Addictive Behaviors 38 (2013) 2847–2850

Contents lists available at ScienceDirect

Addictive Behaviors

Short Communication

Patterns of substance use among Argentinean adolescents and analysis of the effect of age at first alcohol use on substance use behaviors

Angelina Pilatti [a,*], Juan Carlos Godoy [a], Silvina Alejandra Brussino [a], Ricardo Marcos Pautassi [b]

[a] Faculty of Psychology, National University of Cordoba, Enrique Barros y Enfermera Gordillo s/n, Ciudad Universitaria, Córdoba, CP 5000, Argentina
[b] Instituto Ferreyra (INIMEC-CONICET-UNC), Friuli 2434, Cordoba, CP 5016, Argentina

HIGHLIGHTS

- Latent Class Analysis revealed five patterns of substance use among adolescents.
- Classes differed in the quantity and frequency of alcohol and other substance use.
- Classes also differed in relation to personality traits and alcohol expectancies.
- Adolescents with early drinking onset exhibited greater alcohol use.
- Early drinkers reported greater drug use.

ARTICLE INFO

Keywords:
Substance use
Prevalence
Adolescence
Personality traits
Alcohol expectancies
Latent Class Analysis

ABSTRACT

Objective: The present study used an empirically based method to characterize substance use in a sample of Argentinean adolescents and analyzed the association between age at drinking onset and substance use behaviors. Differences in alcohol expectancies and personality traits as a function of different patterns of substance use were also explored.
Method: Data were obtained from 583 adolescents aged 13–18 years ($M = 15.01$ years; $SD = 1.5$ years; 59.5% female) from the city of Cordoba, Argentina. Alcohol, tobacco, and drug use and age at first alcohol use were measured. Personality traits, including extroversion, conscientiousness, impulsivity, and aggression, and positive and negative alcohol expectancies were assessed. Latent Class Analysis was applied to examine the structure of five co-occurring substance use behaviors: frequency of alcohol use, quantity of alcohol use, prevalence of drunkenness episodes, tobacco use, and drug use.
Results: Latent Class Analysis revealed five distinct patterns of substance use. The classes differed in substance use behaviors, personality traits, and alcohol expectancies. Adolescents with early drinking onset were more likely to show heavier alcohol use, more drunkenness episodes, and more drug use than adolescents with late drinking onset.
Conclusions: Latent Class Analysis allowed the detection of groups of adolescents with distinct patterns of substance use. These groups exhibited significantly different personality and alcohol expectancy profiles, likely representing subgroups who are at greater risk for developing alcohol-related problems.

1. Introduction

Heavy alcohol use (AU) by youths and adolescents is a worldwide public health issue (Johnston, O'Malley, Bachman, & Schulenberg, 2011; SEDRONAR, 2011). Regular drinking emerges and often escalates to heavy and problematic drinking during adolescence (Masten, Faden, Zucker, & Spear, 2009). Personality traits and alcohol expectancies have been identified as risk factors for alcohol use and abuse. Higher levels of impulsivity (Fu, Ko, Wu, Cherng, & Cheng, 2007), extraversion (McAdams & Donnellan, 2009), and aggression (Barnow et al., 2004) are related to greater alcohol consumption. A higher level of conscientiousness is associated with lower levels of alcohol consumption (McAdams & Donnellan, 2009). Alcohol expectancies (AEs) comprise beliefs about the positive and negative effects of alcohol on behavior, mood, and emotion (Goldman, Brown, Christiansen, & Smith, 1991). Positive AEs are related to the initiation and escalation of drinking, whereas negative AEs are more important for stopping or delaying drinking (Urbán, Kökönyei, & Demetrovics, 2008). Several studies have linked early drinking onset (DO) with the increased use of alcohol (DeWit, Adlaf, Offord, & Ogborne, 2000) and other drugs (Lo, 2000).

The present study used Latent Class Analysis (LCA) to characterize the structure of a set of five co-occurring substance use (SU) behaviors (frequency and quantity of AU, occurrence of drunkenness episodes,

* Corresponding author. Tel.: +54 351 4333064x164.
E-mail address: angepilatti@gmail.com (A. Pilatti).

