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Tracking Drinks And Diets: An Examination Of The Co-Occurrence Of Alcohol, Drunkorexia, And Fitness Trackers Among College Students

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Abstract

Nearly 40% of all college students binge drink[1]. Such a high prevalence of risky drinking has contributed to health and behavioral issues including increased violence, unwanted sexual relations, and academic problems[2,3]. In addition, approximately 39% of students engage in drunkorexia, or the act of limiting calorie intake on days that alcohol is planned to be consumed or compensating for the calories with excessive exercise [4, 5] . Moreover, drunkorexia is linked to various negative alcohol-related consequences. In addition, many people use smartphone apps and fitness trackers to monitor their diets, especially those who are concerned about their appearances[6]. However, no research has examined if those who use fitness trackers and apps are more likely to engage drunkorexia. To explore the relationship between fitness trackers and drunkorexia, the authors wrote questions to assess fitness tracker usage. The survey also included the Compensatory Eating and Behaviors in Response to Alcohol Scale[7] to assess the participants' drunkorexic behaviors. The online survey was administered electronically to undergraduate college students at a Midwest, mid-sized public university. Results suggest that fitness technology correlates to the drunkorexic scale on dietary restraint and exercise, but not the scales on bulimia, dietary restriction, and alcohol effect; therefore, suggesting fitness technology may be a mechanism that increases drunkorexia in some individuals, but not all. Understanding the mechanisms that drive drunkorexia are important because intervention strategies for binge drinking and drunkorexia can be better targeted towards those factors, such as fitness technology, that are augmenting the problem. Future research may want to investigate when fitness trackers are a mechanism behind drunkorexia and what different personality profiles exist for each scale of drunkorexia. Defining the different profiles of those who engage in drunkorexia will provide a better understanding of what sort of person fitness technology may harm instead of benefit it.

Keywords: Drunkorexia, Alcohol, Wearable Fitness Technology

1. Introduction

Alarmingly, the rate of binge drinking, or drinking 4 or 5 drinks at a time, in college students has increased to nearly 50%[1, 8]. Such high levels of drinking are dangerous given alcohol consumption can result in increased risk of alcoholism, breast cancer, tobacco use, sexual activity, and academic struggles[9, 10]. High levels of alcohol use is not the only health issue colleges are dealing with today. Eating disorders on college campuses present a major issue as well. Twenty-five percent of college women binge or purge and up to 95% have used dieting as a means to control their weight[11]. Students who engage in eating disorder behavior have a higher risk of unhealthy weight loss and heart issues[12].

While drinking and avoiding calories are seemingly contradictory, eating disorder-like behavior and binge drinking are positively correlated[5]. This co-occurrence has been labeled drunkorexia, or the act of skipping meals or excessively

exercising in order to prevent weight gain from drinking alcohol[13]. Along with high rates of drunkorexia on college campuses, more students have shown an interest in monitoring their health through wearable fitness trackers and health apps. Due to the fact both people who engage in drunkorexia and those who use fitness trackers and apps tend to be concerned about weight, appearance, and nutrition this study aimed to investigate if those individuals who use wearable fitness technology or apps are more likely engage in drunkorexia and drink more than their peers.

1.1 Drunkorexia

Given eating disorder behaviors and alcohol use on their own result in health issues, when they co-occur an additional health risk, labeled drunkorexia, may result. Drunkorexia is the act of restricting calories, skipping meals, and/or overly exercising in order to prevent weight gain from alcohol or to get drunk faster[12]. Although drunkorexia is a newer topic of study compared to other health behaviors, various researchers have conducted studies that estimate the scope of the behavior. A study of 10 North Carolina Universities reported that 39% of college students engage in some form of drunkorexia on days they plan to drink[5]. This high prevalence of drunkorexia is a concern because those who engage in such behavior are not only at an increased risk for the typical health issues associated with eating disorders and binge drinking, but they are at an elevated risk for memory loss, sexual assault, and injury[5]. This behavior often arises from conflicting pressures in the college environment; students' desire to remain thin and avoid calories from alcohol while still fitting in with the social drinking atmosphere[14]. More specifically, it has been reported that one underlying risk factor for drunkorexia is students' concerns with body image[5, 14]. Forty-seven percent of women and 32% of men report limiting food intake when they plan to drink because they fear gaining weight[5]. Other students report vomiting after drinking because they want to remain thin[15]. In essence, drunkorexia is an unhealthy behavior that is often driven by a desire for weight maintenance or loss.

