2015

The Impact of Time Perspective Latent Profiles on College Drinking: A Multidimensional Approach

Abby L. Braitman
Old Dominion University

James M. Henson
Old Dominion University

Original Publication Citation

Braitman, A. L., & Henson, J. M. (2015). The impact of time perspective latent profiles on college drinking: A multidimensional approach. *Substance Use & Misuse, 50*(5), 664-673. doi:10.3109/10826084.2014.998233

HHS Public Access

Author manuscript

Subst Use Misuse. Author manuscript; available in PMC 2015 July 22.

Published in final edited form as:

Subst Use Misuse. 2015 April ; 50(5): 664–673. doi:10.3109/10826084.2014.998233.

The Impact of Time Perspective Latent Profiles on College Drinking: A Multidimensional Approach

Abby L. Braitman and **James M. Henson**

Department of Psychology, Old Dominion University, Norfolk, Virginia, USA

Abstract

Background—Zimbardo and Boyd's[1] time perspective, or the temporal framework individuals use to process information, has been shown to predict health behaviors such as alcohol use. Previous studies supported the predictive validity of individual dimensions of time perspective, with some dimensions acting as protective factors and others as risk factors. However, some studies produced findings contrary to the general body of literature. In addition, time perspective is a multidimensional construct, and the combination of perspectives may be more predictive than individual dimensions in isolation; consequently, multidimensional profiles are a more accurate measure of individual differences and more appropriate for predicting health behaviors.

Objectives—The current study identified naturally occurring profiles of time perspective and examined their association with risky alcohol use.

Methods—Data were collected from a college student sample (n = 431, mean age = 20.41 years) using an online survey. Time perspective profiles were identified using latent profile analysis.

Results—Bootstrapped regression models identified a protective class that engaged in significantly less overall drinking (β = −0.254) as well as engaging in significantly less episodic high risk drinking (β = −0.274). There was also emerging evidence of a high risk time perspective profile that was linked to more overall drinking (β = 0.198) and engaging in more high risk drinking (β = 0.245), though these differences were not significant.

Conclusions/Importance—These findings support examining time perspective in a multidimensional framework rather than individual dimensions in isolation. Implications include identifying students most in need of interventions, and tailoring interventions to target temporal framing in decision-making.

Keywords

alcohol; college drinking; time perspective; latent profile analysis

[1]Zimbardo, P. G., & Boyd, J. N. (1999). Putting time in perspective: A valid, reliable, individual differences 10 metric. Journal of Personality and Social Psychology, 77(6), 1271–1288.

Address correspondence to Abby L. Braitman, Department of Psychology, Old Dominion University, Norfolk, VA 23529, USA; abraitma@odu.edu.

Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and the writing of the paper.

Heavy drinking among college students is pervasive. In an extensive survey of 14,115 college students at 119 schools, almost half (44.1%) of students reported at least one symptom of alcohol abuse or dependence (Knight et al., 2002). Similarly, results from the National Alcohol Screening Day (n = 23,334) revealed that 33.9% of college students assessed in person and 58.1% of students assessed online engaged in harmful or hazardous drinking (Wallenstein, Pigeon, Kopans, Jacobs, & Aseltine, 2007). In another survey of students across 134 colleges and universities, 71.8% reported drinking alcohol within the past 30 days (Core Institute, 2006). Understanding the etiology of college drinking can lead to better prevention and treatment programs.

One promising construct as it relates to the etiology of student health behaviors is time perspective. Time perspective is the temporal framework individuals use to process information. It can influence the perception, encoding, storage, and retrieval of experiences and information as well as decisions, actions, and goals (Zimbardo & Boyd, 1999). Zimbardo and Boyd (1999, 2008) posit that time perspective is non-conscious and comprises five different facets: past-negative, past-positive, present-hedonistic, present-fatalistic, and future. Past-negative (P-Neg) perspective represents an unpleasant or unfavorable view of the past. Past-positive (P-Pos) time perspective is a sentimental, nostalgic view toward the past. Present-hedonistic (Pr-Hed) perspective is a risk-taking, pleasure-devoted view of life. Present-fatalistic (Pr-Fat) time perspective is a defeatist, helpless view toward life. Finally, future (Fu-P) perspective is a focus on the future and planning toward goals. Time perspective comprises all five dimensions, but an individual may use only a single dimension when making a decision, depending on the context of the situation and relevant factors. The literature has linked time perspective to multiple theories of behaviors. The idea that an individual able to maintain multiple temporal foci and identify longer-term benefits (both in the future and past) will engage in more goal-directed behaviors has been linked to Barkley's (1997) Theory of Self-Regulation (e.g., Wills, Sandy, & Yeager, 2001), Deci and Ryan's (2002) Self-Determination Theory (e.g., de Bilde, Vansteenkiste, & Lens, 2011; Wininger & De Sena, 2012), and Bandura's (1986, 1991) Social Cognitive Theory (e.g., Guthrie, Lessl, Ochi, & Ward, 2013).

When an individual develops a tendency to repeatedly use the same dimension(s) of time perspective in their decision-making, this becomes a dispositional style or characteristic. One individual may be very future-focused, often making choices that have the largest benefit in the long term (e.g., studying now to have a high GPA later), whereas another individual may have a hedonistic focus on the present (Pr-Hed), and will most often make decisions that yield short-term benefits with negative longterm consequences (e.g., partying now, yielding a worse GPA later). Time perspective as an individual difference variable has been found to be highly predictive of health behaviors.

