

RUNNING HEAD: PRODUCTIVE PROCRASTINATION AND ALCOHOL

Number of Tables: 4

Number of Figures: 1

Productive Procrastination: Academic Procrastination Style Predicts Academic and Alcohol Outcomes

Erin C. Westgate¹

Stephanie V. Wormington²

Kathryn C. Oleson³

Kristen P. Lindgren⁴

¹ University of Virginia, Department of Psychology,
Box 400400, Charlottesville, VA 22904, USA

² Michigan State University, Department of Counseling, Educational Psychology, and Special
Education,

620 Farm Lane, East Lansing, MI 48824-1034, USA

³ Reed College, Department of Psychology,

3203 Woodstock Blvd, Portland, OR 97202, USA

⁴ University of Washington, Department of Psychiatry & Behavioral Sciences,
Center for the Study of Health & Risk Behaviors, Box 354944, Seattle, WA 98195, USA

Funding Acknowledgment: This research was supported by the National Institute of Alcohol Abuse and Alcoholism (R00AA017669; PI: Lindgren). Manuscript support was also provided by R01AA21763 (PI: Lindgren). NIAAA had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit this paper for publication.

Contributors: Correspondence concerning this article should be addressed to Erin C. Westgate, University of Virginia, Department of Psychology, Box 400400, Charlottesville, VA 22904, USA. Email: ecw4za@virginia.edu. The authors of the paper contributed as follows: Designed research: EW SW KO KL; Conducted research: EW KL; Analyzed data: EW SW; Wrote paper: EW SW KO KL. All authors have approved the final manuscript.

Conflict of Interest Declaration: None.

Abstract

Productive procrastination replaces one adaptive behavior with another adaptive—albeit less important—behavior (e.g., organizing notes instead of studying for an exam). We identified adaptive and maladaptive procrastination styles associated with academic and alcohol outcomes in 1106 college undergraduates. Cluster analysis identified five academic procrastination styles—*non-procrastinators*, *academic productive procrastinators*, *non-academic productive procrastinators*, *non-academic procrastinators*, and *classic procrastinators*. Procrastination style differentially predicted alcohol-related problems, cravings, risk of alcohol use disorders, and GPA (all $ps < .01$). Non-procrastination and academic productive procrastination were most adaptive overall; non-academic productive procrastination, non-academic procrastination, and classic procrastination were least adaptive. Productive procrastination differed from other procrastination strategies, and maladaptive procrastination styles may be a useful risk indicator for preventative and intervention efforts.

Keywords: procrastination, alcohol, college students, drinking, GPA, person-centered analysis

Jennifer has an upcoming chemistry exam. She dreads the exam and decides to delay the inevitable by going out to a bar with her friends and drinking instead of studying. As a result, she receives a poor grade on her exam. Procrastination, the decision “to voluntarily delay an intended course of action despite expecting to be worse off for the delay,” (Steel, 2007, p. 66) is associated with various negative outcomes (e.g., poor health and work performance, financial instability, stress; Steel, 2007; Zarick & Stonebraker, 2009) and traditionally attributed to failures in self-regulation or motivation (Soloman & Rothblum, 1984; Steel, 2007, p. 66; but see Chu & Choi, 2005). It is commonplace, with an estimated 80-95% of college students regularly procrastinating in their courses (Steel, 2007).

We focused on the link between procrastination and drinking given the substantial burden and unique context associated with college student drinking (Johnston et al., 2010; Steel, 2007). Procrastination has been linked to greater alcohol consumption (Phillips & Ogeil, 2009, Sirois & Pychyl, 2002) and more alcohol-related problems (Jamrozinski, Kuda, & Mangholz, 2009), possibly due to higher trait impulsivity (McCown & Roberts, 1994; Steele, 2007), greater discounting of delayed losses and gains (Takahashi, Ohmura, Oono, & Radford, 2008) and/or drinking as a self-handicapping strategy (Berglas & Jones, 1978; Jamrozinski, Kuda, & Mangholz, 2009; Richards, Zhang, Mitchell, & de Wit, 1999). We sought to evaluate the relationship between procrastination, drinking, and academic achievement by identifying specific types of maladaptive procrastination. We also investigated whether hazardous drinking mediated the relationship between problematic procrastination and academic achievement, as in our opening example.

Reconceptualizing Procrastination

Although often considered to be wholly maladaptive, some forms of procrastination may be less harmful than others. We distinguish classic conceptualizations of procrastination (i.e., unproductive) from two forms of “productive” procrastination: 1) academically productive procrastination, in which students procrastinate on one assignment by working on a less important or easier assignment, and 2) non-academic productive procrastination, in which students do non-classwork-related activities that are important but not necessarily enjoyable (e.g., washing dishes, exercising, paying bills).

Unlike traditional procrastination, which replaces adaptive behaviors with maladaptive behaviors, productive procrastinations replace one adaptive behavior with another adaptive—albeit less important—behavior (e.g., organizing notes instead of studying for an exam). Academic and non-academic productive procrastination differ in whether the primary academic activity is replaced by a behavior *inside* or *outside* the academic domain (e.g., organizing notes vs. exercising). Substituting one adaptive (but less desirable) behavior for another may have less severe consequences than substituting neutral or maladaptive behaviors. For instance, individuals engaging in productive procrastination are, by definition, not drinking as a means of procrastinating. Students engaging in academic procrastination are still completing academic tasks and should perform better academically than students who procrastinate using non-academic tasks. Preliminary evidence suggests that college students regularly engage in both academic and non-academic productive procrastination (Wormington et al., 2011), but whether these procrastination styles are associated with hazardous drinking or academic outcomes is unknown.

Also unknown is whether these types of procrastination co-occur within the individual. A limitation of the extant research is that it assumes that students who procrastinate do so in the

same way every time. However, students may choose whether to procrastinate—or even employ different forms of procrastination—depending on the circumstances. Accurately modeling this combination of procrastination responses to an academic task—or “procrastination style”—may be particularly important for research on complex outcomes like hazardous drinking. In this study, we evaluate students’ “procrastination styles” using a person-centered correlational approach, which examines how individual behavior strategies combine into discrete “styles” to predict outcomes of interest (Bergman & Trost, 2006). This approach complements variable-centered analyses (e.g., regression analysis), which focus on the unique association of each type of procrastination with outcomes of interest, independently of the presence of other procrastination strategies.

