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Impact of Project P.A.T.H.S. on adolescent developmental outcomes in Hong Kong: findings based on seven waves of data

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Abstract

The present study examined the longitudinal impact of Project P.A.T.H.S. (Positive Adolescent Training through Holistic Social Programmes) on adolescent developmental outcomes in Hong Kong. Using a longitudinal randomized group design, seven waves of data were collected from 24 experimental schools (n=4049 at wave 1) in which students participated in the Tier 1 Program of Project P.A.T.H.S. and 24 control schools (n=3797 at wave 1). Results based on individual growth curve modeling generally showed that, relative to the control participants, participants in the experimental group had: (a) a higher level of positive development; (b) a lower level of substance abuse; and (c) a lower level of delinquent behavior. Participants who regarded the program to be beneficial also showed higher levels of positive development and lower levels of problem behavior than did the control school students. The present findings suggest that Project P.A.T.H.S. is effective in promoting positive development and preventing adolescent problem behavior in Chinese adolescents in Hong Kong.

Keywords: adolescence; Hong Kong; longitudinal survey; Project P.A.T.H.S.; youth development.

Introduction

Adolescent problem behaviors, such as alcohol use, delinquency, teenage pregnancy, violence and different types of substance abuse are always concerns for health professionals, researchers, parents and policy-makers. With particular reference to Hong Kong, there are worrying trends and phenomena related to the development of adolescents in Hong Kong, such as mental health problems, abuse of psychotropic substances, suicide, school violence and reduced family solidarity (1, 2). For health professionals, one relevant question is how such adolescent developmental problems can be prevented and the development of adolescents promoted. A survey of literature shows that there are growing efforts to identify at-risk students at an early stage and to develop primary prevention programs that utilize a classroom-based curricular approach.

Although it is important and meaningful to focus on prevention of adolescent developmental problems, there are several difficulties associated with this approach. First, one may criticize that over-emphasis of adolescent developmental problems represents a "pathological" approach in viewing adolescents. Second, in view of the existence of different developmental problems in adolescents, we need a huge number of separate preventive programs (e.g., prevention of bullying, substance abuse, gambling etc.) and such programs will be time-consuming if they are implemented in the school context. Third, implementation of preventive programs in the school context would receive strong resistance from school authorities who might argue that their students do not have problems to be prevented. Similar resistance from parents is also expected. Finally, consistent with the beliefs that "problem free is not fully prepared" (3) and that "young people are not problems to be solved but resources to be developed", one may counter-argue that it is more useful to consider how adolescents in Hong Kong can develop using a more positive approach. As argued by Shek (4), instead of solely focusing on adolescent developmental problems, it would be helpful to focus our attention on positive youth development programs (i.e., programs that attempt to cultivate the potentials and skills of adolescents).

Regarding strategies for preventing adolescent developmental issues, researchers highlighted the importance of positive youth development which emphasizes adolescents' resilience, strengths and potential contributions to others and society and advocates that youth problematic behaviors could be more effectively prevented by promoting positive youth development, such as prosocial behaviors, trusting relationships, positive self-identity, a sense of hope, social competence, academic performance, and resilience (5). Evaluative studies of the programs in the field have provided support for the effectiveness of fostering youth developmental assets in reducing problem behaviors (6, 7).

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Nonetheless, most of the positive youth development programs are developed and carried out in the West, particularly the USA. In the context of Asia, a survey of the literature shows that there are very few programs that address adolescent problem behaviors using the positive youth development approach despite the proven effectiveness of such programs in Western studies (8). Amongst the limited number of youth programs, rigorously evaluated programs are almost nonexistent. With specific reference to Hong Kong which is a more Westernized and developed society, although researchers have warned that adolescent problem behavior, such as smoking, drinking, substance abuse, Internet addiction and pathological gambling is rising (9), well-designed positive youth development programs with a systematic evaluation component is lacking. Although some schools in Hong Kong offer courses on personal development under the names of moral education, civic education, or life education, they lack good coherence and logical continuation among the units and across the levels. In short, school-based youth development programs in Hong Kong usually deal with isolated problems and adolescent development issues only (i.e., deficits-oriented programs). They are also relatively short term in nature and lack of systematic and long-term evaluation.

In view of these concerns and to promote holistic development in adolescents in Hong Kong, the Hong Kong Jockey Club Charities Trust has invited academics of five local universities to form a research team, with The Hong Kong Polytechnic University being the lead institution and the first author being the principal investigator, to develop a multi-year universal positive youth development program in the territory (Project P.A.T.H.S.; Positive Adolescent Training through Holistic Social Programmes). There are two tiers of programs in this project. The Tier 1 Program is a universal positive youth development program designed for Secondary 1 to Secondary 3 students. There are 10 h and 20 h of training for the core program and full program in each school year for each grade, respectively. The Tier 2 Program is specifically designed for students who display greater psychosocial needs at each grade (i.e., selective prevention). The design of the program can be seen in the publications of the project (10, 11).

Catalano and his associates (5) reviewed the effectiveness of 77 positive youth development programs. Results showed that only 25 programs were successful and several positive youth development constructs were identified in the successful programs. These constructs include: promotion of bonding, cultivation of resilience, promotion of social competence, promotion of emotional competence, promotion of cognitive competence, promotion of behavioral competence, promotion of moral competence, cultivation of self-determination, promotion of spirituality, development of self-efficacy, development of a clear and positive identity, promotion of beliefs in the future, provision of recognition for positive behavior, provision of opportunities for prosocial involvement, and fostering prosocial norms. To help adolescents develop in a holistic manner, these 15 adolescent developmental constructs are included in Project P.A.T.H.S., particularly in the Tier 1 Program.

