**Introduction**

College is considered a pivotal period of development between adolescence and adulthood (Montgomery & Cote, 2006). Although often associated with positive regard, self-exploration, social connections and achievement, this period is also closely associated with increased vulnerability for mental health difficulties and risky behaviors, such as substance use (Cranford et al., 2009; White et al., 2005). Loneliness in college is considered a risk factors for increased substance use, particularly marijuana use (Copeland et al., 2018). Many of these studies investigating these relationships are cross-sectional, limiting the ability to understand the predictive nature of these relationships. This has proven to be a major gap in the literature, therefore, it is crucial to conduct longitudinal studies which investigate the long-term patterns of substance use in college, and the relationships between loneliness and substance use among college students in their late adolescence and early adulthood. The purpose of this study is to investigate how problematic marijuana use changes over time between freshman year of college through junior year of college, and whether greater loneliness early in college predicts problematic substance use later on. Examining the long-term relationships not only expands knowledge of targetable predictors of problematic substance use, but on a larger scale, also may help improve transitions out of college into formal adulthood.

**Research Questions**

The aims of this study were to 1) identify how problematic marijuana use changes over time during the undergraduate experience and how this varies within and between students, and 2) examine whether loneliness early in college predicts problematic substance use throughout college and between students. We predicted that problematic marijuana use would increase with time, and with increased levels of loneliness at baseline.

**Method**

Participants from this study (N = 270, *Mage* = 18.03, *SD* = 0.28)included incoming University of Oregon (UO) freshmen, 17 years or older (see Table 1). Participants were recruited via email and in-person during college orientation events to partake in the “Freshman Project.” Participants were asked to participate in a baseline assessment prior to the onset of freshman year or immediately after beginning their first term at UO (Fall 2018). Furthermore, participants were asked to repeat assessments at four follow-up timepoints: Winter 2019, Spring 2019, Summer 2019, and Fall 2020. The latest timepoint was proposed to assess symptoms and behaviors in response to the COVID-19 pandemic.

The Freshman Project was designed to assess incoming college students’ experiences, goals, priorities, mental health, substance use, neural activity, and risky behaviors across their first year of college. The relevant measures, loneliness and problematic marijuana use, for this research study are as follows: UCLA Loneliness Scale, 8 items (ULS-8; Hays & Dimatteo, 1987), Rutgers Marijuana Problem Index (RMPI; White et al., 2005).

**Table

Description automatically generated with medium confidence**

***Data Preparation***

Data preparation involved subsetting the relevant measures (i.e., ULS, RMPI, age, sex) and timepoints, as well as checking for missing data and the distribution of the data. There was a high rate of missing data (72%) among the RMPI variable, therefore the data was multiply imputed five times, and the imputed data sets were merged into one for further assumption checking and analyses. The distribution of the RMPI measure is fairly positively skewed with a notable number of 0s reported by participants. The skewness of a log transformed variable was not particularly improved, therefore, the raw imputed data was utilized for the analyses.

***Analysis Plan***

The models to answer this research study included time nested within subjects, indicating random effects of the intercepts and slopes. The first model included only time as a fixed predictor, whereas the second model included baseline loneliness as a predictor as well. These models were fitted based on the research questions, so further model comparisons were not conducted and reported.

**Results**

The average levels of problematic marijuana use scores across time points was 2.97 with a range between 0 - 18, while average baseline loneliness was 2.01. Based off model 1, college students, on average, scored a 2.75 (95% CI: [2.52, 2.98]) on problematic marijuana use during Fall term of freshman year. This varied between students with a standard deviation of 1.00 point. The coefficient for time2 conveys that problematic marijuana use was predicted to be .41 points (95% CI: [0.09, 0.73]) higher during Winter term of freshman year, which was a significant difference. According to the coefficients and confidence intervals for time3 (-0.06, 95% CI: [-0.40, 0.28]) and time4 (0.31, 95% CI: [-0.07, 0.69]), the problematic substance use scores during Spring and Summer term of freshman year were not significantly different from Fall of freshman year. Similarly, the coefficient for time5 conveys that problematic marijuana use was predicted to be .51 points (95% CI: [0.07, 0.95]) higher during Fall of junior year, compared to Fall of freshman year.

