The influence of time attitudes on alcohol-related attitudes, behaviors and subjective life expectancy in early adolescence. A longitudinal examination using mover–stayer latent transition analysis

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Abstract

The goal of the present study is to examine the stability of time attitudes profiles across a one-year period as well as the association between time attitudes profiles and several variables. These variables include attitudes towards alcohol, context of alcohol use, consumption of a full drink, and subjective life expectancy. We assessed the reliability and validity of time attitudes scores at baseline (mean age 12.5 years) and Wave 2 (mean age 13.5 years), the viability of time attitudes profiles at both time points, and the degree of stability in profile membership in Wave 2. A total of four latent profiles were identified (Positives, Ambivalents, Negatives, and Negative-Futures). Positives had higher scores on positive time attitude, Ambivalents did not report strong attitudes towards any of the time periods, Negatives had higher scores on negative time attitudes, and Negative-Futures were similar to Negatives, but tended to higher scores on both positive and negative time attitude for the future. Results showed that participants staying in the same time attitude profile across the first year of high school ranged from 33% to 50%. Transition to more negative profiles explained the instability, and those transitions were associated with less favorable outcomes. Having a Positive profile was associated with safer attitudes towards alcohol, lower reported uses of alcohol, and higher self-reported probability of surviving to at least the age of 35.

Keywords: Latent transition analysis, mover–stayer model, time attitudes scale, alcohol-related attitudes

Introduction

Studies examining the prevalence of alcohol use among adolescents in the United Kingdom (UK) have consistently identified the period immediately following the transition from primary to post-primary or high school as an important developmental time. This transition occurs in the UK when children are around 12 years old. Broadly speaking, between ages 10 and 18 years, the prevalence of alcohol consumption increases with each school year band (e.g., Percy & Iwaniec, 2010) so that, although drinking prevalence and frequency is low in early adolescence, by later adolescence patterns of more frequent alcohol use are established, and these are often maintained into early adulthood.

The increase in the study of temporal psychology in the past 20 years has been driven by conceptual and assessment advances. Accordingly, time perspective (e.g., Zimbardo & Boyd, 1999) has come to be considered an over-arching or umbrella term for a range of narrower and more specific constructs including time attitudes (Worrell, Mello, & Buhl, 2013). Concurrent with these conceptual advances, the temporal psychology field has seen the development and application of a growing number of scales to assess these constructs. One such scale is the Adolescent Time Inventory–Time Attitudes Scale (Mello & Worrell, 2007). As suggested by the title, the advances in terms of measurement have also become more nuanced with regard to lifespan and developmental issues. This is an important issue in the literature because time attitudes must be understood as only one aspect of the temporal psychology literature. Therefore, what is true of how individuals feel about the past, present, and future may not necessarily be true of the broader time perspective literature. Time attitudes is said to refer to an individual's emotional and evaluative feelings towards the past, present and future (Andretta, Worrell, Mello, Dixson, & Baik, 2013). The present study aims to investigate the relation between time attitudes and alcohol use indicators among adolescents in a UK context.

For some researchers, the self-reported probability of surviving to age 35 (hereafter Subjective Life Expectancy) has been conceptualized within the broader temporal psychology literature using single question approaches concerning predicted longevity, as a measure of future orientation (e.g. Nagin & Pogarsky, 2004). However, research has revealed only small correlations between Subjective Life Expectancy and scores on other temporal measures (e.g., Adams & Nettle, 2009). Research elsewhere has found that self-estimates parallel age-specific actuarial life expectancies, based on age-specific mortality rates (Brouwer & van Exel, 2005; Mirowsky, 1999). However, in both studies, males expected to live about three years longer than the actuarial estimate. The study of

Subjective Life Expectancy is potentially important as emerging evidence suggests that it influences both behavioral intentions and decision-making (e.g., Griffin, Hesketh, & Loh, 2012). In particular, research has demonstrated that adolescents with a lower Subjective Life Expectancy are more likely to engage in health compromising behaviors (McDade et al., 2011) and more delinquent behaviors (Caldwell, Wiebe, & Cleveland, 2006) than their peers. The literature investigating these relations is sparse and for this reason, we included an assessment of Subjective Life Expectancy to purposively explore how (if at all) this construct might relate to feelings about the past, present, and future.

Studies in temporal psychology have reported significant associations between how individuals perceive time and alcohol use across multiple populations including: dependent drinkers (Smart, 1968); those in treatment services (Klingeman, 2001); university undergraduates (e.g., Linden, Lau-Barraco, & Hollis, 2014); and adolescents (e.g., McKay, Andretta, Magee, & Worrell, 2014). Consistently, more problematic use of alcohol has been shown to be associated with a foreshortened future or greater present focus. Studies have also supported the association between temporal psychology and any alcohol consumption (Keough, Zimbardo, & Boyd, 1999), as well as total alcohol consumption (Henson, Carey, Carey, & Maisto, 2006) in young adults and undergraduates. Recent longitudinal evidence has suggested a more complex relation, with increased future orientation protecting against the use of cigarettes and a range of drugs, but not alcohol use (Barnett et al., 2013). However, again, it is worth pointing out that these relations have been observed using temporal measures including, but not limited to, time attitudes (i.e., McKay, Percy, Cole, Worrell, & Andretta, 2016), and the single study on time attitudes was not longitudinal. The precise relation between alcohol use and time attitudes remains poorly understood.

One limitation of the extant literature is that almost all of the previous studies used cross-sectional data (Barnett et al., 2013 as an exception), and many examined the bivariate or correlational relation between temporal psychology and alcohol use indicators. Barnett et al. (2013) employed a multilevel model that included time and schools as random effects. This type of model also assumes the population is homogeneous with respect to how the predictors operate on the outcomes (Laursen & Hoff, 2006). Some researchers have successfully applied person-oriented analyses using a hierarchical cluster analysis approach (e.g., Boniwell, Osin, Alex Linley, & Ivanchenko, 2010; McKay et al., 2014) or latent profile analysis (Braitman & Henson, 2015) to Zimbardo Time Perspective Inventory scores and identified interpretable Zimbardo Time Perspective Inventory profiles. Accordingly, some (e.g., Boniwell et al., 2010) reported that among university undergraduates, those with similar levels of past positive, present and future orientation (a

balanced profile) were also those reporting the highest levels of wellbeing. By contrast, others (McKay et al., 2014) reported that among adolescents, those with a future profile were least likely to drink problematically, while those with a present profile were most at risk. This latter finding was supported in a latent class analysis where the best alcohol-related outcomes (quantity, frequency, risky, and heavy episodic drinking) were found among those with a future-focused profile (Braitman & Henson, 2015), a result further supported in a recent UK-based study of university undergraduates (Cole, Andretta, & McKay, 2016). Given the more nuanced nature of time attitudes, further studies are required to examine how these relate to criterion variables. Moreover, the paucity of longitudinal studies in this area makes it impossible to tell how (if at all) attitudes towards time influence the development of alcohol use attitudes or behaviors.

