The Effect of Chronotype on Alcohol Consumption Among College Students

Alyssa Fuhr
Department of Kinesiology and Health
Miami University
Oxford, Ohio 45056 USA

Faculty Advisor: Dr. Rose Marie Ward

Abstract

College student alcohol consumption is a public health concern. With 65% of college students consuming alcohol in any given month, they experience negative consequences including lower grades, lasting cognitive deficits, and sexual assault [6]. Previous research has examined patterns of alcohol consumption[5]. However, it is unknown if one's chronotype relates to these patterns of alcohol consumption. A chronotype is the behavioral manifestation of an individual's circadian rhythm[8]. A person's chronotype correlates to the time within a twenty-four block when that individual has the natural tendency to sleep. The purpose of the study was to investigate the relation between chronotype and alcohol consumption. Data was collected via an online survey administered at a mid-size university located in the Midwest. The participant sample consisted of over 500 undergraduates with an average age of twenty. The majority of responses came from people who identified as Caucasian and female. From the data, median age of first drink was 17 years. On a typical day of drinking, people consume an average of about 4 standard drinks. The majority of people identified as an intermediate chronotype. Those described as "intermediate" types typically had at least 1 drink two days per week; and had an average of $3.5 - 4$ drinks in a typical drinking session. The highest number of drinks reported for one occasion was 7. A significant correlation indicated that morning people were more likely to drink fewer days/week, $r(211) = -.17$, $p = .01$. However, it was also determined that chronotype was not significantly correlated to how many drinks an individual consumed on a typical day of drinking, $r(211) = -.05$, $p = .45$. Implications will be discussed.

Keywords: Chronotype, Alcohol, College

1. Introduction

Alcohol consumption among college-aged students poses a serious public health risk. More than 150,000 undergraduate students develop an alcohol-related health problem each year[7]. This is made even more concerning given that possible negative consequences of alcohol consumption include lower grades, lasting cognitive deficits, and sexual assault[7]. It has also been established, from past studies, that individuals identifying as an evening-type are more likely to exhibit increased novelty-seeking, sleep disturbances, and health-impairing behaviors, such as concerning alcohol use and dependence[6]. There is an ever-growing body of research regarding alcohol consumption. And while there is current research regarding the connection between chronotype and behavior related to alcohol, there is not a significant amount of literature regarding how chronotype influences alcohol habits in populations of undergraduate, college-age students.

1.1 Chronotype

Chronotype or diurnal preference describes the period within a 24-hour time cycle that a person is naturally inclined to wake, be most alert and productive, and fall asleep[6]. The three main classifications are: morning-type, intermediate-type, or evening-type. Most of the population identifies as an intermediate-type, with a minority falling into each of

the opposite ends of the spectrum[4]. Because pathways that dictate diurnal preference are also involved in other psychological process, chronotype influences behavior tendencies. Therefore, the purpose of this study was to further investigate the effect that chronotype has on alcohol consumption and alcohol-related habits in college students. Hopefully, results of this study will help explain alcohol tendencies on college campuses and thus permit more effective prevention approaches that can decrease dangerous drinking behaviors and the resulting consequences.

For individuals to determine their chronotype classification, a Morningness-Eveningness Questionnaire (MEQ) was utilized. This self-assessment questionnaire was created by researchers James A. Horne and Olov Ostberg in 1976. This assessment tool suggests if a person's time of peak alertness (related to peak body temperature), occurs in the morning, evening, or sometime in-between. This method of diurnal preference determination is widely used. The standard MEQ consists of nineteen multiple-choice questions in which answers are assigned a point value. The points from each question are added together to form a composite score that reflects to what extent the subject prefers morning versus evening. There are five categories in which an individual can be placed based on their composite score: "definite evening", "moderate evening", intermediate", "moderate morning", and "definite morning". The focus of this study was morning, intermediate, and evening-types.

There is a fair amount of research suggesting that people who are most active in the evening hours tend to show higher neuroticism, lower self-control and self-regulation, as well as greater procrastination, higher novelty seeking, and lower harm avoidance when compared to people who are more morning-inclined[4]. Clearly, society (i.e., work and school) is geared toward morning-type people as starting times for many obligations are normally early in the morning. This social jetlag, or the misalignment of social and biological times, that evening-types experience supports the finding that, under natural circumstances, evening-types report later sleep-wake times, shorter total sleep time on weekdays, and larger differences between sleep-wake times on weekdays and days with no commitments[2]. Additionally, altered-reward functions commonly observed in evening-types are driven by non-circadian sleep disturbances and/or sleep loss. This may explain why evening-oriented people show differences in reward-related scenario processing. Furthermore, acute sleep deprivation increases reward reactivity, reduces concern about losing, and decreases behavioral inhibition[2]. Again, this is logical as circadian genes are also present in the reward-associated regions of the brain and thus can influence behaviors related to reward function. This influence extends to behaviors/habits surrounding alcohol[2]. Notably, there is a switch in chronotype, toward eveningness, around the end of adolescence[4]. This is also a time when alcohol can become more prevalent in an individual's life.

