Adolescent Substance Use Groups: Antecedent and Concurrent Personality Differences in a Longitudinal Study

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Abstract

OBJECTIVE—This study attempted to extend Shedler and Block's (1990) influential study which found that adolescent drug experimenters had the healthiest personality functioning compared to abstainers and frequent users.

METHOD—Using a prospective design, we examined the relationship between antecedent and concurrent personality and age-18 substance use in a community sample of 1,298 twins (96% Caucasian, 49% male). Personality measures at ages 11 and 18 assessed positive emotionality (agentic and communal), negative emotionality, and constraint. Substance use groups—abstainers, experimenters, and problem users—were created at age 18.

RESULTS—Age-18 substance use groups differed in age-11 and age-18 constraint such that problem users were lower than experimenters who were lower than abstainers. Age-18 substance use groups did not differ in age-18 positive emotionality. However, abstainers were significantly lower than experimenters in communal positive emotionality while female abstainers scored higher in agentic positive emotionality than female experimenters who scored higher than female problem users. Experimenters were significantly lower in negative emotionality than problem users.

CONCLUSIONS—Our findings are inconsistent with the notion that experimenters had the healthiest personality functioning and instead suggest different strengths and weaknesses for each group. Future studies should examine agentic and communal positive emotionality separately.

Keywords

personality; substance use; adolescence; experimenters; constraint

In a highly influential paper, Shedler and Block (1990) concluded that among 18-year olds those who had experimented with drugs were psychologically better adjusted than both frequent drug users and drug abstainers. Their conclusion was based on the observations that, as compared to drug experimenters, drug abstainers were characterized both antecedently and concurrently as being overcontrolled, timid, tense, inhibited, not cheerful, and immobilized by stress, while frequent drug users were characterized as undercontrolled, insecure, unable to form good relationships, and emotionally distressed. These findings thus suggest that drug experimentation in late adolescence may be not only developmentally normative but also an indicator of psychological health. Such a conclusion, if valid, would

obviously have major implications for how we think about preventing adolescent substance use. Although a number of recent studies have challenged this conclusion, few have included measures of personality (e.g., Milich et al., 2000; Rohde, Lewinsohn, & Seeley, 1996; Tucker, Ellickson, Collins, & Klein, 2006). In light of Shedler and Block's emphasis on understanding drug use within the context of an individual's personality structure, more studies that include personality measures are needed. Moreover, despite its overall strength, several features of the Shedler and Block study limit its interpretability (e.g., failure to control for multiple statistical tests, a small sample size of 85 participants). The purpose of the present study is to use a contemporary model of personality to extend Shedler and Block's work. Specifically, we sought to address gaps in previous research and examined, using a large, prospective community sample, whether there were antecedent or concurrent personality differences among age-18 adolescent substance use groups.

Findings on the higher-order structure of personality from the past 20 years (Digman, 1990; Watson & Tellegen, 1985) provide a dimensional framework for interpreting Shedler and Block's (1990) findings. The three- and four-factor models underlying the Multidimensional Personality Questionnaire (MPQ; Tellegen & Waller, 2008), the inventory used in the current research, can be used to illustrate. Tellegen (1985) based the MPQ on the following three higher-order factors: positive emotionality (the tendency to be actively and pleasurably engaged with one's environment), negative emotionality (the tendency to experience psychological distress and negative emotions), and constraint (the disposition towards inhibiting behavioral impulses and endorsing traditional cultural values). Although Shedler and Block (1990) did not use the MPQ or link their findings specifically to Tellegen's model, it is possible to use their findings to generate hypothetical expectations arising from the application of their findings to MPQ data.

Recently, Tellegen and Waller (2008) proposed a four-factor MPQ based model that separated positive emotionality into agentic positive emotionality (highest loading was achievement; description of a high scorer would be someone who enjoyed challenging tasks, who tended to experience positive emotions, and who took charge) and communal positive emotionality (highest loading was social closeness, description of a high scorer would be someone who was warm and who took pleasure in his/her interpersonal relationships). The four-factor model may be especially helpful in interpreting Shedler and Block's (1990) results in that a review of item-level findings from their study suggested different patterns of relations between age-18 adolescent substance use groups and antecedent and concurrent agentic and communal positive emotionality.

Specifically, on items from Shedler and Block's (1990) study that tapped agentic positive emotionality in which age-18 abstainers significantly differed from experimenters (e.g., "Is persistent in activities; does not give up easily", "Is productive; gets things done"), abstainers scored significantly higher than experimenters. However, abstainers scored significantly lower on items that tapped into communal positive emotionality (e.g., "Is warm and responsive", reverse scoring of "Keeps people at a distance; avoids close interpersonal relationships"). Frequent users scored significantly lower in both domains when compared to experimenters. Based on these findings, it may be hypothesized that abstainers would score higher than experimenters in agentic positive emotionality but lower than experimenters in communal positive emotionality.

Although no previous studies have explicitly examined the relations between agentic and communal positive emotionality and adolescent substance use groups, studies that examined the relations between the related construct of gender-role personality attributes and substance use behaviors offer some insight. Notably, results from studies in this area were not consistent. For instance, although some studies suggested negative relations between

adolescent substance use behaviors and traditional male attributes that reflected aspects of agentic positive emotionality (e.g., instrumentality, masculinity; Huselid & Cooper, 1992; Horwitz & White, 1987) as well as traditional female attributes that reflected aspects of communal positive emotionality (e.g., expressivity, femininity), other studies suggested no significant relations (Huselid & Cooper, 1994) or suggested relations that were significant for females but not males (Horwitz & White, 1987). In general, the findings from these studies underscored the importance of examining agentic and communal positive emotionality separately and including a substance use group by gender interaction term in the analyses.

