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Co-occurrences Between Adolescent Substance Use and Academic Performance: School Context Inuences a Multilevel-Longitudinal Perspective

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Abstract

A growing body of literature has linked substance use and academic performance exploring substance use as a predictor of academic performance or vice versa. This study uses a different approach conceptualizing substance use and academic performance as parallel outcomes and exploring two topics: its multilevel-longitudinal association and school contextual effects on both outcomes. Using multilevel Confirmatory Factor Analysis and multilevel-longitudinal analyses, the empirical estimates relied on 7843 students nested in 114 schools (Add Health study). The main finding suggests that the correlation between substance use and academic performance was positive at the school level in contraposition to the negative relationship at the individual level. Additional findings suggest a positive effect of a school risk factor on substance use and a positive effect of academic pressure on academic performance. These findings represent a contribution to our understanding of how schools could affect the relationship between academic performance and substance use.

Keywords

Substance use; academic performance; adolescents; co-occurrences; school context; Multilevel longitudinal

1. Introduction

The contextual influences that affect adolescents well-being can range from macro social influences such as culture to micro social influences such as family, friends and schools. Among all these micro contextual influences, the school stands out as one of the most important contexts besides the family (Meece & Schaefer, 2010). Schools are pivotal environments fostering most adolescents in several areas of their development; however, school environments could expose adolescents to at-risk behaviors –violence, ganging and

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bullying, early sex initiation and substance use–; which could substantially affect their development.

Besides the benefits of formal education, schools also have an informal component that traditionally has been studied under the well-established idea of the "hidden curriculum" (Dewey, 1916; Freire, 1972). More recently, Haralambos et al. (2008) defined the hidden curriculum as those "things" –not intended or stated as educational objectives– that students learn by attending schools. This idea provides a general conceptual justification to address issues such as school effects on non-educational outcomes.

Among non-educational outcomes, disrupting experiences such as substance use have been linked to academic performance. Research linking them typically suggests that as levels of substance use increase academic performance could decrease. In opposition, as academic performance improves, adolescents might be less likely to consume drugs (Bachman et al., 2008; Brook et al., 2008; Crosnoe, 2006; Newcomb & Bentler, 1986).

However, by the time adolescents are attending high schools, substance use might not be an isolated phenomenon presiding academic performance or vice versa; an alternative perspective suggests that substance use and academic performance became a correlated phenomenon such that it is difficult to distinguish between cause and effect. Under this perspective substance use and academic performance are conceptualized as co-occurrences (i.e. parallel outcomes interacting across time). This conceptualization is different from the conventional way where substance use presides academic performance or vice versa.

In addition, research addressing the relationship between substance use and academic performance has mainly focused on individual characteristics that condition this relationship. Despite the growing interest in exploring school effects on non-educational outcomes, few studies have integrated school- context predictors; which might modify the substance use-academic performance relationship. Thus, this study integrates the school component as another relevant set of factors that could explain the co-occurrences between substance use and academic performance.

1.1. School effects on education and substance use

There is only a handful of studies that sought to examine if, and how, the school context may have an effect on the substance use-academic performance relationship. It is key to make a distinction between two types of literature related to school research. One type of research uses "individuallevel school-related exposure" measurements as described by Fletcher et al. (2008), which mainly refer to the use of the students perceptions, attitudes, feelings and ideas related to his or her school, see for example, Bryant et al. (2003) and Bryant & Zimmerman (2002). Although, school related measurements are used, this literature focuses on the individual rather than school characteristics.

The second type of research is more scant outside the educational realm and explores how school-level characteristics may influence the relationship between academic performance and substance use. These few studies suggests that schools can affect simultaneously both outcomes. For example, Crosnoe (2006) found that adolescents attending schools with

higher rates of academic failure were more likely to drink more and fail in grades. The author also found that school rates of teacher-bonding and school attachment served as protective factors against academic failure and alcohol use.

Thus, this study searches for empirical evidence that could account for school contextual effects on the co-occurrence between substance use and academic performance. The empirical question guiding the study is: does the school context influence the co-occurrence between academic performance and substance use?

1.2. School context framework and rationale

To address this research question, this study is informed by a theoretical framework derived from the ecological model (Bronfenbrenner, 2005, 1979). Based on this model, Eccles & Roeser (2011) proposed a school model to frame research that accounts for school effects in several domains of adolescent and children experiences. The authors understand the context of schooling as the process where the social and macro levels come together with the middle and micro levels. At the micro levels the schools are conceptualized as hierarchical organizations, e.g. students nested in schools (Eccles & Roeser, 2010, 1999).

However, this theoretical perspective does not specify details on how the school context could affect both substance use and academic performance. In fact, research in education faces a similar challenge in explaining how the school context translates into higher or lower levels of academic performance. For instance, Sörensen & Morgan (2000) highlighted that a basic flaw in most school effects research is that there is not enough conceptualization of how the school and students interact in the learning process. Given the absence of a comprehensive theoretical framework to study school effects on no-academic outcomes; an efficient way to proceed is to generate parsimonious rationales that could explain how the school context might affect the co-occurrence between substance use and academic performance.

To outline these rationales, the school context is defined as a construct, which is not directly observable with three dimensions: (a) school risk factor, (b) school academic and social problems and (c) school academic pressure.

1.2.1. School risk factor and school social/academic problems—These two school context dimensions are based on the fact that schools are socially composed mainly by students who come to schools with a set of attributes such as skills, believes, attitudes and problems. Based on possible problems that adolescents bring to school, it could be assumed the existence of a general school risk factor reflecting on levels of school delinquent behaviors, rates of mental health, low levels of self-esteem, student–school bonding. It also could be assumed the existence of social and academic problems at schools reflecting on how teacher and students relate.