To provide a comprehensive and complete picture regarding the effectiveness of the project, several evaluation strategies, including objective outcome evaluation, subjective outcome evaluation, qualitative evaluation based on focus groups, student diaries and in-depth interviews, process evaluation, and interim evaluation are employed. Based on the data collected in the Experimental Implementation Phase and Full Implementation Phase, there are results demonstrating the effectiveness of the program via objective outcome evaluation, subjective outcome evaluation, process evaluation, interim evaluation and qualitative evaluation (12–15).

Based on longitudinal findings (12, 13, 15, 16), randomized group trials have been carried out to examine the effectiveness of the Tier 1 Program of Project P.A.T.H.S. in Hong Kong. In general, relative to the control participants, three main findings could be highlighted from the existing objective outcome evaluation findings. First, experimental participants showed better development in terms of different positive youth development indicators. Second, experimental participants displayed lower levels of substance abuse. Third, experimental subjects showed lower levels of delinquent behavior. As the present objective outcome evaluation findings are limited to the junior secondary school years (i.e., Secondary 1 to Secondary 3 levels), it would be illuminating to understand the effectiveness of the program beyond the junior secondary school years. As such, the present study examined the longitudinal impact of Project P.A.T.H.S. via individual growth curve models based on seven waves of data (i.e., Secondary 1 to Secondary 4).

Methods

During 2006–2009, a total of 7846 Secondary 1 students (equivalent to Grade 1) were recruited from 48 schools. Shek and associates (17) described the procedures and criteria for recruiting the initial 24 experimental schools and 24 control schools.

Students were measured at baseline in the Fall of 2006 (wave 1) and then followed longitudinally across waves (wave 2: Spring 2007; wave 3: Fall 2007; wave 4: Spring 2008; wave 5: Fall 2008; wave 6: Spring 2009; wave 7: Spring 2010). In year 1 (2006/07), one school withdrew after wave 1. In year 2 (2007/08), wave 3 and 4 data were collected from the same cohort, with 20 experimental schools (i.e., three schools withdrew after wave 2) and 24 control schools. In year 3 (2008/09), waves 5 and 6 data were collected from the same cohort with 19 experimental schools (i.e., one experimental school dropped out after wave 4) and 24 control schools. In year 4, wave 7 data were collected from the same cohort promoting to Secondary 4. A total of 4186 students completed all seven waves of the study (53%). The number of completed questionnaires collected in each measurement occasion can be seen in Table 1.

At pre- and post-test, the purpose of the study was mentioned, and confidentiality of the collected data was repeatedly emphasized to all students in attendance on the day of testing. Parental and student consent had been obtained prior to data collection. All participants responded to all scales in the questionnaire in a self-administration format. Adequate time was provided for the participants to complete the questionnaire. A trained research assistant was present throughout the administration process.

Instruments

Consistent with procedures used in previous years, the participants were invited to respond to a questionnaire that comprised different

Table 1 Number of collected questionnaires across waves.

n (Schools)	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5	Wave 6	Wave 7
	48	47[a]	44[b]	44	43[c]	43	43
n (Participants)	7846	7388	6939	6697	6876	6733	6116
Control group	3797	3654	3765	3698	3757	3727	3442
Male	1936	1876	1896	1888	1874	1894	1770
Female	1613	1619	1666	1599	1682	1679	1592
Experimental group	4049	3734	3174	2999	3119	3006	2674
Male	2154	1998	1691	1548	1632	1591	1408
Female	1745	1571	1283	1259	1312	1278	1155
% of successfully matched	98%	96%	97%	98%	99%	97%	93%

[a]One experimental school (n=207) had withdrawn after wave 1. [b]Three experimental schools (n=629) had withdrawn after wave 2. [c]One experimental school (n=71) had withdrawn after wave 4.

measures of youth development at pretest (i.e., before the program began) and post-test (i.e., after the program ended). The following measures were used:

Chinese Positive Youth Development Scale (CPYDS) The items in the 15 subscales of the CPYDS are as follows:

1. Bonding Subscale (six items)
2. Resilience Subscale (six items)
3. Social Competence Subscale (seven items)
4. Emotional Competence Subscale (six items)
5. Cognitive Competence Subscale (six items)
6. Behavioral Competence Subscale (modified five items)
7. Moral Competence Subscale (six items)
8. Self-determination Subscale (five items)
9. Self-efficacy Subscale (modified two items)
10. Beliefs in the Future Subscale (modified three items)
11. Clear and Positive Identity Subscale (seven items)
12. Spirituality Subscale (seven items)
13. Prosocial Involvement Subscale (five items)
14. Prosocial Norms Subscale (five items)
15. Recognition for Positive Behavior Subscale (four items).