Current Study

The current study investigated (1) whether college students report engaging in productive and unproductive types of procrastination, (2) which procrastination strategies co-occur and if such combinations represent distinct procrastination styles, and (3) whether such procrastination styles are uniquely related to self-reported hazardous drinking (i.e., greater alcohol consumption, alcohol-related problems, clinical screening measures for alcohol use disorders, and alcohol cravings) and academic success (i.e., GPA). We chose to examine alcohol cravings due to the recent inclusion of cravings as a criterion for alcohol use disorders (*DSM-5*; American Psychiatric Association, 2013). We investigated this question using a combination of variable-centered and person-centered analyses to assess discriminant validity and model the effects of procrastination on outcomes of interest, respectively. Because traditional measures of procrastination do not distinguish between productive and non-productive forms, we assessed productive procrastination using a series of vignettes. We chose to use vignettes based on work

suggesting that behavioral tendencies are best measured by presenting concrete scenarios (Ouellette & Wood, 1998; Peng, Nisbett, & Wong, 1997).

We predicted that productive forms of procrastination would be distinct from unproductive forms and that combinations of procrastination strategies would emerge in naturally occurring “styles”. We expected that students with procrastination styles characterized by non-procrastination and/or productive procrastination would report reduced hazardous drinking and higher GPAs. We also expected that procrastination styles characterized by unproductive procrastination would be associated with increased hazardous drinking and lower academic performance. Additionally, we conducted mediation analyses to investigate whether the relationship between procrastination style and GPA might be mediated by drinking, reasoning that maladaptive procrastination styles may lead to hazardous drinking that subsequently impacts academic achievement.

Method

Procedure

Procedures were approved by the university’s Institutional Review Board. Participants were recruited from a randomized list of 2500 current, full-time undergraduate students and invited via email to participate in a study about cognitive processes and alcohol. Forty-four percent of the students elected to participate via a web site, where they completed a battery of questionnaires as part of a larger study, and were compensated \$15. This response rate is typical for non-participant pool samples at this institution.

Participants

Participants consisted of 1106 undergraduates (654 women, 449 men, 2 transgender, 1 declined to answer; $M_{age} = 20.40$, $SD = 1.60$, range = 18-25; 59% White, 27% Asian, 8% bi- or

multi-racial, 6% Black/African American, American Indian/Alaska Native, Native Hawaiian/Other Pacific Islander, unknown, or declined to answer). Two participants were excluded from analyses due to patterns of improbable responses suggestive of deliberate misreporting, leaving a final sample of 1104 participants.

Measures

Procrastination. The Procrastination Styles Questionnaire measured the perceived likelihood of engaging in four behavioral responses to ten difficult academic scenarios (Table 1). The four responses were non-procrastination (“Get started on it right away”; $\alpha = .93$), academic productive procrastination (“First work on an academic easier task that is due relatively soon”; $\alpha = .94$), non-academic productive procrastination (“First do something non-academic but productive [clean your room, do the dishes, exercise, etc.]”; $\alpha = .96$), and classic procrastination (“First do some non-academic, not necessarily productive task e.g., check Facebook, watch television, socialize with friends, etc.”; $\alpha = .96$). For each scenario, participants rated the likelihood that they would engage in each of the four behavioral responses on an 11-point scale from 0% to 100%¹.

Academic performance. Participants self-reported their most recent GPA on a 0 to 4.0 scale. Self-report measures of grades are well-validated and correlate strongly with actual grades (Dornbusch, Ritter, Leiderman, Roberts, & Fraleigh, 1987; Gray & Watson, 2002; Kuncel, Credé, & Thomas, 2005; Nofle & Robins, 2007).

Alcohol consumption. The Daily Drinking Questionnaire (DDQ; Collins et al., 1985) assesses typical weekly alcohol consumption over the past month. Participants reported how many US standard drinks they consumed on each day of a typical week. Scores reflect the total

¹ Percentages did not have to add up to 100%

number of drinks consumed per week. Participants were provided with common standard drink equivalencies.

Alcohol Problems. The Rutgers Alcohol Problem Index (RAPI; White & Labouvie, 1989) asks participants to report how many times in the past 3 months (0 = “never;” 4 = “more than 10 times”) they experienced 23 symptoms of problem drinking and negative consequences as a result of drinking ($\alpha = .93$)². Severity of problems ranged from mild (“Had a bad time”) to serious (“Suddenly found yourself in a place that you could not remember getting to”). Two additional items were added asking participants how often they had driven shortly after consuming two and four drinks, respectively.

Alcohol Use Disorders. The Alcohol Use Disorders Identification test (AUDIT; Babor et al., 2001) is a widely used 10-item measure that can identify individuals at risk for meeting criteria for alcohol use disorders. Participants are asked how much and how often they typically drink on a typical day, as well as how often they report cravings and problems due to alcohol (0 = “never;” 4 = “daily or almost daily;” $\alpha = .79$)³.

Alcohol Cravings. Cravings were measured using the Alcohol Craving Questionnaire Short Form-Revised (ACQ; Singleton et al., 1995). Twelve items measured current alcohol craving (e.g., “If I had some alcohol I would probably drink it”), including alcohol use intentions, anticipated effects of drinking, and lack of control, on a 7=point scale (-3 = “strongly

^{2,3} Three items on the AUDIT and four items on the RAPI could be construed as possible instances of procrastination (e.g., “How often during the last year have you failed to do what was normally expected from you because of drinking?”). To rule out possible confounding effects, the AUDIT and RAPI were scored with and without these items for preliminary analysis. Results did not differ as a function of item inclusion, thus all AUDIT and RAPI items were retained in final analyses.

disagree”; 3 = “strongly agree”; $\alpha = .80$). The final item of the ACQ was omitted due to a programming error.

Analysis Plan

We first examined the relationships between the four procrastination strategies from the Procrastination Styles Questionnaire to determine whether they represented distinct response patterns. Using correlational and multiple regression analyses to assess discriminant validity, we assessed whether the four strategies differentially related to one another and to outcomes of interest, respectively.

We then identified naturally-occurring patterns of procrastination using cluster analysis, which assigns participants to a procrastination style. These styles model the tendency of students to engage in multiple procrastination strategies by identifying common combinations of procrastination strategies and grouping people who use those combinations together. Procrastination styles were then used as a categorical variable in subsequent analyses. For data that were normally distributed (i.e., academic performance, alcohol cravings), we used one-way analysis of co-variance (ANCOVA) and one-way analysis of variance (ANOVA) to analyze the relationship between procrastination style and outcome variables. For non-normally distributed alcohol variables (i.e., alcohol consumption, AUDIT, alcohol problems), data were entered into a generalized linear model – specifically, a count regression model with a negative binomial log link (see Atkins & Gallop, 2007). Generalized linear models are similar to OLS regression, but can accommodate dependent variables with non-normal distributions. Following significant omnibus tests for the generalized linear models, we conducted planned comparisons contrasting each of the procrastination styles against non-procrastinators. Gender was entered as a dummy-coded control variable in all alcohol analyses to control for known effects of gender on drinking

outcomes. Following our primary confirmatory analyses, we conducted an exploratory analysis to test whether alcohol mediated the relationship between procrastination style and GPA.

