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Influence of Family Factors on Substance Use in Early Adolescents: A Longitudinal Study in Hong Kong

Daniel T. L. Shek, Xiaoqin Zhu, Diya Dou, and Wenyu Chai

Department of Applied Social Sciences, The Hong Kong Polytechnic University, Hong Kong, PR China

ABSTRACT

The present study examined the concurrent and longitudinal influences of paternal and maternal factors on the levels of and changes in substance use among early adolescents. Based on three waves of data collected from 2,669 junior high school Chinese students in Hong Kong, we found that fathers' and mothers' behavioral control and the quality of parent–adolescent relationship were negative predictors of the initial levels of substance use. Higher levels of maternal behavioral control and quality of mother–adolescent relationship predicted a slower rate of increase in adolescent substance use. Parental psychological control was not a significant predictor of the growth rate of adolescent substance use. While fathers' behavioral control and mother–adolescent relationship were stable concurrent predictors, the mother–adolescent relationship was a robust longitudinal predictor of adolescent substance use. The findings underline the critical roles of parents in influencing adolescent substance use.

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KEYWORDS
Chinese students; junior high school; substance use; parenting; parent–child relational quality

Introduction

Use of substances such as tobacco, alcohol, and illicit drugs creates adolescent problem behavior and health issues (Balsa, Giuliano, and French 2011; Banzer et al. 2017; Crockett, Raffaelli, and Shen 2006; Lydon-Staley et al. 2014; Odgers et al. 2008; Sussman, Skara, and Ames 2008). In Hong Kong, the prevalence of using substances among adolescents is relatively high (Siu 2011). In a survey conducted by the Narcotics Division of the Hong Kong Security Bureau (Narcotics Division, 2019), the proportions of lifetime drug, tobacco, and alcohol use among all participating students were 2.5%, 7.0%, and 56.7%, respectively. Research also revealed that substance users in Hong Kong started consuming substances during junior secondary school years (Tam et al. 2018), highlighting the importance of prevention for adolescent substance use during this period.

Ecological models suggest an intimate interrelationship between parental control and adolescent substance use. Parental control takes two forms: "behavioral control" and "psychological control" (Bean, Barber, and Crane 2006). Behavioral control refers to the constraints and regulations that parents set to manage their children's behaviors, which include parents' knowledge about children, monitoring, expectation, and discipline setting (Smetana and Daddis 2002). As parental behavioral control transmits behavioral norms to adolescents, it has been considered a protective factor in adolescents' positive development and problem prevention (Finkenauer, Engels, and Baumeister 2005; Kincaid et al. 2011). More specifically, it helps reduce adolescent exposure to risky environments, "curb" their impulsive misbehaviors, hence preventing adolescent substance use behaviors (Ennett et al. 2008; Li, Stanton, and Feigelman 2000). Empirical studies showed that adolescents whose parents exercised effective behavioral control were less likely to consume alcohol, tobacco, or illicit drugs (Ennett et al. 2008; Li, Stanton, and Feigelman 2000; Shek and Law 2014; van der Vorst et al. 2006).

Parental psychological control refers to parental interference or manipulation of children's emotions, feelings, and thoughts through guilt induction, love withdrawal, shaming, manipulation of emotional security, and/or discounting children's perspective (Bean, Barber, and Crane 2006). Instead of regulating adolescent behavior (i.e., behavioral control), psychological control "communicates that the adolescent's thoughts, emotions, feelings, and/or even the adolescent are unacceptable" (Rogers, Buchanan, and Winchell 2003, 350). A high level of parental psychological control undermines adolescent efficacy and autonomy efforts which leads to unhealthy self-concept and adjustment

CONTACT Daniel T. L. Shek daniel.shek@polyu.edu.hk Department of Applied Social Sciences, The Hong Kong Polytechnic University, Hung Hom, Hong Kong, PR China

(Costa et al. 2019), which makes adolescents vulnerable to the development of risk behaviors including using tobacco, alcohol, and other substances (Kincaid et al. 2011; Romm and Metzger 2018). For example, Romm and Metzger (2018) found a positive relationship between parental psychological control and substance use among adolescents suffering from unhealthy psychological conditions.

