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### Using Persuasive Technology to Curb Alcohol Consumption on College Campuses

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# **Using Persuasive Technology to Curb Alcohol Consumption on College Campuses**

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Class of 2018

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It's New Year's Day and you've finally made up your mind that this is the year you are going to begin leading a more active lifestyle. Your motivation to exercise is low, but you're tired of being overweight and unhealthy. To reward yourself for your decision to change your lifestyle, you decide to go shopping. You buy some new workout apparel, running shoes, and an electronic bracelet called a Fitbit. A couple months later, taking steps toward fitness has proven difficult, but you are starting to notice positive results and your Fitbit has held you accountable in many weak moments. On Saturday afternoons after a long week of work, there's been several times where you wanted to spend your day watching Netflix, but your Fitbit's preset reminders to move made your bracelet vibrate until you got off the couch. When out to eat, there have been several occasions where you opted for the low-calorie salad instead of a greasy cheeseburger because the Fitbit app's calorie tracking function has made you aware of your caloric intake and expenditure. At work, you no longer need an afternoon coffee because your Fitbit's sleep tracking function has helped you develop a consistent, healthy sleep schedule. Since beginning your New Year's resolution, your quality of life has improved greatly, and your Fitbit has been a major catalyst in your lifestyle change.

Tired of spending so much money at the pump, you trade in your SUV for a new hybrid vehicle. Your new car is certain to outperform your SUV in terms of fuel performance, but you aren't getting the gas mileage the salesperson said you would be able to achieve when you bought the car. You notice that on your dashboard is the digital image of a withered plant. Upon looking in your owner's manual, you see that the withered plant is a visual representation of your car's fuel performance, and that you can help the plant bloom and grow by making your driving manner more fuel efficient. Having a visual representation of how your driving habits

affect your fuel economy, and not wanting to see the image of the wilted plant on your dashboard, you begin to drive more efficiently, and you save more money in fuel costs.

You're a senior Honor Scholar at DePauw University. You've put off writing your thesis for way too long, and now a deadline is coming up. Unfortunately, every time you try to sit down and write, you end up getting sidetracked and wasting hours looking through Facebook, reading articles from ESPN, and filling out crossword puzzles. Knowing that you desperately need to get some work done, you search for anti-procrastination tools online. You quickly find an app called StayFocusd that can be added as an extension to your browser. After you provide StayFocusd a list of all the websites that you waste time on, it automatically closes your tab if it detects that you've been on one of those websites for more than ten minutes. Finally, free from the endless distractions of the internet, you're able to complete your Honor Scholar thesis without having to spend your last semester of college locked in the library for days at a time.

In the scenarios described above, a person's behavior was influenced by a piece of technology, and because of this influence, their lives were impacted for the better. As computers become increasingly engrained in our everyday lives, we will find ourselves being influenced by them with much greater frequency. When computers are employed to affect our behavior, they become an example of persuasive technology. A persuasive technology can be as subtle as a vibration on your wrist to get you off the couch, or as blatant as closing your browser tabs when you procrastinate, but it always seeks to help you modify your behavior to achieve a goal.

Now, imagine once more that you're a student at DePauw University, but this time you're a first-year student. You've just moved into campus, you're excited to embark on the

adventure that is attending college, and you can't wait to make friends and fit in. You weren't exposed to any sort of party culture prior to leaving home, and you've never consumed alcohol before. All the other students that you meet seem to be very well versed in drinking, and they seem like people that you would like to befriend, so you don't hesitate to accept the invitation to a party in one of the first-year residences during Camp College. At the party, you're offered cans of beer and shots of hard alcohol, which, not wanting to be rude or come across as socially inept, you gladly accept. Before long, you start to feel nauseous and you vomit, which shows everyone that you drank too much and makes a poor impression on your new friends. Without prior experience in drinking, how should you have known when you'd been overserved? How were you, while intoxicated for the first time, supposed to keep track of exactly how many drinks you'd had and know at what point you'd start to damage your health? If students had access to a simple, easy to use piece of persuasive technology that allowed them to keep track of how much alcohol they've consumed and to know when they've had enough, they would be able to make safe, healthy decisions for themselves.

### **Part I: An Introduction to Persuasive Technology**

The original purpose of computers was to assist us with cumbersome calculations and store large amounts of data. However, as time went on, they became increasingly engrained in everyday life, and consequently, they had more opportunity to influence our decisions (Fogg 1). Instead of only being assistants in our calculations, computers are now able to offer services that one might think only a human could properly fulfill. It is not uncommon to find computers serving in roles that advise you on your health, recommend purchases to you based off your interests, and help you achieve goals that you set for yourself. Computers that carry out

functions such as these are considered persuasive technologies, which are defined as “interactive computing systems designed to change people’s attitudes and behaviors” (Fogg 1).

Persuasive technology was first used in the 1970s and 1980s to create applications that promoted good health and encouraged workplace productivity. Originally, the use of persuasive technology was not widespread, but it increased gradually over time until the Internet became popular in the 1990s (Fogg 1). It was at this point that a Stanford Ph.D. student by the name of B.J. Fogg began conducting research to see what computers could do that allowed them to influence the attitudes and behaviors of the people who use them. After receiving his Doctoral degree from Stanford, Dr. Fogg started a lab and continued conducting research in the field that he coined “persuasive technology.” In 2003, nine years into his research, Dr. Fogg wrote a book with the purpose of laying “the groundwork for better understanding current and future persuasive technologies” (Fogg xxv). Since then, persuasive technology has become so popular that it can be found in the technology that controls everything from a web browser to a toothbrush.

The boom in the use of persuasive technology has mainly occurred because it has the potential to be much more effective than traditional forms of media persuasion and most forms of human persuasion. Persuasive technology can outperform traditional media because it is interactive rather than passive (Fogg 6). Traditional forms of media persuasion such as television commercials, magazine ads, or even bumper stickers can send messages that can be tailored to the audience of the television channel or the readers of the magazine, but that message cannot be adjusted specifically for every person it reaches. Persuasive technologies,

on the other hand, “can adjust what they do based on their user inputs, needs, and situations” (Fogg 6).

### **A. Advantages of the Interactivity of Persuasive Technology**

The interactivity of persuasive technology allows it to perform in roles that are much more human-like than traditional forms of media, but there are many aspects of persuasive technology that allow it to outperform humans as well. According to Fogg, there are several ways that persuasive technology has an advantage over humans in terms of persuasive power. Among many advantages, persuasive technologies can offer their users a better level of anonymity than a human can and technologies are scalable, or “capable of being easily expanded or upgraded on demand”, while humans typically are not (Fogg 7; “Scalable”).

In many cases, challenges that people need persuasion to overcome can be sensitive subjects. For this reason, computers have an advantage over humans in terms of persuasive power because they provide for anonymity. For various reasons, people may have trouble telling another person about the problems in their life that they would like to fix. They may feel ashamed or embarrassed because of their problem or burdensome to be asking for help from a human, but these feelings go away when interacting with a computer. For instance, if a person were using a software that helped them stop smoking or drinking, he or she would be more inclined to answer about habits honestly and admit to mistakes when having a relapse. On the contrary, if a person went to a counselor or support group for their issue, they might feel inclined to purposely underestimate their addiction or not admit to falling off the wagon to not feel ashamed in front of their peers. Providing anonymity for their users allows computers to be persuasive to groups who would prefer to change their habits in private.

If one were to own a factory that sewed hand-made blankets, and if demand was to rise or if an employee were to retire, it would take a long time to find a new employee and train them to create blankets to the standards of your factory. However, if the factory didn't make the blankets by hand, but rather with computer guided sewing machines, they could easily meet the new demand by purchasing another computer guided sewing machine. Once the sewing programs from the existing machines were copied onto the new machine, all the machines would be making blankets of the same quality. It is in this way that persuasive technologies are more easily scalable than humans. The extent of a technology's reach of persuasion is significantly greater than a human's because of its scalability. If a human persuader, such as a coach, motivational speaker, or salesperson was found to have a profound persuasive influence on the people they interacted with, it would take a long time for them to expand their influence to a larger group of people. Eventually they could set up a website with videos or podcasts, but the expanded persuasion may not be as effective as the original, more personal persuasion (Fogg 10). If a piece of persuasive technology is found to be effective, however, it can quickly be distributed to a large audience, especially if the technology is something found on the internet.

### **B. Human-Computer Interaction and the Functional Triad**

When computers are used to persuade, they are described as being part of captology, a term created by BJ Fogg meaning "computers as persuasive technology." In captology, persuasion is defined as "an attempt to change attitudes, or behaviors, or both (without using coercion or deception)" (Fogg 15). In captology, the computer hopes to change attitude or behavior through human-computer interaction, or HCI (Fogg 16). In HCI, there are three basic



roles that a computer can take on while interacting with a human. These roles are outlined in the functional triad, which is a piece of technology's ability to function as a tool, a form of media, or as a social actor. These three roles encompass virtually every way that a piece of technology can interact with a human, and in many instances, technologies will be a mixture of two or even all three of the roles within the triad (Fogg 24).

### **The Functional Triad: Computers as Tools**

When modern computers first came into existence, the only role envisioned for them was to be a tool that stored data and performed calculations. Aside from those two functions, not much else was expected of computers and their usefulness was underestimated so much that at one point, the chairman of IBM, Tom Watson, even stated that, "there is a world market for maybe five computers" (Fogg 31). Over seventy years after Mr. Watson uttered those words, most humans in developed countries carry one or two computers on their person at all times and most likely own several other computers. With computers so firmly engrained in our daily lives, they are still useful to us as tools, but now they can do so much more than simply store data and perform calculations. Now, these tools we use can persuade us to change our behavior through several methods: reduction, tailoring, suggestion, and self-monitoring (Fogg 32).

When employing a reduction strategy in an attempt to persuade, a persuasive technology works towards a goal of changing behavior by making the desired behavior easier to carry out (Fogg 33). In studies on decision making carried out by psychologists and economists, it has been found that humans make decisions that have the greatest benefit to cost ratio for themselves. So, if a computer could make the process of accomplishing a desired task less

strenuous or time consuming, it would lower the cost of carrying out the task. Doing this increases the benefit to cost ratio, and makes the human more likely to carry out the task (Fogg 33). An example of a technology employing reduction as a means of persuasion is Papa John's online pizza ordering system. If a repeat customer creates a profile within the system, he can save his favorite orders so that the next time he orders a pizza, he can do it by just selecting his pre-saved pizza instead of going through the trouble of selecting all the different options that comprise his order. Similarly, the system allows users to save their delivery address and payment information to further expedite delivery. By streamlining the pizza ordering process, Papa John's has used reduction technology to increase the benefit to cost ratio of ordering a pizza, and thus made it more likely for people to choose their product.