With regard to constraint and negative emotionality, significant item-level differences found in Shedler and Block's (1990) study suggested that when compared to adolescent drug experimenters, drug abstainers were high in both constraint (e.g., "Overcontrols needs and impulses; Delays gratification unnecessarily"; "Is inhibited and constricted") and negative emotionality (e.g., "Is basically anxious"; "Becomes rigidly repetitive or immobilized under stress"), while adolescent frequent users were high in negative emotionality but low in constraint. These expectations are consistent with previous research that has implicated the roles of constraint and negative emotionality in externalizing behaviors (Eisenberg, Sadovsky, Spinrad, Fabes, Losoya, Valiente et al., 2005; Gjone & Stevenson, 1997; Masse & Tremblay, 1997) and are supported by findings that personality characteristics may identify subsets of individuals who vary in substance use risk (McGue, Slutske, & Iacono, 1999). For instance, a number of previous studies found increased risk for substance use behaviors based on personality characteristics related to behavioral disinhibition (Caspi et al., 1997; Chassin, Flora, & King, 2004; McGue et al., 1999; Ridenour et al., 2009).

Despite the dearth of research examining a priori defined substance use groups in relation to antecedent or concurrent personality functioning, when framed more broadly, Shedler and Block's (1990) study suggested that compared to adolescent abstainers and frequent users, adolescent experimenters should have the best psychological functioning. Given the vast literature documenting the poor adaptation of adolescents who frequently use substances (e.g., Hall & Degenhardt, 2007; Patton et al., 2007) the most intriguing comparison involves that of abstainers and experimenters. Since Shedler and Block's (1990) study, a number of studies conducted with diverse samples (e.g., children of alcoholics; large, representative samples) that used different classification criteria (e.g., tobacco, alcohol) to define substance use groups that varied in number (ranging from 3 to 6 groups) have suggested that adolescent experimentation was not associated with better psychological functioning (Colder & Chassin, 1999; Lewinsohn, Rohde, & Brown, 1999; Rohde et al., 1996; Tucker et al., 2006; Windle, 1996). In fact, in the vast majority of studies, when differences between abstainers and experimenters were found, abstainers tended to have better outcomes. These findings are remarkable considering that the studies varied in sample characteristics, methods, and research questions and outcomes studied. As expected, in most of these studies, problem users had poorer outcomes compared to experimenters.

Notably, studies that challenged Shedler and Block's (1990) findings tended to examine concurrent and young adult outcomes and were not studies of personality but of psychological adjustment. There are few studies that included information on antecedent functioning, personality, or that classified substance use groups across multiple substances. These are major issues given that the few studies that partially supported Shedler and Block's findings come from studies that examined antecedent differences in adolescent substance use groups that incorporated alcohol and drugs into their classification schemes (Baumrind, 1991; Siebenbruner, Englund, Egeland, & Hudson, 2006).

Overall, while great progress has been made in extending and testing Shedler and Block's hypotheses in various populations and across various types of substances, a review of the literature highlights a number of major research gaps. These include a lack of studies that have examined the role of personality, especially antecedent personality, in patterns of adolescent substance use as well as a lack of studies that classified individuals into substance use groups based on their substance use across all substances (i.e., tobacco, alcohol, and illicit drugs).

Shedler and Block's (1990) drug use classification was based primarily on marijuana use, although research has shown that substances—i.e., alcohol, tobacco, and drugs—act on similar neurobiological substrates (Nestler, 2005) and that the types of substances used by adolescents may depend largely on what is available and normative for their particular socio-historical circumstances (Resnick et al., 1997; Tarter, Vanyukov, Kirisci, Reynolds, & Clark, 2006). The limitations of using a single substance to classify substance use groups was made evident by Shedler and Block's inability to classify 16% of their sample, generally individuals who used drugs other than marijuana. Similarly, in their attempt to replicate Shedler and Block's findings, Tucker et al. (2006) excluded 21% of their sample with otherwise valid data primarily because these individuals had tried two or more drugs other than marijuana or were individuals whose use fell between those of experimenters and frequent users. Finally, evidence from many sources have suggested that adolescents who used one substance also tended to use others, and that the tendency to have used multiple substances reflected the actions of genetic and environmental risk factors that were shared across categories of substance misuse (for a recent review, see Iacono, Malone, & McGue, 2008).

There is thus a need to determine whether Shedler and Block's (1990) conclusions extend to classification schemes that incorporate multiple substances and that distinguish groups in a meaningful, reliable way that includes all individuals. Regarding the latter point, substance use disorder symptomatology was used to classify substance users into groups in this study (i.e., experimenters and problem users). Problem users included individuals who met diagnostic criteria (American Psychiatric Association, 1987, 1994) for at least one symptom of substance abuse or dependence for any one substance (i.e., tobacco, alcohol, or illicit drugs). Experimenters included all other individuals who had used any substance. This approach creates groups that meaningfully differ in their pattern of substance use and offers a robust and replicable way of classifying individuals.