In addition, the quality of parental–adolescent relationships also plays an important role in adolescent substance use. In families with good parent–child relationships, adolescents would develop close ties and maintain good communication with their parents, which in turn prevent adolescent problem behaviors including substance use (Kuntsche, van der Vorst, and Engels 2009). Conversely, in families with poor parent–child relationships, adolescents may view their parents as "insensitive, unresponsive, hostile, rejecting, unaffectionate, or unsupportive" (Seiffge-Krenke, Overbeek, and Vermulst 2010, 161). Such unfavorable experience may result in adolescents' negative emotions or even maladaptive coping strategies such as substance use (Goossens et al. 2012; McNally et al. 2003). Studies showed that the lower quality of parent–child relationship predicted heavier substance use (Ackard et al. 2006; Ledoux et al. 2002; Ryan, Jorm, and Lubman 2010).

Several research gaps exist in the research on parental factors and adolescent substance use. Firstly, few studies have been carried out to understand the differential paternal and maternal influences on substance use among adolescents and the findings are inconclusive. One conjecture is that as mothers are more involved in parenting than fathers, mothers would have stronger impacts on children's adjustment (Costa et al. 2019). For example, Henry et al. (2018) revealed that maternal but not paternal psychological control increased the risk of substance use among early adolescents. Alternatively, some scholars remarked that fathers may play a stronger role than mothers in socializing youth and preventing adolescent substance use (Weymouth, Fosco, and Feinberg 2017). Furthermore, some researchers indicated that differential maternal versus paternal impacts may vary across different parenting behaviors. For example, Luk et al. (2017) revealed that maternal psychological control was a risk factor for the development of substance use, while paternal knowledge (an aspect of paternal behavioral control) was a protective factor against substance use among adolescents in specific grades. Given the inconclusive picture, more research is needed to compare maternal with paternal impacts.

The second research gap is the lack of longitudinal research in this field. Compared to cross-sectional studies, longitudinal research with repeated measures can identify time effect and examine the predictive effects of parental factors on development trajectories of adolescent substance use (Caruana et al. 2015). Unfortunately, longitudinal studies in this area are rare. Amongst the existing longitudinal studies, few studies examined growth rates of adolescent substance use using data collected from more than two time points. For example, Diggs et al. (2017) demonstrated that parental factors (such as harsh parenting and parent–child communication) predicted subsequent adolescent substance use level, they did not examine the effects of parental factors on the rate of changes in adolescent substance use.

The third research gap is that parental impacts on adolescent substance use are not fully understood in Chinese societies. Influenced by Confucian values, one unique feature of Chinese parenting is "guan", which implies parental responsibilities to discipline, educate, and train children to learn social rules and develop high moral character (Chao 1994; Russell, Crockett, and Chao 2010). Under such a cultural context, some parenting practices considered dysfunctional in Western contexts may have different impacts on Chinese adolescents because parents may have good purposes behind such parenting behaviors. For example, adolescents might interpret parental psychological control as a form of parental love or involvement, thus less affected by the negative influence of this parenting strategy (Chao 1994; Leung and Shek 2019; Russell, Crockett, and Chao 2010; Soenens and Beyers 2012). It is of interest to investigate the relationships between different parenting factors and adolescent substance use in a Chinese context.

The present study

To bridge the above-mentioned research gaps, this study examined whether family processes (indexed by parents' behavioral and psychological control as well as the quality of parent–adolescent relationships) predict the baseline levels and developmental trajectories in substance use among Chinese adolescents in Hong Kong. Based on the general assumption that positive parenting practices are associated with positive adolescent outcomes whereas negative parental factors are linked to poor developmental outcomes, we proposed three groups of hypotheses, corresponding to these three family processes. First, a higher level of fathers' and mothers' behavioral control would predict a lower initial level (Hypothesis 1a and Hypothesis 1b, respectively) and a slower increase (Hypothesis 1c and Hypothesis 1d, respectively) of adolescent substance

use. Second, a higher level of fathers' and mothers' psychological control would predict a higher initial level (Hypothesis 2a and Hypothesis 2b, respectively) and a faster increase (Hypothesis 2c and Hypothesis 2d, respectively) of substance use among early adolescents. Third, like behavioral control, a higher quality of father– and mother–adolescent relationships would predict a lower initial level (Hypothesis 3a and Hypothesis 3b, respectively) and a slower increase (Hypothesis 3c and Hypothesis 3d, respectively) of substance use.

The present study also examined the differential contribution of paternal versus maternal factors to adolescent substance use at a single time point (i.e., concurrent predictive effects) and over time (i.e., longitudinal predictive effects). Given the equivocal findings in the existing literature (Shek 2005; Weymouth, Fosco, and Feinberg 2017), we tested three possibilities: a) fathers have a greater contribution to adolescent substance use than do mothers; b) mothers have a greater contribution to adolescent substance use than do fathers; and c) fathers' and mothers' contributions are similar.