TIME PERSPECTIVE AND HEALTH BEHAVIORS

Although numerous studies support associations between health behaviors and time perspective in patterns consistent with the theories by Zimbardo and Boyd (1999, 2008) research has also been plagued by inconsistencies. As theorized by Zimbardo and Boyd (1999, 2008), individuals high in Fu-P engage in a multitude of protective health behaviors,

such as increased exercise (Daugherty & Brase, 2010; Henson, Carey, Carey, & Maisto, 2006; Wininger & DeSena, 2012), greater frequency of seat belt use (Daugherty & Brase, 2010), greater likelihood of condom usage (Henson et al., 2006), and higher intention to be screened for diabetes (Crockett, Weinman, Hankins, & Marteau, 2009). Fu-P was also positively associated with more frequent sunscreen use, helmet use, and doctor check-ups (Daugherty & Brase, 2010). Among individuals newly diagnosed with Type 2 diabetes, higher Fu-P was associated with stronger increases in weight management behaviors (e.g., better food choices and increase in physical activities; Hall, Fong, & Cheng, 2012). Being higher in Fu-P is associated with stronger quitting behaviors among smokers (Rise, Kovac, Kraft, & Moan, 2008). Prior research reveals a pattern where individuals higher in Fu-P are making choices that reflect focusing on long-term protection and health, despite short-term inconveniences.

In addition to these elevated levels of protective behaviors, individuals higher in Fu-P also engage in fewer risky health behaviors. Higher levels of Fu-P are often associated with lower levels of tobacco use (Apostolidis, Fieulaine, Simonin, & Rolland, 2006; Barnett, Spruijt-Metz, Unger, Rohrbach, Sun, & Sussman, 2013; Daugherty & Brase, 2010), cannabis use (Apostolidis et al., 2006; Barnett et al., 2013), hard drug use (Barnett et al., 2013), reckless sexual behaviors (Duangpatra, Bradley, & Glendon, 2009), and general substance use, including alcohol, tobacco, cannabis, and other drugs (Keough, Zimbardo,& Boyd, 1999). Interestingly, Barnett and colleagues (2013) confirmed via a longitudinal examination of bi-directional relationships that time perspective is influencing these health behaviors rather than the health behaviors influencing time perspective, an assumption made by many but rarely assessed. These findings support the idea that individuals higher in Fu-P have the priorities to set longer-term goals; they would rather avoid long-term negative consequences than indulge in pleasing behaviors now.

In spite of these consistent findings associating Fu-P with increased positive health behaviors and decreased negative health behaviors, there are still some contradictory findings in the literature. Fu-P was not associated with reckless driving in a study by Duangpatra et al. (2009). In addition, individuals higher in Fu-P actually had a greater likelihood of smoking (Guthrie et al., 2013). The link between Fu-P and positive health behaviors has been regularly countered by inconsistent findings in research.

In opposition to the findings for Fu-P, individuals high in Pr-Hed and Pr-Fat (the two present orientations) often engage in fewer protective health behaviors and more risky health behaviors. For example, higher levels of present orientations have been linked to fewer protective behaviors such as reduced seatbelt use (both Pr-Hed and Pr-Fat, Daugherty & Brase, 2010; Pr-Fat only, Henson et al., 2006), reduced birth control use (Pr-Fat only; Henson et al., 2006), and reduced intentions to participate in diabetes screening (general present orientation; Crockett et al., 2009). Similarly, higher present orientations are often associated with engaging in more risky health behaviors, such as tobacco use (Pr-Hed and Pr-Fat; Daugherty & Brase, 2010), higher cannabis consumption frequency (Pr- Hed only; Apostolidis et al., 2006), and more general substance use (general present orientation, Duangpatra et al., 2009; Pr-Hed only, Fieulaine & Martinez, 2010; general present orientation, Keough et al. 1999). Consistent with theories by Zimbardo and Boyd (1999,

2008), a clear pattern emerges from numerous studies where present orientations are associated with both increased risky behaviors and decreased protective behaviors.

In addition to numerous studies supporting the associations expected by Zimbardo and Boyd (1999, 2008), contradictory findings in the literature also exist for present orientations. No association was found between present time perspectives (Pr-Hed and Pr-Fat) and smoking, obesity, or exercise (Guthrie et al., 2013). Similarly, present orientation was not associated with reckless sexual behaviors or reckless driving (Duangpatra et al., 2009). Further, higher levels of Pr-Hed were associated with higher birth control use, even after controlling for number of sexual partners, and more exercise among women (but not men; Henson et al., 2006). The associations between present orientations and health behaviors are plagued by the same inconsistencies as Fu-P.

TIME PERSPECTIVE AND ALCOHOL USE

Consistent with general health behaviors, time perspective has been linked to alcohol use specifically across multiple populations. Lower levels of Fu-P were associated with being a drinker (French college students; Apostolidis et al., 2006), a problematic drinker (Irish adolescents; McKay, Percy, & Cole, 2013), higher alcohol quantity, frequency, and alcohol-related problems (adjudicated adolescents; Robbins & Bryan, 2004), and more frequent drinking (high school students; Barnett et al., 2013). Fu-P was even inversely related to substance use (including alcohol) among elementary school children (Wills et al., 2001). Overall, it seems being higher in Fu-P leads to drinking less or not drinking at all.

Similar to other risky behaviors, being higher in present dimensions of time perspective is also positively associated with alcohol use. Higher levels of Pr-Hed was positively associated with being a drinker among French college students (Apostolidis et al., 2006). Similarly, higher levels of present orientation was associated with being classified as a problematic drinker among Irish adolescents (McKay et al., 2013). Finally, present orientation was positively related to substance use (including alcohol) among elementary school children (Wills et al., 2001).

Time perspective is an important predictor of alcohol use among college students. Higher levels of the Fu-P dimension has been directly linked to less drinking among college students in both a typical week and a heavy drinking week (Henson et al., 2006), as well as less frequent consumption (Daugherty & Brase, 2010). Consistent with other health behaviors, higher levels of Pr-Hed was associated with higher levels of typical and heavy drinking (Henson et al., 2006), Pr-Hed and Pr-Fat were associated with more frequent drinking (Daugherty & Brase, 2010), and P-Neg was associated with higher levels of alcohol-related problems (Linden, Lau-Barraco, & Hollis, 2014). Finally, when comparing types of drinkers, MacKillop, Mattson, Anderson MacKillop, Castelda, and Donovick (2007) found that hazardous college drinkers were significantly higher on Pr-Hed and lower on Fu-P dimensions than social college drinkers. Taken together, these studies support the pattern that Fu-P is associated with lower levels of alcohol consumption and present orientations are associated with higher levels of alcohol consumption.