The current study examined the association of age-18 substance use groups with personality assessed both antecedently at age 11 and concurrently at age 18. Based on Shedler and Block's (1990) study we developed the following hypotheses for the higher-order MPQ (Tellegen & Waller, 2008) personality factors at each age:

1. Positive emotionality—abstainers and problem users would score lower than experimenters

2. Agentic positive emotionality—abstainers would score higher than experimenters; experimenters would score higher than problem users

3. Communal positive emotionality—abstainers and problem users would score lower than experimenters

4. Negative emotionality—abstainers and problem users would score higher than experimenters

5. Constraint—Abstainers would score higher than experimenters; experimenters would score higher than problem users

Method

Participants

Participants were drawn from the Minnesota Twin Family Study (MTFS), a longitudinal study that has followed same-sex male and female twin pairs since age 11 (see Iacono, Carlson, Taylor, Elkins & McGue, 1999 for more information on the MTFS). Using birth records to identify eligible twins, the resultant sample was demographically representative of Minnesota at the time the twins were born (96% Caucasian). The male cohort (n=376 twin pairs) was recruited from 1977 to 1982 while the female cohort (n=380 twin pairs) was recruited from 1981 to 1985 (overall N=1,512 participants, 50% male). The MTFS research protocol was approved by the University of Minnesota's Institutional Review Board. Participants recruited into the study lived within a day's drive of the University of Minnesota. Lengthy day-long assessments involved in this study precluded individuals with physical (e.g., blindness) or psychological (e.g., mental retardation) disabilities from participating. Approximately 17% of eligible families declined to participate in the intake assessment; however, a comparison of participating and non-participating families revealed few significant differences with the parents in the families of those who participated being slightly better educated (mean of .3 more years of education). No other demographic, socioeconomic, or self-reported mental health factors differentiated participants from nonparticipants in the original study.

The current study used information obtained at two of the MTFS assessments, the baseline assessment when participants were a mean age of 11.71 (SD=.43) and the second follow-up assessment, which occurred approximately six years later (M_{age}=18.16, SD=.70). With their parents' written consent, participants gave their written assent to participate in the study.

To be included in the current study, participants had to have data on substance use at age 18 and personality at either age 11 or 18 (see Measures for variable descriptions). There were 1,298 participants who met these criteria. The remaining 214 participants (14% of sample; 56% male) were excluded due to missing data for both age-11 and age-18 analyses. Among the 1,298 participants included in the current study, 1,072 (83%) had data for both age-11 and age-18 analyses, 159 (12%; 43% male) were missing data for the age-11 analyses and 67 (5%; 72% male) were missing data for the age-18 analyses. The 1,298 participants represented 672 families and contained 400 monozygotic twin pairs, 226 dizygotic twin pairs, and 46 singletons (27 monozygotic, 19 dizygotic). The current study treated the twins as individuals while accounting for the correlated nature of twin data and did not seek to infer genetic and environmental contributions to phenotypic differences. Table 1 contains sample demographic information for the 1,298 participants included in the current study.

Attrition analyses evaluated whether the 1,298 participants eligible for the current study differed significantly in gender, race, SES or personality characteristics compared to those with missing data—i.e., those missing substance use groups and age-11 or age-18 personality data. The only significant difference was that the 214 participants with missing data were significantly lower in SES (Cohen's $d = -.36$).

Measures

Socioeconomic status (SES)—For all study participants, each parent's highest level of education was coded on a 6-point scale (1=less than high school, 2=GED, 3=high school degree, 4=some college/business certificate/associate's degree, 5=bachelor's degree, 6=professional degree). For each family, the highest occupational status for a full-time employed parent was coded on a 7-point Hollingshead scale (1=unskilled labor to 7=professional/executive positions). Educational scores for each parent and the highest

occupational status scores for each family were standardized and summed. The summed scores were standardized again to form a composite socioeconomic (SES) status indicator with a mean of 0 and standard deviation of 1. To ensure inclusion of participants in families that did not have a full-time working parent (n=110), those families were given the mean occupational status score of the sample prior to standardization.

Substance use—To assess substance abuse and dependence (e.g., tobacco, alcohol, marijuana, and other drugs), participants were interviewed at age 18, using the expanded Substance Abuse Module (SAM; Robins, Babor, & Cottler, 1987) from the Composite International Diagnostic Interview (Robins et al., 1988). Substance abuse and dependence symptoms during the past three years were assessed according to Diagnostic and Statistical Manual of Mental Disorders, 3rd edition-revised, criteria (DSM-III-R; American Psychiatric Association, 1987), the standard diagnostic manual used when the MTFS began, as well as DSM-IV criteria (American Psychiatric Association, 1994). Symptoms were assigned by consensus case conferences of two or more individuals with advanced clinical training, using all available information (diagnostic kappa reliabilities were all greater than .91; see Iacono et al., 1999 for more information). In addition, the SAM was modified to include questions relating to the quantity and frequency of tobacco, alcohol, and illicit drug use.