Methods

Participants and procedures

Data used in the current study were derived from a 6-year project which investigated adolescent development in Hong Kong. This longitudinal research project was reviewed and approved by the "Human Subjects Ethics Sub-committee" at The Hong Kong Polytechnic University. In total, 28 Chinese-speaking secondary schools in Hong Kong were randomly selected, in which all Grade 7 (i.e., the first year in high school) students were invited to complete a paper-and-pencil questionnaire in each of the six consecutive years. In each participating school, trained researchers administered the questionnaires and informed students about the research purpose and principles of voluntary participation and withdrawal. All participating schools, students, and parents provided informed written consent. There was no compensation provided to participants.

The present study used the data collected at the first three waves (i.e., Wave 1–3) from 2009/10 to 2011/12 academic years when students were in their 3-year junior secondary school study (i.e., Grade 7–9). There were 3,328 Chinese students who completed the questionnaire at Wave 1, among whom 2,905 returned the questionnaire at Wave 2 and 2,860 further participated in the survey at Wave 3. In total, 2,669 participating students (1,321 boys, 1,344 girls, and 4 unidentified gender) were successfully matched across Wave 1 to 3, forming the working sample of this study with a mean age of 12.56 ± .71 years at Wave 1.

Attrition analyses revealed that students in the working sample (N = 2,669) were slightly younger and comprised of a slightly lower percentage of boys as compared to those who dropped out of the study after Wave 1 (N = 659). For family processes, the two samples had a similar baseline (Wave 1) level of paternal behavioral control. However, in comparison to dropouts, students in the working sample reported a slightly higher baseline level of maternal behavioral control, slightly lower baseline levels of paternal and maternal psychological control, and slightly higher quality of father– and mother–child relationships. The working sample got a slightly lower mean score on the measure of substance use than the dropouts. As the related effect sizes of the differences were small, we concluded that attrition was not a major bias in the present study.

Instruments

Family processes

Parental behavioral control, psychological control, and parent–adolescent relationship were measured via a reliable and valid scale entitled "Parent–Child Subsystem Quality Scale (PCSQS)". Details of the scale reliability and validity were reported in other papers (Shek and Law 2014, 2015). The PCSQS included three subscales for each parent: behavioral control subscale (seven items; sample item: "My father/mother asked me about what I did after school"), psychological control subscale (four items; sample item: "My father/mother always wants to change my views to fit his/her standard"), and parent–child relational quality subscale (six items; sample item: "I shared my feelings with my father/mother"). A 4-point Likert scale ("1 = strongly disagree", "4 = strongly agree") was adopted for all the items. Cronbach's alpha of each subscale at each wave was calculated for fathers and mothers, separately. The alphas ranged from .80 to .91 for paternal subscales and from .85 to .91 for maternal subscales, indicating good reliability of these subscales.

Substance use

Substance use was measured by the frequency of consuming eight forms of substances during the past twelve months, including "tobacco", "alcohol", "ketamine", "cannabis", "cough medicine", "solvent thinner", "ecstasy or other pills such as mandrax", and "heroin". For each item, a 7-point Likert rating scale ("0 = never used"; "7 = used daily") was used. Among these substances, heroin was one of the traditional "narcotics analgesics" used in Hong Kong while others

such as cannabis, ketamine, and ecstasy have been increasingly used as "psychotropic substances" since the late 1990s in Hong Kong (Cheung and Cheung 2018). Of note, ketamine has been the most popular substance used in Hong Kong since the 2000s and some substances (e.g., cough medicine and thinner as a type of organic solvent) have been uniquely used by young people in Hong Kong (Cheung and Cheung 2018; Shek 2017). Frequency analyses of using each substance at each wave showed that both boys and girls reported very low frequency of using "ecstasy" or "heroin" (i.e., 0–2 students among the female or male samples had ever taken these two kinds of substances in the past one year). Therefore, these two items were removed from the final analyses. The average score of the other six items was calculated to form a composite score. The reliability of the 6-item scale was calculated at each wave and the Cronbach's alpha ranged between .60 and .72.

