feedback about features that would make the game more enjoyable and overall comments about the product. Some of the most interesting suggestions were, “take features from other ‘addictive’ games and put them in

this one," "be able to customize your character and their medical supplies," "add more rewards," "[have] a customizable avatar that gets visually healthier as you gain points," and "get points for going to diabetes camps." Other comments included, "the fact that it would be a competition is an amazing idea that would help me and a lot of my friends," "make different levels for the game, like intermediate and expert," and "this game is going to rock!" The overall consensus that can be drawn from this survey is that middle school and many high school adolescents felt positive about the game and the features they mentioned should be highly considered when creating the final product design.

Final Product Design

After analyzing all secondary and primary research, a final product design has been created for Dia-Beat-it. Rather than have it function as a computer or video game, Dia-BEAT-it will be formatted as an app for smartphones and tablets. The game would be targeted to boys and girls with type 1 diabetes ages 12-18 (middle school and high school aged). The actual "game" portion of Dia-BEAT-it would be an endless-running style where users guide their own personal avatar through different adventure levels. The avatar can be edited to look like the player, with options to change hair color, eye color, face shape, skin tone, and clothing. Users can even decide whether their character uses an insulin pump or injections. As the avatar runs through each level, tokens will appear that the user needs to collect, such as insulin, juice boxes, **glucagon**, and blood glucose strips as well as syringes and **infusion sets** depending on the avatar's insulin administration method. As well as these desirable tokens, ketone tokens will appear which the user needs to avoid by speeding around them or jumping over them. If the player gets hit by three ketones, the round is over. A token score is achieved based on the value of tokens collected. This score adds up overtime for a net token value which can be used to purchase upgraded features. Tokens can be used to buy an upgraded pump, fashionable medic alert, faster running shoes, different supply bags, or a number of other accessories and diabetes equipment.

In order to move to the next level, management points must be acquired. These are earned by checking blood sugars, using sensitivity factors and carbohydrate ratios to determine insulin dosages, changing tubing, rotating injection sites, and lowering A1C levels. To decrease the burden of inputting data, a blood glucose monitor will be available for purchase which uses Bluetooth capability to transfer blood sugar readings to the Dia-BEAT-it app. Every time a blood

sugar transfers into the app, management points are added to the user's points' bank. When users first set up Dia-BEAT-it, they will be asked to enter their target blood glucose range and their insulin-to-carb ratios as well as sensitivity factors. Because this data is in the app, Dia-BEAT-it can prompt the user by saying "this blood sugar is above your target range," "this blood sugar is below your target range," or "this blood sugar is within your target range." After each of these prompts a motivational message will appear such as, "great job!" or "thanks for checking!" No extra points will be earned for having a blood sugar in range and no part of the app will ever refer to a blood glucose reading as "good" or "bad" but only as "above" or "below" range. All blood sugars will be automatically logged on a separate "log" screen within the app. The log will provide feedback as well as graphs and charts to show daily trends. As a blood glucose reminder, the game will not be available for play until at least one blood glucose reading has been transferred to the app that day.

On the management points' bank home screen, options will also be available to input other data. Depending on whether the user is set up on the app as using an insulin pump or injections, options will be available for "insulin," "set change," and "check up." They will then be prompted to use their insulin ratios or to choose an injection or infusion set location. Each of these data entries will earn the user management points. Based on the blood sugar levels that are transmitted to the app, an average will be calculated for each week. If the week's average moves closer to the user's target goal, management points will be earned. Once a certain number of management points are accumulated, the user can use these points to upgrade tokens, making them worth more points, or advance to the next level. Levels will be laid out as different fun places such as a carnival, the beach, the Jurassic period, New York City, etc. As the levels progress, the layout of the course becomes more challenging.

The final function of management points will be to earn coupon prizes. Different point goals will be shown such as 1,000, 5,000, 10,000, etc. and once this goal is achieved the player will earn a coupon. These coupons will be for kid-friendly diabetes-related items such as insulin pump skins, meter cases, or medic alert jewelry, and will have values such as 50% off. Larger-scale rewards can also be worked towards at the users' choosing, such as scholarships to a specific diabetes camp or a meet and greet with a type 1 diabetic idol such as singer/songwriter Nick Jonas or Chicago Bears' quarterback Jay Cutler. Affiliation and collaboration with these companies, organizations, and celebrities in order to make these prizes possible will be discussed in the Promotional Strategy section of this document.