Results

Descriptive Statistics

Descriptive statistics are displayed in Table 2. On average, participants reported consuming six drinks per week on a typical week during the last month and experiencing five alcohol-related consequences over the last three months. Overall, 89.8% of participants reported at least one forecasted instance of procrastination (i.e., a > 50% chance of procrastination in at least one scenario). Participants endorsed each of the four procrastination strategies (forecasted probability of non-procrastination: 66.74%, productive academic procrastination: 50.69%, productive non-academic procrastination: 40.04%, classic procrastination: 44.02%). These values were not mutually exclusive.

Procrastination Strategies: A Variable-Centered Approach

We first examined the relationship between the four procrastination strategies outlined above using a variable-centered approach to determine whether they represented distinct response patterns. Correlations are displayed in Table 2. As expected, all four procrastination strategies were significantly correlated, with correlations ranging from $r = -.35$ to $r = .58$. Two overall patterns emerged, representing the dimensions of productivity and domain (i.e., academic vs non-academic). Productive forms of procrastination (both academic and non-academic) were positively related to one another, as were response strategies within the same domain (i.e., non-academic response strategies correlated positively with each other, as did academic response strategies). Notably, academic productive procrastination was the only procrastination type positively correlated with non-procrastination.

We then conducted multiple regression analyses to determine whether the four response strategies were differentially associated with outcome variables of interest. All four procrastination responses were entered simultaneously, along with gender to control for known effects on drinking outcomes. Results of the multiple regression analyses are displayed in Table 3. As expected, procrastination strategies differentially predicted both academic and alcohol outcomes, with non-procrastination the most adaptive. Again, productivity emerged as an important factor: although non-academic procrastination overall was associated with increased alcohol problems, its productive form was associated with higher GPA while its unproductive form was associated with lower GPA. Taken together, results of the correlational and multiple regression analyses support interpretation of the four procrastination strategies as distinct responses characterized by productivity and academic versus non-academic domain.

Procrastination Styles: A Person-Centered Approach

Although variable-centered analyses supported a relationship between procrastination and academic and alcohol outcomes, procrastination strategies are unlikely to occur in isolation from each other. Given the significant correlations found between all four procrastination strategies above, we proceeded with person-centered analyses, which are capable of modeling co-occurring procrastination strategies and are a more statistically appropriate choice when predictor variables are correlated (Lanza, Rhoades, Greenberg, Cox, & Family Life Project Key Investigators, 2011; Park, Lee, Sun, Klemmack, Roff, & Koenig, 2013). Using a person-centered approach, we attempted to identify 1) which procrastination strategies co-occur and 2) whether certain combinations of co-occurring strategies (which we call procrastination “styles”) are associated with academic and alcohol outcomes.

We identified co-occurring procrastination strategies – or procrastination “styles” - with a two-step cluster analysis using a hierarchical (Ward’s linkage) followed by non-hierarchical (*k* means) technique (cf., Hair, Anderson, Tatham, & Black, 1998)⁴. Participants’ composite raw scores for non-procrastination, academic productive procrastination, non-academic productive procrastination, and classic procrastination on the academic scenarios were clustered to identify common procrastination styles; values were centered around each participants’ average response across all forty ratings to account for individuals’ general response bias. The optimal cluster solution consisted of clusters which represented a sizable portion of the sample, were theoretically meaningful, and successfully grouped individuals with similar patterns of values.

Using these criteria, a five-cluster solution best represented the data (see Figure 1). These five procrastination styles represented unique combinations of procrastination behaviors. Cluster names reflect the procrastination strategy that best characterizes the procrastination style. Students in the *non-procrastinator* profile ($n = 200$) reported above average non-procrastination and lower levels of both academic and nonacademic procrastination. Students in the *academic productive* procrastinator profile ($n = 201$) reported both non-procrastination and academic productive procrastination, with an absence of non-academic forms of procrastination. Students in the *non-academic productive* procrastinator profile ($n = 350$), by contrast, reported high levels of both academic and non-academic productive procrastination. Students in the *non-academic* procrastinator profile ($n = 190$) reported mostly non-academic procrastination (both productive and unproductive). Finally, students in the *classic* procrastinator profile ($n = 160$) reported high levels of non-academic unproductive procrastination only, without other forms of

⁴ Because hierarchical cluster analysis is sensitive to outliers, we first probed for significant univariate outliers using Grubb’s test. No outliers were detected.

procrastination. It is interesting to note that this last group, the smallest of the five profiles identified, is the form of procrastination as it is typically conceptualized.

Academic and Alcohol Outcomes

Academic outcomes. A one-way ANOVA revealed that procrastination style was a significant predictor of students' most recent GPA, $F(4,1086) = 11.54, p < .001, \eta^2_p = .04$. Overall, *classic procrastinators* ($M = 3.32, SD = .46$) and *non-academic procrastinators* ($M = 3.30, SD = .42$) reported lower GPAs overall than *non-procrastinators* ($M = 3.51, SD = .41$), *academic productive procrastinators* ($M = 3.52, SD = .37$), and *non-academic productive procrastinators* ($M = 3.44, SD = .40$). Post-hoc Tukey tests revealed that these differences were significant, $ps < .001$. The GPA of *academic productive procrastinators* was significantly indistinguishable from *non-procrastinators*' ($p = .99, d = .03$).

Alcohol-related problems. Procrastination style uniquely predicted self-reported alcohol-related problems in an overall test of the model, Wald $\chi^2(1102) = 40.77, p < .001$. Specifically, relative to *non-procrastinators*, *non-academic procrastinators* reported significantly more alcohol-related problems ($p < .001, d = .23$), and *academic productive procrastinators* reported fewer problems with marginal statistical significance ($p = .07, d = .11$). No other groups differed significantly from *non-procrastinators*. Gender also accounted for significant variance in alcohol-related problems. See Table 4.

AUDIT scores. Procrastination style significantly predicted AUDIT scores in an overall test of the model, Wald $\chi^2(1102) = 21.47, p < .001$. Specifically, relative to *non-procrastinators*, *non-academic procrastinators* reported significantly higher AUDIT scores ($p < .01, d = .18$). None of the other groups differed significantly from *non-procrastinators*. Gender also accounted for significant variance in AUDIT scores. See Table 4.