Control variables

Control variables comprised "gender", "family economic condition", and "family intactness". Regarding the gender of adolescents, the prevalence of using substances was slightly higher among boys than that among girls (Narcotics Division 2019; Park and Kim 2016). In Hong Kong, families under the governmental welfare program entitled "Comprehensive Social Security Assistance (CSSA) Scheme" are usually considered economically disadvantaged (Social Welfare Department 2019). In this study, a total of 225 adolescents (6.8%) at Wave 1 reported that their families were under CSSA. Thus, they were regarded as economically disadvantaged. For family intactness, students whose parents in the first marriage at Wave 1 were considered "intact" families. If parents of the participant were divorced, separated, or in a second marriage at Wave 1, the student was considered having a "not intact" family. In total, 515 students (15.5%) were living in "not intact" families.

Data analysis plan

We first performed reliability, descriptive, and correlation analyses, followed by individual growth curve (IGC) models. IGC models were used to depict the change trajectories of substance use among adolescents over time, and to examine the influence of parental factors on the variation of the original level of and the rate of change in substance use behaviors between individuals. Because of the 1-year interval between each consecutive wave, the values of time were coded as 0, 1, 2 for the three waves. We standardized parental factors and performed a natural logarithmic transformation for adolescent substance use to solve the problem of skewness. All control variables were dummy coded: "female" = "−1", "male" = "1"; "economic disadvantaged family" = "−1", "non-economic disadvantaged family" = "1"; "not intact family" = "−1", "intact family" = "1".

A two-level hierarchical model was developed according to the procedures recommended by Shek and Ma (2011). Using time as a Level-1 factor, the Level-1 models focused on the developmental change within individuals, including "unconditional mean model" (i.e., Model 1) and "linear growth model" (i.e., Model 2). The models in Level 2 captured the variation of growth rate between individuals, involving control variables (i.e., Model 3), and parental factors (i.e., Model 4a-4c) as covariates. The model fit was measured by "−2log likelihood" (i.e., deviance), "Akaike Information Criterion" (AIC), and "Bayesian Information Criterion" (BIC). The smaller the values of these indices, the better the model fit. Thus, model comparisons were performed with reference to differences of each index between two models (Shek and Ma 2011). A significant decrease in these indices suggests a significant improvement in model fit (Schermelleh-Engel, Moosbrugger, and Müller 2003; Shek and Ma 2011).

In addition, we performed multiple regression analyses to investigate the concurrent and longitudinal predictive effects of parental factors on substance use among adolescents. We first examined the concurrent predictive effects using data collected at each wave. Then, we assessed longitudinal predictive effects using Wave 1 parental factors as predictors of adolescent substance use assessed at Wave 2 and 3.

Results

Predictive effects in IGC models

Results of IGC modeling analyses are presented in Tables 1 and 2. As shown in Table 1, the ICC ("intra-class correlation coefficient") of Model 1 was .50 (i.e., 50% of the variance in substance use was due to individual differences). Thus, it is necessary to test the predictive effects of predictors in both Level 1 and Level 2 (Shek and Ma 2011). According to model fit statistics, Model 2 including time as the intra-personal predictor in Level 1 fitted data significantly better than did Model 1 ($\Delta\chi^2_{(3)}$= 378.72, p< .001, ΔAIC = 372.72, p< .001, ΔBIC = 351.82, p< .001). Furthermore, adolescent substance use increased over time (β = .02, p < .001). Control variables were further included in Model 3 and the results showed that male adolescents displayed a higher level of substance use than did female counterparts (β = .01, p < .01).

Table 1. Results of IGC models (Model 1–3) for adolescent substance abuse (Wave 1–3).

		Model 1		Model 2		Model 3	
		Estimate	SE	Estimate	SE	Estimate	SE
Fixed effects							
Intercept	β_{0j}						
Intercept	γ_{00}	.08***	.002	.07***	. 002	.07***	.005
Gender [a]	γ_{01}					.01**	.002
Family economic status [b]	γ_{02}					.01	.005
Family intactness [c]	γ_{03}					−.01**	.004
Linear Slope	β_{1j}						
Time	γ_{10}			.02***	. 002	.02***	.003
Gender [a]	γ_{11}					−.0002	.002
Family economic status [b]	γ_{12}					−.01*	.003
Family intactness [c]	γ_{13}					−.001	.002
Random effects							
Level 1 (within)							
Residual	r_{ij}	.01***	.0002	.01***	.0003	.01***	.0003
Level 2 (between)							
Intercept	u_{0j}	.01***	.0004	.01***	.0005	.01***	.0005
Time	u_{1j}			.002***	.0002	.002***	.0003
Fit statistics							
Deviance		−9421.64		−9800.35		−9833.40	
AIC		−9415.64		−9788.35		−9809.40	
BIC		−9394.75		−9746.57		−9726.05	
Intra-class correlation		.50					
df		3		6		12	

[a]Female = −1. Male = 1.
[b]Having economic disadvantage = −1, Not having economic disadvantage = 1.
[c] Not intact family = −1. Intact family = 1.
*p< .05. **p< .01. ***p< .001.
AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.