1.2 Health and Fitness Technology

Although college campuses are experiencing increased health problems due to drunkorexia, eating disorders, and alcohol, many college students express a concern to live a healthy lifestyle through nutrition and physical exercise. For instance, when the dietary records of 1,912 college students were examined, skim milk, chicken, and turkey were found to be among the top 40 foods college students ate[16]. On the other hand, high fat dairy and red meats were not on the list[16]. Furthermore, physical activity appears to be important to college students. A cross cultural study of physical activity levels among college students indicated that about 50% of college students meet the American College of Sport's Medicine's recommendation of exercising for 150 minutes a week[17, 18]. Because half of college students engage in regular exercise, which decreases the risk of cardiovascular disease and other health imparities, it appears that college students want to maintain a healthy lifestyle.

In order to keep track of their health behaviors, including physical exercise, more students are using health technology, such as wearable fitness trackers and apps. A wearable fitness tracker is any device that has the ability to keep track of the user's physical activity, including but not limited to steps taken, calories burned, and distance walked[19]. These types of devices are becoming more popular, such that from 2013 to 2014 the well-known wearable fitness tracker brand FitBit sold an additional 6.4 million devices, reaching a total of 10.9 million users[20]. Also, more health professionals are recommending that their patients use fitness technology because the use of wearable fitness trackers and apps have been found to motivate people to achieve their fitness goals[21].

Although fitness trackers and apps have helped some people achieve better health outcomes, they have also resulted in other people displaying an unhealthy preoccupation with fitness and weight, similar to those with eating disorders. In interviews with fitness tracker users, some participants reported feeling obsessed with reaching their fitness and calorie burning goals for the day[21]. Some even reported that if they did not reach their fitness goal for the day that they thought they were getting fat[21]. Similarly, another study found that those people with lower self-esteem and a higher concern for their appearances are more likely to perceive wearable fitness technology as useful[6], suggesting that wearable fitness technology may elicit unhealthy concern with one's body and weight. Given that wearable fitness technology has the potential to encourage eating disorder like behaviors and thoughts, it is important to study its role in different health contexts.

1.3 Drunkorexia and Fitness Technology

While research has already established a correlation between alcohol use and eating disorders in the form of drunkorexia, no study has examined the role fitness technology has in drunkorexia. Both people who engage in

drunkorexia and those who wear fitness technology display a similar concern for weight maintenance or loss[5, 14, 21], making it logical to hypothesize that those who wear fitness trackers may engage in more drunkorexic behavior. Additionally, no one has examined if those people who wear fitness trackers drink more than those who do not wear fitness trackers, although drinking and exercise are both popular activities on college campus[1, 8, 17]. Similarly, no one has examined if people who use fitness technology are more likely to exhibit certain drunkorexic behaviors, such as overly exercising, despite the finding that fitness technology may increase physical activity and even provoke an obsession with achieving fitness goals[21]. Thus, this study sought to examine differences in drinking behaviors and drunkorexic behaviors between people who use fitness technology and those who do not through a survey which was given to students at a Midwest, mid-sized University. Taken that those who use fitness technology are more concerned about their health, it is predicted that they will drink less than those who do not use fitness trackers. Similarly, because people who use fitness trackers and people who engage in drunkorexia exhibit similar concerns about controlling their weight, it is predicted that those who wear fitness trackers will engage in more drunkorexic behavior, including overly exercising, than those who do not wear fitness trackers.