As mentioned by Shek (4), different composite indices derived from the scale were used to assess positive youth development. First and foremost, according to Shek et al. (17), the mean of the total mean score based on 12 subscales (excluding behavioral competence, self-determination, prosocial norms) could be used as an overall measure of positive youth development (CPYDS-12). Next, as it can be argued that constructs including spirituality, prosocial norms, prosocial involvement, bonding and recognition for positive behavior are different from the rest of the scales, a summation of 10 subscales (CPYDS-10) assessing psychosocial competence and strengths was used (i.e., resilience, social competence, emotional competence, cognitive competence, behavioral competence, moral competence, self-determination, self-efficacy, beliefs about the future and clear and positive identity). Third, based on conceptual analyses of the items, one key item was derived for each domain which resulted in a 15-item key measure (KEY15). Fourth, based on item analysis, a 36-item measure was derived (KEY36). Shek and Ma (18) also showed that the 15 scales in the CPYDS could be further reduced to four dimensions, including cognitive-behavioral competencies (CBC), prosocial attributes (PA), positive identity (PID) and general positive youth development qualities (GPYDQ). In general, high scores of these variables suggested better positive youth development. The internal consistency of these measures can be seen in Table 2.

School adjustment measures (SA) Three items were used to assess the school adjustment of the participants. The first item assessed a respondent's perception of their academic performance when compared with schoolmates in the same grade. The respondents were asked to rate "best", "better than usual", "ordinary", "worse than usual" or "worst" in this item. The second item assessed the respondent's satisfaction with their academic performance using a five-point response format, i.e., "very satisfied", "satisfied", "average", "dissatisfied" and "very dissatisfied". The final item assessed the respondent's perception of their conduct, in which the respondents were asked to rate "very good", "good", "average", "poor" or "very poor". Previous research findings showed that these three items and the related scale were temporally stable and valid (19). Similarly, a higher scale score indicates a higher level of school adjustment.

Delinquency Scale This scale comprises 12 items that assess the frequency of delinquent behavior of the participants in the past year, including stealing, cheating, truancy, running away from home, damaging others' properties, assault, having sexual intercourse with others, group fighting, speaking foul language, staying outside home overnight without parental consent, strong arming others, and trespasses (20). Respondents rated the frequency of these behaviors in the past half a year on a six-point Likert scale (0=never, 1=one to two times; 2=three to four times; 3=five to six times; 4=seven to eight times; 5=nine to ten times; 6=more than ten times).

Substance Use Scale Eight items were used to assess the participants' frequency of using different types of substance in the past half a year, including alcohol, tobacco, ketamine, cannabis, cough mixture, organic solvent, pills (including ecstasy and methaqualone) and heroin. Participants rated their occurrence of these behaviors on a six-point Likert scale (0=never; 1=one to two times; 2=three to five times; 3=more than five times; 4=several times a month; 5=several times a week; 6=everyday). As severity and reason for consuming different substances (e.g., alcohol and heroin) are not the same, separate analyses were carried out for different types of drugs. A composite score of commercially available substances (CAS) was also calculated by averaging the item scores on alcohol and tobacco to examine the growth trajectories of both groups.

Problem Behavior Intention Scale Five items were used to assess the participants' behavioral intention to engage in problem behavior, including drinking alcohol, smoking, taking drugs (such as ketamine, cannabis or ecstasy), having sex with others and gambling (21). Respondents were asked to rate the likelihood that they may

Table 2 Internal consistency and mean inter-item correlations for all variables.[a]

	Wave 1		Wave 2		Wave 3		Wave 4		Wave 5		Wave 6		Wave 7	
	α	mean[b]	α	mean[b]	α	mean[b]	α	mean[b]	α	mean[b]	α	mean[b]	α	mean[b]
BO	0.83	0.45	0.85	0.49	0.86	0.51	0.88	0.55	0.88	0.54	0.88	0.55	0.86	0.51
RE	0.82	0.44	0.86	0.50	0.88	0.54	0.88	0.55	0.88	0.55	0.89	0.56	0.86	0.51
SC	0.83	0.42	0.86	0.47	0.87	0.51	0.88	0.52	0.87	0.50	0.89	0.53	0.87	0.49
PB	0.76	0.44	0.80	0.51	0.83	0.55	0.84	0.58	0.83	0.56	0.85	0.58	0.82	0.54
EC	0.83	0.44	0.85	0.48	0.86	0.51	0.86	0.51	0.86	0.51	0.87	0.52	0.85	0.49
CC	0.84	0.47	0.86	0.52	0.87	0.54	0.88	0.55	0.88	0.54	0.88	0.56	0.86	0.52
BC	0.76	0.38	0.80	0.44	0.82	0.47	0.83	0.50	0.82	0.48	0.83	0.49	0.81	0.46
MC	0.78	0.37	0.79	0.39	0.81	0.42	0.82	0.43	0.80	0.41	0.82	0.44	0.79	0.39
SD	0.76	0.40	0.80	0.44	0.82	0.48	0.82	0.48	0.81	0.47	0.82	0.47	0.80	0.46
SE	0.50	0.34	0.56	0.39	0.58	0.41	0.61	0.44	0.59	0.42	0.61	0.43	0.61	0.44
CPI	0.84	0.43	0.85	0.45	0.87	0.48	0.87	0.49	0.86	0.47	0.87	0.48	0.85	0.46
BF	0.82	0.61	0.83	0.62	0.84	0.64	0.84	0.65	0.84	0.65	0.85	0.66	0.79	0.57
PI	0.83	0.49	0.83	0.50	0.86	0.55	0.86	0.54	0.85	0.52	0.86	0.55	0.86	0.54
PN	0.77	0.40	0.80	0.45	0.81	0.46	0.81	0.47	0.81	0.46	0.81	0.46	0.82	0.47
SP	0.88	0.51	0.89	0.56	0.91	0.60	0.91	0.62	0.91	0.60	0.92	0.62	0.91	0.61
KEY15	0.88	0.32	0.89	0.35	0.90	0.38	0.90	0.38	0.90	0.37	0.90	0.39	0.89	0.35
KEY36	0.97	0.32	0.98	0.34	0.98	0.37	0.98	0.37	0.98	0.36	0.98	0.38	0.95	0.36
CPYDS-10	0.93	0.56	0.93	0.59	0.94	0.61	0.94	0.62	0.94	0.61	0.94	0.62	0.97	0.36
CPYDS-12	0.94	0.56	0.94	0.56	0.95	0.59	0.95	0.58	0.95	0.58	0.95	0.60	0.97	0.34
CBC	0.85	0.66	0.87	0.69	0.88	0.71	0.89	0.72	0.88	0.71	0.88	0.72	0.87	0.69
PA	0.79	0.65	0.77	0.62	0.79	0.66	0.77	0.63	0.78	0.64	0.79	0.66	0.79	0.65
GPYDQ	0.89	0.52	0.89	0.53	0.90	0.55	0.90	0.55	0.90	0.54	0.90	0.57	0.89	0.53
PID	0.83	0.72	0.84	0.73	0.85	0.75	0.86	0.76	0.85	0.74	0.86	0.76	0.84	0.74
SA	0.70	0.44	0.72	0.46	0.72	0.46	0.74	0.48	0.73	0.47	0.73	0.47	0.72	0.46
BEINT	0.76	0.47	0.78	0.47	0.79	0.49	0.78	0.46	0.79	0.47	0.79	0.46	0.89	0.62