Furthermore, the inclusion of behavioral control (i.e., Model 4a) significantly increased model fit of Model 3 in which only control variables served as predictors in Level 2 (Model 4a: $\Delta\chi^2_{(4)}$= 82.05, p< .001, ΔAIC = 74.05, p< .001, ΔBIC = 46.27, p< .001). As Table 2 shows, both fathers' and mothers' behavioral control negatively predicted their children's initial level of substance use at Wave 1 (father: β = –.01, p < .001; mother: β = –.01, p < .001), supporting Hypotheses 1a and 1b. For the growth rate of substance use, while fathers' behavioral control did not act as a significant predictor (β = .001, p > .05), a higher level of mothers' behavioral control predicted a slower increase rate (β = –.004, p < .05). The findings gave support to Hypothesis 1d but not Hypothesis 1c.

In Model 4b, IGC analyses did not significantly increase model fit of Model 3 (Model 4b: $\Delta\chi^2_{(4)}$= 16.97, p< .01, ΔAIC = 8.97, p> .05, ΔBIC = –18.82, p> .05), where fathers' and mothers' psychological control did not significantly predict the initial level nor change rate of substance use among adolescents. Hence, Hypotheses 2a, 2b, 2c, and 2d were rejected.

Compared with Model 3, Model 4c which included parent–adolescent relationships as additional Level-2 predictors yielded better model fit (Model 4c: $\Delta\chi^2_{(4)}$= 131.64, p< .001, ΔAIC = 123.64, p< .001, ΔBIC = 95.86, p< .001). Both father– and mother–adolescent relationship qualities were negatively linked to adolescent substance use at Wave 1 (father: β = –.01, p < .001; mother: β = – .02, p < .001), supporting Hypothesis 3a and 3b. For growth rate of substance use, while the father–adolescent relationship was not a significant predictor (β = –.001, p > .05), a higher quality of mother–adolescent relationship predicted a slower increase (β = –.005, p < .05), giving support to Hypothesis 3d but not Hypothesis 3c.

Predictive effects in regression analyses

For concurrent effects, paternal factors uniquely explained 2–3% of variance in adolescent substance use. Fathers' behavioral control and father–adolescent relationship emerged as negative concurrent predictors while psychological control was a positive concurrent predictor of substance use at all waves (see Table 3). As shown in Table 4, baseline paternal factors showed a similar pattern of longitudinal predictive effects and uniquely explained around 2% of variance in later adolescent substance use.

As for the maternal factors, they explained around 3–4% of variance in the current level of substance use among adolescents (see Table 3). While mother–child relationship was negatively associated with concurrent substance use at all waves, maternal psychological control was positively linked with concurrent substance use at Wave 2 and 3. Regarding the longitudinal predictive effects (see Table 4), a similar pattern was identified: behavioral control did not predict later substance use while the mother–child relationship was a significant longitudinal positive predictor. Baseline maternal

Table 2. Results of IGC models with level-2 predictors for adolescent substance abuse (Wave 1–3).