These two factors might represent a ‘risk and problematic atmosphere’ which could affect student substance use and academic performance. This atmosphere would be similar to the concept of “herd immunity or community immunity” (John & Samuel, 2000). For example, lower levels of these two factors might account for a healthier school context where

adolescents might be free of problems and consequently less likely to engage in substance use and more able to focus on academic tasks. In contra–position, higher levels of these factors might contribute to school contexts where adolescents could be surrounded by more delinquent behaviors, mental health issues, less peers attached to schools, more social and academic problems among other pressing issues. All these would generate more challenging contexts; which might increase the likelihood of adolescents' drug consumption and make more difficult to focus on academic tasks.

1.2.2. school academic pressure—This school context dimension is set by academic expectations, goals and demands that teachers and principals exert on their students. Academic pressure can provide more structure to the roles that schools expect from their students. Empirical evidence suggests that academic pressure could increase students effort, time spent in academic task and academic performance (Lee & Smith, 1999). Thus, students attending schools with higher levels of academic pressure would benefit from environments oriented toward academics and a general 'atmosphere' demanding academic success.

Moreover, academic pressure could motivate students to spent more time on academic tasks, in and out side the school, taking away leisures time making adolescents less susceptible to substance use.

Based on these three dimensions, the general research question is divided in three more specific questions: (i) Does a general school risk factor relate to the co-occurrence between substance use and academic performance? (ii) Do school social and academic problems relate to the co-occurrence between substance use and academic performance? and (iii) Does academic pressure relate to the co-occurrence between substance use and academic performance?

2. Methods

2.1. Population and Analytic Sample

U.S. Adolescents attending high schools are the population target of this study. From the national representative studies with educational and substance use data, the National Longitudinal Study of Adolescent Health (Add Health) provides a longitudinal multilevel structure ideal to investigate the research topic of this paper. Add Health combined longitudinal survey data on adolescents' social, economic, psychological, educational and physical well-being with contextual data on the family, schools, and other important contexts (Harris, 2011).

The analytic sample consists of 7,843 students nested in 114 schools. This sample was restricted to students who have longitudinal multilevel weights and who were attending 9^th to 11^th at the beginning of Wave 1 and remaining in the same schools at Wave 2. This analytical sample provides a clean group to perform multilevel longitudinal analysis restricted to high schools. The use of these data has IRB approval (HUM00043120) representing no more than minimal risk for participants.

2.2. Measurements

2.2.1. Substance use and academic performance—Academic performance (AP) and substance use (SU) were operationalized using multilevel latent factors constructed for each outcome at Wave 1 and Wave 2. The following paragraphs describe how these factors were constructed.

Substance use: The two latent factors of substance use were based on the adolescents' reports on their annual consumption of alcohol, cigarettes, and marijuana. The operationalization of these factors assumed the existence of a general latent trait of substance use such that higher scores represent more consumption of alcohol, cigarettes, and marijuana. Each substance use factor reflected in nine categorical indicators at the student level and seven indicators at the school level. The nine indicators came from the students' reports in-home questionnaire: Tobacco, Alcohol, Drugs – Audio CASI (Harris & Udry, 1998, 1999).

For example, at Wave 2, the smoking questions were: (1) ever smoked, (3) regularly smoked (at least 1 cigarette per day in 30 days), (5) number of days smoked and (7) number of cigarettes smoked per day. The alcohol questions were:(19) number of days drank alcohol in past year, (20) number of drinks per each time drank, (21) number of days drank five or more drinks, and (22) number of days adolescent has gotten drank. The marijuana questions were: (45) number of times tried marijuana and (46) number of times used marijuana in the last 30 days. The same questions were used for the factor at Wave 1.

Academic performance: The AP measurement assumed a general latent performance trait reflecting in the adolescents reports of their grades in English, mathematics, social studies and science. These grades were categorized into four categories A to D. The reported grades come from the in-home questionnaire section: academics and education at both waves (Harris & Udry, 1998, 1999).

The intraclass correlations, within the SEM framework, are estimated at the item level (Muthén, 1991). Table 1, presents the observed and estimated intraclass correlations (ICCs) for AP and SU while the correlation matrices at the individual and school levels are displayed in the appendix. The ICCs ranged from low to moderate reflecting small variation between schools especially in the case of substance use. However, differences between schools were sufficiently large to be modeled.

Figures 1 and 2 display the combined multilevel factor structure of academic performance and substance use at each wave of measurement. Figure 1 shows that the data fit very well the multilevel confirmatory model at wave 1 (RMSEA: 0.020, CFI: 0.999, and TLI: 0.999). Figure 2 shows an excellent fit for Wave 2 (RMSEA: 0.019, CFI: 0.999, and TLI: 0.998).

2.2.2. School context—All school measurements were constructed using two sources of information: In-school questionnaire and the school administrator questionnaire. All factors were estimated using one of two procedures: (i) using confirmatory factor analysis (CFA) when the factor structure was clear. (ii) Using exploratory factor analysis (EFA) and CFA,

in this procedure the sample was divided into two independent subsamples –one for the EFA and the other for the CFA.