1.2 Alcohol Behaviors

It is crucial to understand the basis of attitudes and behaviors surrounding alcohol because alcohol consumption is common on college campuses around the country. Furthermore, alcohol abuse in the United States uses over $230 billion annually from costs related to crime, lost work productivity, and healthcare[6]. Alcohol habits can be linked to diurnal preference.

1.3 Chronotype And Alcohol Behaviors

Preliminary evidence suggests that diurnal preference influences alcohol use, such that evening-types consume more alcohol than morning types. A common set of genes is involved in diurnal preference and reward function, as discussed above, and this genetic overlap accounts for the associations between diurnal preference, alcohol quantity, and binge drinking[6]. Social jetlag and increased sleep problems, due to school/work/other demands, among people who are more evening-oriented causes stress. Stress requires a coping mechanism – and that mechanism is possibly alcohol[4]. It is also suggested that alcohol was a common method of relaxation[1]. Sleep problems include trouble falling or staying asleep, insufficient time spent asleep, among others and all have been associated with alcohol problems[2]. Consumption of alcohol and other psychostimulants has been found to be highest among evening-types and lowest among morning-types[1]. It should be noted though that most of the population (about 60%) identifies as an intermediate-type[1].

Morning people go to bed earlier and are most productive in the earlier hours of the day with evening people going to bed later and being more productive during the later hours of the day[6]. Again, genetics influences 37% of differences in diurnal preference with environmental circumstances accounting for the rest[6]. The hypothalamic suprachiasmatic nucleus is the primary circadian pacemaker and ensures proper duration and consistent timing of sleep[6]. Differences in chronotype also translate to differences in behavior and reward function. This finding corroborates animal studies that have indicated that circadian genes are active in reward-related brain regions and influence behaviors such as alcohol consumption[2]. Evening-types have shown to be more prone to negative outcomes involving reward. They show a decrease in medial prefrontal cortex (mPFC) reactivity during reward anticipation and an increase in ventral

striatum (VS) reactivity during a win outcome. The latter is associated with greater consumption of alcohol where the former is associated with more symptoms of alcohol dependence[2]. Additionally, one study found that while morning and evening-inclined people didn't differ in frequency of alcohol consumption, evening-types consumed a larger quantity and were more likely to report binge-drinking[6]. These finding are consistent with data from other studies.

Consequently, the purpose of this current study is to show that current findings are also applicable to students at college. This study aims to show that students who identify as an evening-type are more likely to consume more alcohol than students identifying with other diurnal preferences. Literature has shown that there is a connection between chronotype and alcohol behaviors. Data from the sample within this study should show a similar trend in that undergraduates who are more active and alert at some time during the evening hours will report drinking more alcohol, more frequently than their peers who are more inclined to be active at times other than the evening hours. Getting to the cause of certain alcohol tendencies in late adolescents/early adulthood could create new prevention and treatment options with higher success rates.

2. Methods

2.1 Participants

This study was conducted among undergraduate students at a mid-size university located in the Midwest. The sample for this study consisted of 534 individuals. The university in this study is relatively homogenous in terms of ethnic/racial diversity – mostly Caucasian, with many students coming from affluent households. The participants within this study were mainly of white/Caucasian background, with 481 respondents identifying as such (90.1%). Most responses also came from females (75.1 %), with the other 24.3% of responses coming from men. The mean age of respondents was 20.21 ($SD = 1.36$) years.

2.2 Measures

2.2.1 morningness-eveningness measure

The Horne-Ostberg scale was used to determine participant chronotype. A higher composite score on this scale corresponds to a morning-type classification and a lower score corresponds to an evening-type identification. A morning-type person is someone who has the natural inclination to go to bed earlier at night as well as wake earlier in the day. Morning-types also experience an earlier peak time – the time when an individual is most productive. An evening-type person is the opposite. The scale consisted of 19 multiple choice questions, with a point value assigned for each response option. Every question had either four or five response options. Upon completion of the questionnaire, the total number of points was calculated and matched with a chronotype preference. Composite scores ranged from 16 – 86 with a score of 16 being a strong morning-type and a score of 86 being a strong evening-type. All scores in-between the lower and upper-limit were broken down into three intermediate-type categories.

2.2.2 alcohol consumption

The survey used to collect data on alcohol consumption provided the definition of a standard drink as a reference point. After the definition, the participants were asked a series of questions including, if they had ever consumed alcohol, the number of days per week that they typically drank, the number of drinks that they drank on a typical occasion, and their highest drinking occasion in the past 30 days.

2.3 Procedure:

Data for this study was collected using the snow-ball method meaning an email containing the link to an online survey was sent out to students on campus. Each student received an individualized version of the same link and participants were not able to send the link to others. Upon completion of the survey, students were entered to win four $50 gift cards.

3. Results

3.1 Sample Characteristics

Regarding alcohol intake, 92% of participants (n = 493) indicated that they had consumed an alcoholic beverage in the past. Additionally, in a typical week, respondents consumed at least one drink on 2.13 (SD = 1.49). Furthermore, on average, respondents had 3.60 (SD = 2.83) drinks on typical day of drinking. During the last 30 days, the mean highest number of drinks consumed on one drinking occasion was 7.05 (SD = 4.76) drinks. The mean score on the Morningness-Eveningness questionnaire was 51.12 (SD = 7.93) – i.e., intermediate type.