A second tactic that persuasive technology tools can use is tailoring, which exposes the user to information that has been selected specifically for themselves. By attempting to persuade a user by supplying them with information that is of pertinence, tailoring allows users to feel more in touch with the product and to save time by not being forced to search through large deposits of irrelevant information in order to find something meaningful for themselves (Fogg 37). During the recent debate regarding the FCC's decision to end net neutrality, a website called Fight for the Future created a page that allowed people to write emails to their senators and representatives regarding the future of net neutrality. When one went on the website, he would type in his zip code and be shown a list of all of the people who represented him in Congress as well as where that person stood in the debate on net neutrality. Being able to see the stances of each congressional representative allowed the users to decide whether to send a message of thanks and encouragement or displeasure and condemnation. Had the user

been forced to look through a list of every congressperson in the nation and then research each person's opinions on the issue, the process would have been much more time consuming and the user would have been less likely to follow through with the desired behavior.

In many instances, the effectiveness of an attempt to persuade is significantly affected by the timing of the persuasion. A persuasive technology tool that tries to capitalize on this and present persuasive information when the persuasion will be most effective is employing a suggestion tactic (Fogg 41). Behind the usage of suggestion technology is an ancient Greek concept related to persuasion called Kairos, which involves "finding the opportune moment to present your message" (Fogg 41). Typically, suggestion technologies don't try to radically modify a user's behavior. Instead, they attempt to build upon existing habits by serving as reminders to continue a desired behavior (Fogg 41). The tactic of suggestion in persuasive technology tools is exemplified by the reminder systems used by anti-virus software companies. If a person has purchased a subscription, he will likely get a notification telling him when his subscription is almost expired. Since the user is already a customer, if he is satisfied with the product, he will likely renew the subscription instead of leaving his device unprotected. By suggesting an action at the right time, the reminder makes the renewal more likely as most people don't pay any particular attention to when their subscription ends.

In many instances, a person may feel inclined to change his behavior on his own, but he may not know how to track his progress as he attempts to alter his behavior. In such cases, a self-monitoring approach may be used by a persuasive technology in order to help him. A self-monitoring tool would allow people to set a goal for themselves and work to achieve that goal by providing them with information that will show them their progress (Fogg 44). Self-

monitoring technologies are effective because they allow users to learn more about themselves and see how different actions detract from or add to the progress toward a given goal (Fogg 44). If a person were to decide to reduce his home's energy output, he could purchase Smappee's energy monitoring service. The service would allow him to see how much energy each appliance in his home consumes, when his consumption is the highest, and how much his energy consumption is costing him. By being able to pinpoint where the most energy is wasted, people can adjust their behavior accordingly and make decisions that will save money and reduce their environmental footprint.

### **The Functional Triad: Computers as Media**

The second branch of the functional triad is the ability of computers to function as persuasive media. When trying to persuade a person to do something, his experience plays a major role in whether or not he will change his behavior (Fogg 61). This attempt to persuade by offering an experience is evident when gyms offer free visits to potential new members, cable companies offer short term free upgrades to their more expensive packages, and bartenders offer free drinks to their good customers. Computers are effective in persuasion through the offering of an experience because they are so versatile. Computers can create experiences that mimic real world or even fictional, hypothetical conditions. Despite the fact that they are only in a simulation, people have been known to react to these simulations as though they experienced the situation in real life (Fogg 61).

Simulations that allow users to see different cause and effect scenarios are effective persuaders because they can compress time, persuade subtly, and allow users to experiment without having to face any consequences for their actions (Fogg 63). Instead of being forced to

wait long periods of time to see how their actions will affect them in the long run, users can use a cause and effect simulator to see what the future holds for them based on their choices. Then, users can alter their behavior based on what they find in the simulations before it is too late to alter their behavior. Furthermore, when people are taking part in a simulation, they often accept everything within the simulation as factual. In reality though, all the aspects of the simulation have been pre-programmed by a human being whose intent is to persuade the user. Since the user will not be prone to challenging the accuracy of the simulation, he is more susceptible to the persuasion (Fogg 64). Additionally, not being subject to any consequences allows users to try new things that they may be hesitant about. If users find the simulated effects of their actions beneficial to them, they can use the information from the simulation to change their behavior in real life (Fogg 63).

In their training, pilots are persuaded to perform safely and effectively by being exposed to cause-and-effect simulations in a flight simulator. If the pilot is having trouble landing planes, he can repeat a landing simulation over and over again until he is comfortable with it instead of going through the time-consuming process of preparing a plane for flight, taking off from the runway, and getting the plane to a cruising altitude. Additionally, not having to face the consequences of crashing a real plane, pilots are able to relax while they become accustomed to being in a cockpit and piloting an aircraft. While real-life consequences are avoided, pilots are also exposed to simulated consequences so that they won't become negligent and forget to carry out all the important steps involved in flying. Flight simulators provide pilots with a way to immediately see the effects of their actions and to learn their jobs without the potential of damaging life and property.

### **The Functional Triad: Computers as Social Actors**

The third and final piece of the functional triad is the role of computing products as persuasive social actors. This piece of the triad is made up of products that employ social cues to provoke users to have a social response and be persuaded (Fogg 89). Computers are able to perform as social actors because humans generally treat their computers as though they are living, breathing objects. When a computer is operating slowly or not working properly, users take it personally and get mad at the computer. On the other hand, when a computer operates well the user becomes appreciative of the device and is happy with it. By taking advantage of the user's perception of computers as a companion or partner rather than a tool, computers are able to persuade their users by forming a relationship with them. Computers can strengthen their relationship with their users and begin persuading them by providing feedback, modeling a desired behavior, or just providing support (Fogg 90). There are several different "social cues" that computers can also employ to encourage users to think of them as a social actor instead of an inanimate object. Two of the most common forms of cues that are used are physical and language cues (Fogg 91).

Persuasive technologies can be more or less effective based simply upon how they look. The physical qualities of the technology are important because studies have shown that attractive people and objects are more persuasive than their unattractive counterparts. This additional persuasive power comes from the fact that attractive things are considered more likable, trustworthy, and easy to follow (Fogg 92). Similarly, since being attractive is seen as a good quality to have, people often assume that attractive things "also have a host of admirable qualities, such as intelligence and honesty" (Fogg 93). The use of attractiveness to persuade can

be seen every day in advertisements as it is incredibly rare to find a company with a spokesperson that is not attractive. Similarly, most popular computer products have attractive user interfaces that make the program nice to look at.

Within practically every piece of software there are examples of persuasion found in dialog boxes. Each time that a box pops up, it brings your immediate attention to a piece of information and impels you to alter your behavior or make a different decision based off the information that it provided. These dialog boxes are examples of influencing user behavior with language cues. The language used in dialog boxes is also an ample opportunity to provide the application with some personality. The most effective use of language to persuade, however, is to offer praise to the user. By offering praise, applications improve the user's self-image, bolster the user's confidence, and improve their moods. When users feel these positive effects of the praise from a computer they are more likely to be susceptible to persuasion (Fogg 104-105).

## **Part II: An Area in Need of a Persuasive Technology**

Given the countless examples of the ways that persuasive technology can be used to encourage people to modify their behavior in order to achieve goals set by themselves or the creators of the technology, it is evident that the possibilities for the uses of persuasive technology are endless. When used for good, persuasive technologies can help people improve their health, secure their financial well-being, and kick their bad habits. An area in which persuasive technology has not made a lot of headway, however, is in monitoring alcohol consumption. There are several instances in which persuasive technology has been used to encourage bystanders to look out and care for people who have been drinking, but there are no mainstream persuasive technologies that aim to encourage people to drink less to begin with.

A group of people that would undoubtedly benefit from a persuasive technology that encourages people to drink less would be people aged between approximately 18 and 25. This age group is most in need of this persuasive technology because it is during this time in life that people become able to legally purchase alcohol, and often go to college and move away from the watchful eyes of their guardians. Given their newfound freedom and their relative ease of access to alcohol, young people are often guilty of abusing the consumption of alcohol. This abuse of alcohol often stems from young people not knowing their limits, trying to fit in, not realizing the negative ramifications of excessive alcohol use, or not being able to monitor their alcohol intake before they have already overindulged.

A particularly bad practice that many people take part in once they enter the college age range is binge drinking. A person is considered to have binge drunk when they consume enough in one sitting to raise their Blood Alcohol Content above 0.08%, which is the definition of legal intoxication in the United States. To reach this BAC, men typically have to drink five or more drinks within a two-hour period, while women typically have to drink four or more drinks within the same timeframe (Galbicsek). Binge drinking is detrimental to a person because it can not only cause significant short-term health effects after one binge, but also extreme long-term health effects if the behavior becomes habitual. After binge drinking just once, it is likely that a person will experience several side effects such as “coordination problems, dehydration, nausea, memory loss, poor decision making, and shakiness” (Galbicsek). These side effects can be compounded to create larger problems, such as bodily injury resulting from a fall sustained while a person’s body coordination was impaired or a motor vehicle accident resulting from deciding to drive while a person’s judgment and reaction time are impaired (Galbicsek). If a



person decides to participate in binge drinking regularly, they are exposing themselves to serious long-term health consequences such as “brain damage, liver disease, stroke, heart problems, cancer, and infertility” (Galbicsek).

In college, students are led to take part in binge drinking for a variety of reasons. For some people, the stressful, demanding environment of higher education may be weighing down on them, and they decide to use alcohol as an escape from their problems. After a couple of drinks, they may feel the relief of the tension that they have been carrying with them and decide that they should keep drinking in order to sustain the feeling of ease that they have achieved (Galbicsek). In other instances, students may feel like their options for activities to partake in are limited and that drinking may be the only fun thing for them to do. Students are often pressured by their friends to drink more at a party or to participate in a high-risk drinking game. After seeing that they have enjoyed their night of drinking, and that they had come out of their comfort zones to dance and meet new people at a party or other social event, many people feel that in order to have another fun night, they need to drink again. Once convinced that they need alcohol to enjoy themselves, people become dependent on alcohol as their form of entertainment (Galbicsek).

Young people may also be inclined to binge drinking because they feel like they need to behave like their peers or that they must prove themselves. In many situations, people may engage in binge drinking because their peers are doing so. People may try to “keep pace” with their peers so that they don’t appear less able to manage themselves while intoxicated. This trend is found especially in male students who are encouraged to display a high tolerance in order to prove that they possess certain masculine qualities (De Visser and Smith 597). This

effort to assert themselves as masculine leads young men to drink much more than their body can tolerate and suffer many of the short-term side effects of binge drinking. The masculine identity can also be challenged in young men as they play drinking games with each other. As they participate in the games together, their masculine competitiveness kicks in and they feel the need to outperform their peers. Competition in drinking often results in all people involved suffering from the side-effects of binge drinking as a person's tolerance to alcohol is not something that can be strengthened like a muscle, but rather a result of the way that they drink and biological patterns. Alcohol can affect people differently based off the rate of their drinking, their body weight, their sex, and even how much they had to eat before they drank or what sort of medications they are taking (Galbricsek).