(a) School risk factor: This factor was constructed using students reports in the In-school questionnaire (n=84,233) of anxiety/depression, somatic symptoms, risk behaviors, drug use and self-esteem at Wave 1. Factor scores for each measurement were estimated with categorical CFA, which were aggregated to the school level using the Add Health school weights to ensure representativeness of the school. Then, at the school level and using these aggregated scores as indicators, a general dimension of school risk factor was estimated using CFA. The school factor structure fitted the data well (n=128 schools, RMSEA: 0.06, RMSEA 90% CI: 0.00–0.117, CFI: 0.998 and TLI: 0.992). The final factor score was standardized such that higher values represent more risk at schools (see table 6 for factor loadings).

(b) School academic and social problems: Using categorical CFA, a factor accounting for the presence of school problems (reported by 85,413 students in the In-School questionnaire) was estimated. This latent factor reflected in four indicators: getting along with teachers, paying attention in school, getting homework done, and getting along with other students. The goodness of fit showed that the data fit the model well (RMSEA: 0.077, RMSEA 90% CI: 0.071–0.083, CFI: 0.999 and TLI: 0.992). The factor score was aggregated at the school level and then standardized such that higher values represent greater presence of school social and academic problems (see table 7 for factor loadings).

(c) School academic pressure: This dimension was operationalized using two factors: generalized academic pressure and selective academic pressure. After preliminary analysis only the generalized academic pressure factor was used. This factor represents the presence of levels of academic pressure evenly distributed among all students at schools. The construction of this factor was estimated with categorical EFA and CFA using two independent subsamples for each one of the factor analysis. The final factor model fitted the data very well (RMSEA: 0.017, RMSEA 90% CI: 0.000–0.091, CFI: 0.995 and TLI: 0.992). The generalized academic pressure reflected in four indicators: expectations to attend college, participation in academic groups, rates of retention (negative load) and rates of drop out (negative load). The factor score was standardized such that higher values represent higher levels of selective or generalized academic pressure (see table 8 for factor loadings).

2.2.3. Student level covariates—All results were adjusted by student level covariates selected based on previous research. These individual covariates were demographic characteristics: age, gender (reference group: male), mother and father education, family income, ethnicity (reference group: white). In addition, academic covariates were also included: grade attended (reference group grade 11) and retention (1: student was retained in one or more grades).

2.3. Analytic methods

The general analytic framework utilized was structural equation modeling (SEM).

Multilevel structure of outcomes—The multilevel factor structures of both outcomes were carefully constructed following the guidelines for multilevel CFA (Muthén, 1991). Four steps were involved: (1) Build the baseline structure ignoring the nested structure. (2) Incorporating the sample design to correct standard errors. (3) Estimation of variances and correlations at the student and school levels for all indicators, and estimation of the Intra Class Correlations (ICC) which suggested the presence of a multilevel structure. (4) Multilevel CFA was used to estimate the measurement part at each wave for substance use and academic performance.

School models—These models were estimated using a multilevel bivariate cross-lagged model, combining the ideas outlined by Bollen & Curran (2006) about Conditional Bivariate Autoregressive Cross-Lagged Models and the multilevel procedures developed by Muthén & Muthén (2010). The estimation was carried out in three parts: estimation of the unconditional model multilevel bivariate cross-lagged model; the incorporation of the individual level covariates and the estimation of the school level models. This last step estimated each school dimension separately and then a final model was estimated combining all school factors controlling by student level covariates.

All analyses were weighted using the multilevel longitudinal weights specified by Add Health (Chantala, 2006; Tourangeau & Shin, 1999). The survey sample designed was included in the multilevel modeling. (Note that when the multilevel model was adjusted by the sample design using survey analysis techniques, no differences were found compared to the multilevel modeling). Missing data was not a problem as most variables in the model had less than 1% missing data; thus missing was treated under missing data theory algorithms that are based on the full information matrix. All categorical CFA used the estimator Weighted Least Square Parameter Estimates (WLSMV), CFA and multilevel models were computed with Maximum Likelihood with Robust standard Errors (MLR) and numerical Integration using MPLUS 6.2 (Muthén & Muthén, 2010).

3. Results

3.1. Describing the multilevel structure

Results showing the longitudinal multilevel relationship between substance use and academic performance are presented in Figure 3. The overall model fits the data well (RMSEA:0.029, CFI:0.963, TLI:0.914, SRMSR within:0.016 and SMRS between:0.032). The upper part of the figure represents the relationship between substance use and academic performance at the student level. The bottom part shows the school level correspondence of this relationship.

At the student level, *ceteris paribus*, longitudinal effects were found such that as substance use (SU) increased in Wave 1, SU tended to increase in Wave 2. Similarly, academic performance (AP) increments at Wave 1 leaded to increments at Wave 2. Furthermore, after adjusting by individual covariates, negative crossed effects were found between AP and SU suggesting that as AP increased in Wave 1; SU could decrease in Wave 2 and vice versa. This inverse relationship between AP and SU is consistent with previous research (see Figure 3).

However, at the school level, the relationship between AP and SU was different. Only the expected lagged effects were statistically significant; for example, as rates of SU increased in Wave 1, rates of SU were more likely to increase in Wave 2 ($\beta = 0.669$, $p \leq 0.001$). Similarly, as school levels of AP increased at wave 1, school levels of AP were more likely to increment at Wave 2 ($\beta = 0.813$, $p \leq< 0.001$).

The main finding –the opposite direction in the student and school correlation between substance use and academic performance– hold when both individual and school level measures are included in the same model.

3.2. School effects

A final model combining all statistically significant school factors and controlling for individual level covariates is displayed in Figure 4. This final model fits the data extremely well (RMSEA:0.027, CFI:0.960, TLI:0.913, SRMSR within:0.016, and SMRS between: 0.060).