Alcohol cravings. A one-way analysis of covariance (ANCOVA) revealed that procrastination style significantly predicted Alcohol Cravings, $F(4,1086) = 5.95, p < .001, \eta^2 = .02$. Specifically, *non-academic procrastinators* reported significantly stronger alcohol cravings ($p < .001, d = .26$). Likewise, *classic procrastinators* ($p = .06, d = .11$) and *non-academic productive procrastinators* ($p = .08, d = .11$) reported stronger alcohol cravings with marginal statistical significance. *Academic productive procrastinators* were significantly indistinguishable from *non-procrastinators* ($p = .84, d = .01$). Gender also accounted for significant variance in alcohol cravings. See Table 4.

Drinks per week. Procrastination style did not predict overall alcohol consumption in an overall test of the model, Wald $\chi^2(1102) = 6.26, ns$. Gender accounted for significant variance in alcohol consumption. See Table 4.

Mediation

In follow-up analyses, we tested whether hazardous drinking mediated the relationship between procrastination and academic outcomes for *non-academic procrastinators*. Given our findings, we focused on alcohol cravings, AUDIT, and RAPI scores. Membership in the *non-academic procrastination* style was dummy-coded (0 = Non-member, 1 = Non-academic procrastinator). All mediation analyses were performed with bootstrapping procedures using 10,000 samples (Hayes, 2013). Non-academic procrastinators were at higher risk of alcohol use disorder ($a = 1.65$), experienced more alcohol problems ($a = 3.27$), and reported more alcohol cravings ($a = 2.85$). In turn, risk of alcohol use disorder ($b = -.01$), alcohol problems ($b = -.08$), and cravings ($b = -.01$) were all predictive of lower GPA. Hazardous drinking, as indicated by AUDIT scores ($ab = -.01, 95\% \text{ CI: } -.03, -.01$) and alcohol problems ($ab = -.03, 95\% \text{ CI: } -.05, -$

.01) , and alcohol cravings ($ab = -.02$, 95% CI: $-.03, -.01$) thus significantly mediated the association between the non-academic procrastination style and grade point average.

Discussion

Procrastination and alcohol use are widespread during college. We introduced a new concept – productive procrastination - and proposed that procrastination can take both productive and unproductive forms either within the same domain (e.g., academic productive procrastination) or cross-domain (e.g., non-academic productive procrastination). Students reported the use of both productive and unproductive forms of procrastination, which were distinct from both each other and from other outcomes of interest. Productive forms of procrastination were positively related to one another, as were response strategies within the same domain, suggesting that productivity and domain (academic vs non-academic) are potentially important underlying dimensions of procrastination. In addition, we argued that students' procrastination strategies should be studied as a whole (i.e., as procrastination styles) rather than in isolation. Indeed, students reported using combinations of such procrastination strategies, often in distinct patterns or styles.

However, we were interested not only in *how* students procrastinate, but - more importantly – in the practical repercussions of that procrastination. Procrastination styles were related to self-reported alcohol problems, risk of alcohol use disorders, alcohol cravings, and academic achievement, even when controlling for known predictors of drinking. Furthermore, alcohol problems and alcohol craving mediated the relationship between maladaptive procrastination and academic performance. Jennifer's decision to go out drinking instead of staying home to study may be partly to blame for her subsequent poor score on her chemistry exam. Together, these findings suggest that procrastination takes both productive and

unproductive forms and that the differences in adaptive versus maladaptive procrastination styles may have important consequences in college.

What procrastination styles were most adaptive? Adaptive procrastination styles—which were characterized by non-procrastination (i.e., *non-procrastinators*) and academic productive procrastination (i.e., *academic productive procrastinators*)—were defined as those associated with higher grades and lower risk of alcohol problems, cravings, and risk of alcohol use disorders compared to maladaptive procrastination styles. Interestingly, *academic productive procrastinators* and *non-procrastinators* could not be statistically distinguished from one another on academic or alcohol outcomes. That is, when it came to hazardous drinking and academic performance, *academic productive procrastinators* fared just as well as *non-procrastinators*, suggesting that not all procrastination is maladaptive. Maladaptive procrastination styles were defined as styles associated with poor academic and alcohol outcomes, and were characterized by non-academic forms of procrastination. In particular, *non-academic productive procrastinators* reported lower grades and more alcohol cravings (both with marginal statistical significance) than non-procrastinators, and *classic procrastinators* reported significantly lower grades than non-procrastinators. *Non-academic procrastinators* fared the worst, reporting the most alcohol-related problems, highest risk of alcohol use disorders, greatest alcohol cravings, and lowest grades. This procrastination style was characterized by high levels of non-academic procrastination, in both its productive and unproductive forms. Furthermore, we found that alcohol-related problems, risk for alcohol use disorders, and alcohol cravings partially mediated the relationship between the *non-academic procrastination* style and lower GPA. One possible explanation is that students who procrastinate using maladaptive behaviors might be engaging in

drinking as a form of procrastination, as suggested by classical characterizations of procrastination (Steel, 2007).

Surprisingly, *non-academic procrastinators* reported more negative outcomes than *classic procrastinators*. One post-hoc but nonetheless intriguing explanation for this finding is that *non-academic procrastinators* may be using non-academic productive tasks (such as cleaning or exercising) as justification for not getting started on assignments. Supporting this hypothesis, *classic procrastinators* and *non-academic procrastinators* are similar in that they both report that they are likely to respond to a difficult academic task by first doing something non-academic and non-productive (e.g., watching television). However, non-academic procrastinators also report that they are *more likely* to engage in a productive non-academic task (e.g., washing dishes) than classic procrastinators, and *less likely* to actually get started on the assignment. Engaging in productive behaviors of this type may give people psychological license to engage in other less adaptive behaviors later, including drinking and failing to complete assignments. Such “moral licensing” has been found in other domains (Chiou, Wan, Wu, & Lee, 2011; Monin & Miller, 2001; Sachdeva, Iliev, & Medin, 2009) and occurs when “past good deeds...liberate individuals to engage in behaviors that are immoral, unethical, or otherwise problematic” (Merritt, Effron, & Monin, 2010, p. 344). Having done the laundry earlier, *non-academic procrastinators* may feel more comfortable neglecting their studies to party later. This explanation, of course, is speculative and an interesting avenue for future research.