Substance use groups—In Shedler and Block's (1990) study abstainers had never tried marijuana or any other drug; experimenters had used marijuana "once or twice," "a few times," or "once a month" and had tried no more than one drug other than marijuana; and frequent users had used marijuana "once a week" or more often and had tried at least one other drug other than marijuana. Since our study was interested in creating substance use groups that: (1) took into account use across substances (i.e., tobacco, alcohol, and illicit drugs) and (2) distinguished groups in a meaningful, reliable way that included all individuals, the following classification criteria were used to define our adolescent substance use groups:

1. **Abstainers** (n = 264; 105 males, 159 females): No tobacco, illicit drug use, or alcohol use without parent's permission reported.[1]

2. **Experimenters** (n = 537; 231 males, 306 females): Used tobacco, alcohol, and/or illicit drugs but did not meet criteria for any symptoms of DSM-III-R or DSM-IV substance abuse or substance dependence. Among experimenters, 19.7% had tried all three substances (i.e., alcohol, tobacco, and illicit drugs), 54% had tried substances from two classes (97% of these individuals had used alcohol and tobacco only), and 25.9% had used only alcohol while .4% had used only illicit drugs.

3. **Problem Users** (n = 497; 296 males, 201 females): For any one substance (i.e., tobacco, alcohol, or illicit drugs), participant met at least one criteria for one symptom of DSM-III-R or DSM-IV substance abuse or dependence. Among problem users, 74.3% had tried all three substances, 23.1% had tried substances from two classes (96% of these individuals had used alcohol and tobacco only), 2.2% used alcohol only, and .4% used tobacco only.

Rates of poly-substance use were high among experimenters (74%) and problem users (97%). Table 1 provides more information regarding the substance use characteristics of our

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[1]Among the 264 abstainers, 85 had used alcohol with parental permission. Stringent abstainers (i.e., the 179 who had never used any substance) did not differ from the 85 abstainers who drank alcohol with parental permission on any of the outcomes assessed in this study. Moreover, the pattern of results obtained for abstainers was the same for stringent abstainers.

age-18 substance use groups. Our classification criteria clearly differentiated the groups across substances.

Age-18 personality (self-report)—At age 18, participants completed the 198-item version of the Multidimensional Personality Questionnaire (MPQ; Tellegen & Waller, 2008), a self-report personality instrument that assessed a broad range of personality characteristics. The MPQ consisted of 11 primary scales, including well-being, social potency, achievement, social closeness, stress reaction, alienation, aggression, control, harm avoidance, traditionalism and absorption. Each scale was composed of 18 items; each item was rated on a 4-point scale from "strongly agree" to "strongly disagree". The primary scales contributed to the three higher-order superfactors with positiveemotionality primarily comprised of achievement, well-being, social potency, and social closeness; negativeemotionality primarily comprised of alienation, aggression, and stress reaction; and constraintprimarily comprised of traditionalism, harm avoidance, and control. Agentic and communal positive emotionality subfactors were also calculated (Tellegen & Waller, 2008). Although well-being (tendency to experience positive emotions) contributed to both subfactors, they were distinct in that agentic positive emotionality's highest loading was on achievement while communal positive emotionality's highest loading was on social closeness. Agentic positive emotionality could be viewed as an effectance motivation and mastery factor that describes individuals' motivation and ability to interact with one's environment while communal positive emotionality characterizes the more interpersonal aspects of positive emotionality and the tendency for individuals to be involved in interpersonal relationships (Tellegen & Waller, 2008; cf. White, 1959). MPQ internal consistency reliabilities ranged from .78 to .90 and 30-day test-retest reliabilities ranged from .82 to .92 (Tellegen & Waller, 2008). The reliability estimates for the age-18 higher-order personality scales for our sample were as follows: .89 for positive emotionality, .82 for agentic positive emotionality, .84 for communal positive emotionality, .85 for negative emotionality, and .84 for constraint.

Age-11 personality (parent-report)—At baseline assessment, parents (over 99% maternal-report) completed the Multidimensional Personality Ratings (MPR; Cukrowicz, Taylor, Schatschneider, & Iacono, 2006; Tackett, Krueger, Iacono, & McGue, 2008) measure, a 34-item questionnaire rating their children on characteristics chosen to approximate 10 of the 11 MPQ primary scales (absorption was not rated). Each primary scale was comprised of three separate items; each rated on a 4-point scale ranging from "my son/daughter is definitely low on this trait" to "my son/daughter is definitely high on this trait." Higher-order superfactors were created by forming composites of the scales that primarily comprised the four higher-order MPQ factors described above. Internal consistency reliabilities for the individual 3-item primary scales ranged from .53 to .76 (mean=.63), which is reasonable for 3-item scales. The composite reliability estimates for the higher-order factors were all within the acceptable range and were as follows: .82 for positive emotionality, .77 for agentic positive emotionality, .73 for communal positive emotionality, .74 for negative emotionality, and .73 for constraint.

Table 2 gives the correlations among the personality measures, both within as well as between the two assessments. Correlations between the parent-rated higher-order factors at age 11 and their corresponding self-report MPQ scales assessed at age 18 ranged from .17 (negative emotionality) to .36 (constraint) with an average of .24. Although the magnitude of these correlations was modest, given that different instruments and reporters were used to collect personality data at ages 11 and 18, the modest correlations observed over a six-year follow-up interval spanning a period characterized by remarkable developmental change were nevertheless impressive.