The Present Study

The present study used time attitudes profiles from the first two available Waves of data (baseline [12.5 years old] and +12 months [13.5 years old]) from a longitudinal study in the UK to assess their relation to scores on four outcome measures collected at age 13.5: attitudes towards alcohol; context of alcohol use (if any); ever having consumed a full drink; and Subjective Life Expectancy. Despite the exploratory nature of the study, we made three hypotheses based on the limited extant literature: first, we expected that adolescents with more positive time attitude profiles would report more adaptive attitudes toward and less consumption of alcohol at each time period; second, we hypothesized that individuals who had positive time profiles across both time periods and those who moved from a less positive to a more positive profile would also report more adaptive attitudes toward and less consumption of alcohol; and third, we hypothesized that individuals who had negative time profiles across both time periods and those who moved from a more positive to a less positive profile would also report less adaptive attitudes toward and more consumption of alcohol.

Methods

Participants

Participants were those children attending schools which were recruited as part of a UK longitudinal study into adolescent drinking behaviors. At Wave 1, participants were from two samples in school Grade 8 (aged 12–13 years old; mean age = 12.5). Given that the participants were 12 years old at baseline we refer to Wave 1 as “age 12” for clarity in the remainder of the paper. Sample 1 consisted of 1,580 adolescents (40% female, 1.7%

unreported) attending secondary schools in Northern Ireland. Sample 2 consisted of 813 adolescents (46.7% female, 1.4% unreported) attending secondary schools in Scotland. Participants were matched across two waves of data collection (baseline and +12 months), which yielded a final analytic sample of 1,973 adolescents. For clarity, we refer to Wave 2 as “age 13” for the remainder of the paper. Adolescents who did not participate in age 13 data collection (n = 420, 17.6%) were excluded from the study because their responses from age 12 could not be longitudinally matched.

Both Little and Rubin (2002, p. 5) and Schafer and Graham (2002, p. 150) refer to this missing data pattern as “monotone.” When the attrition mechanism does not depend on observed or unobserved outcome variables, the pattern can be described as completely random drop-out (Diggle & Kenward, 1994) which are special cases of Rubin’s (1976) missing completely at random (MCAR) assumption (Little, 1995). Little’s (1995) proposed the use of the term covariate-dependent dropout instead of completely random dropout because there may be instances where sets of model covariates may vary due to model specification that do not affect the conditional missing data mechanism. The attrition mechanism is MCAR when missingness does not depend on observed values recorded prior to dropout, and potential violations of MCAR may be detected via “differences in distributions of observed variables across missing data patterns” (Little & Rubin, 2002, p. 18).

Following the recommendation of Little (1995), we collected multiple pieces of evidence for the tenability of MCAR assumption; that is, we: (a) conducted Little’s (1988) test of missing completely at random using the observed data (i.e., latent profile factor score indicators) as input; (b) tested the equality of the distributions of each of the six time attitude factor scores across the missing data patterns using the t-test for location; (c) computed the standardized mean difference in each of the six time attitude factor scores across missing data patterns; and (d) examined the distribution of sex and a measure of socio-economic status across missing data patterns. Taken together, these procedures allowed us to assess the extent to which excluding those who did not complete both age 12 and age 13 data collection may introduce systematic bias.

Using a pre-established Type I error rate of 0.05, Little’s (1988) MCAR test suggested that the monotone missing data pattern that was observed did not violate the MCAR assumption ($\chi 2 = 20.657$, df = 12, p = 0.06). In conducting t-tests on each of the six baseline time factor scores across missing data patterns, we used Bonferroni adjustment, which yielded a per-comparison Type I error rate of 0.008. No violations of t-test model assumptions were noted

for any of the six time attitude factor scores at baseline, and no statistically significant effects were observed for past-positive ($t = 1.59$, $df = 2381$, $p = 0.11$), past-negative ($t = -2.19$, $df = 2381$, $p = 0.03$), present-positive ($t = 1.07$, $df = 2381$, $p = 0.28$), present-negative ($t = -1.76$, $df = 2381$, $p = 0.08$), future-positive ($t = 0.76$, $df = 23810$, $p = 0.44$), or future-negative ($t = -1.62$, $df = 2381$, $p = 0.11$).

These findings also support the tenability of the MCAR assumption. Third, each observed standardized mean difference was in the trivial range (i.e., $d \leq 0.12$). Mean differences in past-positive, past-negative, present-positive, present-negative, future-positive, and future-negative factor scores were 0.09, 0.12, 0.06, 0.10, 0.04, and 0.09, respectively. These effects suggest that, on average, there was about 94% overlap in the distributions of the time attitude factor scores between missing data patterns. Finally, we examined the relationship between those who did and did not complete both age 12 and age 13 of data collection with sex and free school meals using Cramer's V. Both relationships were negligible ($V_{sex} = 0.01$, $V_{fsm} = 0.10$; Rea & Parker, 2005). Due to lack of differences observed between mean factor scores and available demographic variables, the MCAR assumption was again deemed tenable. When missing data are MCAR, the missing values are "completely benign because the observed data are a simple random sample of the hypothetically complete data" (Mistler & Enders, 2012, p. 743). Therefore, we concluded that bias resulting from excluding those who did not complete both waves of data collection was negligible, because the missing values were MCAR (Rubin, 1976).

Data were collected on the school premises using a paper and pencil technique and under examination-like conditions. Additional to school authorities giving permission for the study to take place, informed parental and individual participant consent was gained from all pupils. There were no incentives offered for schools or individuals to participate.