As with other health behaviors, inconsistent findings have been reported for time perspective and alcohol use. Fu-P was not associated with reckless substance use (Duangpatra et al., 2009), and time perspective was generally not associated with drinking for adolescents (McKay, Percy, Goudie, Sumnall, & Cole, 2012). Finally, P-Neg was negatively associated with being a drinker among French college students (Apostolidis et al., 2006).

The authors of the studies with inconsistent findings suggest several potential explanations for these inconsistencies ranging from sample differences (e.g., age, socioeconomic status), to measure deficiencies (e.g., readability, narrow assessment [cognitions only] versus broad assessment [cognitions, effect, behavior, and attitude]) as possibilities (Duangpatra et al., 2009; Guthrie et al., 2013; McKay et al., 2012). However, another possible explanation for these incongruous findings could be the inconsistency between the nature of time perspective versus how it is typically analyzed in research. This underlying flaw crosses all populations and is present regardless of how narrow or broad the assessment. Time perspective is a multidimensional construct (Zimbardo & Boyd, 1999, 2008), but it is often treated as a series of individual difference variables examined separately. Each dimension is represented as a separate variable, and even those that attempt to examine these as a single construct do so by treating these as a set in hierarchical regressions, which still does not allow for or identify natural correlations among the dimensions (e.g., Daugherty & Brase, 2010; Duangpatra et al., 2009; Holman & Zimbardo, 2009). However, examining individual dimensions of time perspective in isolation is limiting. Zimbardo and Boyd (1999, 2008) suggest that it is preferable to be relatively high in multiple dimensions of time perspective that one can switch quickly between depending on situational context. These individuals with time perspective profiles high on multiple desirable dimensions while simultaneously low on undesirable dimensions would be better able to make decisions that reflect balancing desires and goals across multiple temporal frames simultaneously. One aim of the current study is to confirm the existence of multidimensional profiles of time perspective.

Understanding the etiology of college student drinking can lead to better prevention and treatment. If time perspective profiles are identified that are associated with riskier alcohol use, then time perspective profiles would be a handy tool to identify at-risk students in need of prevention or intervention. Time perspective has been demonstrated to be malleable, and training in forward-thinking has led to improved health outcomes. Hall and Fong (2003) created a brief time perspective intervention delivered in three, half-hour sessions. It was designed to enhance long-term thinking about physical activity by emphasizing how costs and benefits differ in the shortterm versus long-term, incorporating a decisional balance activity. Adolescents receiving this intervention demonstrated increased physical activity at follow-ups as compared with a control condition and alternative intervention. They replicated these results in a second, larger study (Hall and Fong, 2003). This emphasizes the importance of time perspective as a predictor of health behaviors, and its ability to be changed with targeted interventions that yield improved health outcomes. It is possible that similar results could eventually be obtained for college student drinking. Identifying a clear, consistent connection between time perspective and college alcohol use is an important first step.

The current study is a multidimensional assessment of time perspective and college student drinking. Naturally occurring profiles of time perspective combinations were identified and described (aim 1), and the associations between these profiles or classes and alcohol use were examined (aim 2). We hypothesized that students who are higher in multiple favorable dimensions of time perspective (i.e., being future-focused [Fu-P] and having a favorable view of the past [P-Pos]) while simultaneously being low in unfavorable dimensions (i.e., a defeatist view of life [Pr-Fat], a focus on pleasure-seeking [Pr-Hed], and focusing on unpleasant past memories [P-Neg]) would engage in healthier drinking behaviors. They would drink less overall (both in quantity and frequency) and also engage in less risky episodic use such as fewer binge episodes and lower peak usage. Therefore, we also expected students with risker profiles of time perspective (i.e., lower in Fu-P and P-Pos, higher in Pr-Fat, Pr-Hed, and P-Neg) to engage in riskier drinking behaviors. We expected they would drink more overall, and engage in more frequent binge episodes with higher peak usage.

METHOD

Participants and Procedures

This study was found to be exempt after undergoing human subjects review by the institutional review board. All relevant ethical guidelines were followed. Participants were undergraduate students (n = 431) at a public university in the mid-Atlantic region with a mean age of 20.41 years (SD = 3.91, median = 19.00). The sample was predominantly Caucasian/White (56.2%) or African- American/Black (28.4%), and female (65.1%). They completed an online survey and were compensated for their time with course research credits.

Measures

Time Perspective—Time perspective was assessed using Zimbardo's Time Perspective Inventory (ZTPI; Zimbardo & Boyd, 1999). Participants rated how characteristic or true 56 items were for them on a response scale from 1 (*very uncharacteristic*) to 5 (*very characteristic*). P-Pos was assessed with nine items (α = .80), P-Neg was assessed with 10 items (α = .82), Pr-Hed was assessed with 15 items (α = .79), Pr-Fat was assessed with nine items (α = .74), and Fu- P was assessed with 13 items (α = .77). Convergent and discriminant validities have been established by prior research (Zimbardo & Boyd, 1999).

Alcohol Use—Alcohol use was assessed using a modified version of the Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985). A drinking grid was used to assess the number of drinks consumed each day of a typical week, displaying days of the week as columns, and asking number of drinks and hours passed as rows. A second grid assessed the number of drinks consumed each day of the heaviest drinking week in the past 30 days. Additional questions assessed drinking behaviors across the past 30 days (e.g., number of drinking days, number of days drunk/intoxicated). A single drink was defined as 12 oz. of beer, 5 oz. of wine, or 1.5 oz. of liquor.