Numerous surveys have documented the tendency of college-aged students towards binge drinking. Every year, the University of Michigan produces a survey that is given to students in the 8<sup>th</sup>, 10<sup>th</sup>, and 12<sup>th</sup> grades in which they are questioned about their use of drugs, alcohol, and other dangerous substances. This survey, titled Monitoring the Future, polls high school seniors throughout the nation regarding their participation in binge drinking. When the seniors were first polled in 2005, 27.1% of them claimed to have binge drank in the two weeks leading up to them taking the survey. By the year 2017, 33% of high school seniors claimed to have consumed an alcoholic beverage in the thirty days leading up to the survey, and the percentage of students who binge drank in the two weeks before the survey had dropped to 16.6% (Johnston, Miech, et al. 37). Although the act of binge drinking in high school is trending downwards, upon graduating high school, the percentage of people who binge drank grows significantly. In the 2015 National Survey on Drug Use and Health, "37.9% of college students

aged 18-22 reported binge drinking in the past month compared with 32.6% of other persons the same age.” The same survey also told that, binge drinking aside, college students drink more than their peers of similar age in general, as 58% of students reported drinking in the previous month in comparison to the 48.2% of their peers who don’t attend school (“Alcohol Facts”).

To further investigate the prevalence of alcohol abuse and where it occurs, Indiana University has created the Indiana College Substance Use Survey (ICSUS) in which students from 31 colleges in Indiana answer questions about their consumption of drugs and alcohol. The survey hopes to provide the participating campuses with information that will allow them to encourage their students to make healthier choices and reduce the frequency of substance abuse (Hutcheson). In the ICSUS survey, the data were divided into three age ranges; 18-20, 21-25, and 26 or older. When asked whether they had binge drank in the last two weeks, 28.5% of those aged 18-20 responded that they had, while 40.6% of those aged 21-25 responded similarly. Interestingly, only 18.3% of those aged 26 or older responded that they had binge drank in the last two weeks (“Indiana College Substance” 4). It can be surmised that the lower rate of binge drinking for students aged 18-20 in comparison to those aged 21-25 is a result of their inability to acquire alcohol because of their age. However, despite not being legally able to purchase alcohol, these students still have the means to acquire it, as 59% of the underage respondents to the poll said that they have friends over the age of 21 that supply them with alcohol. Additionally, over 25% of the underage respondents have reported receiving alcohol at parties hosted at either on or off-campus house parties or at fraternity parties (Hutcheson).

One of the 31 schools that participated in the 2017 ICSUS was DePauw University in Greencastle, Indiana. Of the 2,147 students that were extended an invitation to participate in the survey, 516 returned surveys were deemed usable (“Results of the...” 1). The data compiled from these surveys revealed that students at DePauw drink at a much higher rate than the average student at an Indiana college. In fact, of all the respondents from the other 30 colleges in Indiana, 28.9% of them reported having binge drank in the two weeks leading up to the survey. At DePauw University, the percentage of respondents who binge drank in the two weeks before the survey was 64.7% (“Results of the...” 4). Binge drinking aside, the consumption of alcohol on DePauw’s campus is much more prevalent than it is at other universities. Throughout Indiana, 59.1% of the students who responded to the ICSUS reported consuming alcohol in the previous month, while 80% of DePauw respondents drank alcohol in that time period (“Results of the...” 2).

Nationally, college students binge drink and consume alcohol at such a high rate that it is estimated “roughly 20% of college students meet the criteria for AUD,” which is better known as alcohol use disorder (“Alcohol Facts”). AUD is “a pattern of alcohol use that involves problems controlling your drinking, being preoccupied with alcohol, continuing to use alcohol even when it causes problems, having to drink more to get the same effect, or having withdrawal symptoms when you rapidly decrease or stop drinking” (Mayo Clinic Staff). People afflicted with AUD can suffer consequences resulting from their altered mental state such as car accidents or other types of accidents, strained relationships with friends, failure to perform in academic and professional settings, or committing violent crimes. The dependency on alcohol resulting from AUD can also cause long term damage to a person’s body by damaging the heart,

liver, and digestive system, weakening the immune system, and creating toxic interactions with any medications that a person may be taking (Mayo Clinic Staff).

In addition to putting themselves at risk for AUD, college students suffer many other harmful effects of overindulging in alcohol. Every year, it is estimated that in America almost 2,000 students aged 18-24 die from injuries sustained as a result of intoxication. Additionally, almost 700,000 students nationally are assaulted by another intoxicated student and almost 100,000 students are sexually assaulted or raped in a situation involving alcohol every year. On top of the staggering numbers of American students who suffer bodily harm as the result of alcohol consumption, many more suffer social and academic consequences. In fact, about a quarter of all students nationally have reported that alcohol has negatively impacted their academic performance by causing them to miss or fall behind in class, leading them to miss important deadlines, or hindering their ability to study and thus causing them to receive poor grades (“Alcohol Facts”).

In the ICSUS, students also reported suffering the negative mental and academic consequences of alcohol consumption. In particular, 20.3% of respondents throughout the state and 49.0% of DePauw respondents in the ICSUS who drank alcohol in the past year claimed that they have blacked out, or experienced memory loss, from drinking too much. Additionally, 10.7% of Indiana students and 20.4% of DePauw students had missed class or failed to complete an assignment because of their drinking (“Results of the...” 10). In addition to suffering academic consequences as a result of their drinking, ICSUS participants also reported taking dangerous and sometimes illegal risks while intoxicated, as 15.0% of Indiana students and 28.9% of DePauw students stated that they had participated in unprotected sex while

drunk and 9.1% of Indiana students and 6.5% of DePauw students claimed to have operated a car while intoxicated (“Results of the...” 10). As a consequence of the negative effects and regrettable decisions that come with their drinking, 22.1% of Indiana college students and 43.4% of DePauw students who consumed alcohol in the year leading up to their participation in the ICSUS “felt bad or guilty about their drinking” (Hutcheson).

One of the staggering differences between DePauw University and the other colleges in Indiana that participated in the survey is the prevalence of fraternity and sorority life on DePauw’s campus, where nearly 70% of students are affiliated with a Greek-lettered organization (“Fraternity and Sorority Life” 11). This percentage of Greek-affiliated students is unmatched by all of the other schools in Indiana, such as Indiana University or Purdue University, where the school’s percentage of Greek students is about 20% (“Student Involvement”; “Purdue University—West Lafayette”). In fact, DePauw University boasts the largest percentage of Greek-affiliated males out of any school in the United States (“Most Students in Fraternities”). While Greek organizations undoubtedly have many positive qualities, they often provide college students an easy route to consume alcohol in excess. Throughout Indiana, 31.5% of underage students and 16.9% of students aged 21 or older who consume alcohol reported doing so at a fraternity or sorority. At DePauw, however, these numbers are drastically different because of the University’s large Greek population. According to the data from the 2017 ICSUS, among the DePauw students who consume alcohol, 79.8% of underage students and 79.6% of students who were of age reported consuming alcohol at a fraternity (“Results of the...” 6).

This high percentage of DePauw's population that chooses to drink at fraternities is coupled with the fact that members of Greek organizations drink alcohol in larger quantities than DePauw's independent students. Because they live in an environment where everyone is more prone to drinking in excess than the average college student, Greek students are more likely to suffer the consequences of alcohol consumption. In a 2013 survey of 41% of DePauw's student body, it was found that only 7% of Greek-affiliated students choose to abstain from alcohol, and that in an average drinking session, a Greek student will consume 6.5 drinks. Comparatively, 29% of independent, or non-Greek, students consider themselves non-drinkers and in a typical drinking session an independent student consumes 4.5 drinks (Propsom 2).

In terms of suffering negative effects of alcohol, Greek students at DePauw are 1.6 times more likely to report having been hungover, 1.7 times more likely to have their academic performance impaired by alcohol, 1.8 times more likely to get in a fight while intoxicated, 2.2 times more likely to miss a class because of their alcohol consumption, and 2.2 times more likely to experience memory loss than their unaffiliated classmates. Additionally, alcohol is associated with Greek students making more poor decisions than independent students as Greek students were 2.4 times more likely to report having damaged property or created a disturbance while drinking, 2 times more likely to have done something while intoxicated that they regretted later, and 1.25 times more likely to have driven the car under the influence of alcohol. Perhaps as a result of these aforementioned negative experiences, in comparison to independent students, Greek students at DePauw are 2.1 times more likely to think that they might have a drinking problem and 1.6 times more likely to have made an unsuccessful attempt at giving up alcohol (Propsom 12).

An unfortunate aspect of consuming alcohol at a fraternity is that the setting is typically not a casual or laid back social gathering, but rather a crowded, high intensity party. The nature of these parties, where there is often loud music and common, loosely monitored sources of alcohol, may contribute to people consuming alcohol in excess. At these parties, it is common for every fraternity to have risk managers and sober monitors that are expected to be responsible for the wellbeing and safety of their house and everyone in it. However, try as they might, fraternity members are not always able to monitor the alcohol consumption of all their guests and help them to make responsible choices. When there are several people at a time grabbing drinks from a cooler in a poorly lit room, it is hard to keep track of how many drinks a certain person has had. Additionally, when a party is crowded, it can be hard to see someone on the dance floor who looks like they've been overserved, and to find those people, sober monitors must spend extra time monitoring the most crowded areas of a party. Consequently, a sober monitor could spend so much time looking over the 100 or more people on the dance floor in the basement that they are completely unaware of a guest puking alone in a second-floor bathroom.

From the perspective of a guest, it can be difficult to monitor your sobriety at a party for several reasons. First and foremost, if there is hard alcohol served at a party, it is usually found pre-mixed in a large dispenser. Not having made the drink themselves, people don't have an easy way to know what kind of alcohol is in the mixed drink or how strong the mixed drink will be. A guest could have several cups of a sweet tasting mixed drink that didn't seem strong, only to find out that the drink was high in alcohol content and that they had been unaware until it



was too late. A guest drinking pre-mixed hard alcohol drinks has almost no way to quantify how much alcohol they have consumed.

If a guest is not drinking hard alcohol, it is likely that they are drinking beer or wine. When a person drinks canned beer at a party, there is a good chance that there will be only one brand of cheap beer served, and without any variety, it can be hard to remember how many beers one has, as they all tasted the same and blended together to some extent. If a guest opts for draft beer or wine over canned beer and hard alcohol, they also face a problem, as these drinks are served from a common source. Each time that the guest wants a drink, they would bring a cup to the common source and fill it as they please, which allows them to moderate how much alcohol they consume. However, when a person is wandering throughout a party with the same cup in their hand all night, it can be easy for them to forget how many times that cup has been finished and refilled. In some cases, a person may feel inclined to top off their cup if someone with a bottle of wine offers them more or if they happen to pass by the keg. By topping off their drink, guests make it much harder on themselves to count how much they've consumed because they are now dealing with fractions of drinks instead of whole drinks.