Users will be able to compete against other players with the Dia-BEAT-it app. If the user knows other friends with the app, they can search for them by username or if they do not know any other adolescents with type 1 diabetes they can select a random opponent. Once users are "competing" they can view the other users' progress based on how many tokens and management points they have earned. Players will be ranked on a leader board with their competitors and can work to move up to a higher position. Because tokens and points are only earned by playing the game and completing healthy diabetes management tasks, competition will not be based in any way off users' actual glucose readings.

Along with the competition option, a chat function can be enabled. This works like Facebook's Messenger app where users can communicate with their friends in a chat-style mode. Users can communicate with a single player or have larger group messages with multiple people. For users who do not know anyone else with type 1 diabetes, Dia-BEAT-it will offer various groups based on current age, diagnosis age, location (by state or region), gender, or interests. Users can choose to join one of these group chats to meet other players and find new

competitors. The chat function can be disabled by parents or caregivers who do not wish for their children to communicate electronically.

As a final feature of Dia-BEAT-it, a partner app will be available for parents and caregivers. This app, called “Dia-BEAT-it: Caregiver” will allow parents or guardians to monitor their child’s diabetes. This app can have various degrees of surveillance depending on the age and independence of the Dia-BEAT-it user. The two apps can be linked so that all blood glucose readings are transmitted to the parent app, so only the number of glucose checks are transferred to the parent app, or so that data is only transferred to the parent app when the user sends it over to the parent app. The Caregiver app will also have the ability to turn off the chat function and to send their own positive feedback messages to their child.

Current Marketing Situation

Due to the rise in smartphone and tablet sales throughout the past decade, experts predict that "in 2017, over 160 billion apps will be downloaded globally onto consumer handsets and tablets," (Jacques, 2013). Of these 160 billion apps, at least 40 percent are predicted to be from the games category. With a current download rate of 80 billion in 2013, this trend demonstrates the continued growth pattern of gaming apps. Another large category of app downloads are health related apps that track and monitor good health. In 2012, mobile health apps for Apple and Android operating systems "generated some $718 million in revenue, up from an estimated $100 million in 2010, according to the National Venture Capitalist Association," (Bradley, 2013).

Along with growth rates for gaming and medical app sales, the number of adolescents being diagnosed with type 1 diabetes is increasing each year. Over 15,000 children are diagnosed with type 1 diabetes in the United States each year, approximately 80 children per day (JDRF, n.d.). Between 2001 and 2009 the prevalence of type 1 diabetes in Americans under the age of 20 rose by 23% and the rate of diagnoses among children under the age of five is predicted to double by the year 2020 (Payne, 2010). With a steadily growing market demand, as well as an expanding target market size, the current marketing situation offers a perfect opportunity to launch an app like Dia-BEAT-it.

As previously mentioned, several products currently exist that fulfill either the gaming function or blood glucose logging function of Dia-BEAT-it. Currently, no products exist on the market that links the gaming to actual blood glucose readings and diabetes management. Dia-BEAT-it's major competitors will be existing logbook apps such as Glucose Buddy and Diabetes Companion, but none of these incorporate a gaming or competition function into their programs.

Because of this, Dia-BEAT-it is unique in a way that will be extremely beneficial when entering the market.

The key to success within the current market will be to successfully target the correct market and position the product as a fun, cool game for kids, as well as a safe and beneficial product from the parents' perspective. In order to do this, Dia-BEAT-it should be sold under an existing medical company brand, such as Lilly, Novo-Nordisk, OneTouch, or Medtronic. Choosing the correct organization to collaborate with and developing an action plan to prove the branding benefits to this company will be discussed in the Distribution Plan section of this document.

Threats and Opportunities Analysis

Threats

One threat to the demographic environment is that not all consumers within Dia-BEAT-it's target market own smartphones or tablets. These products are expensive and easily damaged, making many parents hesitant to purchase them for younger children. Smartphones and tablets also have access to the internet, which some parents are not comfortable allowing their children to use in an uncensored way. Because the majority of middle school and many high school students to not generate enough income to purchase these products on their own, marketing efforts towards them are only effective if parents are also marketed to in a way that encourages them to purchase the product.