[a]All parameters were significant ($p<0.05$). [b]Mean inter-item correlation. BC, behavioral competence; BEINT, problem behavioral intention; BF, beliefs in the future; BO, bonding; CBC, cognitive-behavioral competencies second-order factor; CC, cognitive competence; CPI, clear and positive identity; CPYDS, Chinese Positive Youth Development Scale; CPYDS-10, 10 subscales of the CPYDS; CPYDS-12, 12 subscales of the CPYDS; EC, emotional competence; GPYDQ, general positive youth development qualities second-order factor; KEY15, indicator based on 15 key items of the CPYDS; KEY36, indicator based on 36 key items of the CPYDS; MC, moral competence; PA, prosocial attributes second-order factor; PB, recognition for positive behavior; PI, prosocial involvement; PID, positive identity second-order factor; PN, prosocial norms; RE, resilience; SA, school adjustment measures; SC, social competence; SD, self-determination; SE, self-efficacy; SP, spirituality.

engage in these problem behaviors in the next 2 years on a four-point Likert scale (1=never; 2=not likely; 3=likely; 4=definitely). The internal consistency of this measure can be seen in Table 2.

Data analytic strategies Individual growth curve (IGC) is an advanced statistical technique which is conducted to examine "aggregates" of individual curves rather than separate analysis of each individual growth curve (22). This method models individual change over time, determines the shape of the growth curves, explores systematic differences in change, and examines the effects of covariates (e.g., treatment) on group differences in the initial status and the rate of growth. A survey of the literature shows that the term "individual growth curve modeling" is commonly used in the field (23, 24).

IGC is an appropriate approach in studying individual change as it creates a two-level hierarchical model that nested time within individual (25, 26). The Level 1 model refers to the within-person or intra-individual change model (i.e., repeated measurements over time). It focuses on the individual and describes the developmental changes for each individual (i.e., the variation within individual over time). The Level 1 model estimates the average within-person initial status and rate of change over time. No predictors are included in this model. The basic linear growth model is shown below:

Level 1 model:

$$Y_{ij} = \beta_{0j} + \beta_{1j}\,(\text{Time}) + e_{ij} \quad [1]$$

In our study, β_0 is the initial status (i.e., wave 1) of the outcome variable for individual i. β_1 is the linear rate of change for individual i and e_{ij} is the residual in the outcome variable for individual i at Time t. Y_{ij} is the repeatedly measured of the outcome variable for an individual i at Time t.

To test a non-linear individual growth trajectory across time, other higher order polynomial trends (i.e., quadratic and cubic slopes) can also be included for model testing. This is shown in Eq. [2], in which *Time* (i.e., the linear slope, β_1) remains, while $Time^2$ (i.e., quadratic slope, β_2) and $Time^3$ (i.e., cubic slope, β_3), are added in the model.

$$Y_{ij} = \beta_{0j} + \beta_{1j}\,(\text{Time}) + \beta_{2j}\,(\text{Time}^2) + \beta_{3j}\,(\text{Time}^3) + e_{ij} \quad [2]$$

The Level 2 model captures whether the rate of change varies across individuals in a systematic way. The growth parameters (i.e., the within-subjects intercepts and slope) of Level 1 are the outcome variables to be predicted by the between-subjects variables at Level 2. At this level (see Eq. [3]), an explanatory variable (such as, *group* in the present study) is included to analyze the predictor's effect on inter-individual variation of outcome variable. The errors are assumed to be independent and normally distributed and that the variance is equal across individuals (26).