An alternative explanation for why *non-academic procrastinators* fared worse than *classic procrastinators* is that non-academic procrastinators actually score highest of all the groups on their likelihood of engaging in classic procrastination. We find this explanation unlikely, because classic procrastination scores alone cannot account for all four negative

outcomes associated with *non-academic procrastinators*: lower GPA, more alcohol-related problems, increased risk of clinical alcohol use disorder, and stronger alcohol cravings.

According to standard regression analyses, classic procrastination scores are only predictive of two of the four outcomes above: GPA and alcohol-related problems. Because classic procrastination scores do not predict either risk of clinical alcohol use disorder or alcohol cravings, the association between these outcomes and *non-academic procrastinators* cannot be explained by that group's high scores on classic procrastination. Rather it suggests that there are other combined factors at work (e.g., co-morbid non-academic productive procrastination and/or non-procrastination) that are putting *non-academic procrastinators* at particular risk. Although such effects can be explored in traditional regression models through the use of interaction terms, such analyses require the introduction of three-way and four-way interactions that are notoriously difficult to interpret and that may represent combinations of procrastination style that are not found in the actual population (e.g., high non-procrastination coupled with high classic procrastination). Thus, a strength of the person-centered analyses presented in this paper is the ability to effectively identify naturally-occurring combinations of procrastination strategies that may prove problematic in terms of alcohol and academic outcomes.

Understanding the role of procrastination in college student drinking is important not only theoretically, but also in identifying individuals at risk and facilitating prevention and intervention efforts. While not all forms of procrastination are harmful, maladaptive procrastination styles were associated with elevated risk of serious consequences, including hazardous drinking and poor academic performance. Students experiencing poor academic performance and engaging in maladaptive procrastination might be prime candidates for screening. Although procrastination style was a risk factor for alcohol-related problems and risk

of alcohol use disorders, it notably did not predict overall alcohol consumption. Non-procrastinators and adaptive procrastinators drank just as much as maladaptive procrastinators, but without the same negative consequences. One possibility is that maladaptive procrastinators may be drinking more when they are procrastinating, but less on other nights. Alternatively, non-procrastinators and adaptive procrastinators may be drinking more responsibly. Maladaptive procrastination may indicate an elevated risk of engaging in hazardous or risky drinking behaviors, such as binge drinking or rapid alcohol consumption, even if they are not consuming more than their peers. This may be particularly likely if third variables, such as trait impulsivity, are driving both behaviors. Future research is needed to determine what drinking behaviors drive these differences.

Limitations and Future Directions

Our findings are constrained by several limitations. First, determining causality is difficult in any cross-sectional sample. There is likely a bidirectional relationship between alcohol use and procrastination, with maladaptive procrastination leading to increased alcohol use and vice versa. Our own mediation analysis suggests that drinking and poor academic performance are not independent outcomes of procrastination; rather, procrastination may lead to increased drinking, which may in turn contribute to poor academic outcomes. It is also possible that drinking itself may directly contribute to both procrastination and poor academic outcomes, as well as other negative outcomes associated with procrastination (including poor health, financial instability, depressed mood, stress, and guilt; Steel, 2007, Zarick and Stonebraker, 2009). These outcomes may act as third variables driving the association between procrastination and alcohol use, or (conversely) drinking itself may be the driver behind these other associations. Our data are correlational but future research should address the role of alcohol use and other

third variables using longitudinal and experimental designs capable of determining causal direction.

Additional limitations include the use of a single sample of university students and self-reported measures. It is also important to note that while we chose a five-cluster solution because it resulted in theoretically meaningful clusters representing sizable portions of the overall sample, additional studies are necessary to confirm that these clusters are stable and emerge across other samples. However, it is heartening to note that recent related work on goal pursuit suggests that stable clusters can and do emerge across studies using person-centered analyses, and that future work can be compared using standard meta-analytic techniques (Wormington & Linnenbrink-Garcia, 2016). Finally, although both the alcohol and academic self-report measures are well-validated, they are not immune to response bias or misinterpretation. For instance, it is possible that participants included “drinking” as a form of classic procrastination behavior. Ideally, future research should also include additional standard measures of procrastination to assess incremental validity of the Procrastination Styles Questionnaire.

Although our results are confined to college student drinking (including potential underage drinking), procrastination is common in other contexts. Are the maladaptive procrastination styles identified in this study indicative of alcohol outcomes in other populations at home or in the workplace? Would the way in which a person procrastinates on their tax return predict their drinking behavior? It is unclear whether the relationship between procrastination and drinking among college students should generalize to other populations, given the unique context of college drinking culture and the presence of underage populations. However, our general framework of productive procrastination –substituting an important, urgent task with another adaptive task – likely does exist in other domains. Future research should test these

questions and directly examine possible third variables, such as conscientiousness, trait impulsivity, and self-regulatory capacity.

This study represents a step forward in identifying and differentiating between adaptive and maladaptive procrastination and understanding the role of procrastination in college drinking. When it comes to procrastination, productivity and domain of the replacement activity matter. Productive procrastination was endorsed by a large proportion of students, suggesting that it is a behavior both common and familiar to them. Furthermore, productive academic procrastination and productive non-academic procrastination differed from other forms of procrastination, including the kind of unproductive non-academic procrastination typically studied in the literature. Indeed, *academic productive procrastinators* who procrastinated by working on other less important academic tasks fared just as well as non-procrastinators in terms of alcohol and academic outcomes. Trends in the data suggest that academic productive procrastination may even be protective in terms of alcohol outcomes. This adds to a small but growing literature which suggests that there may be functional benefits to some types of procrastination or delay (Bernstein, 1998; Chu & Choi, 2005; Gevers, Claessens, Van Eerde & Rutte, 2009). On the other hand, certain forms of procrastination were clearly maladaptive. In particular, *non-academic procrastinators* reported significantly more alcohol-related problems (RAPI), higher AUDIT scores, stronger alcohol cravings, and lower grades than non-procrastinators. This kind of procrastination - characterized by high levels of non-academic procrastination paired with very low levels of getting started on assignments - may be a prime target for future prevention and intervention programs.

In closing, it is critical to acknowledge that (1) there are both adaptive and maladaptive procrastination strategies and (2) that students often use multiple procrastination strategies in

combination, resulting in procrastination styles which may be uniquely linked to important outcomes in college students. By overlooking these distinctions, researchers may miss important differences in procrastination that predict hazardous behaviors down the road.