2. Methodology

2.1 Participants

For this study, 513 college students from a Midwest, mid-sized university consisting of 24.2% males (n = 129) and 74.5% females (n = 398) participated in the study. Ages of the participants ranged from 17 to 30 years (M = 20.2, SD = 1.36). The sample consisted of mostly white participants (90.1%, n = 481), and a few Hispanics (2.8%, n = 15), Native Americans (0.6%, n = 3), African Americans (1.9%, n = 10), Asian/Asian American (4.9%, n =26), Pacific Islander (0.6%, n = 3) and other (0.6%, n = 3). Participants were in all years of schooling consisting of 11.8% freshman (n = 63), 27.3% sophomores (n = 146), juniors 20.4% (n = 109), 38.6% seniors (n = 206), 0.6% 5th year seniors (n = 3), and 0.7% graduate students (n = 4).

2.2 Procedure

An online survey, approved by the Institutional Review Board, was distributed through snowball sampling technique to the participants. Social media, class and extra-curricular listservs, and class announcements were used to recruit participants. Some of the students took the survey for extra credit for a class. All participants who completed the survey were entered into a drawing to win one of four $50 gift cards.

2.3 Measures

2.3.1 alcohol consumption

At the beginning of the survey participants were asked to answer 30 questions about their current drinking habits. Questions were tailored toward finding out if students drink, how many drinks they have on occasion, and how many days of the week they typically drink. The students were also asked how many times they had gotten intoxicated in the past 30 days and how many times they binge drank.

2.3.2 drunkorexia

Students' drunkorexic tendencies were measured using the Compensatory Eating and Behaviors in Response to Alcohol Scale (CEBRACS)[7]. This 21 question, Likert-scale survey measures if respondents compensate for the calories by excessively exercising or restricting what they eat in order to not gain weight or to get drunk faster before, during, and after alcohol consumption. Each item is scored on a scale of 1-5 where 1 indicates they "never" engage in the behavior and 5 indicates they engage in that behavior "almost all the time". Each respondent was given a score on each of the four drunkorexia tendencies: alcohol effects, bulimia, dietary restraint/exercise, and restriction. The alcoholic effects scale contained seven questions on behaviors used to enhance the feeling of intoxication, such as eating less. The bulimia scale consisted of six items on purging behavior, including questions on use of laxatives and

vomiting. The dietary restraint and exercise scale consisted of six questions on changes in food habits (i.e. eating only low fat foods) or exercise habits (exercising more); lastly, the restriction scale asked two questions related to if participants skipped meals or did not eat for a full day on days the participants consumed alcohol[7].

2.3.3 fitness trackers

Participants were asked three, newly-designed questions to measure their wearable fitness tracker and app usage. Before the questions, examples of wearable fitness technology were provided. The first two questions were multiple choice questions asking participants if the used some form of a fitness tracker (yes or no) and when they wear the fitness tracker ("all day/when awake", "only when I exercise", "other"). The third question asked the participants to choose all of the features of the technology that they use, including to track calories burned, exercise, heart rate, and food intake.

3. Results

3.1 Alcohol Consumption

Out of the 534 participants, 493 (92.1%) reported having ever had an alcoholic drink. Additionally, 428 (80.1%) students reported having 4 or more drinks in one drinking occasion during the past month, with the average highest number of drinks students consumed during that time being 6.72 drinks (*SD* = 5.00). Students who did drink four or more drinks in the past 30 days reported doing so an average of 3.09 times (*SD* = 1.46). Also, results showed students drank on average 2 days a week (*SD* = 1.49), consuming on average 3.6 (*SD* = 2.38) standard drinks each day, where a standard drink was defined as 12 oz. of beer, 5 oz. of wine, or 1.5 oz. of liquor[22].

3.2 CEBRACS

On the Dietary Restriction and Exercise scale, participants tended to disagree with the statements on the each of the four subscales indicating that most of the participants did not report engaging in high levels of drunkorexic behavior. However, compared to the other scales participants agreed with more items on the on the Alcohol Effect (*M* = 8.87, *SD* = 3.62, Cronbach's alpha = .935) and Dietary Restriction and Exercise (*M* = 9.82, *SD* = 4.84, Cronbach's alpha = .89) subscales. In other words, of those who engaged in drunkorexia, more did so by exercising more or not eating many carbohydrates or fatty foods in order to enhance the effects of alcohol or avoid weight gain. On the Bulimia and Restriction scales participants scored an average of 6.57 (*SD* = 1.98, Cronbach's Alpha = .898) and 2.30 (*SD* = 0.85, Cronbach's Alpha = .708), respectively, suggesting fewer people skip entire meals or purge after drinking.