		Model 4a		Model 4b		Model 4c	
		Estimate	SE	Estimate	SE	Estimate	SE
Fixed effects							
Intercept	β_{0j}						
Intercept	γ_{00}	.06***	.005	.07***	.005	.06***	.005
Gender [a]	γ_{01}	.01***	.002	.01*	.002	.01**	.002
Family economic status [b]	γ_{02}	.01*	.005	.01	.005	.01*	.005
Family intactness [c]	γ_{03}	−.01*	.004	−.01*	.004	−.01	.004
Paternal behavioral control	γ_{04}	−.01***	.003				
Maternal behavioral control	γ_{05}	−.01***	.003				
Paternal psychological control	γ_{06}			.005	.003		
Maternal psychological control	γ_{07}			.004	.003		
Father–child relational quality	γ_{08}					−.01***	.003
Mother–child relational quality	γ_{09}					−.02***	.003
Linear Slope	β_{1j}						
Time	γ_{10}	.02***	.003	.02***	.003	.02***	.003
Gender [a]	γ_{11}	−.0004	.002	−.0003	.002	−.0003	.002
Family economic status [b]	γ_{12}	−.01*	.003	−.01*	.003	−.01*	.003
Family intactness [c]	γ_{13}	−.001	.003	−.001	.002	.0001	.003
Paternal behavioral control	γ_{14}	.001	.002				
Maternal behavioral control	γ_{15}	−.004*	.002				
Paternal psychological control	γ_{16}			.001	.002		
Maternal psychological control	γ_{17}			.002	.002		
Father–child relational quality	γ_{18}					−.001	.002
Mother–child relational quality	γ_{19}					−.005**	.002
Random effects							
Level 1 (within)							
Residual	r_{ij}	.01***	.0003	.01***	.0003	.01***	.0003
Level 2 (between)							
Intercept	u_{0j}	.01***	.0005	.01***	.0005	.01***	.0005
Time	u_{1j}	.002***	.0003	.002***	.0003	.002***	.0003
Fit statistics							
Deviance		−9915.46		−9850.37		−9965.05	
AIC		−9983.46		−9818.37		−9933.05	
BIC		−9772.32		−9707.23		−9821.91	
df		16		16		16	

[a]Female = −1, Male = 1.
[b]Having economic disadvantage = − 1. Not having economic disadvantage = 1.
[c]Not intact family = − 1. Intact family = 1.
*p< .05. **p< .01. ***p< .001.
AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion.

factors uniquely explained 3–4% of variance in later adolescent substance use.

When all parental factors were put in the analyses simultaneously, fathers' behavioral control and mother–adolescent relationship were two most robust concurrent predictors at all time points (see Table 3) and mother–adolescent relationship was the most significant and robust longitudinal predictor (see Table 4). Based on both concurrent and longitudinal predictive effects, mother–child relationship can be regarded as the most significant predictor of adolescent substance use concerning the relative greater effect sizes in regression analyses. In addition, as mentioned above, maternal factors uniquely explained a slightly higher proportion of variance in adolescent substance use than paternal factors (3–4% vs. 2–3%). Taken together, it can be argued that mothers exerted a slightly greater influence on adolescent substance use than fathers.

Discussion

In the current study, male adolescents showed a slightly higher level of substance use than female adolescents. This finding echoes the previous observation suggesting that substance use behavior is more prevalent among boys (Narcotics Division 2019; Peiper et al. 2016). As expected, both parents' behavioral control and their relationships with adolescents were found to be negative predictors of the initial level of children's substance use in early adolescence. These results converge with existing research findings (Cambron et al. 2018; McCann et al. 2016; Ryan, Jorm, and Lubman 2010), suggesting that parents' behavioral control and good relationships with their children are key in preventing and reducing adolescent problem behaviors such as misuse of substances. One possible reason is that these parental strategies can protect adolescents from exposure to deviant peers which constitute a salient context for developing substance use problems (Leung, Toumbourou, and Hemphill 2014). Nevertheless, when maternal behavioral control was considered simultaneously with psychological control and mother–child relationship in regression analyses, the predictive effect of mothers' behavioral control was not as significant as that of the mother–child

Table 3. Concurrent predictive effects of parent–child subsystem qualities on substance abuse.

		Wave 1 Substance abuse [a]			Wave 2 Substance abuse [b]			Wave 3 Substance abuse [c]		
Model	Predictors	β	*t*	Cohen's f^2	β	*t*	Cohen's f^2	β	*t*	Cohen's f^2
1	Gender [d]	.06	3.24**	.004	.04	1.96*	.001	.05	2.55*	.003
	Family economic status [e]	.03	1.60		.02	.74		−.02	−.72	
	Family intactness [f]	−.05	−2.61**	.003	−.08	−3.70***	.01	−.06	2.64*	.003
	R^2 change	.01			.01			.01		
	F change	6.04***			5.90***			5.31**		
2	PBC	−.10	−3.50***	.005	−.07	−2.70**	.003	−.11	−3.90***	.01
	PPC	.07	3.29**	.004	.07	3.17**	.004	.08	3.61***	.01
	FCRQ	−.06	−2.30*	.002	−.09	−3.16**	.004	−.04	−1.53	
	R^2 change	.02			.03			.03		
	F change	21.10***	21.10***		22.85***			21.61***		
3	MBC	−.02	−.57		−.03	−1.07		−.08	−2.93**	.003
	MPC	.03	1.66		.08	3.88***	.01	.09	4.05***	.01
	MCRQ	−.15	−5.68***	.01	−.13	−4.93***	.01	−.09	−3.51***	.01
	R^2 change	.03			.03			.04		
	F change	26.40***			31.07***			30.30***		
4	PBC	−.08	−2.98**	.003	−.06	−2.03*	.002	−.08	−2.71**	.003
	PPC	.07	2.95**	.003	.03	1.43		.05	2.02*	.002
	FCRQ	−.01	−.51		−.04	−1.53		−.01	−.23	
	MBC	.01	.16		−.0001	−.02		−.04	−1.60	
	MPC	.0001	.07		.06	2.69**	.003	.06	2.58*	.003
	MCRQ	−.14	−4.61***	.01	−.11	−3.99***	.01	−.09	−3.09***	.004
	R^2 change	.04			.04			.04	.04	
	F change	17.27***			18.92***			18.16***		