Measures

The Adolescent Time Inventory–Time Attitudes Scale is a 30-item instrument with six 5-item subscales assessing: Past Negative (e.g., My past makes me sad); Past Positive (e.g., I have happy thoughts about my past); Present Negative (e.g., My current life worries me); Present Positive (e.g., I am happy with my current life); Future Negative (e.g., I don't like to think about my future); and Future Positive attitudes (e.g., I look forward to my future). Adolescent Time Inventory–Time Attitudes Scale items are scored on a 5-point Likert scale with verbal and numerical anchors (1 = Totally Disagree, 5 = Totally Agree). Scores on items within each factor are summed and divided by five to yield a mean score. As previously noted, Adolescent Time Inventory–Time Attitudes Scale scores have been

shown to be internally consistent ($0.71 \leq \alpha \leq 0.91$) and structurally valid in Germany and the US (Worrell et al., 2013) as well as New Zealand (Alansari, Worrell, Rubie-Davies, & Webber, 2013), and there has also been evidence of convergent and discriminant validity in adolescents (Worrell & Mello, 2009). Despite cultural differences described previously, McKay, Cole, Percy, Worrell, and Mello (2015) provide strong evidence that the factor structure of this instrument is invariant across research sites.

Attitudes towards alcohol (e.g., People your age have a good time at parties when they get drunk) were measured using a six-item scale ($\alpha = 0.64$; McBride, Midford, Farringdon, & Phillips, 2000). Responses were given on a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Lower scores indicate safer or healthier attitudes towards alcohol use.

Context of use was determined according to the response (yes/no) profile to six statements as follows: (I have) drank alcohol (a) with my family at a special occasion or on holiday; (b) with my family at dinner; (c) at parties where adults were present (all supervised by adults); (d) alone; (e) with small groups of friends where no adults were present; and (f) at parties where no adults were present. Accordingly, participants were classified as: abstainers; supervised (only) drinkers; unsupervised (only) drinkers; and "both," (those who drank both supervised and unsupervised).

Ever having consumed a full drink (not just a taste or sip) was determined by the response (yes/no) to the question, "Have you ever consumed a full drink (not just a sip or a taste)?"

For Subjective Life Expectancy, participants answered a single question concerning their subjective probability of expecting to live to age 35. Participants were asked, "On a scale of 0 to 100, where 0 equals no chance, and 100 equals definitely, how likely do you think that it is that you will live to be 35 years old?" Integer options of "5s" (0, 5, 10, 15, 20, etc.) were available between 0 and 100.

The outcome measures of attitudes towards alcohol, context of drinking ever having consumed a full drink, and subjective life expectancies were measured only at age 13.

Statistical Analyses

The statistical analyses for this study involved a series of steps. Each step summarized below was conducted using Mplus (v 7.2; Muthén & Muthén, 2012). The confirmatory factor analysis (CFA) models were estimated using weighted least squares with mean- and

variance-adjustment, and the latent profile and latent transition models were estimated using full information maximum likelihood with robust standard errors. For detailed information on estimating a latent transition model as well as the factor structure of the Adolescent Time Inventory–Time Attitudes Scale, see Morgan, Wells, Andretta, and McKay (in press).

Latent factor scores for time attitudes

First, using CFA, we examined the factor structure of the time attitude scale for data collected at age 12 and age 13 independently. A model with six correlated time attitude factors was estimated. Each of the time attitude factors was measured by five indicators. After the CFA model was estimated, we reviewed the parameter estimates, including factor loadings and factor correlations. The comparative fit index (CFI), Tucker–Lewis index (TLI), and root mean square error of approximation (RMSEA) were used to evaluate the model-data fit. The lower bounds for acceptable model-data fit of CFI and TLI were set to 0.95 (Brown, 2015; Hu & Bentler, 1999). The upper bounds for acceptable model-data fit of RMSEA was set to 0.06 (Brown, 2015). With results from the analysis of age 12 and age 13 data independently showing good model-data fit, a strict invariance model was tested. The fit of the invariance model was reviewed using the same measures and criteria of model-data fit. Reliability was estimated for each factor using McDonald's (1999) ω, which is more appropriate in instances where loadings are unequal (Revelle & Zinbarg, 2009). Coefficient α was also estimated.

Latent profile analysis

Latent profile analysis (LPA) is a procedure used to examine the number of underlying subgroups (latent profiles) of participants with similar patterns of latent factor scores. The goal of LPA is to correctly identify the optimal number of profiles where participants are as similar as possible to those other participants in the same latent profile while being as different as possible from participants in different latent profiles. Profiles are identified on the basis of differences in means and covariances of the profile indicators.

We estimated a series of LPA models using the six latent factor scores from age 12 and age 13 independently. We examined LPA models with between two and seven profiles using nine different specifications of the covariance matrix, which allowed for various degrees of model complexity. Thus, a total of 54 LPA models (6 profile models × 9 covariance matrix parameterizations) were examined for each wave (i.e., age 12 and age 13) of data. We estimated 54 models for two reasons. First, the study was generally

exploratory, although we did have several hypotheses about the underlying number and forms of latent profiles. Second, LPA is a model-based approach to clustering/classification. As such, it affords much greater flexibility and control to researchers in choosing how to parameterize their desired models. This benefit is greatest in LPA with respect to the various parameterizations of the profile-specific covariance matrices. We took advantage of this flexibility in order to identify a model that best approximated our observed data. We present the three best alternatives.

Several fit indices were used to determine which of the 54 models had the best fit. The fit indices examined were Akaike information criterion (AIC), Bayesian information criterion (BIC), adjusted BIC (aBIC), integrated likelihood criterion with Bayesian-type approximation (ICL-BIC), Lo–Mendell–Rubin likelihood ratio test (LMR), and the bootstrapped likelihood ratio test (BLRT). Models with relatively lower AIC, BIC, aBIC, and ICL-BIC values fit better than models with higher values. The LMR and BLRT test the null hypothesis that the k-profile solution fits better than a solution with k-1 profiles, and it yields a p-value. With a maximum Type I error rate of 5%, the best fitting model is the one where k profiles yields a p-value greater than 0.05. The final model selected was determined by considering statistical fit information along with interpretability and consistency with guiding theory. After latent profile model selection, we interpreted the model using common recommendations for this (cf., DiStefano, 2012; Vermunt & Magidson, 2002). That is, we conducted tests of the model parameters (i.e., profile-specific centroids and covariance matrices) and assigned descriptive names for each time attitude pattern and examined demographic composition of each latent profile. To provide further statistical support for the selected model, we conducted a one-way analysis of variance (ANOVA) model using the profile membership as the between-subject factor for each of the time attitude factor scores as an outcome variable to demonstrate statistically significant mean differences in profiles.

