Latent Profile Analysis Write-up

FILENAME: 2a Project Drinking LPA2 Aux.output

\*See all project drinking files 1-4 to examine comparison of models described in overall model fit.

Analysis Plan

The first goal of the analyses was to discern distinct profiles of individuals’ reports with similar levels of alcohol use and alcohol-related consequences (ARC), as well as similar levels of protective behavioral strategy (PBS) use and perceived effectiveness (PE) of PBS use. Profiles were derived using Latent Profile Analysis (LPA) from three PBS use subscale scores, a PE total score, typical quantity of alcohol consumed on a drinking day, and number of alcohol related consequences in the past month.

One- through 4-class models were run using Mplus version 7.2 (Muthén & Muthén, 1998–2012). Missing data were handled using the maximum likelihood (ML) method, which is a best practice strategy for managing missing data (Schafer & Graham, 2002). We chose model fit statistics based on recommendations from a Monte Carlo study that determined the most appropriate fit indices for LPA (Nylund et al., 2007) and four recommended criteria (Muthén & Muthén, 2000).

The first criterion was the Lo-Mendell-Rubin likelihood ratio test of model fit (LMR; Lo, Mendell, & Rubin, 2001). The LMR compares a model with k classes to a model with k-1 classes. The LMR statistically tests the probability that the data have been generated by the model with k-1 classes (i.e., a significant p-value indicates that the k-class model is an improvement over the k-1-class model). The second criterion was the Bayesian Information Criterion (BIC; Schwarz, 1978). The BIC maximizes the likelihood ratio statistic while rewarding parsimony. Lower values indicate better model fit, and the model with the lowest BIC is generally preferred (Muthén & Muthén, 2000). Third, entropy values provided an index of model classification quality. Values range from 0 to 1; higher values indicate better classification quality (Celeux & Soromenho, 1996). Values greater than 0.80 are generally considered to have adequate classification quality (Jung & Wickrama, 2008). The fourth criterion was the average latent class probabilities for the most likely latent class membership by latent class discrimination. Values close to 1 in the primary diagonal and values close to 0 in off-diagonal represent good fit. Values close to 0.50 indicate that individuals in a particular group would fit equally well in another group. These values provide an index of how likely the individuals within a latent class belong in that class. The usefulness of the LPA classes to differentiate participants on variables of interest was also considered. Final model selection was based on goodness of model fit indices, parsimony, and substantive interpretability of the model.

The second goal of the analyses was to determine whether the latent profiles identified were associated with differences in self-regulation and gender. We used the BCH method (Bakk, & Vermunt, 2016) to determine whether profiles differed by gender and self-regulation. The BCH method has been shown to outperform both the pseudo-class draws method and the 3-step method in simulation studies (Bakk, & Vermunt, 2016; Asparouhov & Muthén, 2015). The BCH method accounts for the probabilistic nature of class membership, and both global and pairwise comparisons can be conducted using Wald tests. Wald tests use Chi-square (χ2) to compare latent groups with a posterior probability-based multiple imputation strategy (Clark & Muthén, 2009). These analyses are conducted simultaneously with LPAs and allow consideration of the probabilistic class membership of participants to control error. Equality tests of means across 2 classes have 1 degree of freedom for each overall (pairwise) test. In order to provide an index of effect size for the Wald tests we calculated Cramer’s V, which is well established for tests of independence and has cutoffs for small, medium, and large effects based on the degrees of freedom for a chi-squared test. Cohen (1988) recommends cutoffs of .1 for small effects, .3 for medium effects, and .5 for large effects, when the chi-squared test has 1 degree of freedom.

**Results**

*Overall model fit.* The 2-class solutions provided the best overall model fit to the data (see Table 1). Specifically, while the 2-class solution did not have the lowest BIC, it did have the highest entropy (not counting the 1-class model which will always have an entropy of 1), and the highest average latent class probabilities. Further, examination of the LMR tests indicated that the 2-class model was an improvement over the 1-class model, but the 3-class model was not an improvement over the 2-class model, and the 4-class model was not an improvement over the 3-class model. In addition, the class breakdown of the 2-class model was reasonable, with 79% of the sample most likely in the larger class, and 21% in the smaller class.

*Description of the best fitting models.* Table 2 presents the estimated means for each latent class on each of the indicators included in deriving the latent profiles. Self-regulation and gender were treated as auxiliary variables and thus are not included as indicators of the latent profiles.

The two classes of the best fitting model can be described as “high and effective strategy use and low alcohol use and consequences” (HES-LAC), and “low and ineffective strategy use and high alcohol use and consequences” (LIS-HAC). The HES-LAC class was associated with the highest use of PBS and the highest ratings of PE along with the lowest levels of alcohol use and ARC. The LIS-HAC class was associated with the lowest PBS use and PE ratings and the highest alcohol use and ARC ratings.

*BCH tests of equality*. The omnibus test, which also serves as the pairwise test with two groups, was significant for self-regulation, and small to medium in effect size, χ2(1) = 36.93, p < .01, Cramer’s V = .25. Pairwise comparisons revealed that the HES-LAC class had significantly more self-regulation compared to the LIS-HAC class. In addition, being female was associated with the HES-LAC more so than with the LIS-HAC, with an effect size in the small to medium range, χ2 (1) = 30.15, p < .01, Cramer’s V = .22.

**Discussion**

A LPA revealed two latent profiles of PBS use, PE, Alcohol use, and ARC. Specifically, one profile was characterized by high levels of PBS use and PE and low levels of alcohol use and ARC, while the other class was characterized by low levels of PBS use and PE and high levels of alcohol use and ARC. This suggests that use of effective PBS is associated with lower levels of alcohol use and ARC. Further supporting this finding, auxiliary tests revealed that higher self-regulation was more strongly related to the HES-LAC profile. In addition, being female was associated with the HES-LAC profile, suggesting that women may be more protective and may use less alcohol compared to males.