While every guest at a fraternity party undoubtedly needs to be kept safe to the best of the abilities of every member of the organization hosting the party, fraternity members face a difficult and sometimes risky task every time that they host a party. In order to make the jobs of the party hosts easier and to help create a safer environment for all the guests of the party, there needs to be a way to shift some of the burden of responsibility off of the hosts and onto the guests. Guests should make responsible decisions regarding the amount of alcohol that they consume at a party, but the aforementioned barriers to keeping track of their

consumption make it very difficult for guests to do that. In order to remove the barriers that prevent people from keeping track of their alcohol consumption and to encourage people to take extra responsibility for their level of intoxication while at a party, there should be a persuasive technology that encourages people to drink less and makes it easier for them to do so.

### **Part III: Designing a Persuasive Technology to Curb Alcohol Consumption**

For my Honor Scholar thesis and my computer science senior project, I have developed a pair of persuasive technologies that are intended to help students at DePauw University make responsible decisions with regards to their alcohol consumption. The first product that I have created is a piece of hardware that monitors how much alcohol people consume from a keg at a party. Prior to the beginning of the party, the host will hook the system up between the keg and the spout so that all of the beer that comes out of the keg will run through the system. After setting up the system, users will be able to get a drink from the keg and see their estimated BAC after swiping their student ID card. The second product that I am creating is an Android mobile application that will allow a user to log drinks on their phone as they drink during an event and to see what their estimated BAC is after finishing each drink. Both of these products will help users to monitor their alcohol consumption and encourage them to make healthy choices by providing advice and health facts depending on the user's estimated BAC.

#### **A. Raspberry Pi Keg Monitoring System**

I was inspired to take on this project for my Honor Scholar thesis by DePauw University's decision to ban hard alcohol from fraternity parties. Having been at DePauw for four years now, I've seen many people at parties who have had way too much to drink and the vast majority of

them had been drinking hard alcohol, so I support the University's decision. Hard alcohol gets people so alarmingly drunk because the liquor can be masked with ease in a sugary, fruity mix. Also, given the delayed nature of inebriation and the high alcohol content of the liquor, it can be easy to consume several drinks in a short period of time without feeling intoxicated and then find yourself barely able to stand only a moment later. The high alcohol content of hard alcohol also leads to more cases of alcohol poisoning than other liquors, which is what DePauw is trying to save its students from. This happens because vomiting, a body's first line of defense against poisoning, is often triggered when a person's stomach is too full. A person drinking only beer will vomit before they drink enough beer to poison themselves, but a person drinking hard alcohol will have already ingested a dangerous amount of alcohol by the time they drink enough to vomit.

In banning hard alcohol, DePauw opened the door for fraternities to have kegs of beer at their parties. After attending a party over the summer that had a keg and accidentally overserving myself, I realized that there could be some danger to having kegs as well if people weren't able to sufficiently monitor their intake. In an effort to prevent other people from suffering the same fate that I did over the summer, I decided that it would be good to create a system that helped people keep track of how much they drank. As a result, this keg monitoring system has been the principal focus of my Honor Scholar thesis while the mobile application is a supplementary project that I am creating for my computer science senior project.

### **Keg Monitoring System: Hardware and Implementation**

The computer that I am using for the keg monitoring system is a Raspberry Pi 2 Model B, which is a credit card sized computer that can be used for numerous hobby projects ranging

from weather balloon data collection to garden irrigation systems to home security systems. I chose this computer because it was relatively inexpensive and it is famous for its ease of use as it is often marketed towards schools as an effective way to familiarize children with computers and to teach them how to code. Aside from the computer, the only other components I used were a computer monitor, keyboard, mouse, an inexpensive flowmeter, and a magnetic card reader that I borrowed from the DePauw Office of Campus Living and Community Development. I chose to write the keg monitoring program in Python, a programming language, for a multitude of reasons. Namely, it is intended to be an easy language to use, is often used for Raspberry Pi projects, and I wanted to learn how to use a language that I had not been exposed to in my time at DePauw.

There were two different methods I used to estimate the user's BACs, depending on varying factors. The first method is a linear interpolation model and the second is an equation-based model. In the interpolation model, I took data from BAC estimation charts, found in **Figure 1** and **Figure 2**, that I found online and added to my program. The charts provided BACs for men weighing between 100 and 240 pounds, who had consumed 10 or fewer drinks, and for women weighing between 90 and 240 pounds, who had consumed 10 or fewer drinks. For the purposes of my project, a drink was considered to be any quantity of alcoholic beverage that contained 0.5 ounces of alcohol. Using the information from the charts, I took the sex and weight of the user to calculate what their BAC should be based on the number of drinks consumed. Knowing that there were people who weighed more than 240 pounds and also people who definitely drink more than 10 drinks throughout the course of a party, I decided

that I needed a second model so that everyone who used the system would be provided with accurate information.

Men									
	Approximate Blood Alcohol Percentage								
Drinks	Body Weight in Pounds								
	100	120	140	160	180	200	220	240	
0	.00	.00	.00	.00	.00	.00	.00	.00	Only Safe Driving Limit
1	.04	.03	.03	.02	.02	.02	.02	.02	Driving Skills Significantly Affected
2	.08	.06	.05	.05	.04	.04	.03	.03	
3	.11	.09	.08	.07	.06	.06	.05	.05	
4	.15	.12	.11	.09	.08	.08	.07	.06	Possible Criminal Penalties
5	.19	.16	.13	.12	.11	.09	.09	.08	Legally Intoxicated
6	.23	.19	.16	.14	.13	.11	.10	.09	
7	.26	.22	.19	.16	.15	.13	.12	.11	Criminal Penalties
8	.30	.25	.21	.19	.17	.15	.14	.13	
9	.34	.28	.24	.21	.19	.17	.15	.14	Death Possible
10	.38	.31	.27	.23	.21	.19	.17	.16	

Subtract .01% for each 40 minutes of drinking.  
 One drink is 1.25 oz. of 80 proof liquor, 12 oz. of beer,  
 or 5 oz. of table wine.

**Figure 1:** This is the male version of the BAC estimation chart that I employed in the linear interpolation method. The chart was found on [brad21.org/bac\\_charts.html](http://brad21.org/bac_charts.html).

Women											
Approximate Blood Alcohol Percentage											
Drinks	Body Weight in Pounds										
	90	100	120	140	160	180	200	220	240		
0	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	Only Safe Driving Limit
1	.05	.05	.04	.03	.03	.03	.02	.02	.02	.02	Driving Skills Significantly Affected
2	.10	.09	.08	.07	.06	.05	.05	.04	.04	.04	
3	.15	.14	.11	.10	.09	.08	.07	.06	.06	.06	
4	.20	.18	.15	.13	.11	.10	.09	.08	.08	.08	Possible Criminal Penalties
5	.25	.23	.19	.16	.14	.13	.11	.10	.09	.09	
6	.30	.27	.23	.19	.17	.15	.14	.12	.11	.11	Legally Intoxicated
7	.35	.32	.27	.23	.20	.18	.16	.14	.13	.13	
8	.40	.36	.30	.26	.23	.20	.18	.17	.15	.15	Criminal Penalties
9	.45	.41	.34	.29	.26	.23	.20	.19	.17	.17	
10	.51	.45	.38	.32	.28	.25	.23	.21	.19	.19	Death Possible

Subtract .01% for each 40 minutes of drinking.  
 One drink is 1.25 oz. of 80 proof liquor, 12 oz. of beer, or 5 oz. of table wine.

**Figure 2:** This is the male version of the BAC estimation chart that I employed in the linear interpolation method. The chart was found on [brad21.org/bac\\_charts.html](http://brad21.org/bac_charts.html).

My second model, the equation-based model, was based on the Widmark Formula, which calculates BAC based off of how many grams of alcohol is consumed, how many grams the drinker weighs, and the sex of the drinker. The Widmark Formula can be found in **Figure 3**. Given these three attributes, the formula would provide the BAC of the user. In testing each model, I was pleased to find that when the inputs were within a range that was viable for each of the models they estimated the BAC to be the same number that the other model provided given the same inputs. Even though each model produced similar results and one of the models

only worked for a subset of users while the other worked for all potential users, I opted to use a two-model system instead of just using the equation model for all of the calculations.

$$BAC = \left( \left( \frac{StandardDrinksConsumed * 14}{BodyWeight * 454 * r} \right) * 100 \right) - (HoursDrinking * 0.015)$$

**Figure 3:** This is the Widmark Formula used to calculate a person's BAC. For the purposes of the formula, a standard drink is any drink that contains 0.5 ounces of alcohol, for instance a 1.25 ounce serving of a 40% liquor. The person's weight in the formula is measured in pounds. The r variable is a sex specific constant. If the person is male, r=0.68. If the person is female, r = 0.55.

### **Keg Monitoring System: Desired User Experience**

My hope is that all those who interact with my keg monitoring system during a party will find that it is quick and easy to use. After the keg has been hooked up to the system and the program has been started, the host of the party will enter the ABV of the beer that the keg is dispensing. Following that, the program will provide the host a list of several different administrative commands that they can use at any point during the party. The commands, which are 'terminate', 'checkBACs', and 'changeABV', can be typed into the program at any point that a user is not dispensing a drink and the corresponding function will be carried out. The 'terminate' function will stop the program and display various statistics about the people who had logged drinks in the program. The statistics displayed will be the number of unique people who had used the program, the average BAC of all the users, the highest BAC of all the users, the number of people with BACs less than 0.08, the number of people with BACs less than 0.15 and greater than or equal to 0.08, and the number of people with BACs greater than or equal 0.15. All of the statistics provided would be completely anonymous in order to protect user privacy. After carrying out the 'terminate' function, all of the user information would be permanently deleted. The 'checkBACs' function will provide the host with the same information

that was provided by the 'terminate' function, but the program will not stop and the user information will not be deleted. Finally, the 'changeABV' function will allow the host to change the ABV of the beer being dispensed. This would be necessary if the initial keg ran out and was replaced by a keg of a different type of beer. After displaying these commands to the host, the system would be ready for the guests at the party to use.

When a guest decides that they would like a drink, he will be prompted to swipe his student ID by the program. If the program has not recorded a swipe by the specific student ID, it will prompt the user to enter his name, sex, and body weight. Following that, his profile will be created and the program will recognize his ID when it is swiped later. When a recognized ID is swiped, the user will be prompted to type either 'new' or 'check'. Typing 'new' will give the user a preset amount of time to pour a beer from the keg. After this time has passed, the program will display the user's estimated BAC. If the user types 'check', the program will recalculate the user's BAC based off of their previous drinks consumed and the amount of time that has passed and display this estimated BAC. Following either of these functions, the program will wait for another user to swipe their ID or for the host to enter one of their commands.