0306-4603/$ – see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.addbeh.2013.08.007

tobacco and drug use) in a sample of Argentinean adolescents. Differences in AEs and personality traits (PTs) associated with different patterns of SU, and the association between early DO on current SU behaviors were also analyzed.

2. Methods

2.1. Participants

Adolescents aged 13 to 18 years ($M = 15.01 \pm 1.5$) (n = 583, 59.5% females) were recruited from six high schools (three public) located in Córdoba, Argentina. Schools were selected based on accessibility.

2.2. Measures

2.2.1. Alcohol, tobacco and drug use

Alcohol use was defined as drinking at least one glass of any alcoholic beverage. Type of alcoholic beverage and number of glasses served to calculate grams of alcohol consumed per drinking occasion. One standard drink (SD) was defined as containing 10 grams of alcohol. The number of SD was recoded as the following: 1 = none, 2 = 1–5, 3 = 5–10, 4 = >10. Answers to frequency of AU were recoded as the following: 1 = no drinking, 2 = annually, 3 = monthly, 4 = weekly. Respondents who reported drunkenness episodes during the last year were coded as 1, and the others were coded as 0. Current tobacco or drug use or lack thereof was coded as 1 or 0, respectively. Adolescents who indicated DO by the age of 13 or younger were classified as early drinkers (Pitkänen, Lyyra, & Pulkkinen, 2005). Those who reported an age of DO of 14 or older were classified as late drinkers.

2.2.2. Extraversion and conscientiousness

Scales (13 item each) from the Spanish-adapted version of the Big Five Questionnaire for Adolescents (Cupani & Ruarte, 2008) were used.

2.2.3. Impulsive behaviors

Ten items were selected from the 18-item Barratt Impulsiveness Scale for Adolescents (BIS-11-A) that was adapted to the local population (Reyna, Sánchez, & Ivacevich, 2009).

2.2.4. Aggressive behaviors

Ten items were selected from two local instruments (Brussino, 2002; Ison & Fachinelli, 1993).

2.2.5. Alcohol expectancies

The Alcohol Expectancy Scale for Argentinean Adolescents (Pilatti, Godoy, & Brussino, 2010) was used.

Personality and AEs scales were answered on a 5-point Likert scale (from never to always). In the present study, all of the scales showed adequate reliability ($\alpha = .73$ to $\alpha = .92$).

2.3. Procedure

Questionnaires were administered collectively in the classrooms during the regular school day by a trained researcher. The voluntary nature of participation was emphasized. Teachers were not present during the 50-min administration of the instruments.

2.4. Statistical analysis

Latent Class Analysis was applied to examine the structure of five co-occurring SU behaviors. The LCA provides class membership probabilities (reflecting the relative size of each class) and class-specific endorsement probabilities (reflecting the likelihood of endorsement of a given indicator for individuals in a particular class) (Uebersax, 1994). Then, analyses of variance (ANOVAs) and Tukey's *post hoc* tests were performed to explore differences in PTs and AEs associated with different patterns of SU and gender. Student's *t*-test and χ^2 tests were conducted to compare SU behaviors between early and late DO. Alpha level was ≤.05.

3. Results

3.1. Latent class analysis: classes of substance use

A five-class LCA solution provided the most parsimonious and stable model, based on AIC and AIC3 values, and fulfilled the assumption of local independence (Magidson & Vermunt, 2002). Class sensitivity was maximized by classifying only those cases in which the class probability was 60% or higher (522 cases). The estimated probability for the five SU behaviors in each class is presented in Fig. 1.