3.2 Chronotype And Alcohol Consumption

Responses to questions regarding both alcohol consumption habits and morningness-eveningness preference were compared. There was a significant correlation that indicated morning-inclined people were more likely to drink fewer days/week, $r(211)$ = -.17, p = .01. However, it was also determined that chronotype was not significantly correlated to how many drinks an individual consumed on a typical day of drinking, $r(211)$ = -.05, p = .45.

4. Discussion

This study was an attempt to investigate the associations between chronotype and alcohol consumption among undergraduate students at a university in the United States. And the findings of this study offer evidence in support of the hypothesis that evening-types tend to drink more frequently than morning or intermediate-types with no significant association between diurnal preference and amount of alcohol consumed.

4.1 Chronotype Identity And Alcohol

The results of this study suggest that morning-inclined people are more likely to drink less often, but there was no significant correlation between chronotype and amount of alcohol consumed. This partially supports the hypothesis that evening-types would drink more and more frequently compared to other people with differing diurnal preferences.

   Outside research does not strongly or completely support these findings. It was found that morning and evening-types did not significantly differ in drinking frequency, but did show that evening-types consumed a greater amount of alcohol and were more likely to say that they binge-drink[6]. Similar results were also seen in another study that concluded that a stronger identification with morning-type showed less frequent alcohol use and healthier behaviors overall[4]. This trend is further supported by other research in that consumption of psychoactive substances, including alcohol, was indicated to be highest among evening-types, moderate in intermediate types, and lowest among those identifying as morning people[1]. It has also been suggested that an evening preference is significantly related to higher alcohol consumption and more alcohol dependence symptoms[3].

   These above-mentioned research studies present a different picture than do the results of this study in that this study showed that chronotype influenced how frequently a person used alcohol, but not how much alcohol was consumed. Generally, other studies have shown the opposite of this study – being that chronotype does not influence frequency of drinking, but does influence how much an individual may drink.

4.2 Limitations

The results of this study may differ from the results of several other studies for many reasons. For one, this study had data reported by a very homogenous, specific population that may not be representative of a broader population. Secondly, this population was of a different average age-group than other studies.

   There are some limitations that need to be considered when interpreting and applying the findings of this study. First, the sample in this study was comprised mostly of females and thus results may be gender-specific and not generalizable toward other populations. Secondly, data was collected using an online survey, which is selective in and of itself. Furthermore, because data was collected using a survey, all data in this study was self-reported. Self-reported data could be a limitation because this type of data may not be the most accurate. Lastly, the population used for this

study was not a random sample. Due to the above-mentioned limitations, it is hard to generalize the findings of this study beyond the sample used.

4.3 Implications

Despite these implications, the results of this study are still useful in further adding to the understanding of different behaviors toward alcohol. This study is also interesting because it increases insight into reasons why some college-aged individuals consume more alcohol or consume alcohol more frequently than their peers. Additionally, it provides the university at which this study was conducted greater insight to the reasons behind alcohol consumption on/around campus. Generally, understanding the root cause(s) of behavior can lead to more unique and effective programs and prevention strategies regarding problematic alcohol behaviors on college campuses across the country. More studies need to be done on this topic, with this age-group to further understand alcohol and its role among college-students.

5. Acknowledgments

6. References

1. Adan, A. (1994). Chronotype and personality factors in the daily consumption of alcohol and psychostimulants. *Addiction*, 89, 455 – 462.
2. Hasler, B.P., Sitnick, S. L., Shaw, D.S., Forbes, E.E. (2013). An altered neural response to reward may contribute to alcohol problems among late adolescents with an evening chronotype. *Psychiatry research: neuroimaging, 214,* 357 – 364.
3. Hasler, B.P., Soehner, M., Clark, D.B. (2014). Sleep and circadian contributions to adolescent alcohol use. *Alcohol, 49,* 377 – 387.
4. Urbán, R., Magyaródi, T., Rigó, A. (2011). Morningness-Eveningmess, chronotypes and health-impairing behaviors in adolescents. *Chronobiology International*, *28* (3), 238-247.
5. Ward, R. M., Cleveland, M. J., & Messman-Moore, T. L. (2013). Latent class analysis of college women's Thursday drinking. *Addictive Behaviors, 38*(1), 1407-1413.
6. Watson, N.F., Buchwald, D., Harden, K.P. (2013). A twin study of genetic influences on diurnal preference and risk for alcohol use outcomes. *Journal of Clinical Sleep Medicine, 9* (12), 1333 – 1339.
7. White, A., & Hingson, R. (2014). The Burden of Alcohol Use: Excessive Alcohol Consumption and Related Consequences Among College Students. *Alcohol Research: Current Reviews*, *35*(2), 201–218.
8. Zavada, A., Gordijn, M. C. M., Beersma, D. G. M., Daan, S., & Roenneberg, T. (2005). Comparison of the munich chronotype questionnaire with the horne-ostberg's morningness-eveningness score. *Chronobiology International, 22*(2), 267-278.