The upper part of this figure shows the student level, which pattern is similar to the previous model presented before. The school context effects are depicted in the bottom part. Three significant results were found: (i) School with higher levels of the latent risk factor represent environments where adolescents might be more likely to engage in SU ($\beta = 0.145$, $p \leq 0.05$). (ii) Schools with higher levels or presence of academic and social problems seemed to be environments that could detriment AP ($\beta = -0.059$, $p \leq 0.05$). (iii) Finally, higher levels of generalized academic pressure could translate into increments in academic performance ($\beta = 0.190$, $p \leq 0.01$).

Other school factors (selective academic pressure, policies against drug use and possession, and policies against delinquent behaviors) were tested resulting non statistically significant. In addition, preliminary analysis controlling by school levels of socioeconomic status showed no effects of the school levels of SES with almost identical results as the ones presented here.

4. Discussion

At the individual level, the study findings suggest longitudinal effects between academic performance and substance use. These effects could resonate with comprehensive programs that aim to reduce substance use while increase academic performance. However, as pointed by Flay (2000) more evidence is needed to support the use of comprehensive combined programs at schools.

At the school level two main findings were relevant. (i) The school level correlations were positive showing a different dynamic between substance use and academic performance. This finding reflects a complex school composition where schools can have students who achieve high levels of academic performance and also students who engage in substance use. Additionally, these positive correlations could be expected given that schools are learning environments focused on academic goals but not aiming to reduce risk behaviors such as substance use.

(ii) The school risk factor was related only to substance use; while the more organizational aspects were related to academic performance. These results suggest that the school influences on substance use come from the student body composition with important implications for school prevention programs. For example, expanding school based programs to other contexts such as the family and group of friends and aiming other problems such as anxiety and depression, violence, bullying, while increasing levels of self-esteem and school bonding; all these might help prevent substance use.

Among the limitations to this study, the assumption of unidimensionality in the conceptualization and operationalization of substance use and academic performance does not allow for differentiated effects of the school context depending on the type of substance (alcohol, cigarettes and marijuana) or subject (mathematics, reading, social science and science). Unidimensionality allowed for a more parsimonious modeling; however, multidimensionality is a topic that needs to be addressed in future research. Another limitation pivots around the conceptualization and operationalization of the school factors. For example, the factors, specially, the school risk factor lack of examination of construct, content or criteria validity. The reader should be cautious in the understanding of these school factors.

Notwithstanding the limitations, these findings are a contribution to our understanding of how schools might affect the co-occurrences between substance use and academic performance. To the best of my knowledge, it is the first time that the substance use-academic performance relationship has been examined using a multilevel longitudinal approach. The findings point to the importance of looking beyond the individual level when considering substance use co-occurrences.

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Appendix

Substance use and academic performance measurements

Correlation matrices: substance use and academic performance indicators

The correlations matrix for academic performance and substance use indicators are presented in the following tables: table 2 and table 3 present the student level correlations for Wave 1 and Wave 2 respectively. Tables 4 and 5 present the school level correlations for Waves 1 and 2 respectively.