Level 2 model:

$$Y_{ij} = \gamma_{0i} + \gamma_{1i} (\text{Time}) + \gamma_{2i} (\text{Time}^2) + \gamma_{3i} (\text{Time}^3) + \gamma_{01} (\text{group}) + \gamma_{11} (\text{group} \times \text{Time}) + \gamma_{21} (\text{group} \times \text{Time}^2) + \gamma_{31} (\text{group} \times \text{Time}^3) + r_{oi} + r_{1i} + \varepsilon_{ij} \quad [3]$$

In our study, Y_{ij} is the grand mean for the outcome variable for the whole sample at Time *t*. γ_{0i} is the initial status of the outcome variable for the whole sample at Time *t*. γ_{1i} is the linear slope of change relating to the outcome variable for the whole sample at Time *t*. γ_{2i} is the quadratic slope of change relating to the outcome variable for the whole sample at Time *t*. γ_{3i} is the cubic slope of change relating to the outcome variable for the whole sample at Time *t*. γ_{01}, γ_{11}, γ_{21}, γ_{31}, are used to test whether the predictor (i.e., *group*) is associated with the initial status, linear growth, quadratic growth, and cubic growth, respectively. r_{oi}, r_{1i} and ε_{ij} are the residual errors that is not explained by Level 2 predictors.

In this study, we tested whether treatment was predictive of students' growth parameters (i.e., initial status, linear change, quadratic change and cubic change) in several positive youth development qualities and other indicators across time. In particular, the relationships between these indicators and group were estimated after controlling the effects of gender and initial age. The intercept (i.e., initial status) and linear slope were allowed to vary across individuals. To examine the amount of total variation in the outcome variables that is related to between-individual differences, the intraclass correlation coefficient (ICC) is calculated.

A dummy variable was created (i.e., *group* – control vs. experimental groups) as a predictor. Participants in the control group were coded as −1 and those in the experimental group as 1. Two covariates (i.e., gender and initial age) were included when examining the predictive program effect on the outcome variables. *Gender* was coded as −1=male and 1=female. Similar coding method for a dichotomous variable was found in previous studies (25, 27). For the continuous variables, grand mean centering method was generally recommended in order to simply the interpretation of the results (28). In our study, the mean age was 12. *Initial age* was then centered by subtracting the mean age, and therefore, the centered initial age was generated.

Following the strategy suggested by Singer and Willet (22), several models were tested. These included: (a) an unconditional model was tested to calculate the ICC; (b) an unconditional growth model served as a baseline model to explore whether the growth curves are linear or curvilinear; (c) two higher order polynomial models were estimated to determine if the rate of change accelerated or decelerated across time; and (d) a conditional model was formed to investigate whether the predictor was related to the growth parameters (i.e., initial status, linear growth, quadratic growth, and cubic growth). The intercept and linear slope were allowed to vary across individuals. Missing data were handled through likewise deletion.

To facilitate the interpretations of the significant interaction effects, we plotted prototypical trajectories as suggested by Singer and Willett (22) in order to demonstrate the effect of treatment on the rate of change across time. The step in creating prototypical plots is generally identical to the method of plotting graphs in regression (29). For each outcome variable, a linear mixed model (LMM) via SPSS version 17.0 (Chicago, IL, USA) with maximum likelihood estimation was conducted. As we focused on the entire model (both fixed and random effects), maximum likelihood (ML) method was used (28). The procedures for analyzing longitudinal data via SPSS can be seen in Shek and Ma (30).

Results

Using schools as the units of analysis, results showed that the 19 experimental schools and 24 control schools did not differ in their school characteristics in the aspects of banding (i.e., categorization of students' academic competence), districts, religious affiliation, gender of the students and source of funding. For the personal characteristics of the participants, results showed that there were no statistically significant differences between the two groups in their socio-demographic background characteristics ($p>0.05$ in all cases), except age. The mean age of the control group was higher than that of the experimental group. In other words, the background characteristics of the experimental schools and control schools were highly comparable at wave 1.

Based on the unconditional model, the values of ICC ranged from 0.29 to 0.65 (Tables 3 and 4). The high ICC value (above 0.20) indicated the nested structure of the data (31). Also, it suggested that over 29% of the total variation in all variables was related to individual differences.

The IGC findings based on several indicators derived from the CPYDS are presented in Table 5. Results showed that there were significant interactions of group and slopes for KEY15, KEY36, GPYDS (general positive youth development qualities second-order factor), PID (positive identity second-order factor), PA (prosocial attributes second-order factor), CBC (cognitive-behavioral competencies), CPYDS-10 (positive youth development based on 10 subscales of the CPYDS), CPYDS-12 (positive youth development based on 12 subscales of the CPYDS), and SA (school academic adjustment).

KEY15 The average growth curve revealed that KEY15 decreased at the beginning ($\beta=-0.20$, SE=0.01, $p<0.01$). This trend was accelerated later ($\beta=0.12$, SE=0.01, $p<0.01$), but declined at the end ($\beta=-0.02$, SE=0.00, $p<0.01$). Group was a significant predictor of the linear, quadratic and cubic slopes in the KEY15 ($p<0.05$), but not associated with the initial status ($p>0.05$) (Table 5). Regarding the growth trajectories of KEY15, the experimental group had a steady rate of change as compared with the control group (i.e., declined slower and accelerated gradually). This was supported in Figure 1. Both groups had similar initial status, significant group difference was shown after wave 2, and this gap grew wider in wave 7.