Mover–stayer latent transition analysis

We next examined the transition of participants between latent profiles at age 12 and latent profiles at age 13 based on their latent factor score patterns. Participants were classified as “movers” if they transitioned to a different profile between waves, or “stayers” if they remained in the same profile at age 12 and age 13. Multinomial regression was used to examine the relation between classification at age 12 and transition status as mover or stayer.

Outcome measures

Finally, we estimated the relation between the transition status and each of four outcome measures using a statistical test and effect size estimate appropriate for the type of comparison. For the attitude towards alcohol measure and subjective life expectancy, we used contrasts between each profile mean and the grand mean and standardized mean differences for effect size estimates. For the lifetime consumption of a full drink and context of drinking, we used a $\chi 2$ test of independence and Cramer's V as the estimate of effect size. Figure 1 shows the path diagram for the final latent transition model with each outcome measure.

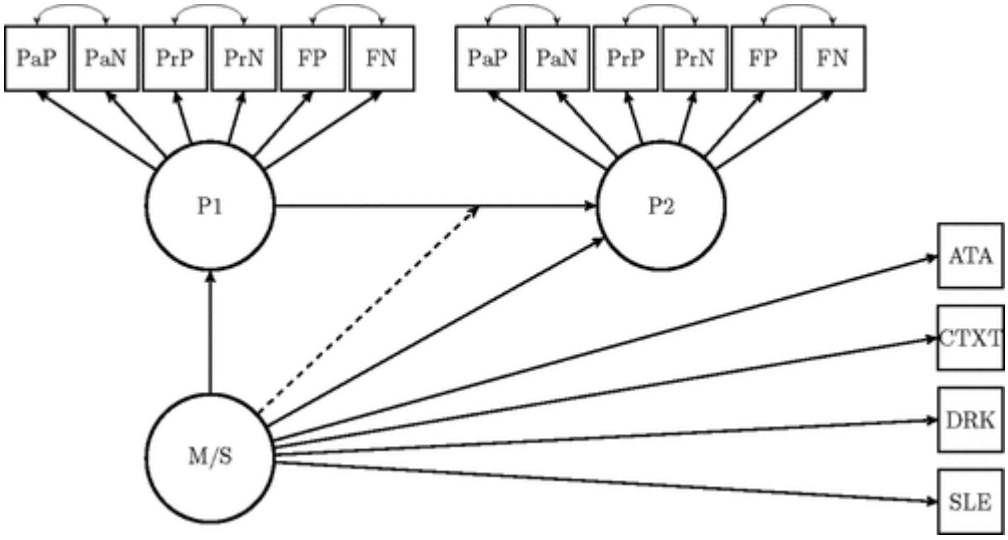

Figure 1. Path diagram of mover–stayer latent transition analysis model.

Note. A mover–stayer model was estimated separately for each of the outcomes (i.e., attitudes towards alcohol, and context of alcohol use) on the right-hand side of the diagram. P1 = profile at age 12; P2 = profile at age 13; PaP = Past-Positive; PaN = Past-Negative; PrP = Present-Positive; PrN = Present-Negative; FP = Future-Positive; FN = Future-Negative; ATA = Attitudes Towards Alcohol; CTXT = Context of Alcohol Use; DRK = Ever consumption of a full drink; SLE = Subjective Life Expectancy.

Results

Confirmatory Factor Analysis

Confirmatory factor analysis was performed on the selected models for age 12 and age 13. Both sets of analyses returned good model fit. The model based on age 12 data had an estimated CFI of 0.95, TLI of 0.95, and RMSEA of 0.06. The model based on age 13 data had an estimated CFI of 0.96, TLI of 0.96, and RMSEA of 0.06. With both age 12 and age 13 showing good model-data fit independently, a strict invariance model was evaluated first instead of iteratively estimating increasingly restrictive factor models. The strict invariance model constrained dimensionality, factor correlations, factor loadings, and residual variances to be equal across age 12 and age 13. The model had estimated CFI of 0.98, TLI of 0.99, and RMSEA of 0.04. Therefore, the factor structures were considered invariant across age 12 and age 13 data collection. Following this, latent factor scores were saved for use in the LPA and subsequent latent transition analysis. All factor score distributions were scaled to be approximately normal with a mean of zero. See Table 1 for factor structure

To further support combining the samples, we conducted a strict invariance test by gender within each wave of data collection. For the age 12 data, the model had fit estimated CFI of 0.98, TLI of 0.99, and RMSEA of 0.04. For the age 13 data, the model had fit estimated CFI of 0.97, TLI of 0.98, and RMSEA of 0.05. These model summaries supported factor invariance based on gender also. Reliability was estimated for each latent factor using ω and α. The ω estimates (α estimates in parentheses) for past-positive, past-negative, present-positive, present-negative, future-positive, and future-negative were 0.86 (0.79), 0.88 (0.83), 0.87 (0.82), 0.86 (0.80), 0.87 (0.81), and 0.80 (0.70), respectively.

Latent Profile Analysis

For the LPA, we examined age 12 and age 13 latent profile time attitude factor scores. Selected model fit summaries for each competing latent profile considered are presented in Table 2. These model summaries represent the closest alternatives to the selected model, which is also included in Table 2. In addition, we provide the profile means from the same model parameterization but with one fewer profile, which is among the closest alternatives. The fit of the alternative model was considerably worse, which provides support for the model selected for interpretation. The model with one additional profile was not well-identified (i.e., random starting values converged on different maxima of the likelihood function); therefore, we do not present it among the closest alternative models.

In the model selected for interpretation, the variances for each of the six time attitude scores and the covariances between the past positive and negative, present positive and negative and future positive and negative time attitudes were allowed to differ across latent profiles. Of the models considered, the four-profile model had the best statistical fit summary (i.e., smallest values of AIC, BIC, aBIC, and ICL-BIC) and was also deemed most interpretable. The time attitude score means provided the primary basis for model interpretation. Figure 2 shows the plot for each latent profile mean. For both age 12 and age 13 data, the same model was identified independently. This provided support for the stability of the selected latent profile model. The final step was to estimate the invariant latent profile model where the means, variances, and covariances within each latent profile were held equal across both Waves of data. For instance, at both age 12 and age 13, the factor means of the past-positive and past-negative were 0.57 and -0.87, respectively. The latent profile characteristics are shown in Table 3.