For models 2–4, demographic variables were controlled.
[a]Parent–child subsystem qualities measured at Wave 1 were used.
[b]Parent–child subsystem qualities measured at Wave 2 were used.
[c]Parent–child subsystem qualities measured at Wave 3 were used.
[d]Female = − 1. Male = 1.
[e]Having economic disadvantage = − 1. Not having economic disadvantage = 1.
[f]Not intact family = − 1. Intact family = 1.
*$p < .05$. **$p < .01$. ***$p < .001$.
PBC = paternal behavioral control; PPC = paternal psychological control; FCRQ = father–child relational quality; MBC = maternal behavioral control; MPC = maternal psychological control; MCRQ = mother–child relational quality.

relationship. This finding indicates the importance of investigating parent–child relationship in addition to parental control. Future research could further examine the potential interactions between parental control and parent–child relationship.

Regarding the developmental trajectory of substance use among adolescents, results showed that a higher level of mothers', but not fathers', behavioral control, and higher quality of mother–adolescent relationship but not father–adolescent relationship slowed down the upward trajectory of substance use. These research findings support the general thesis that positive parenting characteristics lead to favorable adolescent developmental outcomes, including a slower increase or a faster decrease in problem behaviors (Barnes, Reifman, Farrell, & Dintcheff, 2000; Galambos, Barker, and Almeida 2003). Furthermore, maternal impacts were more significant as compared to paternal impacts, which can be understood in terms of the higher involvement of mothers in the socialization process. Also, as mothers are emotionally more expressive and sensitive (McKinney and Renk 2008; Russell et al. 1998), they would be more attentive to the negative emotions of their children which are commonly regarded as contributors to children's maladaptive coping strategies such as substance consumption (Holahan et al. 2001).

The present findings suggest that youth programs aiming at preventing adolescent substance use should involve parents and educate them about positive parenting strategies, such as behavioral control practice and building good parent–child relationships. In fact, a recent review on effective family-based interventions delineated desirable effects of parent training on the enhancement of parent–child relationships (e.g., communication) as well as the use of behavioral control (e.g., rule-setting, monitoring) in preventing, restraining or cutting down adolescent substance use (Kuntsche and Kuntsche 2016). This is important because deteriorating family interaction is an increasing risk factor in Hong Kong (Shek and Siu 2019).

Regarding the influence of psychological control, the findings of IGC analyses do not support the common conjecture that parental psychological control has negative impacts on adolescent development (Barber 2002; Barber and Xia 2013). However, despite the insignificant results in the present IGC analyses, paternal psychological control showed significant predictive effects both concurrently and longitudinally, and maternal psychological control showed concurrent predictive effects in the regression models. Thus, we can argue that psychological control may still influence Chinese adolescent substance use to some extent, although the

Table 4. Longitudinal predictive effects of parent–child subsystem qualities on substance abuse.