Class 1 comprised 26% of the sample. Fifty-five percent of these adolescents reported that they drank 5–10 SD, and 42% reported ingesting up to 5 SD per drinking occasion. Fifty-eight percent reported monthly AU, and 38% drank on a weekly basis. Most reported that they neither got drunk (99%) nor used illegal drugs (92%). Almost one third reported tobacco use. This class was denoted moderate to high drinkers (M-HD). Most adolescents (82%) in Class 2, comprising 24% of the sample, had an estimated probability of weekly AU. Half of them had an estimated probability of drinking >10 SD, and the other half had an estimated probability of drinking 5–10 SD per drinking session. Most of these adolescents (88%) were likely to report drunkenness episodes. The estimated probability of tobacco and other drugs use was 66% and 51%, respectively. This class was denoted risky polysubstance users (RPSU). Class 3 comprised 21% of the sample and was characterized by an annual frequency (69%) of drinking up to 5 SD per drinking occasion (85%). The great majority of the adolescents within this class had an estimated probability of no drunkenness episodes (99%), no tobacco use (95%), and no other substance use (99%). This group was denoted light drinkers (LD). Adolescents in Class 4, comprising 20% of the sample, were very likely to report no AU (99%), no tobacco use (97%), and no drug use (98%). This class was denoted substance use naives (SUN). Among the adolescents in Class 5, comprising 11% of the sample, the estimated probability of weekly AU was 57%. Half of these adolescents had an estimated probability of drinking >10 SD, and the other half had an estimated prevalence of drinking 5–10 SD (Fig. 1). This group was characterized by a high probability of drunkenness episodes (82%). Most of these adolescents reported no tobacco use (98%) and no drug use (99%). This group was denoted heavy drinkers (HD).

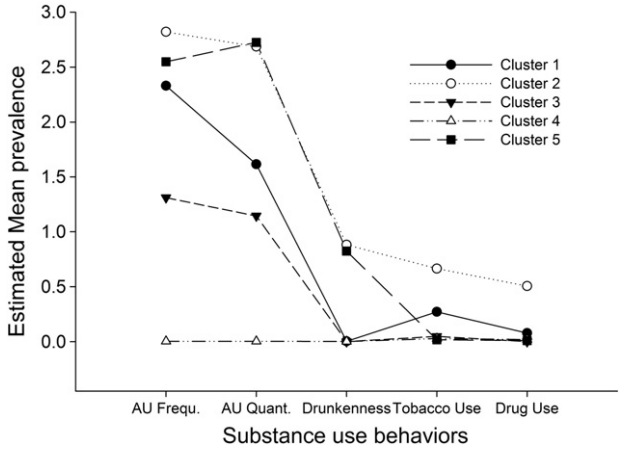

Fig. 1. Estimated mean prevalence of substance use behaviors (alcohol use frequency [AU frequency], alcohol use quantity [AU quantity], drunkenness, tobacco use, and drug use) for a five-class model of underage substance use. Clusters 1–5 were derived from a Latent Class Analysis, referring to moderate to high alcohol drinkers, risky polysubstance users, light drinkers, substance use naives, and heavy drinkers.

3.2. Differences in alcohol consumption, AEs and PTs

3.2.1. Alcohol drinking scores

All of the classes, with the exception of RPSU and HD, differed in alcohol use ($F_{4,512} = 171.75$, $p \leq .001$). These two classes, however, differed in tobacco ($\chi^2 = 119.09$, $p \leq .001$) and drug use ($\chi^2 = 74.21$, $p \leq .001$). The interaction between sex and class was significant ($F_{4,512} = 10.88$, $p \leq 001$). Males who were assigned to the HD and RPSU classes drank significantly more alcohol than males from the other classes and significantly more alcohol than all of the females. Females in M-HD, HD, and RPSU reported that they drank more alcohol than females in LD and SUN.

3.2.2. Positive AEs (social facilitation, relaxation and sexuality)

A main effect of class on AE for social facilitation was found ($F_{4,512} = 27.117$, $p \leq 001$). HD and RPSU anticipated more positive effects about social facilitation than adolescents from the other classes. Moreover, M-HD had higher scores than SUN. HD and RPSU anticipated more relaxing effects than the other three classes ($F_{1,512} = 14.505$, $p \leq .001$), and RPSU scored higher than M-HD ($F_{1,512} = 4.22$, $p \leq .002$) in sexuality. Males had significantly higher scores than females in relaxation ($F_{1,512} = 7.057$, $p \leq .008$) and sexuality ($F_{1,512} = 47.342$, $p \leq .001$).