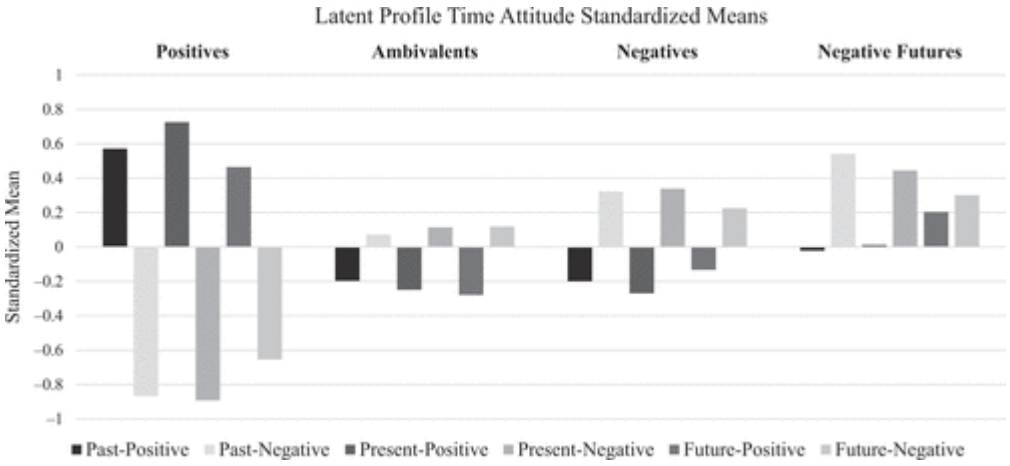

Figure 2. Time attitude variable means for each latent profile in final model. *n* = 1973.

To add further statistical support for the latent profile solution selected, we examined the structural invariance of the latent profile models by computing the average squared Euclidean distances of the standardized centroids (cf., Bergman, Nurmi, & von Eye, 2012). Small differences in these distances are indicative of structural stability, where “small” is defined as <2 in standardized scores and ideally <0.25 (Bergman et al., 2012, p. 240). All four profiles had average squared Euclidean distances that were well below Bergman and colleagues’ (2012) recommendation of 0.25, which provides evidence for the structural stability of the latent profile solution. The range and median squared Euclidean distance between the standardized centroids for each latent profile are described below.

Finally, we conducted six one-way ANOVAs models using the profile membership as the between-subject factor and each of the time attitude factor scores as the outcome variable. We selected to conduct six univariate ANOVAs models instead of a single multivariate ANOVA because the assumption of homogeneous covariance matrices, which is very restrictive, was violated. Furthermore, we used Welch adjustment to the one-way ANOVA results because the homogeneity of variance assumption was also not tenable. To control the overall Type I error rate of 0.05, we used Bonferroni adjustment to produce a per-comparison Type I error rate of 0.008 for each univariate ANOVA. Statistically significant effects were observed for all time attitude factor scores, that is, all estimated p values were less than 0.001. All pairwise post hoc comparisons were also conducted, and the results have been incorporated into the presentation of the latent profiles below. The partial eta-squared ($\eta 2p$) estimates for the time attitude factor scores ranged from 0.204 (Future-Positive) to 0.569 (Past-Negative).

Latent profile #1: Positives

This profile was characterized by higher scores ($p < 0.001$) on the past-positive, present-positive, and future-positive factors than all other profiles. Conversely, they scored lower ($p < 0.001$) on the past-negative, present-negative, and future-negative time attitude factors than all other profiles. At age 12, there were 479 (24.3%) participants in this latent profile and at age 13 there were 472 (23.9%) participants in this latent profile. The median squared Euclidean distance between the standardized centroids in this profile was 0.02 with minimum and maximum distance of 0.00002 and 0.16, respectively which indicates the structural stability of this profile (Bergman et al., 2012).

Latent profile #2: Ambivalents

This profile was so named because adolescents in this subgroup reported a lack of strong feelings towards any of the three time periods. The Ambivalents were characterized by positive and negative time attitude scores that were close to the overall mean. Ambivalents did not differ, on average, statistically from the Negatives (discussed below) on Past-Positive or Present-Positive factor scores, but all other mean differences were statistically significant ($p < 0.001$). At age 12, there were 648 (32.8%) participants in this latent profile and at age 13 there were 652 (33.0%) participants in this latent profile. The median squared Euclidean distance between the standardized centroids in this profile was 0.02 with minimum and maximum

distance of 0.00007 and 0.05, respectively which indicates the structural stability of this profile (Bergman et al., 2012).

Latent profile #3: Negatives

The Negatives were characterized by their negative evaluation of all three time periods. Adolescents in this profile reported higher scores ($p < 0.001$) on the negative time attitude factors relative to peers in the Positives and Ambivalents profiles. They also tended to have lower scores on the past-positive, present-positive, and future-positive factors when compared to adolescents in the Positives and Negative-Futures profiles. At age 12, there were 600 (30.4%) participants in this latent profile and at age 13 there were 606 (30.7%) participants in this latent profile. The median squared Euclidean distance between the standardized centroids in this profile was 0.009 with minimum and maximum distance of 0.0001 and 0.03, respectively which indicates the structural stability of this profile (Bergman et al., 2012).

Latent profile #4: Negative-futures

Members of this latent profile reported higher scores on past-negative, present-negative, and future-negative factors than the other profiles and near zero scores on positive time attitude factors. The primary distinguishing feature between the Negative-Futures and the Negatives profiles is in the pattern of future time attitude scores. Future-positive scores were significantly higher ($p < 0.001$) than Ambivalents and Negatives and future-negative time attitude scores were both significantly higher ($p < 0.001$) for this profile than the Positive and Ambivalent profiles. Adolescents in this profile also reported higher scores ($p < 0.001$) on Past-Negative and Present-Negative time attitude factors than all other profiles. At age 12, there were 246 (12.4%) participants in this latent profile and at age 13 there were 243 (12.3%) participants in this latent profile. The median squared Euclidean distance between the standardized centroids in this profile was 0.04 with minimum and maximum distance of 0.0005 and 0.17, respectively which indicates the structural stability of this profile (Bergman et al., 2012).