Analysis Plan

Our analytic approach was based on recommendations for analysis of variance frameworks (Jaccard & Guilamo-Ramos, 2002). The ten personality scales were clustered into two families (antecedent and concurrent personality) consisting of each of the five personality measures—i.e., positive emotionality, agentic positive emotionality, communal positive emotionality, negative emotionality, and constraint—at ages 11 and 18 respectively. Analysis of covariance (ANCOVA) was used to investigate the relations between age-18 adolescent substance groups and (1) antecedent (age-11) personality traits and (2) concurrent (age-18) personality traits. Covariates included gender, SES, and age when personality was assessed. The interaction between substance use group and gender was included to assess whether the effects differed by gender. A 3×2 between-subjects factorial ANCOVA was performed on each of the ten personality scales with a Holm-based modified Bonferroni correction to control Type 1 error rates across scales for a given factor. If the effects did not differ by gender the substance use group by gender interaction was trimmed from the ANCOVA model. Of primary theoretical interest were contrasts comparing (a) abstainers to experimenters and (b) experimenters to problem users. Tests of statistical significance of these comparisons using least-square means were performed with experimentwise controls across the two contrasts using the Holm test procedure. Due to the clustered nature of the twin data, hierarchical linear models using PROC MIXED of the Statistical Analysis System, version 9.2 (SAS 9.2) were used for all of the analyses. Gender and age were included as level-1 covariates and SES was included as a level-2 covariate. A random intercept for family was included at level-2 to account for the clustering of twins within families. Degrees of freedom were estimated using the formula of Kenward-Rogers. Standardized effect size estimates (Cohen's d) were calculated to assist with interpretation of the group comparisons and were estimated by dividing the difference in the covariate-adjusted means by the residual standard deviation.

Results

Table 1 displays sample demographic and substance use characteristics. Our classification led to the following distribution of age-18 substance use groups: 20% abstainers, 42% experimenters, and 38% problem users. Compared to Shedler and Block's (1990) groups (34% abstainers, 42% experimenters, 23% frequent users) we had less abstainers and more frequent users. As seen in Table 1, our experimenters were light substance users who rarely used drugs and who, on average, used tobacco two days per month and drank two drinks on occasions on which they drank. Group differences in demographic characteristics were found for gender, SES, age at baseline, and age at follow-up. These differences were expected and support their use as statistical covariates.

Antecedent Personality and Age-18 Substance Use

For our first family of five personality scales, after statistically adjusting for age at baseline assessment, gender, and baseline SES, constraint was the only antecedent personality characteristic that significantly differed among age-18 substance use groups, $F(2,1088)=25.56$, $p<.001$. Abstainers were higher in constraint than experimenters ($t=2.76$, $p=.006$, Cohen's $d = .33$) who in turn were higher than problem users ($t=5.55$, $p<.001$, $d = .55$). None of the effects for the other age-11 personality scales were statistically significant.[2]

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[2] A full table of means is available from the authors upon request.

Concurrent Personality and Age-18 Substance Use

For our second family of five personality scales—i.e., concurrent (age-18) personality measures—means (SDs) and statistical tests for age-18 personality scales as a function of concurrent substance use group are given in Table 3, with associated single degree of freedom main effect contrasts and standardized effect sizes reported in Table 4. For completeness in Table 4 we included all contrasts even if the corresponding effect was not statistically significant. After statistically adjusting for age at follow-up assessment, gender, and baseline SES, there were no significant differences between age-18 substance use groups in concurrent positive emotionality. However, there were significant differences between age-18 substance use groups and concurrent personality measures of constraint, negative emotionality, and communal positive emotionality. A group by gender interaction was found for agentic positive emotionality. Specifically, age-18 agentic positive emotionality only differed between concurrent substance use groups for females but not males.

The pattern of findings for age-18 constraint were identical to the age-11 personality findings; however, the effect sizes at age 18 were larger ($d = .60$ and $.76$ respectively). Abstainers were still higher in constraint than experimenters who again were higher than problem users. Regarding negative emotionality, abstainers did not significantly differ from experimenters; however, experimenters were significantly lower in negative emotionality compared to problem users ($d = -.40$). With regard to communal positive emotionality, the only significant difference was that abstainers were significantly lower than experimenters ($d = -.44$). In terms of agentic positive emotionality, age-18 substance use group differences were only found for females with female abstainers scoring higher in concurrent agentic positive emotionality ($d = .53$) than female experimenters who in turn scored higher than female problem users ($d = .29$).

Discussion

Inspired by Shedler and Block's (1990) influential study, the current study examined whether groups differing in patterns of substance use differed in antecedent (age-11) and concurrent (age-18) personality characteristics. Extending previous work in this area, the current study took a broader approach to creating substance use groups by including tobacco, alcohol and illicit drugs in its classification scheme and also examined personality functioning using a four-factor dimensional model of personality. The current study is also unique in that it used a contemporary conceptualization of personality to provide a framework for investigating effects. Our findings suggest that an adolescent substance use group classification that utilized all substances (i.e., tobacco, alcohol, and illicit drugs) as well as substance use disorder symptomatology to differentiate between substance users resulted in groups that significantly differed in both antecedent and concurrent personality. Hypotheses in this study were based on findings from Shedler and Block's study and mixed results were found. Although age-18 substance use groups differed in antecedent and concurrent personality characteristics, the only antecedent personality difference was in the domain of constraint. Concurrent personality differences suggested that using a four-factor dimensional model of personality in studies involving substance use may be helpful given that all four factors significantly differed between groups. Use of a three-factor dimensional model that did not account for agentic and communal positive emotionality separately would have masked concurrent differences in the domain of positive emotionality since positive emotionality did not differ by substance use group.