3.2.3. Negative AEs (risk and aggression, cognitive and behavioral impairment, negative mood)

SUN and LD anticipated more risk and aggression effects from drinking alcohol than adolescents from the other classes ($F_{4,512} = 11.824$, $p \leq .001$). SUN and LD anticipated more alcohol-induced cognitive and behavioral impairment than adolescents in M-HD ($F_{4,512} = 3.309$, $p \leq .01$). SUN and LD had higher scores in negative mood than the other classes ($F_{1,512} = 6.51$, $p \leq .001$). Females scored higher than males in cognitive and behavioral impairment ($F_{1,512} = 5.245$, $p \leq .02$) and negative mood ($F_{1,512} = 17.34$, $p \leq .001$).

3.2.4. Personality traits

HD and RPSU were more extroverted than LD and SUN ($F_{4,512} = 4.952$, $p \leq .001$). SUN had significantly higher conscientiousness scores than adolescents in the other classes. LD and M-HD had higher scores than RPSU ($F_{1,512} = 17.506$, $p \leq .001$). HD and RPSU had higher scores on impulsivity than LD and SUN. M-HD had higher scores than SUN ($F_{1,512} = 10.477$, $p \leq .001$). RPSU users were significantly more aggressive than adolescents from the other groups ($F_{4,512} = 32.483$, $p \leq .001$]). HD scored significantly higher than LD and SUN, and M-HD reported higher scores than SUN. No significant differences were found between females and males. These scores are presented in Table 1.

3.3. Effects of age at drinking onset

To reduce telescopic bias, differences between early and late drinkers (EDs and LDs, respectively) in the occurrence of drinking behaviors, tobacco and drug use, were analyzed only in adolescents who were 16 and older at drinking onset ($n = 199$, 60.8% female). EDs (44.2%) began to drink at a significantly younger age ($M = 12.51$ years $\pm$ .73) compared with LDs ($M = 14.72$ years $\pm$ .80; $t = 20.14$, $p \leq .001$). Current age was similar across groups. Males are more likely than females to be EDs ($\chi^2 = 13.37$, $p \leq .001$).

Main effects of sex ($F_{1,195} = 35.73$, $p \leq .001$) and age at DO ($F_{1,195} = 27.21$, $p \leq .001$) were found on SD per drinking occasion. Early drinkers reported a higher quantity of AU per drinking occasion ($M = 129.55 \pm 84.73$) than LDs ($M = 65.69 \pm 59.52$). Males ($M = 137.70 \pm 92.26$) had higher drinking quantities than females ($M = 65.70 \pm 51.11$).

EDs were more likely to drink more than 5 SD per drinking occasion than LDs ($\chi^2 = 20.89$, $p \leq .001$), and to report drunkenness episodes ($\chi^2 = 37.88$, $p \leq .001$) and drug use ($\chi^2 = 31.81$, $p \leq .001$). Early DO was not associated with actual tobacco use.

4. Discussion

Five distinct patterns of SU were found underlying five co-occurring SU behaviors. Classes differed in quantity and frequency of alcohol use, and in tobacco and other drugs use. LCA was used to cluster adolescents into groups who exhibited similar SU patterns, instead of relying on arbitrary methods or clinical diagnostic criteria (Reboussin, Song, Shrestha, Lohman, & Wolfson, 2006). It seems important to consider both frequency and quantity of AU to understand consumption patterns.

Heavy drinkers and RPSU were characterized by a lack of impulse control and greater disinhibition. They were more extroverted and impulsive than the other classes. Aggression was significantly higher in RPSU than in the other users. Adolescents with the heaviest AU had more positive AEs for social facilitation and relaxation than the rest of their counterparts (Randolph, Gerend, & Miller, 2006). The results suggest that a combination of more positive beliefs about the effects of alcohol on social facilitation and less negative expectancies could facilitate the escalation of drinking (Urbán et al., 2008).

SUN and LD had significantly greater negative AEs than adolescents in the other classes. SUN had higher conscientiousness scores than all of their peers, including LD. There were also significant differences in AEs and PTs between SUN and M-HD, but not between LD and M-HD. Adolescents in the M-HD class were somewhat similar in Pts to HD and RPSU, and somewhat similar to SUN and LD in AEs.

An important result, consistent with previous epidemiological evidence (Lo, 2000; Pitkänen et al., 2005) was that adolescents with early DO were more likely to show heavier AU, more drunkenness

Table 1
Mean personality traits and alcohol expectancy scores separately for males and females and for five-LCA classes.