### **Keg Monitoring System: Potential Benefits**

If people respond to my program in the way that I hope they will, I believe that the people who choose to host parties will be able to reap some of the greater benefits that my program can offer. While the group of people that I am trying to influence is the party attendees, the job of the host will be made easier if people decide to drink less given the information that I provide them. If every single person that was drinking at a party decided to



have one less drink than they normally would, the entire mood of the party could shift. Instead of being a chaotic, sloppy mess, the party could be more of a composed, laid-back environment where people drink socially. Additionally, if a party host were to take advantage of the commands that the program has made available to them, they could alter their risk management plan in real time to suit the immediate needs of their guests. For instance, if the host used the 'checkBACs' command and saw that the average BAC for the guests at the party was too high, they could have the fraternity's sober team walk through the party and encourage people to drink water or they could order pizza for everybody to help them sober up. Additionally, if the 'checkBACs' command revealed that there were a significant number of people with BACs above 0.15, then the sober team could spend extra time making sure that nobody is getting sick in remote areas of the house. They could also post a sober monitor by the keg to make sure that nobody who already appears drunk is overserving themselves.

While the host of the event may stand to benefit the most, the keg monitoring system would be beneficial to the guests as well. Rarely is it the case that someone walks in to a party hoping to have a hangover the next day or suffer some other alcohol related malady. Using the keg monitoring system would allow the guests to learn about their alcohol tolerance and to make better decisions the next time they drink. For example, a guest may reflect on a past party and realize that he was having fun when his BAC was at 0.12, but after he had another drink and his BAC rose to 0.16, he felt nauseous and he woke up with a bad hangover the next day. Armed with this information, the next time he drinks he would likely try to keep his BAC close to 0.12 in order to enjoy himself longer and not suffer through a hangover later. These benefits may not be seen by the guests immediately, but after a couple of trial-and-error

experiences with the keg monitoring system, I would hope that they would choose to adjust their alcohol consumption habits to more responsible, healthy levels. By making this adjustment, party hosts would also see benefits from employing the keg monitoring system at their parties.

### **Keg Monitoring System: Future Improvements**

There are many improvements that I can see being made to my keg monitoring system that were beyond the scope of my capabilities for this project. The first and most significant improvement I would make would be to add a shut-off valve. At this point, if someone decided they didn't like the premise of the program, they could walk up to the keg and pour a beer without swiping. I don't think it would be difficult to add a shut off valve, but I was unable to find a valve that would be inexpensive and easily compatible with the rest of the system, and I didn't want my thesis to turn into a plumbing project. Adding a shut-off valve could potentially open the door for a lot of other functions. In addition to not allowing people to pour without swiping, it could prevent people from pouring if their BAC was estimated to be above a pre-determined level or prevent a guest from pouring a certain volume of beer within a certain period. Either of these abilities would help keep the BACs of the guests lower by not letting them drink more if their BAC is too high or forcing them to space out their drinking.

An additional augmentation to the program would be to add some sort of text messaging capability. I can foresee instances in which a person may be in too much of a rush to wait to see their BAC estimation on the computer monitor and leave. These people would be missing the benefit of the program altogether. If users were given the option to add their phone number to the program, they could receive a text message with their estimated BAC.

The text messaging capability could also be used to tell people who had been locked out when they will be allowed to get another drink or to provide warnings or advice such as reminders to drink water. The texting system could also benefit the party host by alerting them when the average BAC for the event reaches a certain threshold or a certain number of people are found to have a BAC over a certain point. If a keg level monitoring function were to be added, the party host could also be alerted when the keg needs to be changed.

An issue that I can see arising as a result of my system being used is that depending on how many people show up to a party at once, there could be a bottleneck of people waiting to get a drink when the party starts. If everyone has to create a profile for every event they attend, even though it only takes a couple seconds, it could slow people down if everyone decides to create a profile at the same time. To avoid this, I would like to be able to create a way for people to create their profile either from their phones prior to each party, or to create a profile at the beginning of the semester that they would use at every party. If my system proved to be effective and multiple organizations used the product, it would be good for the systems to be able to interact with each other in a network. If a person was going to several different parties in a night and his BAC was reset to 0.0 every time he went to another party, the information provided would be neither accurate nor beneficial.

Another feature to add to the keg monitoring system is a calorie tracking function. In some instances, young people may not care as much about the damage that they do to their liver and other organs by binge drinking and abusing alcohol, but many of them will care a lot about what it will make their body look like. It could be an effective method of persuasion to find the caloric value of different drinks and tell users how many calories they have consumed

in addition to what their BAC is. People who are not alarmed by their BAC being 0.16 may be alarmed to see that they've consumed 1,100 calories worth of beer in a night. The statistics could even be put into perspective by telling them how many Big Macs worth of calories they've consumed in alcohol or how many minutes on the treadmill it will take them to work off the calories. By changing the way people gauge their alcohol consumption from something that is hard to quantify or put in perspective, such as BAC, to something that people can relate to more readily, such as calories, it is likely that more people will respond positively to the persuasion and drink less.

A final modification that I would make to my program that I believe would go a long way in making it seem more credible would be to create a Graphical User Interface. Right now, the program either runs in a Python shell or a command line and while the information provided is accurate and the program functions, it looks far from elegant. Adding a GUI would not only make it more persuasive just because it was elegant, but also because it could allow me to display different graphics and manipulate the GUI based off of the user's BAC. OPower, a company that encourages people to be more energy efficient, has saved their customers \$16 million in energy costs just by comparing homeowners to their neighbors. If a person is using energy above the neighborhood average, they are told how much extra they are spending, but if they are below the average, their bills are stamped with a smiley face and their savings are shown (LaGesse). I could potentially use the GUI to show people if their BAC is above or below the party average, and put smiley faces on the screen if their BAC is below the party average. Finally, at this point, when someone uses the system to get a drink, they can easily scroll up to see the BACs and other personal information of previous users. This presents a worrisome

privacy issue, so if I used a GUI instead of what I am doing now, I could make the other user's information disappear a certain time after they were done pouring their drink.

### **Keg Monitoring System: Ethical Concerns and Potential Misuses**

In creating any piece of technology that collects information about people, there are bound to be certain ethical implications that one must consider. At this point in my project, the only major issue that I have come across is the fact that users can scroll up on the screen to see the information of their fellow guests. To some extent this is minor in that the code could just be changed to display a large amount of space between users, and the host could hide the mouse to prevent other people from scrolling. However, that is hardly elegant and there are many more ethical questions that will arise if some of my future improvements are made.

The most challenging question I have come across so far is, if the program is upgraded so that a campus-wide system keeps track of all the people drinking at every house, what happens with all the data? If a party ends at one house, the data can't be deleted from the system because another house might still be having a party and using the data for that guest. So, the data must be kept somewhere. Should the University store the data, or should it be on a third-party server? If I had to guess, the University will likely want access to the data as a matter of public health and safety. Inherently, a lot of people would be uncomfortable with trusting the University with information like that, so the University having access to the data would probably be seen as an invasion of privacy and cause a drop in usership. Regardless of who controls the data, could they be held legally liable if a minor used the system, became intoxicated, and got in trouble with the law? If so, excluding minors from the system would preclude them from something that they stand the most to benefit from, but including them

and letting them know that the keepers of the data are keeping a closer watch on them will make them less likely to use the program, thus making it worthless.

To avoid a situation such as this, I have made the data ageless, and the only required identification is the user's student ID. However, is it fair to report to the host of a party that there is a certain amount of people somewhere in their house with a dangerous BAC, but not tell them who the people are? Instead of being able to quickly address the issue of having people dangerously intoxicated, hosts will be forced to either ignore the issue or become a detective and try and deduce who is too drunk just from context clues. For the host, this would be a waste of time and it would take a watchful eye off of the other attendees of the party, thus making them less safe. However, by providing names and faces with the high BACs, some would consider the program to be invading their privacy and would not be comfortable using the system. I have yet to think of a solution to this, but it will be an important question to answer if the program is to advance and become more widely used.

A third question lies once more in the anonymity of data. When a guest swipes their ID to enter the party, should the sober monitors at the door be able to see their BAC if their card has been swiped in a system at another house? It would be beneficial for the sober monitors to be able to know what state people are in as they enter their house, but it could again be seen as an invasion of privacy. Additionally, if the sober monitors are not granted permission to see the BACs of incoming guests, and a new guest gets sick or creates a scene without drinking at the new house, who is liable for the guest's actions? The house where the incident happened, the house where the person was at immediately prior to entering the house, or somebody else? Similarly, if a guest drinks too much at a party and the guest leaves and gets in trouble with the

law, could the host of the party be liable since they allowed the guest to get so drunk? Unfortunately, when it comes to ethics, the law, and alcohol, especially when there is a potential for minors to be involved, there are no cut and dry answers regarding the right decision to make. In many instances, taking the most legal or safe route would discourage people from using the program, which would defeat the purpose of creating the program in the first place.

Without having tested my system in a live party situation, I am not sure how people will respond to it in the real world. In talking with friends about my project, most seem to agree that it is a good idea and could be effective. However, there are two major fears that I have regarding how people may react to my system. My first, and probably worst fear is that people will accept the BAC estimates generated by the program as a piece of fact. I wrote a lengthy disclaimer to display when the user creates their profile, but I have no way of making sure that people read and understand it. I would be sick with myself if someone saw that they were estimated to have a 0.07 BAC and decided to drive and wound up in legal trouble or worse. My second fear is that people will not see the BAC estimation as a warning or piece of advice, but as a challenge. I would be disheartened if this system that I spent so much time on in an effort to help people moderate their alcohol consumption just became a tool for “frat boys” to compete with each other and see who can get the most drunk.

### **Keg Monitoring System: Persuasive Technology Design Elements**

There are several persuasive design elements included in the current version of the keg monitoring system and the system’s potential future improvements that were defined by Dr. Fogg’s research of the effectiveness of persuasive technology. If a network of keg monitoring

systems was made that connected all the systems in use on a college campus, the technology that I have created will prove to be scalable, as the network could easily expand to gather data from more systems once it is set up. This scalability will increase the keg monitoring system's ability to persuade by offering more people the chance to use it. I believe that the keg monitoring system functions primarily as a tool instead of as a social actor or a piece of media. The keg monitoring system uses three of the methods that tools employ to persuade people: tailoring, suggestion, and self-monitoring. Self-monitoring and tailoring are evident in their use because supplying a BAC to a user is giving him the opportunity to monitor his own intake, and the information given to each user is tailored to show him exactly what he needs to know and nothing else. The suggestion method is employed by the keg monitoring system because it is supplying the user with information that will make him think about drinking less when it is the most opportune time to persuade him to do so. Seeing what the BAC will be after finishing a beer that was just poured will certainly make people start to wonder if they've had enough before they've had too much, which will allow them to make the healthiest choice for themselves.