3.3 Fitness Trackers

3.3.1 fitness tracker usage

Sixty-seven participants (12.5%) indicated that they wear some form of a fitness tracker and 132 (24.7%) indicated they use either a health app or a wearable fitness tracker, for a total of 199 (37.2%) students using fitness technology Students who use the app or fitness tracker do so for the reasons listed in Table 1.

Table 1. Reasons students wear fitness trackers and use fitness apps

Reason	Number of Students	Percent of Total (%)	Percent of App Users (%)
Track exercise	132	24.7	100.0
Keep record of food intake	64	12.0	48.5
Keep record of calories burned	66	12.4	50.0
Monitor heart rate	20	3.7	15.2
Other	9	1.7	6.8

3.3.2 fitness trackers and alcohol consumption

A series of independent t-test revealed no difference in the highest number of drinks consumed at one time during the past month between participants who wear fitness trackers and those who do not. Additionally, no difference was found between those who wear fitness trackers and those who do not in the number of times they binge drank, got intoxicated, or in the number of typical drinks they consumed per drinking day.

3.3.3 fitness trackers and drunkorexia

A set of independent t-tests revealed that students who use fitness technology (M = 11.47, SD = 5.94) scored higher on the Dietary Restraint and Exercise than those who do not use fitness trackers (M = 9.20, SD = 4.27), $t(249) = 3.08$, $p = .002$. There was no difference between participants who use fitness trackers and those who do not on the scales of Alcohol Effect, Bulimia, and Restriction. Additionally, a moderate-low correlation was found between the number of reasons a person uses a fitness tracker with increased drunkorexic behavior on the CEBRACS Dietary Restraint and Exercise scale, such that those who use fitness trackers for more reasons are more likely to restrict their diet or exercise in order to prevent weight gain from alcohol, $r(113) = .26$, $p < 0.01$. Due to the sample being homogenous with respect to age and race, differences across these categories were not pursued.

4. Discussion

Overall, those people who use fitness trackers are not more likely to binge drink, purge or skip entire meals on days they plan to drink than those who do not wear fitness trackers. Also, those who use fitness trackers do not engage in drunkorexic behaviors to enhance the effects of alcohol more often than their peers. However, those who use fitness trackers are more likely to exercise and limit the number of carbohydrates and fats they eat to compensate for the calories from alcohol. Given these results, the hypothesis that those who use fitness trackers drink less than other students was not supported. Also, the hypothesis that users of fitness trackers are more likely to engage in drunkorexic behaviors was only partially supported; fitness tracker users only exhibit the drunkorexic behavior of restricting calories and exercising to compensate for calories from alcohol more than their peers.

This study's finding that users of fitness technology do not drink less than those who do not use fitness technology, adds to the current literature on alcohol use and drunkorexia in that a value for thinness does not imply less drinking. Contrary to the hypothesis that concerns over weight gain, exhibited by many people who wear fitness trackers, would deter them from binge drinking, other studies report the opposite. The higher the drive for thinness or eating disorder like behavior, the higher the rates of binge drinking[5]. Furthermore, the relatively similar amounts of binge drinking between students who express a high value for fitness (users of fitness technology) and those who do not publically show a high value for fitness (those who do not use fitness technology) suggests students' motivation to drink is higher than their motivation to stay fit. In other words, due to the high level of binge drinking among students who use fitness trackers and those who do not demonstrates that regardless of their value of fitness, the peer pressure to drink is highly influential and possibly stronger than the desire to avoid the calories from alcohol.