School factor measurements

School risk factor

School academic and social problems

School academic pressure

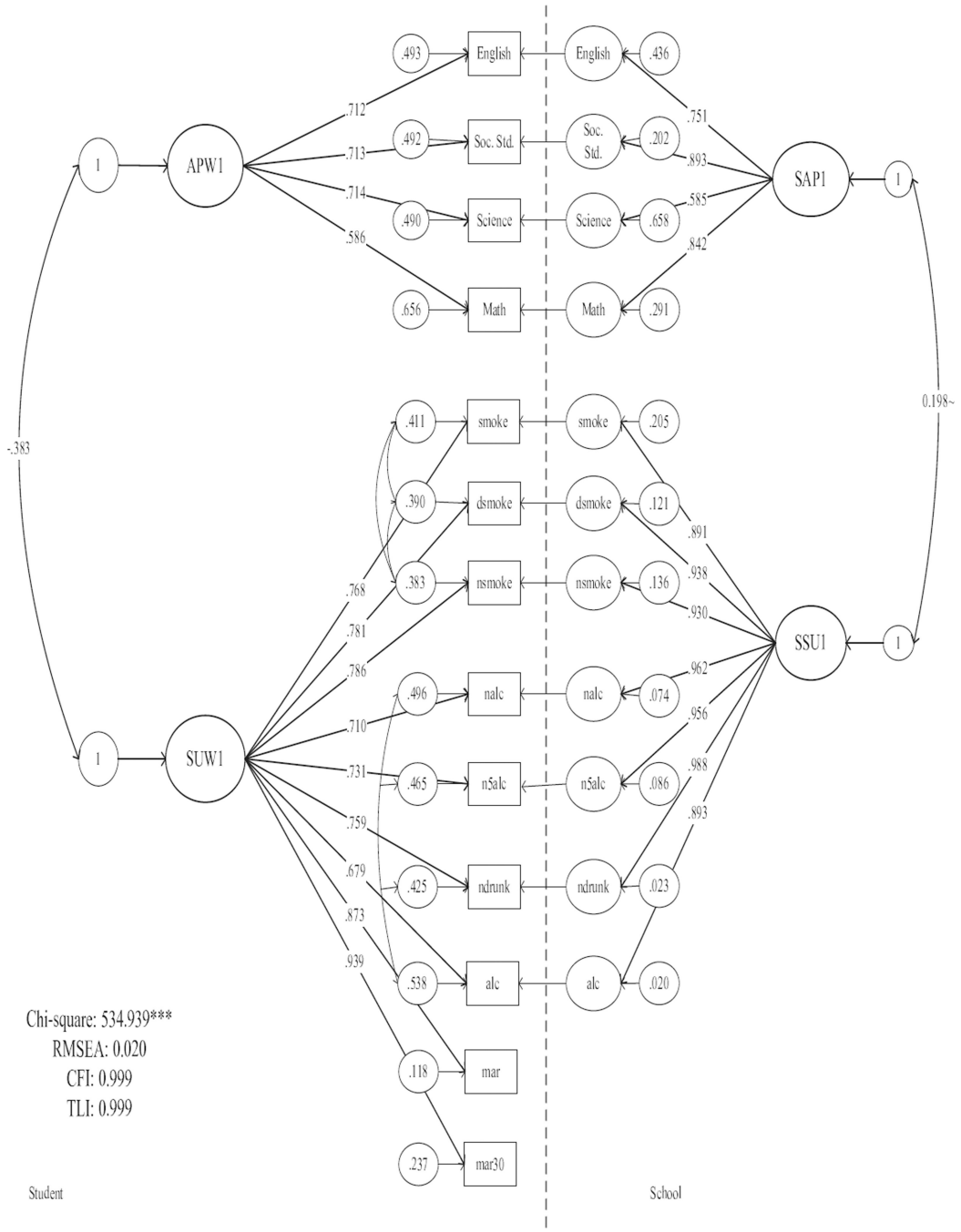

Figure 1.

Measurement model for substance use and academic performance: Multilevel CFA (Wave 1). All coefficients are standardized and significant at $p \leq 0.001$ ($n = 7984$, $k = 114$).

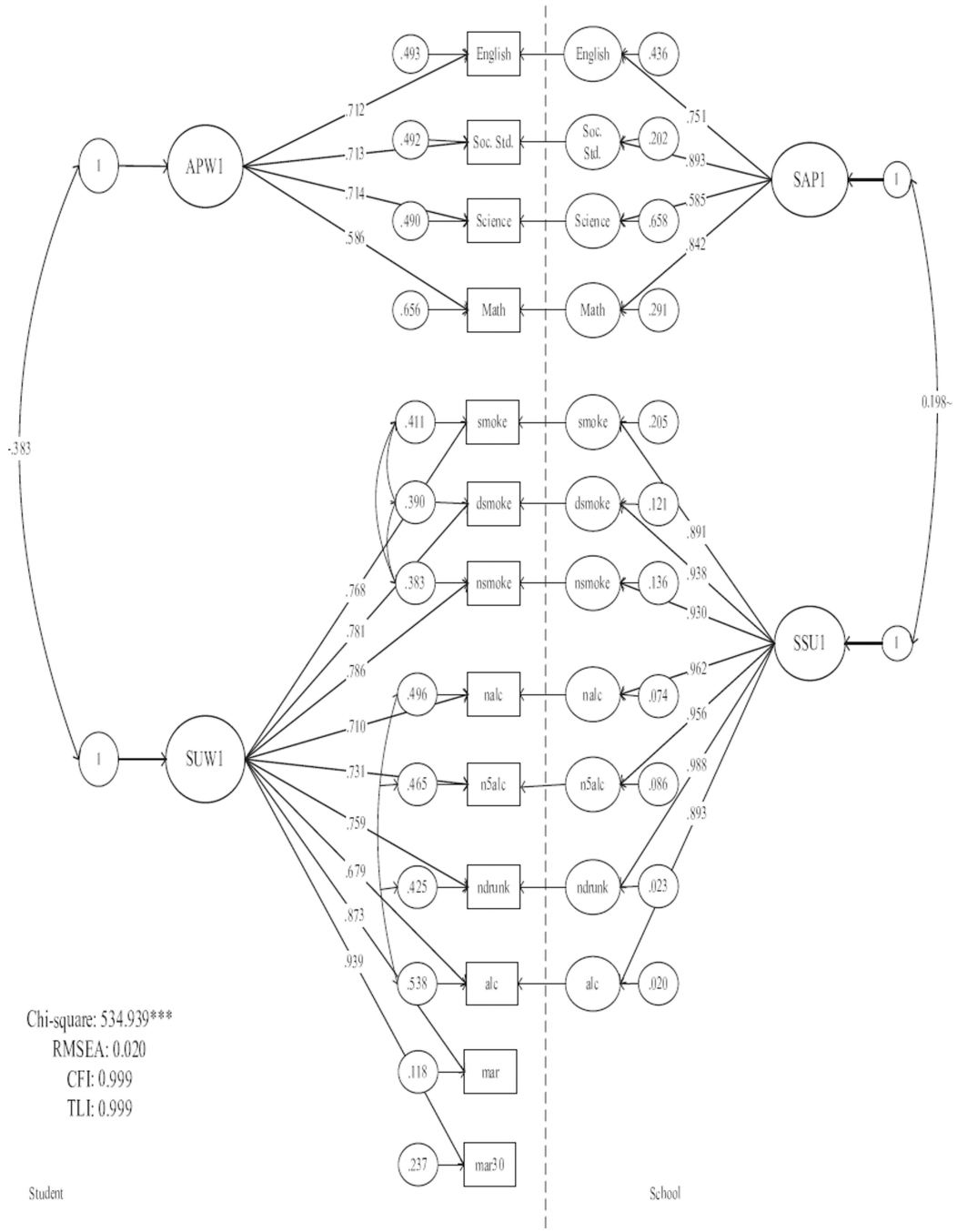

Figure 2.

Measurement model for substance use and academic performance: Multilevel CFA (Wave 2). All coefficients are standardized and significant at $p \leq 0.001$ ($n = 7984$, $k = 114$).