Overall, we found no evidence for our first hypothesis that abstainers and problem users would score lower than experimenters in positive emotionality. We only found partial support for our second through fourth hypotheses for concurrent agentic positive

emotionality (for females only), communal positive emotionality, and negative emotionality, respectively. Age-18 female abstainers scored significantly higher than experimenters in concurrent agentic positive emotionality; age-18 experimenters scored significantly higher than abstainers in concurrent communal positive emotionality; and age-18 problem users scored significantly higher than experimenters in concurrent negative emotionality. We found full support for our last hypothesis regarding antecedent and concurrent constraint, abstainers scored significantly higher than experimenters who in turn scored significantly higher than problem users.

Recall that the aim of Shedler and Block's (1990) study was to examine adolescent drug use and psychological health. In addition, they also emphasized understanding drug use within the context of personality structure. One way to do so is to conceptualize and interpret our findings using Roberts et al.'s (2001) mature personality constellation—i.e., high constraint and communal positive emotionality and low negative emotionality—as a prototype for a healthy and adaptive personality profile at age 18. Roberts et al. suggested that individuals with this personality constellation may be better prepared to handle life's challenges and may be more resilient. We added high agentic positive emotionality to this adaptive personality prototype based on findings that it predicted greater adaptation in important developmental domains of academic achievement and work functioning (Roberts, Caspi, & Moffitt, 2003; Shiner, Masten, & Tellegen, 2002).

Although none of the adolescent substance-use groups clearly fitted the mature personality prototype, it is useful to distinguish the ways in which they did or did not fit in order to identify areas of strength and weakness. In general, abstainers fitted the constraint, negative emotionality, and agentic positive emotionality criteria, but were clearly lowest in communal positive emotionality. It has been suggested that both agency and communion are necessary for positive well-being and that the existence of one in the absence of the other can lead to poor health outcomes (Helgeson, 1994). Thus, despite having numerous strengths, abstainers may be at-risk for poor health and interpersonal outcomes.

Experimenters fitted the communal positive emotionality and negative emotionality criteria but were moderate in constraint and agentic positive emotionality. As such, for outcomes in which constraint and agentic positive emotionality may play roles (e.g., conduct, academic) experimenters may not score as high as abstainers. It remains to be seen whether experimenters actually have poor outcomes, or whether they simply score within the normal range. Problem users only fitted the communal positive emotionality criteria. Thus, they may be at-risk for negative outcomes in domains in which constraint, negative emotionality, and agentic positive emotionality play roles.

The picture that emerged from these findings suggests that a more nuanced understanding of the relations between personality functioning and adolescent substance use groups than implied by the original Shedler and Block (1990) findings may be needed. None of the groups clearly fitted an adaptive personality prototype; instead, each group showed different areas of strength and weakness. For instance, although it would be tempting to conclude that the relatively high communal positive emotionality scores of problem users were indicative of their showing healthier interpersonal adjustment, such a conclusion would be premature in the absence of other indices of adjustment.

Our findings suggested that experimenters did not possess the healthiest personality profile nor was their profile indicative of overall greater maturity compared to abstainers. In addition, our findings provided insight into the conflicting results found in previous research. Instead of viewing high constraint in a negative light (e.g., abstainers as "overcontrolled and prone to delay gratification unnecessarily"; Shedler & Block, 1990, p.

618), perhaps high constraint is an adaptive personality characteristic in certain domains but not others. For example, it may direct individuals away from externalizing behaviors and substance use and towards achievement-oriented tasks. Caspi, Roberts, and Shiner's (2005) review briefly addressed the debate over how to conceptualize high constraint (e.g., positively or negatively) and they called for further research in this area. We suggest that it may be useful to contextualize and interpret high constraint at the individual level and in relation to other indices of personality functioning and behavior. Understanding the constellation of personality characteristics in an individual in a given context at a given time may help improve our understanding of personality-adaptation linkages. Testing the nature of these relations in a developmental cascades model (cf. Masten et al., 2005) may increase our understanding of how personality and adaptive systems work together across development (Shiner, 1998). There is evidence to suggest that adaptation and maladaptation in important developmental domains (e.g., physical, social, cognitive) can impact personality development (Ge & Conger, 1999; Shiner et al., 2002) and vice versa (Roberts et al., 2003).

Despite its many contributions, this study does have limitations. Firstly, this sample was predominantly Caucasian (96%); therefore, future studies should examine whether these findings hold in more diverse samples. Secondly, because our study was not intended as a literal replication of Shedler and Block's (1990) work, it is possible that there exists a subgroup of well-adjusted adolescent drug experimenters. However, we believe that our investigation constituted a worthy extension of their report. Given their findings, it is reasonable to ask whether adolescents who tried or only occasionally used forbidden substances showed a personality profile suggestive of healthier adaptation than abstainers and problem users. Our results suggested that they do not. However, when differences in our findings compared to Shedler and Block's are discussed, it is important that geographical and historical differences are taken into account. Shedler and Block's (1990) study took place in the San Francisco bay area of California and participants were age 18 in approximately 1985. Our study took place in Minnesota and participants were, on average, age 18 in 1999. Rate of marijuana use was much higher in Shedler and Block's study, 68%, compared to 38% in our study. Comparing these rates to national, regional, and population density rates in 1985 and 1999 using Monitoring the Future (Johnston, O'Malley, & Bachman, 2001) data, it appears that Shedler and Block's sample had higher rates of illicit drug use than normative levels while ours had lower rates. Thus, differences due to cohort effects cannot be ruled out. Moreover, patterns of substance use may have different meanings in these distinct socio-historical contexts.