Additionally, the finding that those who use fitness trackers and those who do not, did not differ on the CEBRAC's bulimia and restriction subscales may indicate that fitness trackers do not enhance the most drastic drunkorexic behaviors. Binging, purging, and skipping entire meals are examples of dieting measures that have serious health effects including starvation, tooth decay, and kidney failure[14, 23]. Although some people who wear fitness trackers feel pressured to not eat in order to meet their diet standards specified by the fitness tracker, many more use the technology to effectively monitor their food intake, improve exercise levels, and enhance health[21].Thus, fitness trackers may not actually promote the drunkorexic behaviors with the most serious health consequences, but be a mechanism that facilitates healthy dietary monitoring.

However, fitness trackers may facilitate the more moderate drunkorexic behaviors because those who wear fitness trackers, exercise and monitor their food consumption more than those who do not wear fitness trackers[24]. This study's finding that those who wear fitness trackers engage in more exercise and food compensation behaviors than those who do not wear fitness trackers supports the literature. It makes sense that those who wear fitness trackers use exercise and food limitations when drinking more than people who do not wear fitness trackers because fitness technology has been found to increase dietary monitoring[21, 24]. Also, fitness technology has been correlated to lower self-esteem and higher concerns about body appearances[6]. Therefore, it is logical that people who use fitness technology are more

likely to use compensatory behaviors when drinking than those who do not wear fitness trackers because they, too, are more concerned about appearances.

Taken that people who wear fitness trackers scored higher on the drunkorexia restraint/exercise subscale, but not higher on the bulimia or restriction drunkorexia subscales suggests that each drunkorexia subscale (enhance alcohol, bulimia, restriction, and restraint/exercise) may correspond to a unique person profile. For instance, fitness tracker wearers tend to value health through self-improvement[21] and have lower body image esteem[6] than those who do not wear fitness trackers. This research suggests that the people who modify what type of foods they eat and exercise to make up for the calories from alcohol also exhibit the above characteristics. However, because fitness tracker usage did not correspond to higher rates of drunkorexic bulimia or restriction implies that there are other behaviors, values, beliefs, or personality traits that differentiate the people who skip meals or purge in order to avoid weight gain from alcohol. In essence, different behavioral, value, and personality profiles may exist for each four most common drunkorexia behaviors.

The results of this study highlight the differences in drunkorexic behaviors in regards to fitness trackers; however, the study is limited in several ways. First, the sample was relatively homogenous consisting of a mostly white women, around the age of 20, thus limiting the generalizability of the study. Another point to consider is that the influence of wearable fitness technology was not differentiated from the use of fitness apps when comparing drunkorexic behaviors. Future studies may want to compare how drunkorexic behaviors differ in those who use fitness apps, wearable fitness technology, and those people who do not use either. Lastly, the study did not take into account whether participants had ever been formally diagnosed with an eating disorder.

Taking these limitations into account, future research may want to ask if participants have a history of an eating disorder. Additionally, future research should examine drunkorexic behaviors across various fitness technologies, including apps and wearable technology in order to better understand the role each type of technology has in predisposing someone for drunkorexic behaviors. Furthermore, due to the finding that fitness technology can be used to moderate extremely unhealthy eating behaviors such as self-induced vomiting, but can also encourage drunkorexia on the restraint and exercise subscale suggests that more research is needed to find out when fitness technology is an underlying mechanism of drunkorexia and when it is not. Lastly, further research may want to explore what characteristics and behaviors that define each of the four drunkorexic behaviors.

In conclusion, contrary to expectations, those who wear fitness technology are not more likely to binge drink or to engage in the drunkorexic behaviors to get drunk faster than their peers. Wearers of fitness technology are also not more likely to purge or skip meals in order to avoid weight gain when drinking. However, in align with expectations, people who wear fitness technology are more likely to modify the types of food they eat and exercise to compensate for calories from alcohol. Given these results and the fact that fitness technology is effective in some contexts, but used unhealthily in others suggests that fitness technology can benefit or harm its users. Further studying the role of fitness technology in drunkorexia is important because it is necessary to find out what drives drunkorexic behaviors that may damage health. Lastly, studying fitness technology in relation to drunkorexia is important because it may also serve as a tool to promote smarter choices and motivate people to achieve their health goals when not abused.

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