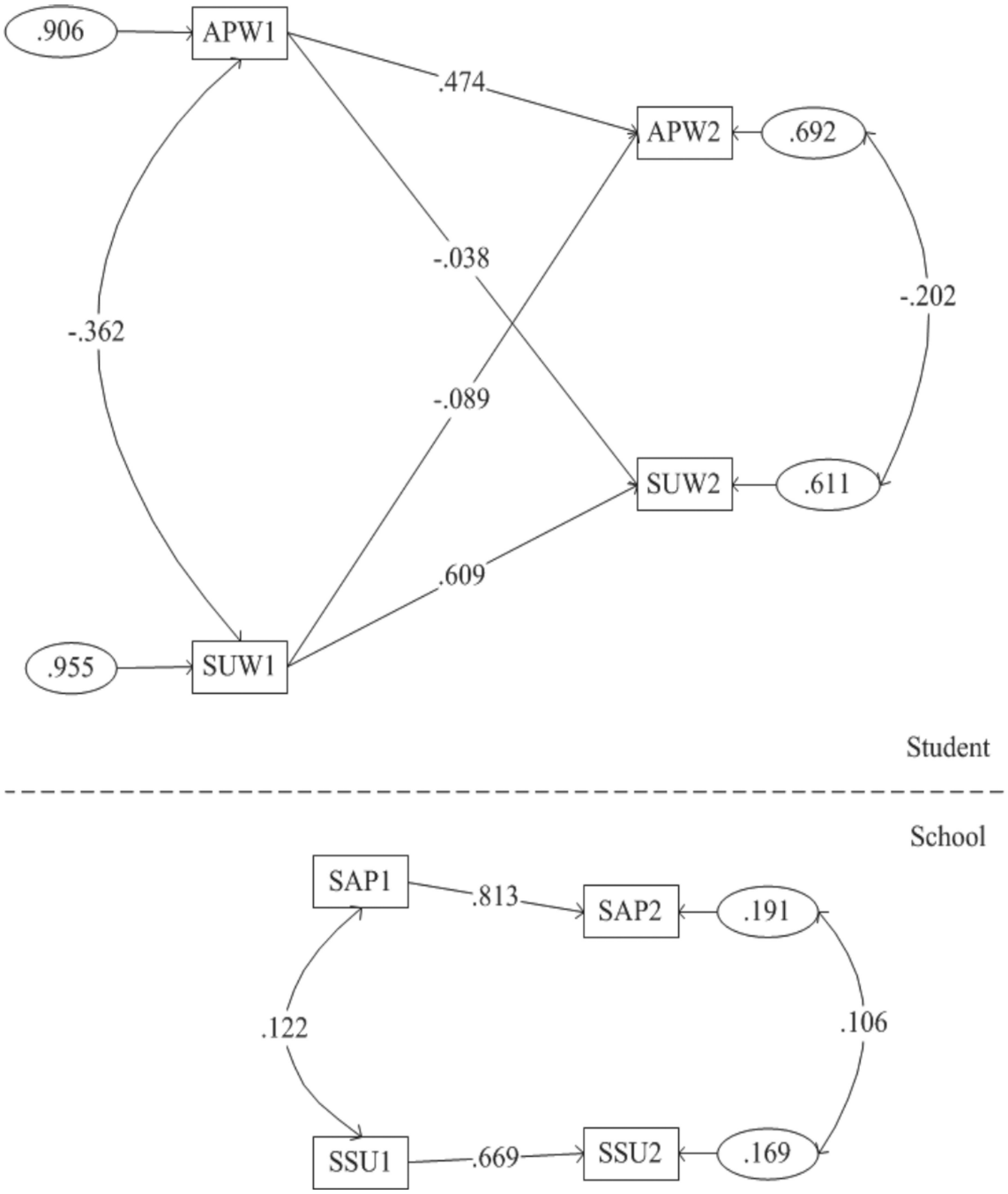

Figure 3.

Multilevel conditional cross-lagged model between substance use and academic performance controlling by student level covariates. All coefficients are standardized and significant at $p \leq 0.001$, except for the effect of AP at Wave 1 on SU at Wave 2 ($p \leq 0.01$). *RMSEA* = 0.029,*CFI* = 0.963, *TLI* = 0.914, *SRMSR within* = 0.016*and SMRS between* = 0.032 (n = 7984, k = 114).