KEY36 Similar to KEY15, a S-shaped growth curve was shown in this model (i.e., negative signs of the linear and cubic slopes and positive quadratic slope, Table 5). Results indicated that group significantly predicted the linear, quadratic, and cubic slopes of KEY36 ($p<0.01$). The test of group difference in initial status of KEY36 was not significant ($p>0.05$). Consistent with the results of KEY15, the control group dropped faster (linear slope: $\beta=1.87$, SE=0.53, $p<0.01$; cubic slope: $\beta=0.21$, SE=0.06, $p<0.01$) and accelerated slower (quadratic slope: $\beta=-1.17$, SE=0.36, $p<0.01$) as compared with the experimental group. This indicated that the initial status was similar for control and experimental groups. However, the gap between the groups became bigger over time (Figure 2).

PID The trends in the above indicators were also shown in PID. The interactions of group and PID were significant ($p<0.01$) in all growth parameters (i.e., linear, quadratic, and

Table 3 Results of intraclass correlation coefficients and random effects for all positive youth indicators.

	Subjects joining the Tier 1 Program as experimental subjects				Subjects joining the Tier 1 Program and regarded the program as beneficial				
	KEY15	KEY36	PID	SA	CPYDS-10	CPYDS-12	CBC	GPYDQ	PA
Within-individual variance									
M1	0.17	200.18	0.31	0.24	0.16	0.15	0.20	0.15	0.28
M2	0.17	189.22	0.30	0.23	0.14	0.13	0.18	0.14	0.25
M3	0.17	184.74	0.30	0.23	0.14	0.13	0.18	0.14	0.25
Between-individual variance									
Intercept									
M1	0.37	544.66	0.58	0.31	0.35	0.38	0.34	0.36	0.42
M2	0.35	514.53	0.55	0.29	0.30	0.32	0.29	0.31	0.35
M3	0.34	511.34	0.55	0.29	0.30	0.32	0.29	0.30	0.34
Linear slope									
M1	0.02	25.37	0.03	0.02	0.02	0.02	0.02	0.02	0.02
M2	0.02	25.05	0.03	0.02	0.02	0.02	0.02	0.02	0.02
M3	0.02	24.88	0.03	0.02	0.02	0.02	0.02	0.02	0.02
Baseline model									
Within-individual	0.20	237.74	0.36	0.28	0.18	0.18	0.22	0.18	0.31
Between-individual	0.31	440.27	0.49	0.29	0.30	0.33	0.28	0.31	0.35
ICC	0.61	0.65	0.58	0.51	0.62	0.65	0.56	0.64	0.53

CBC, cognitive-behavioral competencies second-order factor; CPYDS, Chinese Positive Youth Development Scale; CPYDS-10, 10 subscales of the CPYDS; CPYDS-12, 12 subscales of the CPYDS; GPYDQ, general positive youth development qualities second-order factor; ICC, intraclass correlation coefficients; KEY15, indicator based on 15 key items of the CPYDS; KEY36, indicator based on 36 key items of the CPYDS; M1, baseline growth model; M2, predictors only model; M3, predictors and covariates model; PA, prosocial attributes second-order factor; PID, positive identity second-order factor; SA, school adjustment measures.

cubic slopes), except in the initial status ($p>0.05$). Compared to the experimental group, control group declined more rapidly (linear slope: $\beta=0.06$, SE=0.02, $p<0.01$; cubic slope: $\beta=0.01$, SE=0.00, $p<0.01$) and accelerated slower ($\beta=-0.04$, SE=0.01, $p<0.01$). These findings further supported the beneficial treatment effect on participants' perceptions of positive identity over time (Figure 3).

SA Another mixed model was used to test the effect of treatment on school adjustment performance. Group was significantly associated with linear ($\beta=0.05$, SE=0.02, $p<0.01$) and quadratic slopes ($\beta=-0.02$, SE=0.01, $p<0.05$), but was not related with other growth parameters ($p>0.05$). This indicated that the control group had a steeper initial decline and accelerated slower in SA than the experimental group (Figure 4).

The positive treatment effects on positive youth development indicators were further supported by comparing the control participants and experimental participants who found the program to be beneficial (i.e., response to SOS-20 in the positive direction). Significant interactions with group and slopes were found in the five indicators (i.e., CPYDS-10, CPYDS-12, CBC, GPYDQ and PA). In particular, more significant findings were shown in these analyses. Group significantly predicted all growth parameters, including the initial status, linear, quadratic, and cubic slopes ($p<0.01$). Specifically, the experimental group experienced a steady growth in the positive youth indicators as compared to the control group (i.e., decline slower and accelerated faster) (Figures 5–9).

Apart from positive youth developmental outcomes, treatment effects on participants' past and future engagement in substance use and delinquent behaviors were examined. Consistent with the positive youth indicator models, group was significantly associated with all growth parameters ($p<0.05$) in the three models (i.e., BEINT, problem behavioral intention; CAS, commercially available substance; and FOUL, foul language), except the initial statuses of BEINT and CAS ($p>0.05$).

BEINT The effect of treatment was significantly related to all growth parameters ($p<0.01$), except in the initial status ($p<0.05$). The control group increased faster (linear slope: $\beta=0.04$, SE=0.01, $p<0.01$; cubic: $\beta=0.01$, SE=0.00, $p<0.01$), but decelerated slower (quadratic slope: $\beta=0.04$, SE=0.01, $p<0.01$) than the experimental group. These results indicated that the control group had a faster growth in behavioral intention to engage in problem behavior than the experimental group over time and this difference slightly increased over time (Figure 10).