		Wave 2 Substance abuse			Wave 3 Substance abuse		
Model	Predictors	β	t	Cohen's f^2	β	t	Cohen's f^2
1	Gender [a]	.04	1.96*	.001	.05	2.55*	.003
	Family economic status [b]	.02	.74		−.02	−.72	
	Family intactness [c]	−.08	−3.70***	.004	−.06	−2.64**	.003
	R^2 change	.01			.01		
	F change	5.90***			5.31**		
2	PBC	−.07	−2.58*	.002	−.06	−2.64**	.002
	PPC	.06	2.77**	.003	.05	2.29*	.002
	FCRQ	−.08	−2.89**	.003	−.09	−2.27*	.004
	R^2 change	.02			.02		
	F change	17.33***			18.11***		
3	MBC	−.04	−1.41		−.03	−1.13	
	MPC	.04	1.71		.04	1.74	
	MCRQ	−.13	−4.89***	.01	−.16	−5.78***	.01
	R^2 change	.03			.04		
	F change	24.94***			30.66***		
4	PBC	−.04	−1.46		−.04	−1.35	
	PPC	.06	2.39*	.002	.04	1.78	
	FCRQ	−.04	−1.22		−.04	−1.34	
	MBC	−.02	−.74		−.01	−.51	
	MPC	.01	.30		.01	.61	
	MCRQ	−.12	−4.15***	.01	−.14	−4.95***	.01
	R^2 change	.03			.04		
	F change	15.11***			17.60***		

For models 2–4, demographic variables were controlled; parent–child subsystem qualities measured at Wave 1 were used as predictors.
[a]Female = −1. Male = 1.
[b]Having economic disadvantage = −1. Not having economic disadvantage = 1.
[c]Non intact family = −1. Intact family = 1.
*$p < .05$. **$p < .01$. ***$p < .001$.
PBC = paternal behavioral control; PPC = paternal psychological control; FCRQ =father–child relational quality; MBC = maternal behavioral control; MPC = maternal psychological control; MCRQ = mother–child relational quality.

findings are mixed. This observation can be explained by two possible reasons. First, it is plausible that adolescents in some cultures may not see parental psychological control as negative manipulation but culturally acceptable or even a parental means of showing love and concern (Leung and Shek 2019; Mason et al. 2004; Shek and Zhu 2019). For instance, the psychological control of parents did not significantly predict delinquency among Chinese adolescents (Shek and Zhu 2019). In Latino families, psychological control was even linked with positive outcomes of adolescents including less substance use (Henry et al. 2018; Sher-Censor, Parke, and Coltrane 2011).

Second, the nature of the association between parental psychological control and children's developmental outcome may vary across different outcome indicators or depend on moderators. Among Chinese adolescents, parental psychological control contributed to severe internalizing problems and Internet addiction (Luebbe, Tu, and Fredrick 2018; Shek, Zhu, and Dou 2019; Shek, Zhu, and Ma 2018) but not delinquency (Shek and Zhu 2019) and substance use. Besides, psychological control may interact with parents' behavioral control (Leung and Shek 2019). In Henry et al.'s (2018) study, the association between parental psychological control and son's substance use was moderated by neighborhood quality. Concerning these possibilities, additional studies are warranted to measure multiple outcome indicators (e.g., both externalizing and internalizing problems) simultaneously and involve more potential moderators (e.g., peer influence and neighborhood quality).

As for the relative contribution of fathers and mothers, regression analyses revealed that maternal factors tended to have a slightly stronger predictive effect on substance use, both concurrently and longitudinally. This finding echoes the IGC results showing the unique predictive effects of maternal factors on the change trajectories of substance use. The finding is also consistent with past research revealing unique or equal impacts of maternal parenting as compared to paternal parenting (Diggs et al. 2017; Padilla-Walker et al. 2008). Furthermore, among all parental factors considered in the present study, mother–child relationship showed the most robust cross-sectional and longitudinal associations with children's substance use, which

converges with a previous finding that the mother–child relationship was the most significant longitudinal predictor of adolescent delinquency (Shek and Zhu 2019). Nevertheless, our observations are inconsistent with past research which suggests that paternal impact may be more salient in the development of youth substance use (Schwartz et al. 2009; Weymouth, Fosco, and Feinberg 2017). In view of the mixed findings, there is a need to further address this issue in future.

The present study had several limitations. First, as all data were derived from adolescents' responses in self-report measurement tools, future studies should replicate and extend the current research by collecting data from multiple informants (e.g., teachers and parents) and through different approaches (e.g., objective observation or daily diary). Second, we did not examine the underlying mechanisms for the relations between parental factors and adolescent substance use. It is worthwhile to consider possible mediators such as adolescent emotional adjustment (Weymouth, Fosco, and Feinberg 2017) and life satisfaction (Shek and Liang 2018). Last, the present sample is restricted to Hong Kong Chinese adolescents only. Future studies should further explore the present research questions in other diverse samples such as adolescents in different Asian regions.

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ORCID

Daniel T. L. Shek http://orcid.org/0000-0003-3359-6229
Xiaoqin Zhu http://orcid.org/0000-0002-5527-9729

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