References

- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: APA.
- Atkins, D.C., & Gallop, R.J. (2007). Rethinking how family researchers model infrequent outcomes: A tutorial on count regression and zero-inflated models. *Journal of Family Psychology, 21*, 726-735.
- Babor, T., Higgins-Biddle, J.C., Saunders, J.B., & Monteiro, M.G. (2001). *The Alcohol Use Disorders Identification Test: Guidelines for Primary Care (2nd Ed.)*. World Health Organization: Department of Mental Health and Substance Dependence.
- Berglas, S., & Jones, E. E. (1978). Control of attributions about the self through self-handicapping strategies: The appeal of alcohol and the role of underachievement. *Personality and Social Psychology Bulletin, 4*, 200-206.
- Bergman, L. R., & Trost, K. (2006). The person-oriented versus the variable-oriented approach: Are they complementary, opposites, or exploring different worlds? *Merrill-Palmer Quarterly, 52*, 601-632.
- Bernstein, P. (1998). *Against the gods: The remarkable story of risk*. New York: Wiley.
- Chiou, W. B., Wan, C. S., Wu, W. H., & Lee, K. T. (2011). A randomized experiment to examine unintended consequences of dietary supplement use among daily smokers: taking supplements reduces self-regulation of smoking. *Addiction, 106*, 2221-2228.
- Chu, A. H. C., & Choi, J. N. (2005). Rethinking procrastination: Positive effects of “active” procrastination behavior on attitudes and performance. *Journal of Social Psychology, 145*, 245-264.

- Collins, R.,L. & Lapp, W.M. (1992). The Temptation and Restraint Inventory for measuring drinking restraint. *British Journal of Addiction*, *87*, 625-633.
- Dornbusch, S. M., Ritter, P. L., Leiderman, H., Roberts, D. F., & Fraleigh, M. J. (1987). The relation of parenting style of adolescent school performance. *Child Development*, *58*, 1244-1257.
- Gevers, J. M. P., Claessens, B. J. C., Van Eerde, W., & Rutte, C. G. (2009). Pacing styles, personality, and performance. In R. A. Roe, M. J. Waller & S. R. Clegg (Eds.), *Time in Organizational Research* (pp. 80-102). New York: Routledge.
- Gray, E. K., & Watson, D. (2002). General and specific traits of personality and their relation to sleep and academic performance. *Journal of Personality*, *70*, 177-206.
- Hair, J.F., Anderson, R.E., Tatham, R.L., & Black, W.C. (1998). *Multivariate Data Analysis*, (5th Edition). Upper Saddle River, NJ: Prentice Hall.
- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis*. New York: Guilford.
- Jamrozinski, K., Kuda, M., & Mangholz, A. (2009). Langzeitstudierende als Klienten psychotherapeutischer Beratung. *Psychotherapie Psychosomatik Medizinische Psychologie*, *59*, 370-375.
- Johnston, L.D., O'Malley, P.M., Bachman, J.G., & Schulenberg, J.E. (2010). Monitoring the future national survey results on drug use, 1975-2010. Volume II: College students and adults ages 19-50. The University of Michigan, Institute for Social Research, Monitoring the Future. Available from <http://monitoringthefuture.org/pubs/monographs/mtf-vol2-2010.pdf>

- Kuncel, N. R., Credé, M., & Thomas, L. L. (2005). The validity of self-reported grade point averages, class ranks, and test scores: A meta-analysis and review of the literature. *Review of Educational Research, 75*, 63-82.
- Lanza, S. T., Rhoades, B. L., Greenberg, M. T., Cox, M., & Family Life Project Key Investigators. (2011). Modeling multiple risks during infancy to predict quality of the caregiving environment: Contributions of a person-centered approach. *Infant Behavior and Development, 34*, 390-406.
- McCown, W., & Roberts, R. (1994). A study of academic and work-related dysfunctioning relevant to the college version of an indirect measure of impulsive behavior. *Integra Technical Paper, 28-94*.
- Merritt, A. C., Effron, D. A., & Monin, B. (2010). Moral self-licensing: When being good frees us to be bad. *Social and Personality Psychology Compass, 4*, 344-357.
- Monin, B., & Miller, D. T. (2001). Moral credentials and the expression of prejudice. *Journal of Personality and Social Psychology, 81*, 33-43.
- Noftle, E. E., & Robins, R. W. (2007). Personality predictors of academic outcomes: Big five correlates and GPA and SAT scores. *Journal of Personality and Social Psychology, 93*, 116-130.
- Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin, 124*, 54-74.
- Park, N. S., Lee, B. S., Sun, F., Klemmack, D. L., Roff, L. L., & Koenig, H. G. (2013). Typologies of religiousness/spirituality: Implications for health and well-being. *Journal of Religion and Health, 52*, 828-839.

- Peng, K., Nisbett, R. E., & Wong, N. Y. (1997). Validity problems comparing values across cultures and possible solutions. *Psychological Methods, 2*, 329-344.
- Phillips, J.G., & Ogeil, R.P. (year). Decisional styles and risk of problem drinking or gambling. *Personality and Individual Differences, 51*, 521-526.
- Richards, J. B., Zhang, L., Mitchell, S. H., & de Wit, H. (1999). Delay or probability discounting in a model of impulsive behavior: Effect of alcohol. *Journal of Experimental Analysis of Behavior, 71*, 121-143.
- Sachdeva, S., Iliev, R., & Medin, D. L. (2009). Sinning saints and saintly sinners the paradox of moral self-regulation. *Psychological Science, 20*, 523-528.
- Singleton, E.G., Tiffany, S.T., & Henningfield, J.E. (1995). Development and validation of a new questionnaire to assess craving for alcohol. *Problems of Drug Dependence, 1994: Proceeding of the 56th Annual Meeting, the College on Problems of Drug Dependence, Inc., Volume II: Abstracts*. NIDA Research Monograph 153 (p. 289). Rockville, MD: National Institute on Drug Abuse.
- Sirois, F. M., & Pychyl, T. A., (2002). Academic procrastination: Costs to health and well-being. Paper presented at the 110th Annual Convention of the American Psychological Association, Chicago, Illinois.
- Solomon, L. J., & Rothblum, E. D. (1984). Academic procrastination: Frequency and cognitive-behavioral correlates. *Journal of Counseling Psychology, 31*, 503-509.
- Steel, P. (2007). The nature of procrastination: a meta-analytic and theoretical review of quintessential self-regulatory failure. *Psychological Bulletin, 133*, 65-94.
- Takahashi, T., Ohmura, Y., Oono, H., & Radford, M. (2008). Alcohol use and discounting of delayed and probabilistic gain and loss. *Neuroendocrinology Letters, 30*, 749-752.