Analysis Approach

To address the first aim of the study, a latent profile analysis was conducted using Mplus version 6.1 (Muthén & Muthén, 1998–2010). Latent profile analysis assumes an underlying construct that explains participants' responses to observed indicators. It identifies classes of individuals that minimize within-class variability on observed variables while maximizing between-class differences. Multiple models are estimated specifying different numbers of classes, and the ideal number of classes is determined using model comparison. For the present study, the ideal number of classes was determined using information criteria (Akaike Information Criterion [AIC], Akaike, 1987; Bayesian Information Criterion [BIC], Schwartz, 1978; and sample-sized adjusted Bayesian information criterion [aBIC], Sclove, 1987]) as well as relative entropy values, the Lo–Mendell–Rubin (LMR) likelihood ratio test (Lo, Mendell, & Rubin, 2001), proportional class size, and interpretability of the identified classes. Lower AIC, BIC, and aBIC values indicate better fit, whereas higher relative entropy values indicate higher certainty of classification. The LMR likelihood ratio test assesses whether the current number of classes for that model (k) is a significant improvement compared with one less class ($k - 1$) for each model tested. Relatively small probabilities (p) support the current model being tested whereas larger probability values support the model with fewer classes. Models were explored for $c = 1$ through $c = 7$ classes based on scores for each time perspective dimension (five items in total). See Table 1 for model fit values.

Bootstrapped regressions ($n = 5{,}000$) were conducted to assess how the latent classes were associated with alcohol consumption indicators. Bootstrapping was appropriate because of non-normality of alcohol use count data (Schroder, Carey, & Vanable, 2003). This allowed for the estimation of bias-corrected bootstrapped confidence intervals as a more accurate assessment of significance. Regressions were conducted to compare class differences on number of drinks (quantity) in a typical week, number of drinking days in a typical week, quantity for a heavy drinking week, and number of drinking days in a heavy week. We also examined several indicators for the past 30 days, including number of drinking days in the past 30 days, number of days intoxicated, number of days passed out or sick, number of days binged (four+ drinks for females, five+ drinks for males), number of drinks on the highest drinking days, and blood alcohol concentration (BAC) on that highest drinking day. For their heaviest drinking day, participants were also asked how many hours passed during the drinking occasion to determine their BAC. BAC was estimated using a formula by Matthews and Miller (1979) based on the number of standard drinks consumed, number of hours over which the drinks were consumed, weight in pounds, and gender. Latent class was dummy-coded with class 2 (the most populous class size) as the category of reference. Gender was included as a covariate in each regression analysis.

RESULTS

Latent Class Analysis

The fit indices displayed in Table 1 support varying conclusions depending on index chosen. Among the information criteria, AIC and aBIC indicate that model fit improves as the number of classes increases, whereas BIC indicates that the model with three classes is the

best fit for the data. A simulation study by Nylund, Asparouhov, and Muthén (2007) found that AIC was not accurate in identifying the correct number of classes, and that BIC and aBIC performed similarly well for models with simple structures such as the current model. They also conclude that no one indicator is consistently accurate across all models, and that examining multiple indices is necessary to see the complete picture. Relative entropy is the highest for five classes, indicating the highest certainty for classification. However, the LMR likelihood ratio probabilities indicate that these higher numbers of classes do not significantly improve model fit, and that the models with four or more classes are less than ideal. Finally, the proportion of participants in the smallest class is a factor to consider in model comparison. Classes consisting of only a handful of students are not inherently meaningful. The model with three classes yielded the smallest proportion of .091 (44.57 participants) whereas the model with four classes yielded the smallest proportion of .012 (6.09 participants), which becomes much less meaningful.

Taking all fit indices into account, the model with three classes was identified as the best fitting model relative to the others examined. This model had the lowest BIC value. Although aBIC continued to decrease and relative entropy continued to increase for models with more classes, the sample size for each class continued to decline past meaningful proportions. In addition, the LMR *p*-values were higher for models with more classes, indicating that the model with three classes was most appropriate. Given that the LMR *p*-value was of marginal significance (.07) for the three-class solution, indicating only tepid support, we also conducted a bootstrap likelihood ratio test (McLachlan & Peel, 2000) for the three-class solution, which yielded $p < .001$, confirming that the three-class solution is more appropriate than the model yielding two classes. Using likelihood values for each class, final class membership was determined for each participant, and descriptive statistics were calculated for each time perspective dimension. *Class 1* ($n = 36$; 7.3%), named the "high risk" class for reasons described below, had the least desirable time perspective attributes based on the literature reviewed above. They comparatively had the highest levels of P-Neg, Pr-Hed, and Pr-Fat perspectives as well as the lowest levels of Fu-P. *Class 2* ($n = 338$; 68.6%) comprised the majority of the sample, and represented medial levels of P-Neg, Pr-Hed, Pr-Fat, and Fu-P perspectives. Finally, *Class 3* ($n = 118$; 23.9%), named the "protective" class for reasons described below, had the most desirable attributes based on the literature, with the lowest levels of P-Neg, Pr-Hed, and Pr-Fat as well as the highest levels of Fu-P. P-Pos was relatively similar across all classes. See Table 2 for the mean values and standard deviations of each time perspective by class. Finally, given that class 2 is the largest and the most medial class in the three-class solution, we conducted *t*-tests comparing class 1 with class 2, and comparing class 3 with class 2 across all dimensions of time perspective. As shown in Table 3, class 1 is significantly different from class 2 across all five dimensions of time perspective. Similarly, class 3 is significantly different from class 2 on four dimensions. This confirms our profile analysis findings that there are three distinct profiles of time perspective, yielding three differing patterns of use. Figure 1 represents the general profile for each class.

Alcohol Use by Class

Dummy variables compared class 1 (the least favorable time perspective profile) with class 2 (majority of the sample) on each alcohol outcome, and class 3 (the most favorable time perspective profile) with class 2. As seen in Table 4, class 3 consumed alcohol significantly less often and at lower levels during both typical drinking weeks and their heaviest drinking weeks as compared with class 2. They consumed almost three fewer drinks per typical week, and almost four fewer drinks per heavy week. Table 5 shows that class 3 drank less often as well as binge drank less often than class 2 (about one day less for each). They also passed out or got sick from drinking less often and had lower levels of maximum consumption by 1.3 drinks. In contrast, class 1 did not significantly differ from class 2 on any drinking indicators. Estimates indicate that class 1 drank over two additional drinks per typical week and three additional drinks per heavy week, but these differences were not significant (Table 4). Similar trends were observed for class 1 indicating higher consumption and more frequent drinking, but these estimates again failed to achieve statistical significance. However, findings indicated marginal significance ($p < .10$) for days intoxicated, the highest drinking day, and the highest BAC (Table 5). These findings generally support that one profile (class 1) yields increased alcohol consumption across multiple indicators, indicating it is a higher risk profile of time perspective whereas another profile (class 3) yields reduced alcohol consumption across multiple indicators, indicating it is a more protective profile of time perspective.