Because of the difficult economic environment since the 2008 financial crisis, many consumers have less expendable income. This poses a threat to the economic environment because consumers may hold off on purchasing smartphones or tablets for younger children. Without access to one of these products, a platform does not exist on which the child can play Dia-BEAT-it.

There are no major physical/natural environmental threats for Dia-BEAT-it because it has no physical product. No materials will need to be stored and it will not generate any hazardous waste. The meter which links to the app does require a battery, which may pose a small threat to the environment when being disposed of.

New technology often takes time to be adopted into society and any product that utilizes a new technical feature can be risky. Because Dia-BEAT-it is the first product to use gaming technology to increase blood glucose and diabetes management logging, consumers may be hesitant about its benefits. Another technical threat is the possibility of "bugs" or mistakes within

the initial system. Often the first version of a game can have some unforeseen glitches which may post a threat to the game's quality.

A threat to the product's legal environment is possible if the product is not patented. Other companies could copy the product's design and technology to create their own product. Another legal threat could occur if the chat function is exploited in a way that encourages bullying or sexual predators. Like any other online chat system, communication is "faceless" allowing bullies to act more aggressively and people to pretend to be someone who they are not when communicating.

A threat to the socio-cultural environment is the negative connotation many children associate with type 1 diabetes. Because middle school and high school aged children are very concerned about fitting in with their peers, having a disease which makes them "different" can be very difficult. For this reason, consumers may not want to play a game focused on their differences. Many diabetics in this age group also dislike logging blood sugars and performing diabetes management tasks due to diabetes burnout. While the goal of the game is to minimize effort required in logging and provide a fun, engaging experience, the pre-conceived bias against diabetes management may deter consumers from wanting to play Dia-BEAT-it.

Opportunities

One opportunity within the demographic environment is the increasing number of middle school and high school aged consumers who own smartphones and tablets. Although many parents are still hesitant about purchasing such products for younger children, the number of smartphone consumers within this age group has still increased by 400% since 2007 due to the popularity of new technologies (Noonoo, 2012). A mobile learning report published by

Blackboard and Project Tomorrow in 2012 announced that 50% of high school student and 40% of middle school students now have access to smartphones or tablets (Noonoo, 2012). Even if a child does not own their own smartphone or tablet, it is likely that their parents might and they would still be able to play the game on their caretaker's device.

The economic opportunity for Dia-BEAT-it is the lack of cost to consumers to download the app. The app will be a offered as a free product, funded by advertising, or as a "Plus" version sold at $5.99 which eliminates all ads. For consumers who are used to purchasing exorbitantly expensive health care products to manage their disease, six dollars is not likely to deter them from purchasing the game. The coupon prizes will also offer an economic advantage to consumers, allowing another opportunity for a positive economic environment.

A physical/natural environment opportunity exists for Dia-BEAT-it because it makes blood sugar logging paperless. Before online glucose logs were created, blood sugars were tracked in small paper notebooks that could then be shown to doctors when adjusting insulin dosages and pump settings. Logging blood sugars on a phone or tablet decreases the amount of paper that is used by diabetic consumers.

An opportunity within the technological environment is the increase in demand for new, innovative technologies within the diabetes management product market. The Bluetooth technology's automatic upload function is a huge opportunity because it decreases the manual work users need to perform and simplifies diabetes management. Glucose meters already exist that automatically send readings over to insulin pumps, so this technology is possible and just needs to be implemented in a new context. A final technological opportunity is the increasing number of app downloads and smartphone/tablet purchases each year.

An opportunity for the legal environment is to patent Dia-BEAT-it so its intellectual property cannot be exploited. Another opportunity is to provide information about safe online communication. All chat systems, such as Facebook Messenger, Google Chat, or AIM have some risk due to their anonymous nature, but many middle school and high school still use them to speak with friends and choose not to engage in conversation with those they do not know. If parents are uncomfortable with this setting, the chat function can also be disabled via the Caregiver app.