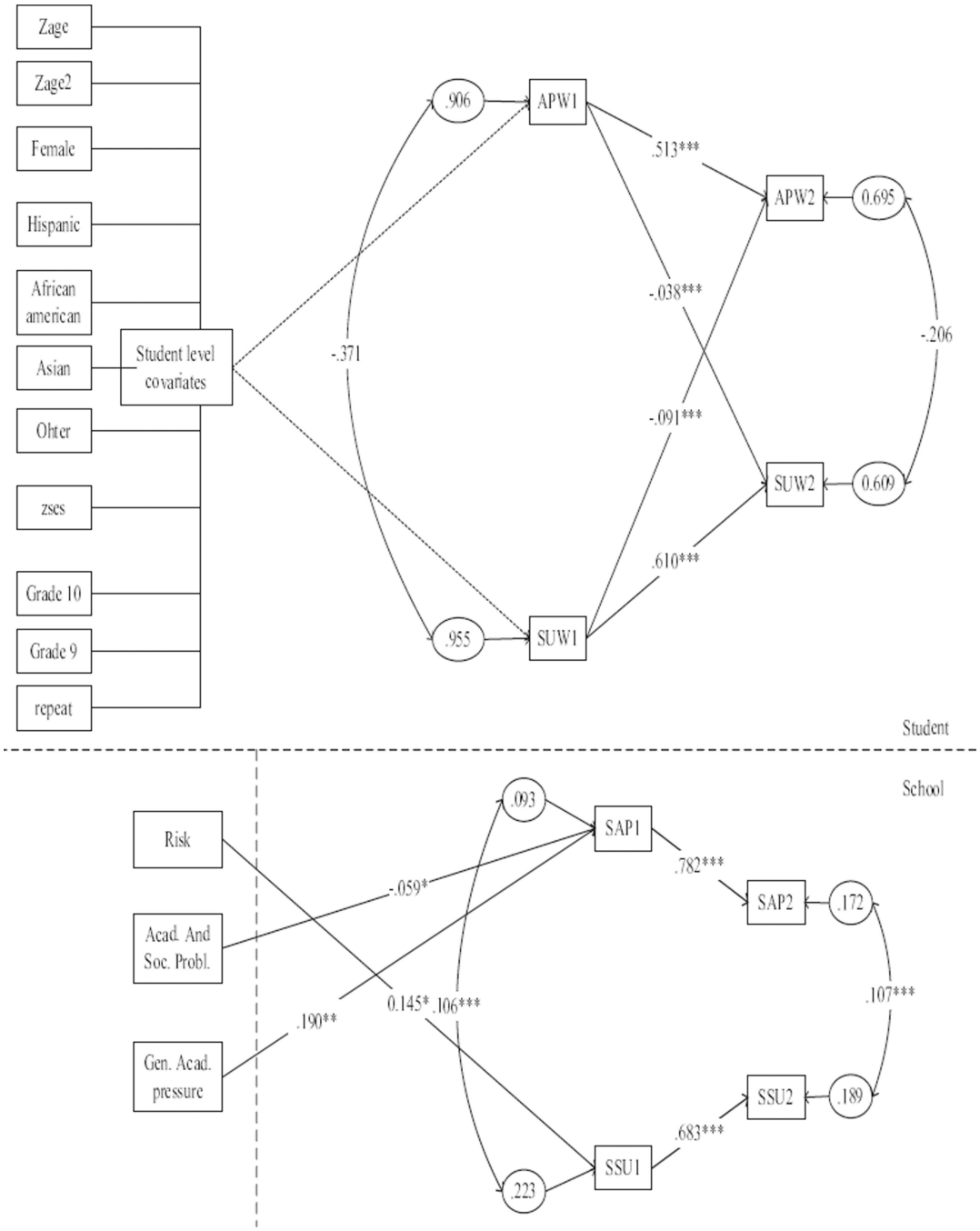

Figure 4.

Multilevel conditional cross-lagged model between substance use and academic performance controlling by student covariates and school effects. Only statistically significant paths are displayed. All coefficients are standardized and significant at *$p \leq$ 0.005, * * $p \leq 0.01$ and * * *$p \leq 0.001$. *RMSEA* = 0.027,*CFI* = 0.960, *TLI* = 0.913, *SRMSR within* = 0.016*and SMRS between* = 0.060 (n = 7984, k = 114).

Table 1

Observed and estimated intraclass correlations (ICC) for substance use and academic performance indicators in Wave1 and Wave 2.

	Observed		*Estimated*	
	W1	**W2**	**W1**	**W2**
AP				
English	0.058	0.063	0.065	0.072
Soc. Studies	0.073	0.078	0.083	0.086
Mathematics	0.065	0.072	0.078	0.074
Science	0.065	0.078	0.068	0.092
SU				
Smoke	0.064	0.079	0.068	0.080
Dsmoke	0.090	0.096	0.103	0.096
Nsmoke	0.084	0.095	0.095	0.097
Alc	0.059	0.079	0.071	0.094
Nalc	0.063	0.079	0.073	0.090
N5alc	0.048	0.060	0.054	0.072
Ndrunk	0.067	0.077	0.078	0.088
Mar	0.089	0.064	0.094	0.076
Nmar30	0.092	0.071	0.109	0.082

Table 2

Student level correlations among SU and AP indicators at Wave1.

	1	2	3	4	5	6	7	8	9	10	11	12
1. English	1											
2. Math	0.424	1										
3. Soc. Std.	0.551	0.369	1									
4. Science	0.488	0.411	0.497	1								
5. Smoke	−0.243	−0.234	−0.256	−0.246	1							
6. Dsmoke	−0.253	−0.229	−0.268	−0.258	0.918	1						
7. Nsmoke	−0.249	−0.226	−0.265	−0.248	0.907	0.973	1					
8. Nalc	−0.157	−0.163	−0.161	−0.176	0.568	0.566	0.568	1				
9. N5alc	−0.179	−0.190	−0.184	−0.213	0.562	0.585	0.582	0.849	1			
10. Ndrunk	−0.159	−0.176	−0.170	−0.194	0.577	0.609	0.606	0.842	0.905	1		
11. Mar	−0.237	−0.228	−0.229	−0.248	0.671	0.667	0.661	0.611	0.635	0.672	1	
12. Nmar30	−0.225	−0.183	−0.205	−0.224	0.569	0.642	0.626	0.566	0.622	0.657	0.927	1
13. Alc	−0.153	−0.142	−0.14	−0.157	0.556	0.543	0.543	0.832	0.829	0.836	0.625	0.617

Table 3

Student level correlations among SU and AP indicators at Wave2.