Similar results were obtained when controlling for race with only minor changes in the numbers. Five of the alcohol indicators were unchanged in significance across classes (typical quantity, typical drinking days, heavy quantity, heavy drinking days, and days passed out/sick). The remaining differences were minor changes. The differences between class 1 and class 2 were actually strengthened, with two previously nonsignificant results becoming marginally significant ($p < .10$; days binged and drinking days out of past 30), and three marginally significant results becoming significant ($p < .05$; days intoxicated, highest drinking day, and highest BAC). For the differences between class 3 and class 2, one was strengthened, becoming marginally significant (days intoxicated), and two were weakened ($p < .05$ becoming $p < .10$ for the highest drinking day and drinking days out of past 30 days).

DISCUSSION

The current findings generally support our hypotheses. The protective profile (class 3) was higher in Fu-P and lower in Pr-Fat, Pr-Hed, and P-Neg, reflecting that they are relatively future-focused, do not have a defeatist attitude, are not pleasure-seeking, and do not view the past unfavorably. In contrast, the risky profile (class 1) was lower in Fu-P and higher in Pr-Fat, Pr-Hed, and P-Neg, reflecting that they were not very future-focused, were comparatively defeatist, were pleasure-seeking, and viewed their past more unfavorably than their peers. P-Pos was relatively equal across profiles, indicating that a favorable view of the past may not cluster naturally with other dimensions. Alternatively, its similarity across profiles may reflect that this dimension has limited variability among college students, where no students are particularly high or low on the construct.

As expected, the protective class (class 3) was associated with significantly fewer drinking days, fewer drinks, fewer binge episodes, fewer days passed out or sick from drinking, and lower peaks. Contrary to expectations, the high risk class (class 1) did not reveal significant increases in alcohol outcomes, although some indicators reached marginal significance. However, the group differences (*b*) and standardized values for these differences (β) indicate larger average increases in drinking for class 1 from class 2 as compared with the size of the decline in drinking for class 3 from class 2 for five out of six 30-day indicators. Likely, these differences were not significant because class 1 has the smallest *n*, which increased the width of confidence intervals. However, although not significant, the expected general pattern was still observed. Power estimations conducted within the structural equation modeling framework using Monte Carlo methods (Muthén & Muthén, 2002) indicate that a sample size of $n = 219$ students in class 1 should yield power = .823 for typical quantity of alcohol consumed, and $n = 292$ students in class 1 should yield power = .912, meaning $b = 2.11$ would yield significant findings 91.2% of the time.

There are many implications for the current study. Our initial findings indicate that there are naturally occurring patterns of time perspective. If individuals high in Fu-P tend to also be low in Pr-Fat, it may be difficult to disentangle the influence of a single dimension. Thus, examining individual dimensions in isolation may not provide a complete picture for researchers interested in investigating the associations between time perspective and related behaviors.

We also found that there is a protective time perspective profile associated with lower overall alcohol use as well as less engagement in the riskiest episodic drinking, and emerging evidence of a high risk profile that needs to be further explored. Identifying these profiles among college students could help identify the students that are most in need of an alcohol intervention. This could help institutions devote their limited resources to the students who would reap the most benefits. This conclusion is supported by Carey, Henson, Carey, and Maisto (2007) who found that time perspective was a moderator for their intervention effect, where students low in Fu-P at baseline had the strongest decreases in drinking after the intervention. Improvements in focusing on the future could explain these stronger decreases in drinking. The highest risk students were most receptive to that particular intervention. Relying on the profiles of time perspective rather than individual dimensions to identify students in need may yield even stronger results.

Since the associations between time perspective and alcohol use have been observed not just among college students (e.g., Daughtery & Brase, 2010; Henson et al., 2006; Linden et al., 2014; MacKillop et al., 2007) but also across multiple populations (e.g., adjudicated adolescents [Robbins & Bryan, 2004], elementary school children [Wills et al., 2001], French college student [Apostolidis et al., 2006], Irish adolescents [McKay et al., 2013]), it is a reasonable conclusion that the identification of multidimensional profiles of time perspective will lead to more consistent associations with health behaviors in other samples outside of college students. These other populations have experienced the same inconsistency of findings among individual dimensions. Profiles of time perspective should more accurately represent multidimensional classes as compared with individual dimensions, and at least one protective class would likely emerge as well as a high risk

class. However, the number of profiles identified, their associations with individual ZTPI dimensions, and the general proportions of each class will likely vary across different populations.

The protective effects of time perspective profiles could be expanded to more students if we are able to influence their temporal frameworks. Hall and Fong (2003) found that an intervention focusing on time perspective increased physical activity in college students as compared with a control goal-setting intervention or no intervention. This demonstrates that helping retrain students to access favorable time perspective dimensions when appropriate can result in improved health behaviors, and could potentially be used to help students make smarter decisions regarding drinking.

The current study is not without limitations. Given that the classes that have the most predictive time perspective profiles (classes 1 and 3) were also the classes with the fewest members, our sample size for the alcohol analyses was relatively low and we were not able to achieve significance for the alcohol increase in the high risk class. We also relied on self-report for the drinking outcomes and were limited to a cross-sectional design, which does not allow for conclusions of causation. Future research should replicate these findings with larger samples, and confirm the self-report drinking data using peer observations. In addition, future research should explore if interventions targeting time perspective can actually shift college students into the more protective profile. Similarly, we should use a prospective design to investigate whether those changes in profile will be associated with reduced drinking. Finally, time perspective is not the only influential individual difference on college drinking. Future research should explore the association of time perspective on college drinking in the context of other predictors such as personality factors and coping style.