A socio-cultural opportunity is the positive impact Dia-BEAT-it can have on decreasing diabetes burnout and increasing feelings of normalcy among type 1 diabetics. Because glucose readings transfer automatically, the effort required in logging numbers decreases. Earning points for managing one's diabetes also decreases burnout because it rewards the user and shows an immediate positive outcome. Dia-BEAT-it has the opportunity to improve users self-esteem and feelings of normalcy because they are communicating with and competing with other adolescents just like them.

Segmentation Strategy

Dia-BEAT-it will implement a concentrated marketing strategy when reaching out to consumers, targeting one specific market segment. The target market was selected based off both psychographic and demographic segmentation. Deciding the psychographic segment to target was simplest because the product is clearly designed for people living with type 1 diabetes. Type 1 diabetes affects every aspect of a patient's lifestyle and for this reason it is a huge defining trait when categorizing markets psychographically. Based off feedback received in the interviews, focus group, and surveys, demographic categories were put in place to choose the most effective target market. After analyzing all data, Dia-BEAT-it will be targeted towards both male and female users ages 12-18 with an education level equivalent to middle school or high school. Therefore, Dia-BEAT-it's exact target market based off these segmentation strategies is "girls and boys ages 12-18 living with type 1 diabetes."

The size of Dia-BEAT-it's target market is surprisingly quite large. Recent data shows that approximately 450,000 children in America are living with type 1 diabetes and each year 15,000 more adolescents are diagnosed (JDRF, n.d.). Scientific projections show that the number of people within this market is also likely to continuing growing over time. Predictions cannot be exact because doctors do not know the actual cause of the disease, but because it is based on both environmental and virus-based triggers as well as genetic factors, research shows with certainty that diagnoses will increase. Environmental issues and viruses mutations become increasingly more serious over the years and the greater number of young adults with type 1 diabetes increases the risk of passing the disease on to their children. Statistics prove the likelihood of a child developing type 1 diabetes if the father has the disease is 1 in 10 (or 10%) while the mother having diabetes has a slightly lower risk with a 1 in 25 possibility that the child will develop the

disease (or 4%). If either parent was diagnosed with diabetes before age 11, the child's risk doubles (Joslin Diabetes Center, n.d.). The genetic portion of type 1 diabetes leads to a prediction that the number of children and adolescents diagnosed with the disease will continue to rise each year.

Sales Forecast

Because Dia-BEAT-it is the first product of its kind, sales forecasts may not be as accurate as other games or apps. An estimate of sales can still be calculated though, based off sales data and projections of other diabetes logbook apps. Glucose Buddy, one of the most popular online logbooks, has totaled nearly 500,000 downloads via Android devices ("Glucose Buddy: Diabetes Log," n.d.). Although Apple does not release download statistics, due to the heavy volume of Apple users one can assume that a similar number of app downloads have been installed on iPhones and iPads. The mySugr Diabetes Companian app has also seen an increased number of downloads with estimates reaching 150,000 downloads nationwide ("Diabetes Companion by mySugr," n.d.). Diabetes Companion is less than two years old, having been launched in early 2012, so these download statistics show a healthy adoption rate by new customers.

Based off this data, a sales projection for years 1-3 can be estimated as follows:

Quarter 1: 5,000 downloads

Quarter 2: 10,000 downloads

Quarter 3: 25,000 downloads

Quarter 4: 40,000 downloads

Year 2: 150,000 downloads

Year 3: 400,000 downloads

Because apps like Glucose Buddy and Diabetes Companion are target to diabetics of all age and to both type 1 and type 2 diabetics, sales for Dia-BEAT-it are expected to be lower. Another factor that affects sales data is that Dia-BEAT-it is not only a logbook, but also incorporates a gaming element which no other log utilizes. Because of this, units downloaded are

projected to be significant. While the adoption rate may be slow in quarters 1 and 2, just like with any other new product, once patients and doctors become more aware of the product, sales are expected to skyrocket.

As discussed in the following Marketing Plan section of this document, Dia-BEAT-it will not only be marketed to our target group, but also to pediatric **endocrinologists** and **diabetes nurse educators** who are recommending products to adolescents and their families. Once several patients at a practice begin playing the game, these institutions will be encouraged to set up their own chat rooms and competitions for their patients specifically, and in doing so will encourage other patients to download the game, quickly growing sales volumes.