Finally, as I mentioned in the potential improvements section, creating an elegant GUI for the keg monitoring system would go a long way in terms of improving the keg monitoring system's persuasive ability. Having a better GUI would allow me to create physical persuasion cues that are effective when computers function as social actors. By creating an interface with graphics and employing human-computer interaction principles in its design, my system would quickly become more trustworthy, and, as a result, more persuasive.



## **B. BAC Minder: An Android BAC Estimation App**

After I began my thesis and explained the keg monitoring system to some people, I received some pushback from some people who said they would not be comfortable using the system if it required that it take their personal information. I soon saw the point in their argument and realized that there may be a need for a second project. In an effort to reach people who would not be trusting of other people having their information, I decided that I would create a similar tool that put all of the power in their hands in the form of a mobile application. I also realized that a mobile application would be useful because the companies that insure DePauw fraternities have made it incredibly difficult to get kegs into the houses. As a consequence, houses have stopped serving hard alcohol, and just begun serving more things like canned beer, wine, and malt liquor. This, coupled with the fact that some people don't enjoy drinking beer, basically meant that my keg monitoring system would not prove useful at a fraternity party. Finally, I realized that a BAC monitoring system could be useful in contexts outside of a fraternity where people drink too much, such as the local bars. Having a mobile application would allow people to maintain privacy, drink wherever they want, and drink more than just beer, which are all options that would make them more likely to use my application and be persuaded to drink responsibly.

### **BAC Minder: Implementation**

I decided to make my application an Android application. To create and test the application I have been using the Android Development Studio which has an emulator that allows me to run the app on my laptop as though it were on a phone. If I were to put my app on

the Android Marketplace upon its completion, people would be able to use all the functions of the app with nothing more than a phone that runs an Android operating system.

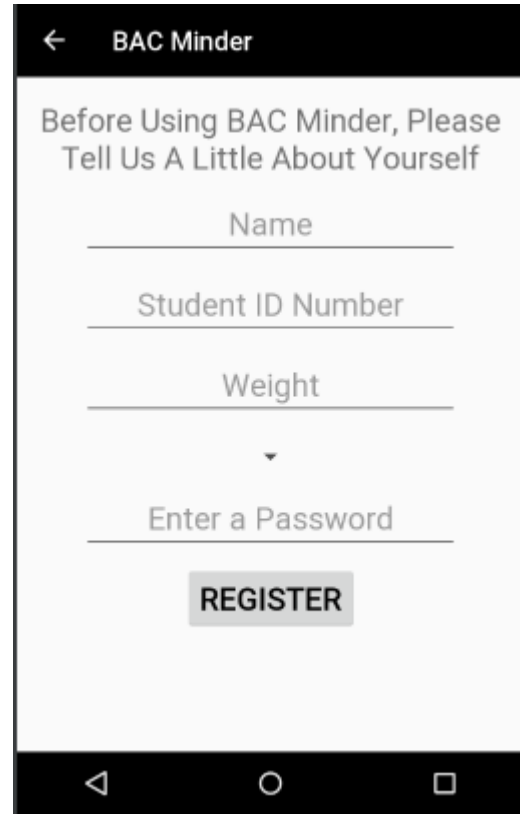
My mobile application, called BAC Minder, will provide the same service that the keg monitoring system does, but on a user's own mobile device. As a user consumes an alcoholic beverage, he will open the app and tell the app what he drank. Based on information that the user provided when he downloaded the app and what the user has consumed, the app will calculate an estimation of the user's BAC. The user's BAC will be calculated using the same two models that were used for BAC estimation in the keg monitor program. While doing all of this, there will be no reason for the app to be connected to the Internet, so all of the information stored by the app will be stored locally on the user's phone. Just like the keg monitoring system, BAC Minder will hopefully encourage people to adjust their alcohol consumption to make more responsible decisions.

#### **BAC Minder: Desired User Experience**

After downloading BAC Minder, users will be taken to a Log-In Screen, which is shown in **Figure 4**. At the Log-In Screen, users will be able to sign in to the app, register a user profile, and reset their password. Since they have not created a profile yet, users will have to select the Register Button, which will take them to the Registration Screen, found in **Figure 5**. At the Registration Screen, the user will be asked to enter his preferred name, student ID number, weight, sex, and a password. After filling out the required fields and pressing the Register Button, the user is taken back to the Sign-In Screen where he can sign in to the app using the student ID and the password he registered with.



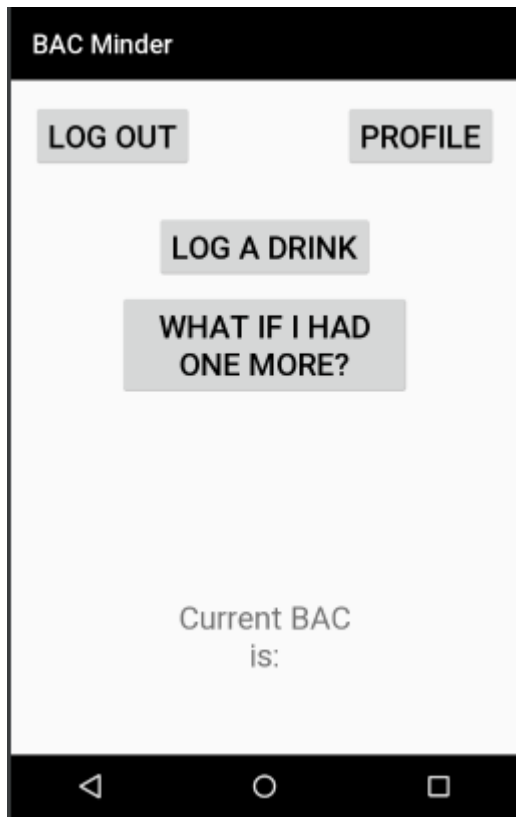
**Figure 4:** The Sign-In Screen for the BAC Minder.



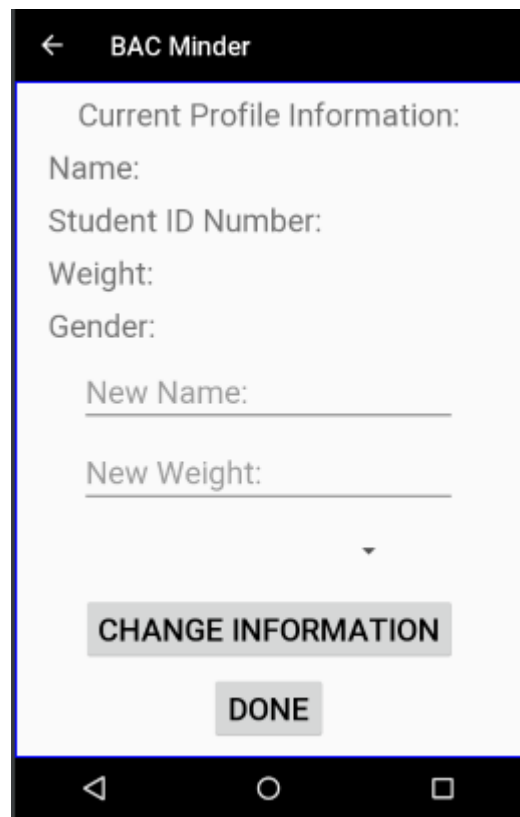
**Figure 5:** The Registration Screen for the BAC Minder.

Once logged in to the app, users will be shown the Home Screen of BAC Minder, which can be found in **Figure 6**. At the Home Screen, users can sign out, which will return them to the Sign-In Screen; change their information, which will take them to the Profile Information Screen, shown in **Figure 7**; log a drink; or estimate what their BAC would be if they were to have another drink. If the user has just consumed a drink, they will press the Log A Drink Button. From there, they are taken to the Add Drink Screen, shown in **Figure 8**. At the Add Drink Screen, users can quickly log one of the last three unique drinks that they consumed, which will calculate their estimated BAC and return them to the Home Screen. If the user would like to log a drink that was not one of the last three drinks they had, they would select the category of alcohol that they had consumed, either beer, wine, hard alcohol, or malt liquor, and press the

Go! Button. Pressing that button will take the user to a page that corresponds with the category of alcohol that they selected in the Add Drink Screen. The page that would be shown if beer were selected is shown in **Figure 9**.



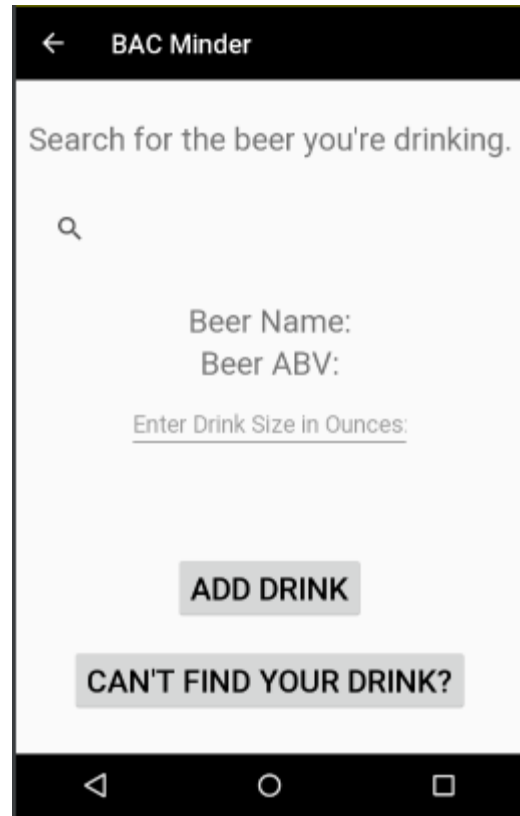
**Figure 6:** The Home Screen of the BAC Minder App.



**Figure 7:** The User Information Screen of the BAC Minder App.



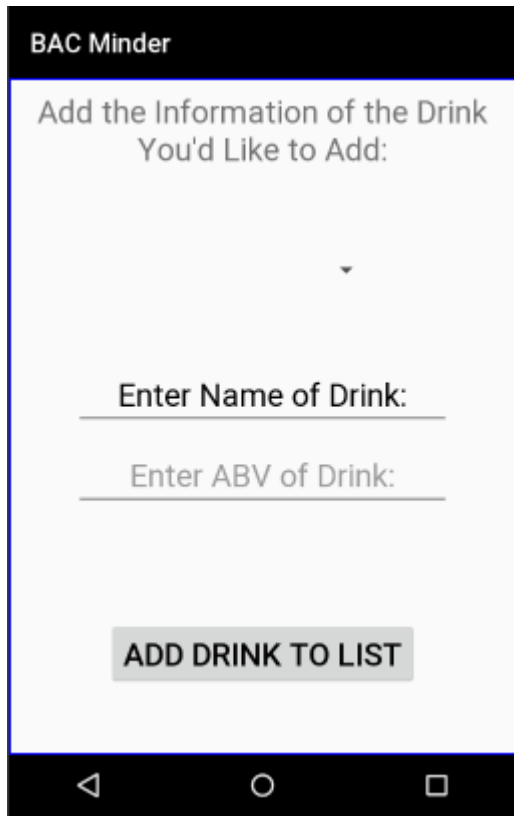
**Figure 8:** The Add Drink Screen of the BAC Minder app.