CONCLUSIONS

This study demonstrates that naturally occurring time perspective profiles are significantly associated with high risk alcohol use. The majority of college students (class 2) have median levels of each time perspective facet. However, a small proportion of the student population (class 3) has time perspective profiles considered most desirable that act as a protective factor, and these students engage in significantly less risky alcohol use (i.e., less frequent alcohol use, smaller quantities of consumption). An even smaller subset of the student population (class 1) has time perspective profiles considered least desirable, and these students engage in riskier alcohol use (i.e., more frequent alcohol use, larger quantities of consumption), although this pattern did not achieve significance. Further research should explore time perspective profiles as a multidimensional construct rather than continuing the tradition of isolated variable prediction.

Acknowledgments

The authors would like to acknowledge the contributions of Melissa P. Reeves. Her insights were invaluable to the development of the current research. This investigation was supported by the National Institute on Alcohol Abuse and Alcoholism under a Ruth L. Kirschstein National Research Service Award (F32-AA021310).

Biographies

Abby L. Braitman, PhD, is in the department of psychology at Old Dominion University. Her research explores the etiology of college student drinking, with a focus on developing techniques to strengthen and extend the effects of interventions directed at harm reduction. She is also interested in the application of quantitative methods and approaches for risky health behaviors.

James M. Henson, PhD, is an associate professor of psychology at Old Dominion University. A quantitative psychologist by training, he's been focusing his applied research program on college drinking intervention for the past 10 years. His research involves the application of advanced statistical models to alcohol intervention and prevention data among college populations.

GLOSSARY

Future time perspective	A focus on the future and planning toward goals.
Latent profile analysis	A form of analysis that assumes an underlying categorical construct which explains participants' responses to observed indicators. It identifies classes of individuals that minimize within-class variability on observed variables while maximizing between-class differences, resulting in different profiles across observed indicators.
Present-fatalistic time perspective	A defeatist, helpless view toward life.
Present-hedonistic time perspective	A risk-taking, pleasure-devoted view of life.
Past-negative time perspective	An unpleasant or unfavorable view of the past.
Past-positive time perspective	A sentimental, nostalgic view toward the past.

Time perspective	The temporal framework individuals use to process information. It consists of five facets, and can influence the perception, encoding, storage, and retrieval of experiences and information as well as decisions, actions, and goals.

REFERENCES

Akaike H. Factor analysis and AIC. Psychometrika. 1987; 52:317–332.

Apostolidis T, Fieulaine N, Simonin L, Rolland G. Cannabis use, time perspective and risk perception: Evidence of a moderating effect. Psychology & Health. 2006; 21:571–592.

Bandura, A. Social foundations of thought and action: A social cognitive theory. Englewood Cliffs, NJ: Prentice-Hall; 1986.

Bandura, A. Self-regulation of motivation through anticipatory and self-reactive mechanisms. In: Dienstbier, R., editor. Perspectives on motivation. Lincoln, NE: University of Nebraska Press; 1991. p. 69-164.

Barkley RA. Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. Psychological Bulletin. 1997; 121:65–94. [PubMed: 9000892]

Barnett E, Spruijt-Metz D, Unger JB, Rohrbach LA, Sun P, Sussman S. Bidirectional associations between future time perspective and substance use among continuation high-school students. Substance Use & Misuse. 2013; 48:574–580. [PubMed: 23750661]

Carey KB, Henson JM, Carey MP, Maisto SA. Which heavy drinking college students benefit from a brief motivational intervention? Journal of Consulting and Clinical Psychology. 2007; 75(4):663–669. [PubMed: 17663621]

Collins RL, Parks GA, Marlatt GA. Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. Journal of Consulting and Clinical Psychology. 1985; 53(2):189–200. [PubMed: 3998247]

Core Institute. American campuses: 2006 statistics on alcohol and other drug use. Carbondale, IL: Southern Illinois University; 2006.

Crockett RA, Weinman J, Hankins M, Marteau T. Time orientation and health-related behaviour: Measurement in general population samples. Psychology & Health. 2009; 24(3):333–350. [PubMed: 20204997]

Daugherty JR, Brase GL. Taking time to be healthy: Predicting health behaviors with delay discounting and time perspective. Personality and Individual Differences. 2010; 48:202–207.

de Bilde J, Vansteenkiste M, Lens W. Understanding the association between future time perspective and self-regulated learning through the lens of self-determination theory. Learning and Instruction. 2011; 21:332–244.

Deci EL, Ryan RM. The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. Psychological Inquiry. 2000; 11:227–268.

Duangpatra KNK, Bradley GL, Glendon AI. Variables affecting emerging adults’ self-reported risk and reckless behaviors. Journal of Applied Developmental Psychology. 2009; 30(3):298–309.

Fieulaine N, Martinez F. Time under control: Time perspective and desire for control in substance abuse. Addictive Behaviors. 2010; 35:799–802. [PubMed: 20442007]

Guthrie LC, Lessl K, Ochi O, Ward MM. Time perspective and smoking, obesity, and exercise in a community sample. American Journal of Health Behavior. 2013; 37(2):171–180. [PubMed: 23026098]

Hall PA, Fong GT. The effects of a brief time perspective intervention for increasing physical activity among young adults. Psychology & Health. 2003; 18(6):685–706.

Hall PA, Fong GT, Cheng AY. Time perspective and weight management behaviors in newly diagnosed type 2 diabetes: A mediational analysis. Journal of Behavioral Medicine. 2012; 35(6):569–580. [PubMed: 22105339]

Henson JM, Carey MP, Carey KB, Maisto SA. Associations among health behaviors and time perspective in young adults: Model testing with boot-strapping replication. Journal of Behavioral Medicine. 2006; 29:127–137. [PubMed: 16421652]

Holman EA, Zimbardo PG. The social language of time: The time perspective-social network connection. Basic and Applied Psychology. 2009; 31:136–147.