Sales for Dia-BEAT-it are also projected to be significant even though the target market is smaller because it is available not only for smartphones, but also for tablets. Several of the current logbook products, such as Diabetes Companion, are only available on smartphone and not on other electronic devices (“mySugr GmbH,” n.d.). For middle-school aged consumers, they may be more likely to own a tablet than a smartphone, so they will have better access to this app than other logbooks.

Once consumers become aware of the product, downloads are predicted to rise significantly. By the end of year 1, sales are expected to reach 80,000 downloads and by year three a goal of 400,000 downloads is likely to be achieved.

Marketing Plan

Augmented Product Concept

The brand name "Dia-BEAT-it" is a core aspect of the overall product. When pronouncing the word "diabetes," the emphatic inflection is placed upon the syllable, "di-" which can sound very frightening to a young child or adolescent. Dia-BEAT-it's brand name utilizes the word diabetes but takes the emphasis off the "die-"ing aspect and places it on the syllable "-beat-" creating a psychological association with one's ability to "beat" or overcome the frustrations and negative long-term effects of the disease. The brand name also incorporates the gaming association of the word "beat," alluding to the fact that players will compete while playing the app's game.

The physical products involved in a Dia-BEAT-it purchases are the "Dia-BEAT-it" app, the "Caregiver" app, and the Dia-BEAT-it linked blood glucose monitor. Consumers can either choose to purchase the free version of Dia-BEAT-it which is funded through advertisements, or can upgrade to a "Plus" version of the app that eliminates all advertising. The Caregiver app is only offered as a free download and links directly to the "Dia-BEAT-it" app by entering the player's username and password. When the user first downloads either the regular or "Plus" version of Dia-BEAT-it, they will receive an electronic coupon for a free Dia-BEAT-it glucose monitor, manufactured by OneTouch. The user or their parents can pick up the meter from any pharmacy that sells diabetes products such as CVS Pharmacy, Rite Aid, or Walgreens. This meter will use the same glucose strips as all other OneTouch meters and will automatically transfer glucose readings from the meter to the app.

While many different meter manufacturers exist, OneTouch was selected as a partner company because their meters were rated one of the most "excellent and accurate" by Consumer

Reports Magazine in 2012 (Mendosa, 2012). OneTouch already produces a number of kid-friendly meters which come in fun colors such as pink, green, and blue. OneTouch was also selected as a partner company because they already utilizes blood glucose reading technology in their meters through their OneTouch UltraLink meter which sends numbers to a user's MiniMed insulin pump ("OneTouch UltraLink," n.d.). The OneTouch meter that will link to the Dia-BEAT-it app will be called the "OneTouch DiaBeatIt" and will come in a variety of colors. The meter will use the same strips as all other OneTouch meters. These strips are covered by a majority of health insurance companies and are a preferred brand ("Learn About Coverage for OneTouch Test Strips," n.d.). The meter will have a four-year warranty which allows users to receive a new, free meter if their product is damaged or malfunctions.

Distribution Plan

Dia-BEAT-it will be distributed through the iPhone and iPad App Stores, the Google Play Android App Store, and the Amazon Kindle's App Store. Both the "Dia-BEAT-it" app and "Caregiver" app can be easily downloaded either in the free or "Plus" version within these online stores. The OneTouch DiaBeatIt meter will be distributed by the following major retail pharmacies: Walgreens, CVS, Rite Aid, Walmart, and Kroger. This meter can be purchased over the counter, although the OneTouch strips associated with the meter must be purchased with a prescription, just like any other blood glucose strip. The OneTouch strips are also distributed by all major pharmacies in the United States. Based on the projected sales forecast, the number of OneTouch DiaBeatIt meters placed in each pharmacy will be calculated, though pharmacies can request more if they believe demand will be higher for their store.

Pricing Strategy

As previously mentioned, the "Dia-BEAT-it" app will be available as either a free download or in a "Plus" version which will have a one-time purchase cost of $5.99. Like many other gaming apps, Dia-BEAT-it has the ability to earn profits even as a free download because it can gain revenues through advertising that will be placed between each round of game play. Based on current advertising cost trends, a single ad would average between $15,000-$50,000/month depending on the frequency that the ad will appear on user's mobile devices (Marshall, 2013). Users will also be able to get a free OneTouch DiaBeatIt meter by scanning their digital coupon at the time of purchase. OneTouch often gives away free meters to encourage new users to buy their products. Because glucose strips are expensive, must constantly be purchased, and are necessary in using a glucose meter, the cost of these free meters is absorbed through revenues generated by strip purchases.