CAS The effects of group were significantly related to the linear, quadratic, and cubic slopes of CAS ($p<0.01$), but not the initial status ($p>0.05$). The control group showed a faster rate of linear change ($\beta=0.07$, SE=0.02, $p<0.01$) and slower rate of deceleration ($\beta=-0.05$, SE=0.01, $p<0.01$) as compared with the experimental group. Also, the control group had a steeper cubic slope as compared with the experimental group ($\beta=0.01$, SE=0.00, $p<0.01$). However, the gap between the groups was generally small as shown in Figure 11.

Table 4 Results of intraclass correlation coefficients and random effects for all risk and delinquent behaviors.

	Subjects joining the Tier 1 Program as experimental subjects				Subjects joining the Tier 1 Program and regarded the program as beneficial					
	BEINT	CAS	FOUL	TRESPASSES[c]	CANNABIS[c]	COUGH[c]	ECSTACY[c]	HEROIN[c]	DAMAGE[c]	FIGHTS[c]
Within-individual variance										
M1	0.18	0.39	2.46	0.25	0.09	0.11	0.10	0.09	0.47	0.31
M2	0.16	0.34	2.36	0.20	0.07	0.08	0.07	0.06	0.40	0.25
M3	0.16	0.34	2.36	0.20	0.07	0.08	0.07	0.06	0.40	0.25
Between-individual variance										
Intercept										
M1	0.12	0.47	2.66	0.10	0.11	0.09	0.11	0.09	0.27	0.17
M2	0.10	0.37	2.52	0.05	0.02	0.02	0.02	0.02	0.19	0.10
M3	0.09	0.35	2.48	0.05	0.02	0.02	0.02	0.02	0.18	0.09
Linear slope										
M1	0.04	0.08	0.25							
M2	0.02	0.06	0.25							
M3	0.02	0.06	0.24							
Baseline model										
Within-individual	0.22	0.39	2.46	0.25	0.09	0.11	0.10	0.09	0.47	0.31
Between-individual	0.20	0.47	2.66	0.10	0.11	0.09	0.11	0.09	0.27	0.17
ICC	0.48	0.55	0.52	0.29	0.55	0.45	0.52	0.50	0.36	0.35

[c]Time was not allowed to vary in this model because of the iteration problem. BEINT, problem behavioral intention; CANNABIS, substance use (cannabis); CAS, commercially available substance use (alcohol and tobacco); COUGH, substance use (cough mixture); DAMAGE, delinquent behavior (property damage); ECSTACY, substance use (ecstasy); FIGHTS, delinquent behavior (group fights); FOUL, delinquent behavior (foul language); HEROIN, substance use (heroin); ICC, intraclass correlation coefficients; M1, baseline growth model; M2, predictors only model; M3, predictors and covariates model; TRESPASSES, delinquent behavior (trespasses).

Table 5 Results of growth curve models for all positive youth indicators.

	Subjects joining the Tier 1 Program as experimental subjects				Subjects joining the Tier 1 Program and regarded the program as beneficial				
	KEY15	KEY36	PID	SA	CPYDS-10	CPYDS-12	CBC	GPYDQ	PA
Intercept									
Initial status	4.47[a]	158.96[a]	4.34[a]	3.27[a]	4.55[a]	4.61[a]	4.69[a]	4.69[a]	4.69[a]
Group	0.01	0.15	0.01	0.01	0.05[a]	0.05[a]	0.05[a]	0.05[a]	0.05[a]
Gender	0.08[a]	2.93[a]	0.03[a]	0.06[a]	0.07[a]	0.08[a]	0.06[a]	0.09[a]	0.13[a]
Age	–0.03[a]	–1.64[a]	–0.07[a]	–0.09[a]	–0.03[a]	–0.04[a]	–0.02	–0.04[a]	–0.06[a]
Linear slope									
Initial status	–0.20[a]	–9.05[a]	–0.26[a]	–0.36[a]	–0.17[a]	–0.23[a]	–0.16[a]	–0.23[a]	–0.31[a]
Group	0.03[b]	1.87[a]	0.06[a]	0.05[a]	0.06[a]	0.08[a]	0.04[a]	0.06[a]	0.08[a]
Gender	–0.08[a]	–4.06[a]	–0.14[a]	–0.09[a]	–0.10[a]	–0.10[a]	–0.08[a]	–0.09[a]	–0.11[a]
Age	0.04[b]	2.41[a]	0.08[a]	0.13[a]	0.04[a]	0.05[a]	0.03	0.05[a]	0.05[a]
Quadratic slope									
Initial status	0.12[a]	5.37[a]	0.15[a]	0.17[a]	0.10[a]	0.12[a]	0.09[a]	0.11[a]	0.15[a]
Group	–0.02[b]	–1.17[a]	–0.04[a]	–0.02[b]	–0.04[a]	–0.05[a]	–0.03[a]	–0.04[a]	–0.06[a]
Gender	0.03[a]	2.02[a]	0.08[a]	0.04[a]	0.05[a]	0.05[a]	0.03[a]	0.04[a]	0.06[a]
Age	–0.02	–1.26[a]	–0.04[a]	–0.07[a]	–0.02[b]	–0.02[b]	–0.02	–0.02[b]	–0.02
Cubic slope									
Initial status	–0.02	–0.86[a]	–0.03[a]	–0.03[a]	–0.02[a]	–0.02[a]	–0.01[a]	–0.02[a]	–0.02[a]
Group	0.00[b]	0.21[a]	0.01[a]	0.00	0.01[a]	0.01[a]	0.01[b]	0.01[a]	0.01[a]
Gender	0.00[b]	–0.29[a]	–0.01[a]	–0.01[b]	–0.01[a]	–0.01[a]	0.00	0.01[a]	–0.01[a]
Age	0.00	0.19[b]	0.01[b]	0.01[a]	0.00	0.00	0.00	0.00	0.00