Mover–Stayer Latent Transition Analysis

A mover–stayer latent transition model was used to explore the inter-profile transition between age 12 and age 13 of these data. A higher-order categorical latent variable captures each person's likelihood of moving from one profile to another between waves. Movers are those participants who transitioned from one profile to another between age 12 and age 13 whereas

stayers are those who had a stable profile across waves. Overall, 1,102 (55.9%) participants were classified as movers, and 871 (44.1%) participants were classified as stayers. Mover–stayer transition pattern frequency is shown in Table 4. Of the 479 participants classified as Positives at age 12, the most common transition was to the Ambivalents profile (n = 104, 21.7%) at age 13. Of the 648 participants classified as Ambivalents at age 12, the most common transition was to the Negatives profile (n = 174, 26.9%) at age 13. Of the 600 participants classified as Negatives at Age 12, the most common transition was to the Ambivalents profile (n = 202, 33.7%) at age 13. The odds of transitioning from Positive at age 12 to either Ambivalent (odds ratio (OR) = -2.36, $p < 0.001$) or Negative (OR = -3.35, $p < 0.001$) at age 13 were significantly less than the odds of transitioning to either of these profiles if classified as Negative-Future at age 12. Of the 246 participants classified as Negative-Futures at age 12, the most common transition was to the Negatives profile (n = 98, 39.8%) at age 13. The odds of transitioning from Ambivalent at age 12 to either Positive (OR = -2.60, $p < 0.001$) or Negative (OR = -1.73, $p < 0.001$) at age 13 were significantly less than the odds of transitioning to either of these profiles if classified as Negative-Future at age 12.Transition was less likely for those who were classified as Positives at age 12 (b = -0.70, p = 0.001, OR = 0.50) or as Ambivalents at age 12 (b = -0.60, p = 0.008, OR = 0.55) than for those classified as Negative-Futures (reference group in multinomial regression). The difference in transition likelihood between Negatives at age 12 and Negative-Futures at age 13 were not statistically significant (b = -0.26, p = 0.16, OR = 0.77).

Inclusion of Outcome Measures

Factor scores on the outcome measures were estimated and recorded in the same way as described above for each of the time attitude factors prior to including those outcomes in the mover–stayer transition model. The relation of interest for the outcome measures was that between transition type and each of the four outcomes: attitudes towards alcohol; context of drinking; ever having consumed a full drink; and subjective life expectancy. Effect size estimates for the attitude towards alcohol and subjective life expectancy outcome measures used contrasts between each profile mean and the grand mean. Effect size estimates for lifetime consumption of a full drink and context of drinking used the $\chi 2$ test of independence and Cramer's V.

Attitudes towards alcohol

When making profile comparisons, several statistically significant effects were observed for the attitudes towards alcohol outcome. The attitudes towards alcohol scores were estimated as latent factor scores from a confirmatory factor model, and they were scaled to follow the

standard normal distribution. For each significant effect, we present the estimated mean on the factor score metric, associated p value (H0: μ = 0), and effect size shown as standardized mean difference from grand mean of 0 (Cohen's d). On average, staying in the Positives profile was associated with lower (safer) attitudes towards alcohol (M = –0.46, p < 0.001, d = –0.60) than the grand mean, whereas staying in the Negative (M = 0.12, p < 0.05, d = 0.15) and Negative-Future (M = 0.33, p < 0.01, d = 0.43) profiles was associated with higher attitudes toward alcohol scores than the grand mean. Among the movers, a decrease in alcohol attitudes score was associated with transitioning from Ambivalents to Positives (M = –0.20, p < 0.05, d = –0.26), and a move from Negative to Positive (M = –0.19, p < 0.05, d = –0.25), but an increase in alcohol attitudes score was associated with transitioning from Ambivalents to Negatives (M = –0.16, p < 0.01, d = –0.21), Negatives to Ambivalents (M = 0.15, p < 0.01, d = 0.20), or Negatives to Negative-Futures (M = 0.27, p < 0.05, d = 0.35) and Positives to Negative-Futures (M = 0.35, p < 0.05, d = 0.46). The estimated reliability (ω) for attitudes toward alcohol scale was 0.70.

Context of Drinking

Context of use was determined by asking questions regarding the circumstances of alcohol consumption. There were determined to be four types based on context of use: abstainers (n = 643, 32.6%); supervised (only) drinkers (n = 931, 47.2%); unsupervised (only) drinkers (n = 96, 4.9%); and those who drank both supervised and unsupervised (n = 303, 15.4%). For the stayers, the percentages ranged from 5.4% of Positive profiles who drank both supervised and unsupervised to 28.4% of Negative-Futures; those drinkers who stayed in the Ambivalent profile had the highest rate of supervised drinking (50.3) among all stayers and those drinkers who stayed in the Negative-Futures profile had the lowest rate of supervised drinking (44.4%) among all stayers. The Positive stayers had the lowest rate of unsupervised drinking at 1.3% and the highest rate of abstainers (43.7%) among all stayers. Of the stayers, the Negatives had the highest rate of unsupervised drinking at 8.0%, and Negative-Futures had the lowest percentage of abstainers at 24.7%. For the movers, those who transitioned from Negative to Positive Profiles had the lowest rate (5.1%) of adolescents who drank both supervised and unsupervised ranged from 5.1%, and those who transitioned from Positive to Negative-Future profile had the highest rate (28.2%) for supervised and unsupervised drinking. Similarly, for those who transitioned from Positive to Negative profiles, 52.5% were supervised drinkers, whereas those who transitioned from Negative-Future to Ambivalent and from Ambivalent to Negative future were at 31.6% and 34.1% of supervised drinkers, respectively.

Of those transitioning from Positive to Ambivalent, 9.2% were classified as the unsupervised drinkers. Those transitioning from Positive to Negative, Ambivalent to Negative-Future, and Negative-Future to Positive all had 0% unsupervised drinking. Finally, 44.0% of those transitioning from Ambivalent to Positives were abstainers as were 15.4% of those transitioning from Positive to Negative-Futures. For a full table of transition compositions, see Table 5.

Consumption of a full drink

Participants were asked whether they had ever consumed a full drink. The overall percentage of the participants having had a full drink was 28.8%. For the stayers, 14.2% of the Positives profile, 33.0% of Ambivalents, 31.1% of Negatives and 33.3% of Negative-Futures reported having a full drink in their lifetime. Among the movers, 18.0% of those transitioning from of Ambivalent to Positive reported ever having consumed a full drink along with 50.8% of Positives transitioning to Negative-Future, 47.6% of Negatives transitioning to Negative-Future, and 43.1% of those transitioning from Negative-Futures to Ambivalent. For a full table of percentages, see Table 6.