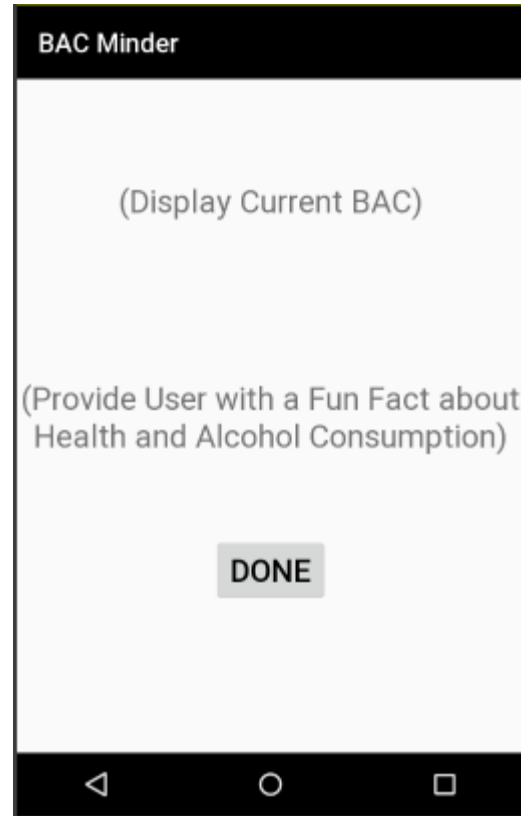
**Figure 9:** The Beer Finder Screen of the BAC Minder app.

At the Beer Finder Screen, or whatever screen corresponds to the alcohol category that the user chose, users will be able to search through a local database of beers to find the beer that they just consumed. If the user finds their beer, they would select the correct beer, enter the number of ounces of the beer that they consumed, and press the Add Drink Button. If the beer they drank was not in the database, they would press the Can't Find Your Drink? Button, which would take them to the Drink Not Found Screen depicted in **Figure 10**. At the Drink Not Found Screen, users would select the category of alcohol that they were unable to find, enter the name and ABV of the drink, and press the Add Drink To List Button. Doing so will return the user to the Beer Finder Screen where they will now be able to find the beer in the database and press the Add Drink Button. Pressing the Add Drink Button will calculate the user's estimated

BAC and take him to the Health Facts Screen that is shown in **Figure 11**. The Health Facts Screen simply displays the updated BAC estimate and a fact about alcohol consumption and health. Pressing the Done Button on the Health Facts Screen will return the user to the Home Screen.



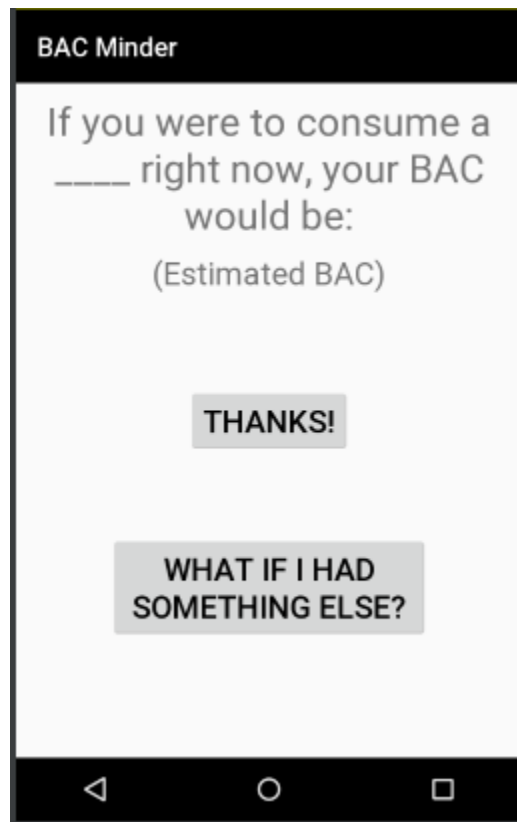
**Figure 10:** The Drink Not Found Screen of the BAC Minder app.



**Figure 11:** The Health Facts Screen of the BAC Minder app.

The final button on the Home Screen, the What If I Had One More Button, takes the user through the same process that was outlined after the Log A Drink Button was pressed, but this time, once the user logs a drink, either using the function on the Add Drink Screen that adds a recently consumed drink or after searching for and selecting a drink on a drink at the Beer Finder Screen level, the user will be taken to the BAC Estimation Screen that is shown in **Figure 12**. The BAC Estimation Screen will show the user what his BAC would be if he were to consume the drink that he just added, but it does not permanently change his BAC estimation.

Depending on whether the user's curiosity had been satisfied by the estimation, he would either press the Thanks! Button to return to the Home Screen, or press the What If I Had Something Else? Button, which would send him to the Add Drink Screen, negate the hypothetical addition of the drink he just logged, and let him see what his estimated BAC would be if he were to have a different drink.



**Figure 12:** This is the BAC estimation Screen of the BAC Minder.

### **BAC Minder: Future Improvements**

While the app in its intended form will effectively calculate an estimation for a user's BAC, there are still many improvements that I would like to make if I had more than a semester to develop the app. Firstly, I think that BAC Minder would become much more persuasive if it were given the calorie tracking function that I mentioned as a potential improvement for the

keg monitoring system. After adding that, the first major improvement that I would make would be adding a function that polls the user on the day after they logged drinks in the app. BAC Minder could ask the user questions regarding their wellbeing to see if they are hungover or if they vomited while drinking the previous day. If users were to answer these questions truthfully, BAC Minder could store this information along with the user's peak BAC and the type of drinks consumed during their last drinking session. After a few drinking sessions, BAC Minder would provide the user with warnings the next time that they match a drinking pattern that led them to have a negative experience. For instance, while drinking, a user could receive a notification from the app saying, "Your BAC is 0.18! The last time your BAC was above 0.18, you woke up with a headache and an upset stomach". Another notification could say, "You've taken three tequila shots. The last time you took more than three tequila shots you reported vomiting and blacking out".

I would also expand the day-after-drinking poll to include regrettable decisions that the user might have made while intoxicated. These stats could also be stored along with data regarding their alcohol consumption and used to prevent the poor decisions from happening again. A person contemplating ordering a third strawberry daquiri might change their mind if they received a notification that said, "You've had two strawberry daquiris. The last time you had more than two strawberry daquiris you lost your purse and texted your ex-boyfriend". By associating a potentially positive experience, getting another drink, with a negative experience, such as eating multiple garlic cheeseburgers at 3:00 A.M. or having a bad hangover, people will be less inclined to repeat the behavior that led them to have the negative experience.



In order to help users play a role in the moderation of their own drinking, I would like to add a function to the app that allows users to set an ideal maximum BAC for themselves before they begin drinking. As the night goes on, BAC Minder could give them alerts to tell them how close to the maximum they are so that the user can adjust his consumption accordingly. If a night passed where a user did not break his maximum BAC, BAC Minder could give him a badge or another in-app reward for his accomplishment. Users could collect more badges for maintaining streaks where they didn't break their maximum desired BAC, or for setting more stringent maximums for themselves. By creating rewards that users will likely hope to obtain, BAC Minder will become more persuasive and people will be more inclined to use it.

A final idea for an adaptation to the app is linking BAC Minder with the keg monitoring system. If a student had been monitoring their BAC using BAC Minder during a pregame and then wanted to keep monitoring it while at a fraternity party, it would be incredibly easy for him if the keg monitoring system automatically updated his estimated BAC in BAC Minder. However, this would likely mean that his privacy could be impinged. Ideally, I would set up the system so that a user would select a party location with a keg monitor on the BAC Minder and have the keg send the information straight to the BAC Minder instead of storing it with its own data. This would allow the user to dispense drinks without having to log anything on a phone, then just receive notification from the app as time goes on. By making the process as simple as possible, the chances that more people will use the system will increase, as will the effectiveness of the persuasion.

### **BAC Minder: Ethical Concerns and Potential Misuses**

With all the user data being added voluntarily, a concern that I have is that there is no way for BAC Minder to always provide accurate information. If a person forgets to log a drink or has no way to quantify the volume of a poured drink, such as a glass of wine, then the app won't be able to provide an estimation with any real accuracy. Mixed drinks could also prove to add confusion when a user is at a bar because a patron may not always know what type of alcohol is in a certain mixed drink. Even if users were aware of all the components that went into a drink, they could not be certain how much of each component a bartender puts in their drink as bartenders might be more heavy-handed when mixing for people who talk to them or tip them more than the other patrons. If people are unable to input any accurate information into the app then it is likely that they won't trust the app to make accurate estimates and will ultimately end up not using it altogether. This fear lies in conjunction with my fear that people might trust the estimates too much and use them to justify decisions such as driving after consuming alcohol. Making a decision such as that would be inadvisable even if the information provided was guaranteed to be accurate, but with no guarantee that the user will be able to provide that information, it could be extremely dangerous. In an effort to avoid a situation such as this, I plan on changing the layout of the Home Screen in BAC Minder so that anytime the BAC is displayed, a warning is displayed as well. The warning will remind users that the number shown is merely an estimate and that they should never drive or make risky decisions while they have been drinking.

### **BAC Minder: Persuasive Technology Design Elements**

Providing my users with anonymity was a decision that made BAC Minder an effective piece of persuasive technology. People who were not comfortable sharing their drinking habits with other people now have an outlet where they can record their consumption without judgment from other humans. This allows users to enter information honestly, thus allowing themselves to be persuaded by the application. In designing BAC Minder, it was my intention to create it in a way that would make it intuitive and quick to use. If someone had to spend several minutes on his phone every time he finished a drink, it would be a social burden and the app would not be likely to catch on. Additionally, if the app were hard to navigate, usage time would increase as the user became intoxicated. To accomplish my goal, I made a special effort to make sure that all of my buttons would be self-explanatory and that there would not be any long blocks of text that the user would have to read. I also tried to eliminate steps that the user would have to take whenever possible, such as the quick drink addition buttons on the Add Drink Screen and the button on the BAC Estimation Screen that immediately began another estimation without returning to the Home Screen. This instance of using the reduction method of persuasion will allow people of various levels of sobriety to use my product easily. Once more, the persuasive methods of tailoring and self-monitoring were employed because the app's sole purpose is to allow the user to track his alcohol consumption. All of the information recorded and supplied by the app is meant for the sole use of the user, so the user is able to get the most personalized experience possible.