Lastly, although our study partly addressed the need for research that examined personality continuity among children over time (Caspi et al., 2005; Shiner, Masten, & Roberts, 2003), the rank-order stabilities of the MPQ scales were relatively small with parents reporting on children's personality at age 11 and participants reporting on their own personality at age 18. Thus, discrepant findings could be due to method factors. However, another longitudinal study that used self-reported MPQ data at age 20 and multiple raters of childhood personality found similar small to moderate correlations between childhood personality characteristics and age 20 MPQ personality characteristics (Shiner et al., 2002). Thus, our small stability coefficients were not anomalous and may instead reflect the developing nature of personality from age 11 to age 18. Future studies should extend these findings into adulthood as it has been argued that the study of personality from childhood into adulthood offers a more rigorous test of continuity (Shiner et al., 2003). In addition, studies looking to integrate multiple reporters may want to utilize teacher ratings as Shiner's (1998) review suggests that teacher-ratings show more robust relations with the Big Five personality factors than parent-ratings.

Our study found differences between adolescent substance use groups in both antecedent and concurrent personality. Of the several hypotheses tested in this study, only one was fully supported and it involved constraint. Although our findings regarding constraint were consistent with what Shedler and Block (1990) would have predicted, there is current debate as to how to conceptualize high constraint and more research is needed to flesh out the relations between high constraint and psychological health. Results also suggested that studies of adolescent substance use and personality should minimally utilize a four or five-factor dimensional model of personality since a three-factor model may mask differences for agentic and communal positive emotionality. Given the high rates of substance use, including poly-substance use among adolescents, our substance use group classification approach resulted in straightforward, meaningful groups that clearly differed in personality functioning and ostensibly, psychological health. Experimenters did not appear to have the healthiest personality functioning nor did they fit Roberts et al.'s (2001) mature personality constellation. Instead, our findings suggested different areas of strength and weakness for each substance use group. Future research may want to utilize developmental cascades and short-term longitudinal approaches (e.g., examination of peer interactions) to help identify personality-psychopathology linkages and the moderating and mediating factors involved.

Acknowledgments

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Table 1

Sample Demographic and Past 12 Month Substance Use Characteristics by Age-18 Substance Use Groups

	χ^2/ANOVA	Age-18 Substance Use Groups			
		Abstainers (n=264)	Experimenters (n=537)	Problem users (n=497)	Overall (N=1,298)
% in age-11 analyses	$\chi^2(2, N{=}1{,}298) = 14.75, p{=}.001$	89%$_a$	90%$_a$	84%$_b$	88%
% in age-18 analyses	$\chi^2(2, N{=}1{,}298) = 32.76, p{<}.001$	99%$_a$	97%$_a$	91%$_b$	95%
% Caucasian	$\chi^2(2, N{=}1{,}298) = 4.72, p{=}.094$	98%$_a$	95%$_a$	95%$_a$	96%
% male	$\chi^2(2, N{=}1{,}298) = 38.78, p{<}.001$	40%$_a$	43%$_a$	60%$_b$	49%
Family SES at baseline (SD)	$F(2,1295) = 23.07, p{<}.001$	.29 (1.01)$_a$	.13 (.99)$_a$	−.18 (.96)$_b$	.05 (1.00)
Baseline age in years (SD)	$F(2,1295) = 8.91, p{<}.001$	11.63 (.46)$_a$	11.74 (.42)$_b$	11.76 (.41)$_b$	11.73 (.43)
Follow-up age in years (SD)	$F(2,1290) = 30.92, p{<}.001$	17.90 (.56)$_a$	18.15 (.65)$_b$	18.31 (.77)$_c$	18.16 (.70)
% used tobacco	$\chi^2(2, N{=}1{,}293) = 742.84, p{<}.001$	0%$_a$	72%$_b$	96%$_c$	67%
Mean number of days used tobacco per month (SD)	$F(2,1295) = 724.85, p{<}.001$	0$_a$	2.21 (5.43)$_b$	20.28 (12.83)$_c$	8.68 (12.62)
% used alcohol without parent's permission	$\chi^2(2, N{=}1{,}177) = 930.51, p{<}.001$	0%$_a$	90%$_b$	96%$_c$	74%
Mean number of drinks per occasion (SD)	$F(2,1295) = 266.55, p{<}.001$	0$_a$	2.00 (2.56)$_b$	5.28 (4.43)$_c$	2.85 (3.80)
% used drugs	$\chi^2(2, N{=}1{,}284) = 526.23, p{<}.001$	0%$_a$	22%$_b$	75%$_c$	38%
Mean number of illicit drugs used (SD)	$F(2,1295) = 248.45, p{<}.001$	0$_a$	.22 (.42)$_b$	1.44 (1.60)$_c$	.64 (1.20)
% meeting substance abuse criteria	$\chi^2(2, N{=}1{,}298) = 625.64, p{<}.001$	0$_a$	0$_a$	60%$_b$	23%
% meeting substance dependence criteria	$\chi^2(2, N{=}1{,}298) = 636.56, p{<}.001$	0$_a$	0$_a$	61%$_b$	23%

Note. SES was scaled such that the sample mean was zero and the standard deviation was 1. Baseline = age-11 assessment. Follow-up = age-18 assessment. Group means and percentages that share a subscript do not significantly differ from one another.