Subjective life expectancy

Participants were asked to rate the probability of surviving to age 35. The overall mean percentage for Subjective Life Expectancy was 85.2%. For the stayers, Positives had a higher mean percentage, 89.27% ($t = 2.58$, $df = 241$, $p = 0.01$, $d = 0.23$), indicating they believed they would live to 35 years old compared with the grand mean. The average Subjective Life Expectancy reported by movers who were classified as Negative-Future was statistically significant for all transitions. That is, the mean Subjective Life Expectancy for those transitioning from Negative-Future to Positive was 93.40% ($t = 4.73$, $df = 28$, $p < 0.001$, $d = 0.46$), which was higher than the grand mean. The transitions from Negative-Future to Negative and from Negative-Future to Ambivalent had profile means of 78.59% ($t = –3.24$, $df = 37$, $p = 0.003$, $d = –0.33$) and 79.29% ($t = –2.33$, $df = 97$, $p = 0.02$, $d = –0.37$), respectively. These mean Subjective Life Expectancy percentages were lower than the grand mean. For a full table of mean percentages, see Table 6.

Relations with gender and socioeconomic status

Gender and socioeconomic status (SES) were examined to understand what, if any, role they played in predicting latent profile transition. Because SES was unavailable, free school meal status (FSM) was used as a proxy. There were a total of 1,973 participants in this study, of which, gender was unavailable for 26 and FSM for 10. Of the 1,947 participants reporting

gender, the proportions were similar between movers and stayers with 57.1% of the movers and 58.0% of the stayers identifying as male ($\chi2 = 0.11$, $p = 0.737$, $V = 0.008$). Within the movers, statistically significant gender differences were observed for those transitioning from Positives to Ambivalents with 47.6% identifying as male ($\chi2 = 3.99$, $p = 0.046$, $V = 0.159$). Among the stayers, there were statistically significant differences observed for those who stayed in the Positive profile with those identifying as male making up 64.7% ($\chi2 = 5.39$, $p = 0.020$, $V = 0.281$). Likewise, there were significant gender differences for those who stayed in the Negative profile. Of those who stayed, 48.1% identified as male ($\chi2 = 9.37$, $p = 0.002$, $V = 0.242$).

There were 1,963 participants with available FSM status. Mover and stayer proportions were similar with 23.5% of the movers and 21.9% of the stayers having FSM status ($\chi2 = 0.62$, $p = 0.432$, $V = 0.018$). Unlike gender, there were no significant differences between those with and without FSM status for any of the profile transitions. Overall, females were more likely than males to remain in the Negative profile whereas males were more likely to remain in the Positive profile and those females who were in the Positive profile at age 12 were more likely than males to transition out of that profile by age 13.

Outcome Measures by Sex and Country/Context

Across male and female respondents, no significant differences were observed on the outcome measures. The mean attitude towards alcohol factor score for females was -0.03 (standard deviation (SD) = 0.75), and the mean attitude towards alcohol factor score for males was 0.01 (SD = 0.83). The difference is 0.05 (d) in SD units. There was, similarly, a small non-significant relationship observed between sex and context of drinking ($V = 0.04$, $\chi2 = 3.32$, $p = 0.34$). Among females, about 32% were abstainers, about 49% were supervised (only) drinkers, about 4% were unsupervised (only) drinkers, and about 15% were those who drank both supervised and unsupervised. Among males, about 33% were abstainers, about 46% were supervised (only) drinkers, about 5% were unsupervised (only) drinkers, and about 16% were those who drank both supervised and unsupervised. No significant relationship was observed between sex and consumption of a full drink in one's lifetime ($V = 0.02$, $\chi2 = 0.80$, $p = 0.37$). About 28% of females and 29% of males reported lifetime consumption of a full drink. The mean percentage for Subjective Life Expectancy was 84.5% among females and 85.8% among males ($t = 1.49$, $p = 0.14$, $d = 0.07$).

Country/context differences in outcome measures were all statistically significant (i.e., expected given the sample size). The mean attitude towards attitude factor scores were higher ($t = 4.92$, $p < 0.001$, $d = 0.24$) in the Scottish sample ($M = 0.12$, $SD = 0.74$) than the Northern Ireland sample ($M = -0.07$, $SD = 0.81$). A significant relationship was observed between sex and context of drinking ($V = 0.16$, $\chi 2 = 52.5$, $p < 0.001$). In the Northern Ireland sample, about 37% were abstainers, about 43% were supervised (only) drinkers, about 5% were unsupervised (only) drinkers, and about 13% were those who drank both supervised and unsupervised. In the Scottish sample, about 22% were abstainers, about 55% were supervised (only) drinkers, about 4% were unsupervised (only) drinkers, and about 20% were those who drank both supervised and unsupervised. Similarly, there was significant relationship with consumption of a full drink in one's lifetime ($V = 0.16$, $\chi 2 = 49.5$, $p < 0.001$). About 24% of Northern Ireland respondents and 40% of Scottish respondents reported lifetime consumption of a full drink. The mean percentage for Subjective Life Expectancy was 84.0% among Northern Ireland respondents and 87.8% among males ($t = 3.94$, $p < 0.001$, $d = 0.20$).

Discussion

The present study investigated the stability of time attitudes profiles and the relation between membership in these profiles and outcome measures at a highly sensitive time in terms of adolescent development, namely, in the period immediately following the transition from primary to post-primary (high) school. Epidemiological studies in the UK suggest that it is around this time that young people begin to consider and engage in alcohol use (e.g., Northern Ireland Statistics and Research Agency, 2014). It is also a time of life when young people begin to think more about their future (e.g., Simons, Vansteenkiste, Lens, & Lacante, 2004), and for this reason we investigated the subjective life expectancy of this cohort. The study yielded some noteworthy findings.

Firstly, we found strong evidence for the psychometric validity of the Adolescent Time Inventory–Time Attitudes Scale in terms of both the factor structure and the factor coefficients, adding to a growing literature documenting the validity of this scale's scores (e.g., Worrell et al., 2013). This is important given the plethora of studies in the temporal psychology literature which have questioned and criticized the psychometric properties of scores on scales used to measure various dimensions of the construct (e.g., McKay, Morgan, Van Exel, & Worrell, 2015). Given the robust psychometric properties of the scores, four time attitudes profiles were identified which were conceptually meaningful and sufficiently discreet to allow subsequent analyses. Moreover, the same profiles were identified in two separate waves of data collection,

which suggests that the profiles are robust and allow for longitudinal analysis of time attitude profiles. Profile stability ranged from 33% to 50% suggesting that the number of young adolescents who have the same general attitudes toward time across a one-year period varies based on time attitude profile.