White, H.R., & Labouvic, E.W. (1989). Towards the assessment of adolescent problem drinking. *Journal of Studies on Alcohol, 50*, 30-37.

Wormington, S., Westgate, E., Call, A., Harati, A., Moshontz, H. & Oleson, K. (2011, January). *A person-centered investigation of academically-productive procrastination: Relations to self-doubt, concern with performance, and mastery-approach goals*. Poster presented at the 11th Annual Meeting of the Society for Personality and Social Psychology, San Antonio, Texas.

Wormington, S. V. & Linnnebrink-Garcia, L. (2016). A new look at multiple goal pursuit: The promise of a person-centered approach. *Educational Psychology Review*.

Zarick, L. M., & Stonebraker, R. (2009). I'll do it tomorrow: The logic of procrastination. *College Teaching, 57*, 211-215.

Table 1. Procrastination Styles Questionnaire.

Scenarios	Response Options
1. It is Sunday afternoon and you recall that you have a paper due soon in your hardest class.	<i>[For all scenarios]</i>
2. You have a problem set that you are not sure you will do well on and it is due soon.	Rate the likelihood that you would:
3. You just picked up a take-home exam from one of your classes that is due soon. You have as much time to work on it as you like, as long as you turn it in by 5pm the day it's due. The teacher has warned that due to its difficulty, many students may need much of that time in order to do well on it.	a) Get started on it right away [0-100%]
4. You have a few free hours. You were checking your email in the library/computer lab/coffee shop and your professor just assigned you a short but difficult assignment due soon.	b) First work on an easier academic task that is due relatively soon [0-100%]
5. The date of your midterm has just been announced for your most time-consuming class and it is a few days from now. You've heard from students in previous years that this midterm is particularly hard and that lots of people fail it.	c) First do something non-academic but productive (clean your room, do the dishes, exercise, etc.) [0-100%]
6. You planned on working on a particular assignment this afternoon but you find out that it is going to be much more difficult than expected.	d) First do some non-academic, not necessarily productive task (check Facebook, watch television, socialize with friends, etc.) [0-100%]
7. The reading for your next class is very long and particularly dense. Your professor has suggested that the class spend more time than usual discussing the reading, because students have struggled with understanding it in the past.	
8. You check your email and your professor has just sent out the review sheet for the final in your most difficult class.	
9. You are working on a lab report for one of your science classes. You've found your section of the report to be more complicated and difficult than you expected, and your lab group is waiting on you to finish your section of the report.	
10. Your midterm for one of your classes is in the form of a paper, to be written over the course of one week. When the topic is announced, it is clear that the paper is going to be fairly lengthy and require a good bit of background research in an area you are not very familiar with.	

Table 2

Bivariate correlations and descriptive statistics for independent and dependent variables

	1	2	3	4	5	6	7	8	9
1. Non-procrastination	--								
2. Academic Productive Procrastination	.23**	--							
3. Non-academic Productive Procrastination	-.07*	.58**	--						
4. Classic Procrastination	-.35**	.36**	.55**	--					
5. GPA	.19**	.00	-.01	-.17**	--				
6. DDQ	-.11**	-.11**	.00	.03	-.10**	--			
7. RAPI	-.16**	-.06	.09**	.15**	-.17**	.54**	--		
8. AUDIT	-.16**	-.10**	.06*	.08**	-.14**	.74**	.75**	--	
9. ACQ	-.17**	-.03	.06*	.13**	-.14**	.37**	.48**	.49**	--
Mean	66.74	50.69	40.04	44.02	3.43	6.48	5.22	6.28	-12.84
Standard Deviation					0.42	9.00	8.35	5.83	8.29

Note: $N = 1104$. GPA=grade point average; DDQ=Daily Drinking Questionnaire; RAPI=Rutgers Alcohol Problem Index; AUDIT=Alcohol Use Disorders Identification Test; ACQ=Alcohol Craving Questionnaire.

* = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Table 3. Variable-centered analysis: Procrastination strategy as a cross-sectional predictor of academic and drinking outcomes

	<i>B</i>	<i>SE B</i>	Exp. <i>B</i>	<i>t</i>	Cohen's <i>d</i>
Grade Point Average (GPA)					
Gender	.04	.03	-	1.50	.09
Non-procrastination	.03	.01	-	4.12***	.25
Academic Productive Procrastination	-.01	.01	-	-1.21	-.07
Non-academic Productive Procrastination	.02	.01	-	2.93**	.18
Classic Procrastination	-.03	.01	-	-4.41***	.27
Alcohol Cravings					
Gender	-.86	.52	-	-1.67	-.10
Non-procrastination	-.48	.14	-	-3.47**	-.21
Academic Productive Procrastination	-.18	.15	-	-1.21	-.07
Non-academic Productive Procrastination	.16	.15	-	1.12	.07
Classic Procrastination	.24	.13	-	1.88	.11
Drinks per week (DDQ)					
Gender	-.46	.08	.63	5.60***	.34
Non-procrastination	-.02	.02	.98	-1.06	-.06
Academic Productive Procrastination	-.09	.03	.92	3.37**	.21
Non-academic Productive Procrastination	.07	.02	1.08	3.07**	.19
Classic Procrastination	.01	.02	1.01	.28	.02
Alcohol-related problems (RAPI scores)					
Gender	-.11	.10	.89	1.20	.07
Non-procrastination	-.06	.03	.95	2.01*	.12
Academic Productive Procrastination	-.11	.03	.90	3.82***	.23
Non-academic Productive Procrastination	.07	.02	1.08	2.69**	.16
Classic Procrastination	.08	.02	1.09	3.35**	.20
Risk of clinical alcohol use disorder (AUDIT)					
Gender	-.24	.06	.78	4.29***	.26
Non-procrastination	-.04	.02	.96	2.26*	.14
Academic Productive Procrastination	-.07	.02	.93	4.08***	.25
Non-academic Productive Procrastination	.07	.02	1.07	3.95***	.24
Classic Procrastination	.02	.02	1.02	.97	.06

Note: $N = 1104$. Gender was dummy-coded (0 = men, 1 = women). Cohen's $d = 2t / \sqrt{df}$. The regression model for GPA and cravings used ordinary least squares regression. The regression models used generalized linear models with a negative binomial log link for DDQ, RAPI, and AUDIT. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

Table 4. Person-centered analysis: Procrastination style as a cross-sectional predictor of drinking outcomes