	1	2	3	4	5	6	7	8	9	10	11	12
1. English	1											
2. Math	0.406	1										
3. Soc. Std.	0.495	0.349	1									
4. Science	0.426	0.4	0.452	1								
5. Smoke	−0.246	−0.200	−0.229	−0.2	1							
6. Dsmoke	−0.251	−0.209	−0.226	−0.192	0.959	1						
7. Nsmoke	−0.251	−0.205	−0.221	−0.197	0.949	0.971	1					
8. Nalc	−0.131	−0.112	−0.081	−0.115	0.527	0.512	0.507	1				
9. N5alc	−0.153	−0.112	−0.100	−0.140	0.548	0.542	0.550	0.859	1			
10. Ndrunk	−0.155	−0.131	−0.103	−0.137	0.560	0.554	0.557	0.85	0.926	1		
11. Mar	−0.205	−0.176	−0.185	−0.185	0.634	0.624	0.611	0.586	0.603	0.649	1	
12. Nmar30	−0.224	−0.174	−0.209	−0.194	0.585	0.609	0.598	0.528	0.564	0.609	0.951	1
13. Alc	−0.136	−0.122	−0.083	−0.127	0.539	0.523	0.523	0.885	0.907	0.903	0.615	0.566

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Table 4

School level correlations among SU and AP indicators at Wave1.

	1	2	3	4	5	6	7	8	9	10	11	12
1. English	1											
2. Math	0.619	1										
3. Soc. Std.	0.723	0.528	1									
4. Science	0.516	0.578	0.723	1								
5. Smoke	0.010	0.184	0.035	−0.220	1							
6. Dsmoke	0.139	0.321	0.199	−0.101	0.987	1						
7. Nsmoke	0.172	0.354	0.231	−0.066	0.983	1	1					
8. Nalc	0.057	0.230	0.227	−0.102	0.871	0.903	0.885	1				
9. N5alc	0.184	0.222	0.288	−0.064	0.876	0.890	0.889	0.985	1			
10. Ndrunk	0.144	0.286	0.202	−0.124	0.94	0.927	0.917	0.974	0.974	1		
11. Mar	−0.245	−0.045	−0.308	−0.305	0.518	0.367	0.328	0.498	0.444	0.577	1	
12. Nmar30	−0.271	0.031	−0.332	−0.336	0.565	0.427	0.398	0.565	0.506	0.685	1.000	1
13. Alc	−0.032	0.168	0.178	−0.093	0.819	0.788	0.764	0.970	0.945	0.937	0.541	0.640

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Table 5

School level correlations among SU and AP indicators at Wave 2.

	1	2	3	4	5	6	7	8	9	10	11	12
1. English	1											
2. Math	0.794	1										
3. Soc. Std.	0.789	0.743	1									
4. Science	0.603	0.680	0.754	1								
5. Smoke	0.002	0.082	−0.017	−0.037	1							
6. Dsmoke	0.081	0.160	0.021	0.011	1.000	1						
7. Nsmoke	0.055	0.154	0.011	0.004	0.995	1.000	1					
8. Nalc	0.092	0.210	0.123	0.213	0.907	0.908	0.888	1				
9. N5alc	0.223	0.274	0.160	0.203	0.908	0.919	0.898	0.986	1			
10. Ndrunk	0.197	0.269	0.123	0.208	0.907	0.897	0.871	0.977	0.981	1		
11. Mar	−0.163	−0.055	−0.264	−0.244	0.566	0.512	0.488	0.652	0.572	0.687	1	
12. Nmar30	−0.130	0.034	−0.262	−0.288	0.508	0.451	0.413	0.546	0.469	0.590	0.995	1
13. Alc	0.173	0.262	0.204	0.285	0.844	0.832	0.801	0.973	0.971	0.971	0.647	0.574

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Table 6

Factor structure for Student Body Composition: Risk factor. A mental health problems construct was accounted using correlated errors between somatic symptoms and emotional (anxiety/depression) indicators; similarly risk behaviors and drug use errors were also correlated to account for a strong correlation between risk behaviors and sub-stance use. All loadings are significant at $p \leq 0.001$, $k = 128$.

	Fit indicators ($n = 128$)	
Chi-square	4.77	
RMSEA	0.068	
RMSEA 90% CI	0.000–0.117	
CFI	0.998	
TLI	0.992	
Indicator	*Loadings*	*Residual variances*
Emotional problems	1.000	0.387
Somatic symptoms	0.892	0.47
Risk behaviors	1.139	0.201
Drug use	1.106	0.227
Self -esteem	−0.978	0.51

Table 7

Factor structure for School Social and Academic Problems (SSAP). Loadings are standardized and significant at $p \leq 0.001$. Indicators had as response alternatives a five level ordinal scale (0:never to 4: everyday). RMSEA 0.077, RMSEA 90% CI = (0.071,0.083), CFI = .999, TLI=0.992. Errors between the academic indicators were correlated 46b with 46c, $n = 85413$.

Indicators	loadings
46.*How often have you had trouble:*	
a. getting along with your teachers?	0.771
b. paying attention in school?	0.784
c. getting your homework done?	0.733
d. getting along with other students?	0.766

Table 8

Factor structure for School Academic Pressure: Selective Academic Pressure and Generalized Academic Pressure. All loadings are significant at $p \leq 0.001$. RMSEA = 0.017, RMSEA 90% CI = (0.000,0.091), CFI = .995, TLI=0.992, $k = 132$.

Indicators	Selective	Generalized
Percent of 12th graders in academic/college prep	1.000	
Expectations go to college	0.553	1.966
Tracking /ability groups	0.437	
More part in academic groups		1.000
Retention		−2.381
Dropout		−2.422