Table 2

Correlations Between Age-11 and Age-18 Higher-order Personality Scales

	Age-11 PEM	Age-11 PEM-A	Age-11 PEM-C	Age-11 NEM	Age-11 CON	Age-18 PEM	Age-18 PEM-A	Age-18 PEM-C	Age-18 NEM	Age-18 CON
Age-11 PEM	--									
Age-11 PEM-A	**.92**	--								
Age-11 PEM-C	**.90**	**.67**	--							
Age-11 NEM	**-.29**	**-.25**	**-.28**	--						
Age-11 CON	**.19**	**.25**	**.08**	**-.28**	--					
Age-18 PEM	**.26**	**.26**	**.22**	**-.03**	**-.01**	--				
Age-18 PEM-A	**.15**	**.19**	**.07**	**.01**	**.03**	**.67**	--			
Age-18 PEM-C	**.16**	**.11**	**.20**	**-.04**	**-.11**	**.58**	**-.21**	--		
Age-18 NEM	**-.09**	**-.11**	**-.04**	**.17**	**-.10**	**-.16**	**.11**	**-.30**	--	
Age-18 CON	**.11**	**.13**	**.07**	**-.05**	**.36**	**.12**	**.12**	**-.12**	**-.09**	--

Note. Values in bold are significant at *p*<.05. PEM = Positive Emotionality; PEM-A = Positive Emotionality-Agentic; PEM-C = Positive Emotionality-Communal; NEM = Negative Emotionality; CON = Constraint.

Table 3

Concurrent Relationship Between Age-18 Personality and Age-18 Substance Use Group Membership (N=1,231)

Age-18 Personality	ANCOVA (F, p)	Age-18 Substance Use Groups		
		Abstainers (n=262) Mean (SD)	Experimenters (n=519) Mean (SD)	Problem users (n=450) Mean (SD)
Positive emotionality	F(2,1156)=.95, p=.388	123.94 (13.82)	124.01 (13.63)	122.91 (12.70)
Positive emotionality— Agentic (females)	**F(2,589)=14.53, p<.001**	51.70 (15.64) ***	45.59 (15.07)	41.80 (14.09) *
Positive emotionality— Agentic (males)	F(2,550)=1.04, p=.355	51.76 (13.64)	50.09 (13.69)	50.13 (13.89)
Positive emotionality— Communal	**F(2,1133)=14.16, p<.001**	109.05 (14.64) ***	114.66 (14.71)	115.25 (15.39)
Negative emotionality	**F(2,1152)=12.95, p<.001**	83.96 (13.31)	84.66 (13.38)	89.05 (14.18) ***
Constraint	**F(2,1138)=82.82, p<.001**	143.15 (15.19) ***	136.99 (14.18)	127.77 (15.18) ***

Note. Bolded values represent significant main effects for group following a Holm-based modified Bonferroni correction. Asterisks denote significant differences from experimenters (comparison group).

*
$p < .05$.

***
$p < .001$.

Table 4

Single Degree of Freedom Main Effect Contrasts and Standardized Effect Size Estimates (d) for Concurrent Age-18 Personality and Age-18 Substance Use Groups

Age-18 Personality	Parameter	Standard Error	t Value	p Value	Effect Size	Lower Limit	Upper Limit
Positive emotionality							
Abs-Exp	.551	1.05	.52	.601	.053	−.147	.254
Exp-PU	.951	.905	1.05	.293	.092	−.080	.264
Positive emotionality— Agentic (females)							
Abs-Exp	**6.242**	**1.566**	**3.99**	**<.001**	**.535**	**.272**	**.797**
Exp-PU	**3.360**	**1.434**	**2.34**	**.019**	**.288**	**.047**	**.528**
Positive emotionality— Agentic (males)							
Abs-Exp	2.276	1.661	1.37	.171	.210	−.090	.511
Exp-PU	−.072	1.326	−.05	.957	−.007	−.247	.233
Positive emotionality— Communal							
Abs-Exp	**−5.353**	**1.188**	**−4.50**	**<.001**	**−.443**	**−.636**	**−.250**
Exp-PU	−1.293	1.020	−1.27	.205	−.107	−.273	.059
Negative emotionality							
Abs-Exp	−.875	1.085	−.81	.420	−.082	−.282	.118
Exp-PU	**−.422**	**.93**	**−4.53**	**<.001**	**−.396**	**−.568**	**−.225**
Constraint							
Abs-Exp	**6.840**	**1.130**	**6.05**	**<.001**	**.600**	**.406**	**.794**
Exp-PU	**8.611**	**.970**	**8.88**	**<.001**	**.755**	**.589**	**.922**

Note. Standardized effect size (Cohen's *d*) was computed as adjusted mean of first named group minus adjusted mean of second named group divided by residual standard deviation. Except for agentic positive emotionality, covariates included in the ANCOVA models were gender, SES, and age at baseline. For agentic positive emotionality, the separate ANCOVA models for males and females only included SES and age at follow-up. Bolded values represent significant main effect contrasts following a Holm-based modified Bonferroni correction. Abs = Abstainers (age-18); Exp = Experimenters (age-18); PU = Problem Users (age-18).