	Males		Females		SUN		LD		M-HD		HD		RPSU	
	M	*M*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Personality Traitst														
Extroversion	47.16	47.16	46.50	7.35	45.26	7.78	45.21	7.81	46.53	6.62	48.34	6.26	48.73	6.94
Conscientiousness	38.16	38.16	39.44	8.26	43.44	8.23	40.23	8.49	38.62	7.48	36.96	7.43	35.17	7.30
Impulsiveness	29.57	29.57	29.30	7.68	26.65	7.56	27.38	7.16	29.74	6.82	31.10	7.27	32.18	7.37
Aggr. Beh.	22.39	22.39	21.19	7.05	17.53	5.33	19.34	5.77	21.31	6.34	23.71	5.92	26.66	8.01
Alcohol Expectancies														
Sociability	33.14	33.14	32.69	10.88	26.76	10.87	29.65	10.15	31.96	10.18	37.86	9.05	39.22	9.28
Relaxation	14.85	14.85	13.57	5.07	12.17	5.13	13.04	4.85	13.41	4.99	16.06	4.52	16.38	5.04
Sexuality	12.39	12.39	9.17	4.69	10.52	5.73	10.21	5.52	9.24	4.43	11.26	5.32	11.79	5.18
Risk Aggr.	16.52	16.52	16.16	7.72	19.64	8.72	18.77	8.79	13.91	6.95	14.05	5.15	15.66	6.48
Cog. Beh. Imp	22.48	22.48	23.97	8.01	24.98	9.64	24.83	9.21	21.59	8.17	22.09	6.14	23.68	6.05
Negative Mood	18.12	18.12	20.93	8.19	21.97	9.15	22.63	8.88	18.37	7.80	17.65	6.28	18.55	6.88

SUN = substance use naives; LD = light drinkers; M-HD = moderate to high drinkers; HD = heavy drinkers; RPSU = risky polysubstance users; Aggr. Beh. = Aggressive Behaviors; Risk Aggr. = Risk and aggression; Cog. Beh. Imp. = Cognitive and Behavioral Impairment.

episodes and more current drug use than adolescents with late DO. The lack of association between age at DO and tobacco use appears to have resulted from the high prevalence of tobacco use among females, who were more likely to be LDs.

Some limitations are that schools were selected based on accessibility and that other important risk factors for AU (e.g., family history of alcohol problems, peer and parental AU, motives for AU) were not measured.

The most important findings were the identification of distinct patterns of SU, which were associated with different personality and AE profiles. The significantly higher prevalence of SU among those with early DO underscores the importance of delaying DO and studying drinking behavior early during development.

Role of funding source

This work was supported by grants from the Secretary of Science and Technology, National University of Córdoba (SECyT-UNC), and Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET, Argentina) to JCG and RMP, respectively, and a scholarship awarded by CONICET to AP. CONICET and SECyT-UNC had no role in the study design, collection, analysis and interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

Contributors

All authors designed the study. Pilatti collected the data, and conducted the analysis. Pautassi reviewed the statistical analyses. Pilatti and Pautassi prepared the first draft of the manuscript. Brussino and Godoy provided critical reviews of the first draft and subsequent versions of the manuscript.

Conflict of interest

All the authors declare that they have no conflicts of interest.

Acknowledgments

This work was supported by grants from the Secretary of Science and Technology, the National University of Córdoba (SECyT-UNC), and Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET, Argentina) to JCM and RMP, respectively, and a scholarship from CONICET awarded to AP.

The authors wish to thank Martín Aparicio for their assistance in collecting the data.

References

Barnow, S., Schultz, G., Lucht, M., Ulrich, I., Ulrich-W., P., & Harald, J. F. (2004). Do alcohol expectancies and peer delinquency/substance use mediate the relationship between impulsivity and drinking behavior in adolescence? *Alcohol and Alcoholism*, *39*, 213–219.

Brussino, S. A. (2002). *Análisis causal del comportamiento agresivo infantil: Pautas de crianza, estilo atribucional, capacidad intelectual y habilidad social*. Tesis doctoral no publicada. Universidad Nacional de Córdoba.