Keough KA, Zimbardo PG, Boyd JN. .Who's smoking, drinking, and using drugs? Time perspective as a predictor of substance use. Basic and Applied Psychology. 1999; 21:149–164.

Knight JR, Wechsler H, Kuo M, Seibring M, Weitzman ER, Schuckit MA. Alcohol abuse and dependence among US college students. Journal of Studies on Alcohol. 2002; 63(3):263–270. [PubMed: 12086126]

Linden AN, Lau-Barraco C, Hollis BF. Associations between psychological distress and alcohol outcomes as mediated by time perspective orientation among college students. Mental Health and Substance Use. 2014; 7(2):134–143.

Lo Y, Mendell NR, Rubin DB. Testing the number of components in a normal mixture. Biometrika. 2001; 88:767–778.

MacKillop J, Mattson RE, Anderson MacKillop EJ, Castelda BA, Donovick PJ. Multidimensional assessment of impulsivity in undergraduate hazardous drinkers and controls. Journal of Studies on Alcohol & Drugs. 2007; 68:785–788. [PubMed: 17960295]

Matthews DB, Miller WR. Estimating blood alcohol concentration: Two computer programs and their applications in therapy and research. Addictive Behaviors. 1979; 4:55–60. [PubMed: 420046]

McKay MT, Percy A, Cole JC. Present orientation, future orientation, and alcohol use in Northern Irish adolescents. Addiction Research and Theory. 2013; 21(1):43–51.

McKay MT, Percy A, Goudie AJ, Sumnall HR, Cole JC. The temporal focus scale: Factor structure and association with alcohol use in a sample of Northern Irish school children. Journal of Adolescence. 2012; 35:1361–1368. [PubMed: 22704493]

McLachlan, G.; Peel, D. Finite mixture models. New York, NY: John Wiley; 2000.

Muthén, LK.; Muthén, BO. Mplus user's guide. 6th Edn.. Los Angeles, CA: Muthén & Muthén; 1998–2010.

Muthén LK, Muthén BO. How to use a Monte Carlo study to decide on sample size and determine power. Structural Equation Modeling. 2002; 9:599–620.

Nylund KL, Asparouhov T, Muthén BO. Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. Structural Equation Modeling. 2007; 14:535–569.

Rise J, Kovac V, Kraft P, Moan IS. Predicting the intention to quit smoking and quitting behaviour: Extending the theory of planned behaviour. British Journal of Health Psychology. 2008; 13(2): 291–310. [PubMed: 17535498]

Robbins RN, Bryan A. Relationships between future orientation, impulsive sensation seeking, and risk behavior among adjudicated adolescents. Journal of Adolescent Research. 2004; 19(4):428–445. [PubMed: 16429605]

Schroder KEE, Carey MP, Vanable PA. Methodological challenges in research on sexual risk behavior: Item content, scaling, and data analytical options. Annals of Behavioral Medicine. 2003; 26(2):76–103. [PubMed: 14534027]

Schwartz G. Estimation the dimensions of a model. The Annals of Statistics. 1978; 6:461–464.

Sclove SL. Application of model-selection criteria to some problems in multivariate analysis. Psychometrika. 1987; 52:333–343.

Wallenstein GV, Pigeon S, Kopans B, Jacobs DG, Aseltine R. Results of National Alcohol Screening Day: College demographics, clinical characteristics, and comparison with online screening. Journal of American College Health. 2007; 55(6):341–349. [PubMed: 17517546]

Wills TA, Sandy JM, Yeager AM. Time perspective and early-onset substance use: A model based on stress-coping theory. Psychology of Addictive Behaviors. 2001; 15:118–125. [PubMed: 11419227]

Wininger SR, DeSena TM. Comparison of future time perspective and self-determination theory for explaining exercise behavior. Journal of Applied Biobehavioral Research. 2012; 17(2):109–128.

Zimbardo PG, Boyd JN. Putting time in perspective: A valid, reliable, individual differences metric. Journal of Personality and Social Psychology. 1999; 77(6):1271–1288.

Zimbardo, PG.; Boyd, JN. The time paradox: The new psychology of time that will change your life. New York, NY: Free Press; 2008.