Promotional Strategy

When promoting Dia-BEAT-it, the app will be marketed to four specific groups: type 1 diabetes professionals, caregivers of adolescents with diabetes, nongovernmental organizations and summer camps associated with type 1 diabetes, and to the actual user. The majority of marketing will be geared towards diabetes professionals such as endocrinologists and diabetes nurse educators. These professionals play a vital role in helping diabetic consumers make purchasing decisions because they are viewed as being the most informed about new products and most aware of their affects on diabetes. Patients and family members often ask these doctors and nurses for advice when making purchasing decisions or simply use whichever product is recommended to them. In order to inform these doctors and nurses about Dia-BEAT-it and its

beneficial qualities, representatives from both Dia-BEAT-it and OneTouch will visit hospitals and practices that specialize in diabetes treatment, just like a pharmaceutical company would send representatives to market a new drug. Representatives will demonstrate how the game is used and show data that demonstrates the positive impact the game can have on adolescents. These locations will be given free samples of the OneTouch DiaBeatIt meter as well as business-card sized promotional documents that include information on how to download the app. Because patients and caregivers often spend a good amount of time waiting for appointments, posters will be hung in waiting rooms and inside examining rooms advertising the app and telling patients to, "ask their doctor about the game and how to get a free OneTouch DiaBeatIt meter." Finally, hospitals and doctor's offices will be asked to include a press release or advertisement about the product on their websites, in e-newsletters, or in print publications.

Marketing directly to caregivers of adolescents with type 1 diabetes is another critical aspect of Dia-BEAT-it's promotional plan because they are often the one picking out and purchasing diabetes care products. Many of these caregivers stay engaged about new products by following diabetes-related blogs and subscribing to diabetes care magazines. Advertising space will be purchased in these magazines and on blogs that generate enough income to choose their own advertisers. For smaller, but still popular blogs, authors will be asked to try the products and give a review on their site explaining what, if any, benefits they felt it offered as well as what aspects they think make it a great product for younger consumers. Although there is some risk in asking bloggers to write an uncensored review of a product, Dia-BEAT-it is a high quality product that is likely to generate more positive reviews than negative. Because many consumers trust other consumers more than they trust in the advertising of a company promoting their own

product, these positive reviews are likely to have a great impact on caregivers' opinion of the app and likelihood to download it for their child.

Dia-BEAT-it will also be marketed to NGO's and organizations that promote diabetes research or work closely with type 1 diabetics in an attempt to partner with them in advertising the product. Both major diabetes research and awareness organizations in the United States (the Juvenile Diabetes Research Foundation and the American Diabetes Association) hold hundreds of fundraising events throughout the country such as walks, bike races, and fun runs. After speaking with executives from these non-profit organizations and explaining the app and its positive qualities, they will be asked to partner with Dia-BEAT-it and help promote the game. This promotion will occur during these fundraising events by including a Dia-BEAT-it logo on the back of promotional t-shirts and having representatives work tables or booths at the events where they can give out promotional materials and speak directly with consumers and caregivers about the app. Both organizations will also be asked to promote the app on their websites with a short press release or advertisement.

As well as diabetes awareness groups, Dia-BEAT-it will market to diabetes camps such as ADA Camp Carefree in Wolfeboro, NH and Camp Joslin in North Oxford, MA. Many of these camps allow companies that sell diabetes-related products such as glucose monitors and insulin pumps to set up tables on opening-day so campers and parents can learn about new products as they're waiting to check into camp. Along with an opening day table, a number of these camps accept free products from diabetes companies to give out to campers as they're leaving camp at the end of the session. The OneTouch DiaBeatIt can be given out to campers as they leave camp along with the promotional business cards or flyers that contain information and download instructions for the Dia-BEAT-it app. In an extra effort to make the product more

appealing to camps, Dia-BEAT-it will work with camp directors and staff to set up camp communities on the game so campers can continue to communicate with friends they make throughout the sessionvia the chat and competition functions of the game. Each camp can set up their own chat room or camp-specific leader board. As the app becomes more popular, several camps will be approached about offering scholarship money as a prize for Dia-BEAT-it players. By advertising their camp as a prize, the organization will gain free advertising and because many of these camps already provide scholarships to campers who fill out applications or write essays, they would not need to put any additional money into funding this prize.