Cupani, M., & Ruarte, M. (2008). Propiedades psicométricas del Cuestionario de los Cinco Factores para Niños (BFQ-C) en una muestra de adolescentes argentinos. *Estudios de Psicología*, *29*, 351–364.

DeWit, D. J., Adlaf, E. M., Offord, D. R., & Ogborne, A.C. (2000). Age at first alcohol use: A risk factor for the development of alcohol disorders. *The American Journal of Psychiatry*, *157*, 745–750.

Fu, A. T., Ko, H. C., Wu, J. Y., Cherng, B.L., & Cheng, C. P. (2007). Impulsivity and expectancy in risk for alcohol use: Comparing male and female college students in Taiwan. *Addictive Behaviors*, *32*, 1887–1896.

Goldman, M. S., Brown, S. A., Christiansen, B.A., & Smith, G. T. (1991). Alcoholism and memory: Broadening the scope of alcohol-expectancy research. *Psychological Bulletin*, *110*, 137–146.

Ison, M. S., & Fachinelli, C. C. (1993). Guía de Observación Comportamental para Niños [Behavioral observation guide for children]. *Interdisciplinaria*, *12*, 11–21.

Johnston, L. D., O'Malley, P.M., Bachman, J. G., & Schulenberg, J. E. (2011). *Monitoring the future: National results on adolescent drug use—Overview of key findings, 2010.* Ann Arbor: Institute for Social Research, University of Michigan.

Lo, C. C. (2000). Timing of drinking initiation: A trend study predicting drug use among high school seniors. *Journal of Drug Issues*, *30*, 525–554.

Magidson, J., & Vermunt, J. K. (2002). Latent class models for clustering: A comparison with K-means. *Canadian Journal of Marketing Research*, *20*, 36–43.

Masten, A. S., Faden, V. B., Zucker, R. A., & Spear, L. P. (2009). A developmental perspective on underage alcohol use. *Alcohol Research & Health*, *32*, 3–15.

McAdams, K. K., & Donnellan, M. B. (2009). Facets of personality and drinking in first-year college students. *Personality and Individual Differences*, *46*, 207–212.

Pilatti, A., Godoy, J. C., & Brussino, S. A. (2010). Construcción y valoración psicométrica del Cuestionario de Expectativas hacia el Alcohol para Adolescentes de Argentina (CEA-A). *Anales de Psicología*, *26*, 288–301.

Pitkänen, T., Lyyra, A. L., & Pulkkinen, L. (2005). Age of onset of drinking and the use of alcohol in adulthood: A follow-up study from age 8–42 for females and males. *Addiction*, *100*, 652–661.

Randolph, K. A., Gerend, M.A., & Miller, B.A. (2006). Measuring alcohol expectancies in youth. *Journal of Youth and Adolescence*, *35*, 939–948.

Reboussin, B.A., Song, E. Y., Shrestha, A., Lohman, K. K., & Wolfson, M. (2006). A latent class analysis of underage problem drinking: Evidence from a community sample of 16–20 year olds. *Drug and Alcohol Dependence*, *83*, 199–209.

Reyna, C., Sánchez, A., & Ivacevich, M. G. (2009). Diferencias de género y relación entre agresión y búsqueda de sensaciones en adolescentes. *II Congreso Internacional de Investigación de la Facultad de Psicología de La Plata*.

SEDRONAR (2011). *Secretaría de Programación para la Prevención de la Drogadicción y la Lucha contra el Narcotráfico (SEDRONAR): Algunos datos sobre el consumo de alcohol en Argentina.* Informe del Sistema de Vigilancia Epidemiológica en Salud Mental y Adicciones.

Uebersax, J. (1994). Latent class analysis of substance use patterns. In L. M. Collins, & L. A. Seitz (Eds.), *Advances in data analysis for prevention intervention research. NIDA research monograph, Vol. 142.* (pp. 64–80). Rockville, MD: National Institute on Drug Abuse.

Urbán, R., Kökönyei, G., & Demetrovics, Z. (2008). Alcohol outcome expectancies and drinking motives mediate the association between sensation seeking and alcohol use among adolescents. *Addictive Behaviors*, *33*, 1344–1352.