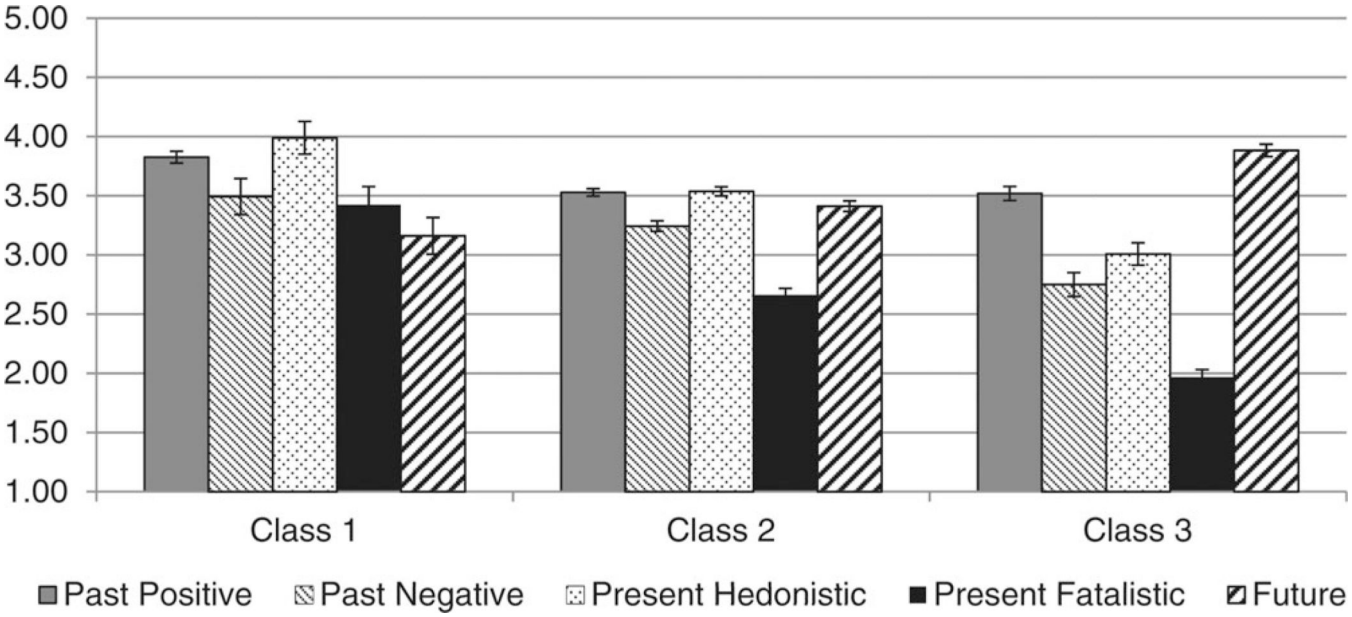

FIGURE 1.

Mean levels of specific time perspectives within the multidimensional profile of each class. Error bars indicate the standard error for each dimension mean. Class 1 (7.3%) is the higher risk profile, class 2 (68.6%) is the medial profile, and class 3 (23.9%) is the protective profile.

TABLE 1

Model fit based on number of classes

Classes	AIC	BIC	Adjusted BIC	Relative entropy	LMR *p*	Proportion of smallest group
1	3952.805	3994.790	3963.050	—	—	—
2	3788.383	3855.559	3804.775	0.620	.0000	.341
3	3756.886	3849.253	3779.425	0.700	.0694	.091
4	3736.655	3854.213	3765.341	0.754	.1910	.012
5	3722.782	3865.530	3757.614	0.773	.1497	.013
6	3715.194	3883.134	3756.174	0.753	.7717	.012
7	3703.795	3896.925	3750.921	0.766	.7638	.011

Note. AIC = Akaike information criterion; BIC Bayesian information criterion; LMR = Lo–Mendell–Rubin likelihood ratio test.

TABLE 2

Mean values and standard errors for time perspective facets by latent class

Classes	Past positive M (SE)	Past negative M (SE)	Present hedonistic M (SE)	Present fatalistic M (SE)	Future M (SE)
Class 1	3.83 (0.050)	3.49 (0.153)	3.99 (0.138)	3.42 (0.153)	3.16 (0.156)
Class 2	3.53 (0.031)	3.24 (0.044)	3.54 (0.038)	2.66 (0.057)	3.41 (0.044)
Class 3	3.52 (0.059)	2.75 (0.101)	3.01 (0.095)	1.97 (0.065)	3.88 (0.052)

Note. Class 1 is the higher risk profile, class 2 is the medial profile, and class 3 is the protective profile.

TABLE 3

Differences across time perspective facets by latent class

Classes	Past positive *t*(*p*)	Past negative *t*(*p*)	Present hedonistic *t*(*p*)	Present fatalistic *t*(*p*)	Future *t*(*p*)
Class 1	7.21 (<.001)	3.22 (.001)	6.64 (<.001)	16.30 (<.001)	−2.90 (.004)
Class 3	0.06 (.951)	−7.71 (<.001)	−12.62 (<.001)	−19.06 (<.001)	10.69 (<.001)

Note. Each class listed is compared with class 2 for the *t*-test results included in this table. Also, class 1 is the higher risk profile, class 2 is the medial profile, and class 3 is the protective profile.

TABLE 4

Regression results for latent class differences on weekly drinking

	Class 1 difference from class 2				Class 3 difference from class 2			
	b	**β**	**95% CI**		***b***	**β**	**95% CI**	
			Typical week					
Drinking days	0.288	0.171	[−0.236,	0.859]	−0.610*	−0.362	[−0.945,	−0.260]
Quantity	2.110	0.198	[−1.259,	5.966]	−2.701*	−0.254	[−4.615,	−0.448]
			Heavy week					
Drinking days	0.276	0.148	[−0.340,	0.972]	−0.679*	−0.365	[−1.043,	−0.302]
Quantity	3.575	0.226	[−1.622,	9.214]	−3.859*	−0.244	[−6.591,	−0.729]

Notes. Class 1 is the higher risk profile, class 2 is the medial profile, and class 3 is the protective profile.

95% CI = 95% bias-corrected bootstrapped confidence intervals with n = 5,000.

Gender was controlled for in all analyses.

β reflects the standardization of the outcome but not the predictor since it is binary.

* $p < .05$ based on confidence intervals.

Subst Use Misuse. Author manuscript; available in PMC 2015 July 22.

TABLE 5

Regression results for latent class differences on drinking (past 30 days)

	Class 1 difference from class 2				Class 3 difference from class 2			
Outcome	***b***	**β**	**95% CI**		***b***	**β**	**95% CI**	
Drinking days	1.340	0.254	[−0.370,	3.395]	−1.308*	−0.248	[−2.355,	−0.072]
Days intoxicated	1.075†	0.361	[−0.024,	2.230]	−0.626	−0.210	[−1.223,	0.024]
Highest drinking day	2.088†	0.335	[−0.005,	4.344]	−1.343*	−0.216	[−2.500,	−0.094]
Highest BAC	0.056†	0.366	[−0.002,	0.128]	−0.031	−0.206	[−0.061,	0.004]
Days passed out/sick	0.289	0.357	[−0.063,	0.810]	−0.153*	−0.189	[−0.285,	−0.012]
Days binged	0.877	0.245	[−0.346,	2.257]	−0.978*	−0.274	[−1.684,	−0.186]

Notes. Class 1 is the higher risk profile, class 2 is the medial profile, and class 3 is the protective profile.

95% CI = 95% bias-corrected bootstrapped confidence intervals with n = 5,000.

BAC = blood alcohol concentration.

Gender was controlled for in all analyses.

β reflects the standardization of the outcome but not the predictor since it is binary.

† Significance for a 90% bias-corrected bootstrapped confidence interval, equating to $p < .10$.

* $p < .05$ based on confidence intervals.