Finally, Dia-BEAT-it will market directly to the target market through social media and coupons located within OneTouch supply packages. Many middle school and high school aged adolescents use social media platforms such as Facebook and Twitter. Along with creating a Dia-BEAT-it Facebook page and user "group," pre-existing diabetes-related groups will be utilized to promote the game. Many of these groups exist on Facebook in which anyone can openly post comments or questions. Dia-BEAT-it will post information about the game with promotional images and ads to drive Facebook users to their page. On this page, a link will exist to download the app to one's device and users who "like" the Dia-BEAT-it page will receive an electronic coupon for a free OneTouch DiaBeatIt glucose meter. Through the Facbeook page, users will also be encouraged to visit and follow Diab-BEAT-it's Twitter account. In order to gain followers, both sites will advertise that Twitter will be the first place that information about new prizes will be released. The sooner a user knows about a prize, the earlier they can begin working to earn coins so Twitter users will have motivation to follow the product's handle.

In order for users to be excited about the prizes Dia-BEAT-it will offer, the rewards need to be up-to-date on current trends and celebrities. As previously mentioned, several type 1

diabetic “idols” will be approached such as Nick Jonas and Jay Cutler. Dia-BEAT-it will work with these celebrities’ public relations teams to establish terms of a meet-and-greet along with a free concert or game ticket depending on the celebrity in question. Once an agreement has been made, the celebrity will be asked to be filmed for a short promotional video clip which can be featured on the Dia-BEAT-it app to encourage users to work towards the prize, and posted to social media sites to pull in new users. Only five players will win each of these celebrity prizes and they will be selected based on who reaches the management points goal fastest once the prize challenge has been accepted.

Finally, the target market will be directly advertised to by placing promotional cards inside OneTouch glucose strip packages. Type 1 diabetics typically buy 3-5 boxes of these test strips a month, offering a perfect opportunity to reach potential customers directly. Small print ads will be placed in each box giving a link to download the app and a coupon to get a free OneTouch DiaBeatIt glucose meter. Both adolescents and their caregivers will be marketed to in this way and this method will reinforce the fact that users are getting the meter from a company they already trust and can continue to use the same test strips they already buy.

Launch Plan

Diab-BEAT-it will be launched at the 2014 Diabetes Innovation Convention. This annual event sponsored by the Joslin Diabetes Center will be held from October 15 – October 18, 2014 in Washington D.C. and will draw in, "all stakeholders in diabetes care to take action towards cost effective solutions that work in policy, delivery, research, technology, and adherence ("Diabetes Innovation 2014," n.d.) from around the globe. The 2013 conference hosted many prominent speakers such as President of the American Diabetes Assoication John E. Anderson, MD, Senior Director of Novo-Nordisk Christopher Porter, Chief Medical Officer of Walgreens Harry Leider, MD, and National Medical Director of Aetna Insurance Richard A. Feifer, MD ("Diabetes Innovation 2013," n.d.).

A member of OneTouch's top executive team will unveil the product at this event alongside a Dia-BEAT-it representative. Advertising for the app will appear on several documents given out at the three-day event, such as schedules and building maps. Giveaways such as pens and mugs will be handed out to those who attend the event to keep the product fresh in their mind even after they return home. Once the product is unveiled, Dia-BEAT-it will begin speaking with reporters and medical professionals about the product and begin utilizing the promotional strategy.

Moving Forward

Once Dia-BEAT-it sales begin to grow, the company may choose to expand into different target markets both demographically and psychographically. An adapted version of the app will be created for older target markets such as ages 19-30 or 31-50. Dia-BEAT-it may then begin considering the creation of similar apps to target users with other chronic illnesses such as type 2 diabetes or various forms of cancer. The possibilities for Dia-BEAT-it's future as a gaming and medical app company are endless and the product's impact on its users is likely to one of great motivation and success.

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