The results indicate that there are interpretable profiles in early adolescence, but that the profiles are less stable in some individuals. The results further suggest that alcohol use may be related to profile change, but it is also possible that there are other factors that are leading to both changes in profile and alcohol use, for example, an extremely stressful or dysfunctional family environment. It is also possible that increases in cognitive ability, especially the increased capacity to engage in abstract thought (Piaget, 1955, 1975) may be related to time perspective, and adolescents going through the physical manifestations of puberty may also start thinking about time in different ways.

Consistent with the broader literature, adolescents with a Positive profile in both waves of data collection (i.e., stayers) reported: (a) healthier attitudes towards alcohol; (b) a lower likelihood to ever have consumed a full alcoholic drink; and (c) a slightly greater Subjective Life Expectancy. These results contrast somewhat with those observed elsewhere in longitudinal analyses (Barnett et al., 2013), where baseline future time perspective was not protective against alcohol use at +12 months. However, there are a number of important differences between that study and the present one. Firstly, their cohort was substantively different in terms of age (mean age = 16.8 years at baseline), and secondly, whereas the present study used a measure of time attitudes with reliable and valid scores, Barnett et al. (2013) measured future time perspective using only seven of the 56 possible Zimbardo Time Perspective Inventory items. For these reasons, it is perhaps unfair to draw comparisons between the similarity or otherwise of the findings. It should also be noted that because Zimbardo Time Perspective Inventory is used with adults and includes Hedonism and Fatalism scales, which differs from the measure employed in the current study. Thus, differences in findings may be due to the instrumentation used.

In terms of attitudes towards alcohol, the worst outcomes were observed for those remaining in the Negative and Negative-Future profiles, with Ambivalents falling in the middle. The results for the Negatives are not surprising, as the pattern of attitudes in this profile is in direct contrast to the pattern of attitudes in the Positives profile. However, the Negative-Future profile

was so-named on the basis of an elevated score on the future positive factor although it should also be noted that membership of this profile was also associated with elevated (higher than the Negatives) scores on all three negative factors. It appears that the modestly elevated future positive scores were not enough to counter the negative attitudes and, in terms of effect size, stable membership of this profile was associated with worst attitudes towards alcohol, although the Negatives were not substantially different in many categories.

The results of the present study can be contextualized and understood in relation to the emerging time attitudes literature. For example, those with what the authors called Optimistic, Balanced, and Ambivalent time attitudes profiles, reported significantly higher scores for life satisfaction, self-efficacy, perspective taking, trust in school, perceived support in school, and teacher/student relationships than adolescents with more Negative or Pessimistic profiles (Buhl & Linder, 2009). Moreover, others have reported that positive time attitudes profiles were associated with higher self-esteem and educational expectations and lower perceived stress (Andretta et al., 2013). The present study adds to a developing literature by reporting similar patterns of findings for alcohol use and Subjective Life Expectancy.

Interestingly, the developmental importance of transitioning from one profile to another is also observable in respect to attitudes towards alcohol. The move from both the Ambivalent and Negative profile to the Positive one was associated with more healthy attitudes towards alcohol, whereas a move to the Negative-Futures profile from Negative and Positive, and the interchange between Ambivalent and Negative profiles was associated with poorer outcomes, with the differences in attitudes most evident in the abstainer and unsupervised drinking categories.

In a survey of almost 12,000 15–16 year olds in the UK, Bellis and colleagues (2010) reported that among those identifying any measure of unsupervised consumption or heavy or frequent drinking there was a significantly greater likelihood of alcohol-related violence, regretted sex, or forgetting things after drinking. Further, those reporting any measure of unsupervised consumption were also more likely to drink frequently and to drink heavily. Recent UK-based research demonstrated that drinking both supervised and unsupervised in early adolescence was associated with the worst alcohol outcomes at age 16 (McKay, Dempster, & Cole, 2015). The results of the present study suggest that those in the Negative-Future profile are those most likely to drink both supervised and unsupervised, suggesting that these are most at risk.

At only 28.8%, the proportion of the present study reporting ever having consumed a full drink is somewhat lower than that suggested in other studies based in Northern Ireland and Scotland (NHS, National Services Scotland, 2014; Northern Ireland Statistics and Research Agency, 2014). Again, membership of the Positive profile was associated with a substantively better outcome so that whereas approximately a third of those staying in the Negative, Ambivalent and Negative-Future profiles reported consumption of a full drink, a considerably smaller percentage (14.2%) of those remaining in the Positive profile did. As with the other alcohol indicators discussed previously, the transition to the Positive profile was associated with a reduced likelihood of consumption of a full drink, with the reverse being true for the transition to the Negative-Futures profile. This finding is particularly important given that previous research has suggested an association between early initiation into alcohol use behavior and more alcohol problems in later life (e.g., Bonomo, Bowes, Coffey, Carlin, & Patton, 2004).

The impact of the inflated future positive score associated with membership of the Negative-Future profile is seen in the subjective life expectancy results. While, in general, membership of the Negative-Future profile was associated with poorer alcohol-related outcomes, membership of it and transition to it was associated with a slightly higher Subjective Life Expectancy. Accordingly, being in and/or transitioning to the Positive and Negative-Future profiles was generally associated with a higher self-reported probability of expecting to live to 35, with the reverse true for membership of the Ambivalent and Negative profiles.

Several potential limitations should be noted. First, as noted above there was a small degree of attrition between age 12 and age 13 data collection. Although our analytic comparisons of mean differences and associations between those who completed both age 12 and age 13 data collection and those who did not were negligible, access to a complete set of responses may have provided slightly more stability to the parameter estimates presented here. Second, mover–stayer models can also be used with more than two waves of data collection to assess for those who tend not to shift given multiple opportunities versus those who move between classes. Our study was limited by the availability of two waves of data collection. Although the availability of two waves of data collection allowed us to examine the transition between profiles across time, access to additional waves of data collection would provide more information about the stability of the latent profile structure across time.

Conclusion

Research into the effects of temporal psychology (broadly) on attitudes and behavior is developing rapidly. The present study adds to this developing literature by demonstrating the psychometric strength of Adolescent Time Inventory–Time Attitudes Scale scores; the ability of researchers to derive conceptually meaningful and replicable profiles (enabling person-centred, developmental analysis) based on Adolescent Time Inventory–Time Attitudes Scale scores, and the developmental importance of Positive time attitudes profiles compared to a Negative or Ambivalent ones.

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