	<i>B</i>	SE <i>B</i>	Exp. <i>B</i>	<i>t</i>	Cohen's <i>d</i>
Drinks per week (DDQ)					
Gender	-.50	.08	0.61	6.25***	.38
Procrastination Style					
<i>Non-procrastinators</i>	.	.	.	.	.
<i>Academic productive procrastinators</i>	-.07	.14	.93	-.50	.03
<i>Non-academic productive procrastinators</i>	.03	.12	1.03	.25	.02
<i>Non-academic procrastinators</i>	.19	.13	1.21	1.46	.09
<i>Classic procrastinators</i>	-.09	.15	.91	-.06	.00
Alcohol-related problems (RAPI scores)					
Gender	-.16	.07	.86	-2.29***	.14
Procrastination Style					
<i>Non-procrastinators</i>	.	.	.	.	.
<i>Academic productive procrastinators</i>	-.29	.16	.75	-1.81	.11
<i>Non-academic productive procrastinators</i>	.22	.15	1.24	1.47	.09
<i>Non-academic procrastinators</i>	.61	.16	1.83	3.81***	.23
<i>Classic procrastinators</i>	.20	.18	1.22	1.11	.07
Risk of clinical alcohol use disorder (AUDIT)					
Gender	-.27	.04	0.73	-7.49***	.46
Procrastination Style					
<i>Non-procrastinators</i>	.	.	.	.	.
<i>Academic productive procrastinators</i>	-.13	.09	.88	-1.44	.09
<i>Non-academic productive procrastinators</i>	.10	.08	1.11	1.25	.08
<i>Non-academic procrastinators</i>	.27	.09	1.3	3.00**	.18
<i>Classic procrastinators</i>	.05	.11	1.05	.45	.03
Alcohol cravings					
Gender	-1.06	.51	-	-2.89*	.18
Procrastination Style					
<i>Non-procrastinators</i>	.	.	-	.	.
<i>Academic productive procrastinators</i>	.161	.82	-	.20	.01
<i>Non-academic productive procrastinators</i>	1.28	.73	-	1.76	.11
<i>Non-academic procrastinators</i>	3.58	.83	-	4.30***	.26
<i>Classic procrastinators</i>	1.61	.87	-	1.85	.11

Note: $N = 1104$. Procrastination (0=non-procrastinators, 1=academically productive procrastinators, 2=non-academic productive procrastinators, 3=non-academic procrastinators, 4=unproductive procrastinators) and gender were dummy-coded (0 = men, 1 = women). Cohen's $d = 2t / \sqrt{df}$. The regression models used generalized linear models with a negative binomial log link for all outcome variables other than cravings. The regression model for the cravings variable used ordinary least squares regression. * = $p < .05$, ** = $p < .01$, *** = $p < .001$.

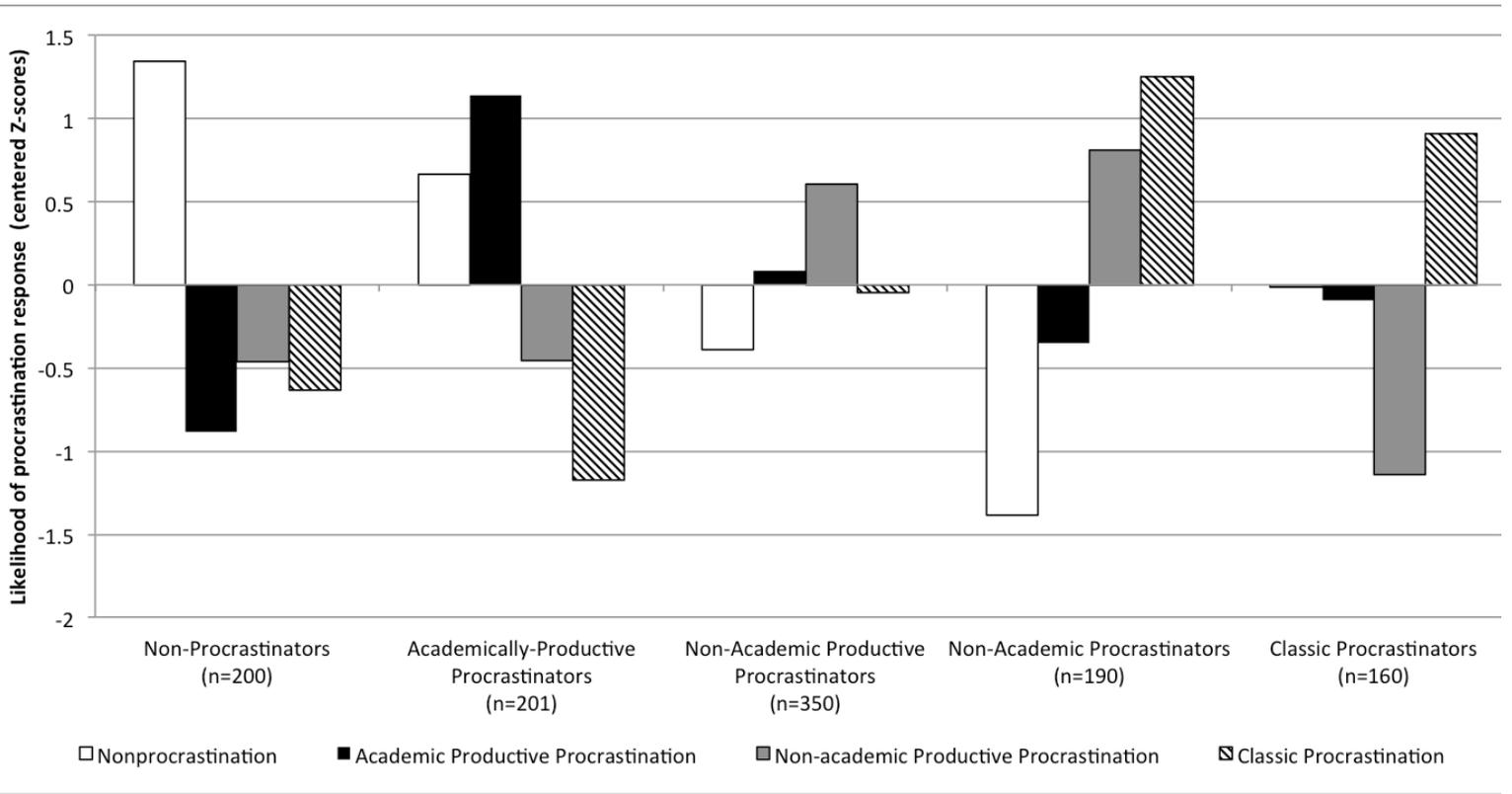


Figure 1. Five-cluster solution for procrastination styles with centered z-scores.