If all of my future improvements are carried out, BAC Minder will not only function as a persuasive tool, but also as a persuasive media and a persuasive social actor. As a form of

persuasive media, BAC Minder will create cause-and-effect simulations that will persuade users to drink less based on the negative consequences of overindulging. This technique is exemplified by the functions that use information regarding hangovers and regrettable decisions made while intoxicated to warn people when they might be in danger of suffering an unwanted consequence. BAC Minder's role as a persuasive social actor will be shown when it uses language cues to persuade people to drink less. If a user sets a goal to maintain a low BAC and achieves that goal, BAC Minder will provide positive reinforcement by giving rewards and writing encouraging messages for the user.

### **C. Target Users**

In designing a product, it is important to determine a set of target users who would benefit the most from the new product. In psychology, there is a Transtheoretical Model that serves as a way to categorize people who are trying to change their behavior. In categorizing people, they are placed at different stages in the model in accordance with their openness to changing their behavior. There are six stages within the model that a person can be placed at: precontemplation, contemplation, preparation, action, maintenance, and termination (LaMorte). The first three stages correspond with people who are not actively trying to change their behavior and the last three stages correspond with people who are changing or have changed their behavior. People in the precontemplation stage have no intentions of ever changing their behavior; people in the contemplation stage want to change their behavior, but not in the immediate future; and people in the preparation stage are ready to begin changing soon. Conversely, people in the action stage started changing their behavior and plan on continuing to change, people in the maintenance stage have fully changed their behavior and

plan to maintain their status, and people in the termination stage have changed their behavior to the point that they would never return to their previous ways (LaMorte).

One effective process that can be used to move people up to a higher stage in the Transtheoretical Model is stimulus control, which involves creating cues that make it easier to maintain a healthy behavior, and eliminating cues that make that behavior difficult to achieve (LaMorte). In the context of drinking in moderation as a healthy habit, providing an abuser of alcohol support by telling them when they should stop drinking would be an example of stimulus control. I believe that by offering people the opportunity to see an estimate of their BAC, I am using stimulus control to help them change their behavior. However, my form of stimulus control may not be effective for people in every stage of the Transtheoretical Model. For instance, a student who is in the precontemplation stage and has no desire to drink less may see his estimated BAC displayed, and instead of it being a healthy stimulus, it could be an unhealthy one. The low BAC on the screen could be seen as a challenge, and watching his BAC rise may further stimulate his desire to drink.

Since anyone who wants a beer from the keg will interact with the keg monitoring system, the system will attempt to persuade a wide variety of people. Undoubtedly, the system will be used by people in the precontemplation stage, but hopefully they will see it as merely an annoyance instead of seeing it as a reason to increase their self-destructive behavior. Perhaps over time, a person in the precontemplation stage will grow tired of dealing with the negative effects of his alcohol consumption and be aware that the keg monitoring system could help him form healthier habits if he wanted to. By beginning to plan this change in their behavior, a user would move from the precontemplation stage to the contemplation stage of the

Transtheoretical Model. For the people who are not in the precontemplation stage, however, the keg monitoring system should help them to move into a higher stage of the Transtheoretical Model by using stimulus control. A person in the contemplation stage who had considered cutting back on alcohol but wasn't sure when he would start doing so may begin to give the idea more thought as he sees his BAC displayed on the screen. Other users, who are waiting to start or have already started trying to drink less will have no excuses to not drink in moderation as the keg monitoring system will make it easy for them to moderate themselves.

As I stated previously, I created BAC Minder with user privacy in mind as I knew some people would not be comfortable with their information being stored somewhere that wasn't within their control. However, while BAC Minder is undoubtedly more private than the keg monitoring system, it does have a major disadvantage in that there is no way to make people use it. If a fraternity were to employ the keg monitoring system, everyone at the party who wanted a drink would have to use the system. Even if they didn't want to know their BAC, it is likely that they would see it in passing and be aware of it. However, there is no way to force people to download a mobile app, create a profile, and log drinks as they drink at a fraternity party. Therefore, the people who use this app will likely not be problem drinkers, but rather people who would like to drink less but need a little extra help in doing so.

Because anyone who downloads BAC Minder will already presumably be in the preparation stage of the Transtheoretical Model, BAC Minder's target users are people at that stage or higher. Because these people are already determined to change their habits, BAC Minder does not have to be quite as gentle as the keg monitoring system and only persuade by using stimulus control. Instead, BAC Minder uses two other techniques to move people higher

in the Transtheoretical Model: self-reevaluation and environmental reevaluation. Both techniques force the user to reflect on his past actions and think about how he'd like for things to be different. Self-reevaluation makes the user see the negative things that he's made happen in their own lives and realize that changing his behavior would prevent those things from happening again. In environmental reevaluation, the user is forced to realize how his unhealthy behavior has had a negative impact on other people (LaMorte).

When the future improvements are carried out, BAC Minder will use both of these techniques as it attempts to persuade users with the reminders of the negative consequences of their past. By reminding users of their hangovers or the times that they got sick or blacked out, it will force them to think about how their drinking affected their lives and how their experience would have been better had they decided to drink less. If a user were reminded of a time that he got into a fight while drunk or got arrested, he would have to think about how his poor decisions hurt his friends and family and how it could have been avoided if he had decided to drink in moderation. These slightly more aggressive techniques will hopefully push users to change their behavior so that they can move to a higher stage of the Transtheoretical Model.

#### **Part IV: Conclusion**

Having drinks with friends, when done responsibly, can be one of the more enjoyable privileges that come with being an adult. However, if alcohol is not consumed in moderation, having a few drinks can quickly change from an innocent pastime to a dangerous and unhealthy activity. Without meaning to do so, people can cause serious harm to their health and the health of those they interact with, strain important relationships with friends and family members, or even find themselves in serious legal trouble, all because they didn't know when

to stop drinking. In many cases, people overindulge in alcohol because the intoxicating effects of their drink are often delayed, especially if one is drinking a strong liquor. A person may decide that since they don't feel drunk after taking one shot of hard liquor, they should take another shot. In reality, however, the person's body had not yet processed the alcohol from the first shot, which would cause him to feel the effects of the alcohol. This desire for immediate gratification leads people to drink too much in a short period of time, and then feel the effects of multiple drinks all at once.

Problems like these are especially prominent on many college campuses, where hundreds of young people gather together and drink every weekend to relieve themselves of the stress from a long week of class. At DePauw University, specifically, many students choose to drink with their friends at fraternity parties. At these parties, which are often crowded and noisy, drinks often come from a central source of alcohol that may allow people to dispense drinks in volumes that are not uniform or prevent people from knowing the alcohol content of the drink prior to dispensing it. Because of this, many people have difficulty accurately quantifying how many drinks that they have consumed throughout the night. Additionally, fraternities are environments in which masculinity is typically seen as a very important trait. For whatever reason, many young people associate being able to drink in large quantities with being more masculine. This association creates an environment of competition among the young men in which they drink more to assert their masculinity. An inability to quantify the number of drinks one has had, combined with being in an environment where one must drink more in order to show their worth leads people to become overly intoxicated at fraternity parties.



As a result of their overindulgence in alcohol, many college students have been subjected to the negative consequences of alcohol consumption. In surveys that questioned the college students in Indiana and the students of DePauw University in particular, a significant portion of students reported suffering from hangovers, experiencing memory loss, missing class or failing to turn in assignments, getting in fights, and damaging property all because of their alcohol consumption. Many students even reported feeling guilty about their alcohol consumption or trying to quit alcohol but not being successful. If students have felt the negative consequences of consuming alcohol in excess and they feel guilty about it and want to change, then why aren't they drinking less? There is no simple answer to this question, but there are things that can be done to help those students who would like to make a change. These students are in the contemplation stage of the Transtheoretical Model, and to get them to graduate to a higher level of the model, they may need encouragement to change their behavior.

By providing students with an easy way to monitor how much they drink, students may be less hesitant to begin making changes in their behavior. In order to accomplish this goal, I have researched the work of Dr. BJ Fogg, a pioneer in the field of persuasive technology, to create persuasive technologies that will encourage people to drink alcohol in more responsible ways. My first product, the Raspberry Pi keg monitoring system, is a computer system that tracks how much beer has been poured from a keg. The system will keep track of how much beer each individual person pours and tell that person what his estimated BAC should be after finishing the most recent beer that he poured. This system is an example of computers being

used as a persuasive tool because the system helps its users quantify how much alcohol they have consumed and tells them what their BAC should be.

In some instances, people may be uncomfortable with their personal information being stored on a computer that is not controlled by them, as would be the case with my keg monitoring system. To appease this group of people, I created an Android application, BAC Minder, that will allow people to monitor their alcohol consumption on their own, without any chance of outsiders easily accessing all their data. BAC Minder will also allow users to monitor their consumption of alcoholic beverages that are not served from a keg, such as hard alcohol or wine, which many people may prefer over beer in the first place. In designing BAC Minder and laying out the groundwork for future enhancements, I developed BAC Minder to persuade not only as a tool but as a piece of media and a social actor. I created functions in which BAC Minder would expose its users to cause-and-effect simulations so that they could see what negative consequences could arise from the night if they were to follow a specific drinking pattern that had produced poor results for them in the past. Finally, I outlined a system where goal setting and positive reinforcement could be used to encourage the users of BAC Minder to continue carrying out good habits.

Both these pieces of persuasive technology are intended to help someone in the contemplation stage or higher of the Transtheoretical Model advance to a higher stage and make positive changes in their behavior. My products may not be able to immediately have a positive impact on the DePauw community as a whole, but there are students at DePauw who are aware that they drink too much and have tried unsuccessfully to mitigate their drinking. By providing these people with tools to accomplish their goals of drinking less, I can hopefully

create a wave of positive change that could impact everyone on campus. If people who don't realize or care that they drink too much see that their peers who have elected to drink less earn better grades, endure less hangovers, and enjoy better health, they might decide to make a similar change in their own lives. Peer pressure often plays a role in encouraging people to drink more, but it could also be used to make people drink less. In many ways, the influence of peers could be much more powerful than any persuasive technology.

College should be a time to explore, meet new people, and have fun, and drinking alcohol can without a doubt be a part of how people go about doing those things. However, when alcohol begins to impair one's health and wellbeing or have a negative impact on their studies, then it has become a problem. Students need to be able to recognize when their alcohol consumption has become problematic. When that realization is made, they need to be supported with information and other guidance that will allow them to mitigate their problems. It is my hope that the persuasive technologies that I have created, or something similar, will soon allow students to help make positive changes in their behaviors so that DePauw University can be a safer and more enjoyable environment for all of the students who live here.

**Go DePauw, Beat Wabash**

**Jacob Bertucci '18**

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