Model 2, which includes baseline loneliness as a predictor suggests that problematic marijuana use increases by .68 points (95% CI: [0.43, 0.92]) as loneliness at baseline increases; this varied between students with a standard deviation of .12. Students, on average, rated their problematic use at 1.35 during their first assessment Fall of freshman year (95% CI: [0.79, 1.91]), which varied between students with a standard deviation of .93 points. Overall, the model suggests that problematic marijuana use is predicted to increase significantly between Fall of freshman year to Fall of junior year of college by .47 points (95% CI: [0.02, 0.91]) to a score of 1.82. The coefficient for time2 indicated that problematic substance use is predicted to increase significantly by .41 points (95% CI: [0.08, 0.73]) during Winter term of freshman year. Compared to problematic use during Fall term, there was not a significant change during Spring term (-0.07, 95% CI: [-0.08, 0.73]) or Summer term (0.30, 95% CI: [-0.08, 0.69]) of freshman year, however.

**Table 2.** Model 2 Results

**Table

Description automatically generated**

**Discussion**

Overall, the results of this study displayed increased patterns of problematic marijuana use among college students between freshman year and junior year. Levels of problematic marijuana use during the second half of freshman year did differ significantly from baseline. Possible explanations for this may be that students adapted their patterns of marijuana use to mitigate consequences or learned to better manage substance use. The significant increase between freshman year (timepoint 1) and junior year (timepoint 5) perhaps could be attributed to the COVID-19 pandemic (Horigian et al., 2020). Substance use, among adolescents and the general public, has been on the rise as a result of the pandemic, and could be partially attributed to loneliness. Lastly, these findings demonstrated the predictive nature of greater levels of loneliness on increased problematic use, corresponding with previous study findings **()**. The range of reported scores of the problematic substance use was fairly small, considering the measure is 18-items, therefore it is important to interpret the findings cautiously without making bold claims about the quantity of increased problematic use.

Limitations of this study include data that violated assumptions (i.e., normality of residuals) and contained a large proportion of missing data. Future steps include replicating this longitudinal study across various undergraduate campuses in order to improve generalizability, validity, and better highlight areas of intervention for problematic adolescent substance use.

**Work Cited**

Copeland, M., Fisher, J. C., Moody, J., & Feinberg, M. E. (2018). Different Kinds of Lonely: Dimensions of Isolation and Substance Use in Adolescence. *Journal of Youth and Adolescence*, *47*(8), 1755–1770. <https://doi.org/10.1007/s10964-018-0860-3>

Cranford, J. A., Eisenberg, D., & Serras, A. M. (2009). Substance use behaviors, mental health problems, and use of mental health services in a probability sample of college students. *Addictive Behaviors*, *34*(2), 134–145. <https://doi.org/10.1016/j.addbeh.2008.09.004>

Hays, R., & DiMatteo, M. R. (1987). A Short-Form Measure of Loneliness. *Journal of Personality Assessment*, *51*(1), 69–81. <https://doi.org/10.1207/s15327752jpa5101_6>

Horigian, V. E., Schmidt, R. D., & Feaster, D. J. (2021). Loneliness, Mental Health, and Substance Use among US Young Adults during COVID-19. *Journal of Psychoactive Drugs*, *53*(1), 1–9. <https://doi.org/10.1080/02791072.2020.1836435>

Montgomery, M. J., & Cote, J. E. (2006). College as a Transition to Adulthood. In G. R. Adams & M. D. Berzonsky (Eds.), *Blackwell Handbook of Adolescence* (pp. 149–172). Blackwell Publishing Ltd. <https://doi.org/10.1002/9780470756607.ch8>

White, H. R., Labouvie, E. W., & Papadaratsakis, V. (2005). Changes in Substance use during the Transition to Adulthood: A Comparison of College Students and Their Noncollege Age Peers. *Journal of Drug Issues*, *35*(2), 281–306. <https://doi.org/10.1177/002204260503500204>