

Undergraduate Thesis Prospectus

Providing Weightlifters with Immediate Performance Feedback

(technical research project in Electrical Engineering)

Coke and Obesity in the United States

(STS research project)

by

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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General Research Problem

How can the incidence of overweight in United States be reduced?

Obesity has been a growing issue in the United States: the incidence was 39.8% in 2015~2016 (Hales et al., 2017). According to Columbia Mailman School of Public Health (2013), obesity is a contributing factor in 18 percent of deaths among Americans. The estimated annual medical cost of obesity in the United States was \$147 billion in 2008 US dollars; the average annual medical cost for people who have obesity was \$1,429 higher than those of normal weight (Finkelstein et al., 2009). Measures to counter this common, serious, and costly issue are urgently needed.

Providing Weightlifters with Immediate Performance Feedback

How can we provide immediate and critical performance feedback to weightlifters?

This ECE capstone project is conducted in a team of 5 supervised by Professor Harry Powell. Other team members are Kevin Zheng, Nathan Park, Daniel Wu, and Hamza Kakeh.

The research team aims to create a small device, the Smartbell, capable of collecting and displaying weightlifting statistics to evaluate stance and physical performance when attached to a barbell.

A correct stance while weightlifting can prevent injury and help muscle targeting. Injury can also be prevented by lifting weights within one's physical capability. A successful Smartbell will provide weightlifters with instant evaluations on stance to prevent potential injuries and statistics on performance to help improving their workouts in the future.

Most state-of-the-art wearables such as the Nexus only provides workout statistics and does not track stance (Sawh, 2018). Another one that does, BaziFIT, costs \$200 and only provides

feedback at the end of a workout through an app that requires a subscription (Bazifit, n.d.). Most weightlifting injuries are sustained due to imbalances during the lift, so SmartBell aims to provide real-time stance feedback with an affordable and simple device. However, the SmartBell can only provide immediate feedback on whether correct posture was used for a repetition. It cannot teach the user the correct form.

The research team will create a prototype of the SmartBell to test the methods of detecting correct form and gathering statistics. This prototype involves designing and manufacturing a printed circuit board (PCB), soldering integrated circuits and circuit elements onto the PCB, and writing the software logic to detect and analyze form and statistics. Testing will be done in a lab to check the physical components' functionality while volunteers will test the stance analyzer portion of the SmartBell in an actual gym.

At the end of the project, the team will deliver a working prototype that will be optimized for mass-production. We hope that the SmartBell will be simple and cheap enough for the masses, which should see an increase in form correctness due to its deployment.

Coke and Obesity in the United States

Since 2005, how has Coca-Cola defended itself from accusations that its products cause obesity?

Coca-Cola Company is one of the largest beverage companies in the world. Its flagship brand, Coca-Cola, is one of the best-selling carbonated soft drinks. Even though many researchers and nutritionists have criticized Coca-Cola for contributing to obesity and other health impairments (Taubes, 2018), Coke has remained popular and contributed 70% to Coca-Cola's net operating revenue of 31.8 billion dollars in 2018 (Coca-Cola, 2019). By studying the

method Coca-Cola used to defend its products, one can develop a better judgment on health information.

Researchers have studied Coca-Cola Company's business success, concentrating on its marketing and advertising techniques (Butler & Tischler, 2015). Other companies have also succeeded despite marketing products that can harm consumers' health. For instance, beginning in the 1950s, confronted by compelling peer-reviewed scientific evidence of the harm of smoking, the tobacco industry used sophisticated public relations approaches to undermine and distort the emerging science. The industry campaign created a scientific controversy through a program that depended on academic conflicts of interest. This strategy of producing scientific uncertainty undercut public health efforts and regulatory interventions designed to reduce smoking (Brandt, 2012). Industry can also influence politics through lobbying. The meat and dairy industries lobbied USDA to skew the final 2015 USDA dietary guidelines from the Advisory Committee's report which suggests nutrition intake based on scientific researches (Heid, 2016). According to Dr. Walter Willett, chair of the Department of Nutrition at Harvard School of Public Health, "The USDA's primary stakeholders are major food producers and manufacturers." (Heid, 2016)

Critics of Coca-Cola, including some researchers from Harvard School of Public Health, have contended that Coke's sugar, additives, and sweet taste may contribute to the high national obesity rate in the U.S. (Taubes, 2018).

The Coca-Cola Company has tried to counter such doubts. It launched its no-calorie product, Coca-Cola Zero, in 2005, collaborated with health advocacies to protect the market. Noncaloric drinks can reduce weight gain and fat accumulation (Ruyter, 2012). In 2014 the American Beverage Association and the Alliance for a Healthier Generation started the Balance Calories

Initiative, claiming that such beverage, plus physical activity, can prevent obesity (IBISWorld, 2019). Coca-Cola promoted its no-calorie products, in this way.

Coca-Cola also used a preemptive advertising strategy, publicizing the health costs of fat on television in Australia. Andrew Hughes, a marketing professor at the Australian National University, argues the ads are its way to promote its healthier brands, which are likely to grow (Robin, 2013). Coca-Cola's strategy is similar to that of tobacco companies which voluntarily ran ads to promote products they claimed could help smokers quit (American Lung Association, 2019).

One attempt to defend Coke failed. The Global Energy Balance Network (GEBN) was a US-based nonprofit founded in 2014, claiming to fund research into causes of obesity. In fact it promoted claims that inactivity, not bad diet, was primarily responsible for the obesity epidemic (Conner, 2015). After reporters exposed Coca-Cola's funding of this organization, it was disbanded within a year (Conner, 2015).

While funding health groups, Coca-Cola and PepsiCo have also spent millions to defeat public health legislation that would reduce Americans' soda intake (Aaron & Siegel, 2017). The nonprofit group Save the Children, which had actively supported soda tax campaigns in several states, withdrew its support in 2010. Save the Children had accepted a \$5 million grant from Pepsi (Neuman, 2010).

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