[a]$p<0.01$. [b]$p<0.05$. CBC, cognitive-behavioral competencies second-order factor; CPYDS, Chinese Positive Youth Development Scale; CPYDS-10, 10 subscales of the CPYDS; CPYDS-12, 12 subscales of the CPYDS; GPYDQ, general positive youth development qualities second-order factor; KEY15, indicator based on 15 key items of the CPYDS; KEY36, indicator based on 36 key items of the CPYDS; PA, prosocial attributes second-order factor; PID, positive identity second-order factor; SA, school adjustment measures.

FOUL The interactions of group and FOUL were significant in all growth parameters ($p<0.05$). Compared to the experimental group, the control group increased more rapidly (linear slope: $\beta=0.12$, SE=0.06, $p<0.05$; cubic slope: $\beta=0.03$, SE=0.01, $p<0.01$) and decelerated slower ($\beta=-0.14$, SE=0.04, $p<0.01$). These findings further supported the beneficial treatment effect on participants' engagement in problem behaviors over time (Figure 12).

Significant treatment effects were also shown in other indicator models:

- TRESPASSES, delinquent behavior (trespasses)
- CANNABIS, substance use (cannabis)
- COUGH, substance use (cough mixture)
- ECSTASY, substance use (ecstasy)
- HEROIN, substance use (heroin)
- DAMAGE, delinquent behavior (property damage)
- FIGHTS, delinquent behavior (group fights).

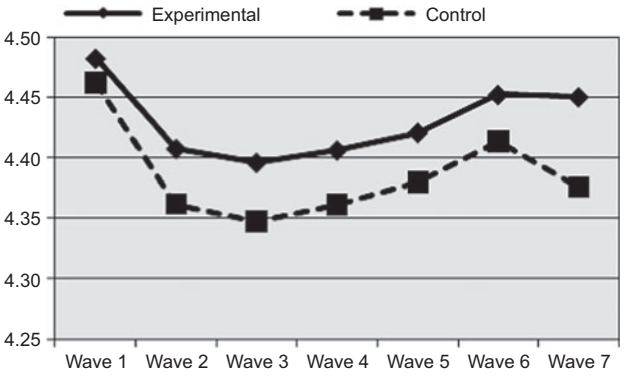

Figure 1 Growth trajectories of the experimental participants and control participants, using KEY15 as an outcome indicator.
KEY15, indicator based on 15 key items of the Chinese Positive Youth Development Scale.

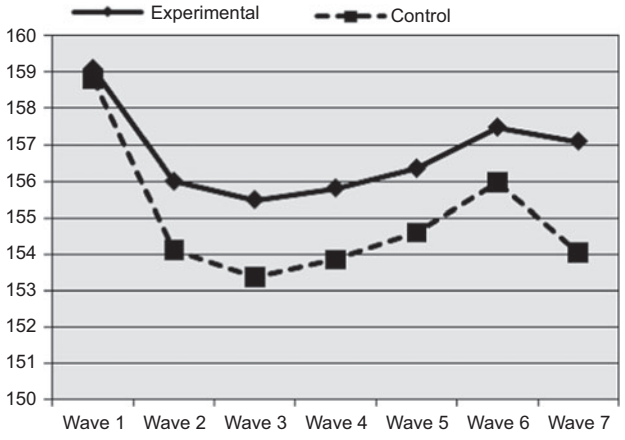

Figure 2 Growth trajectories of the experimental participants and control participants, using KEY36 as an outcome indicator.
KEY36, indicator based on 36 key items of the Chinese Positive Youth Development Scale.

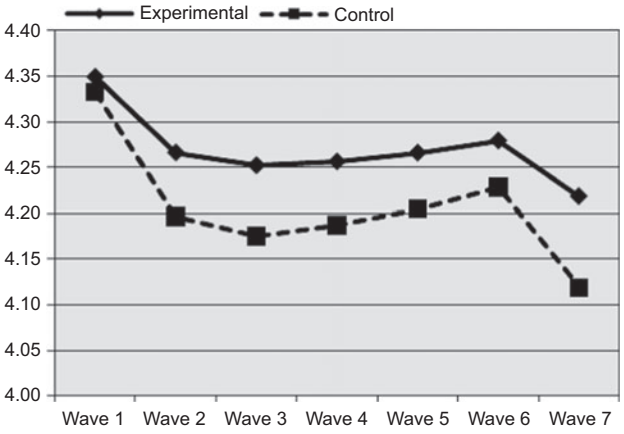

Figure 3 Growth trajectories of the experimental participants and control participants, using PID as an outcome indicator.
PID, positive identity second-order factor.

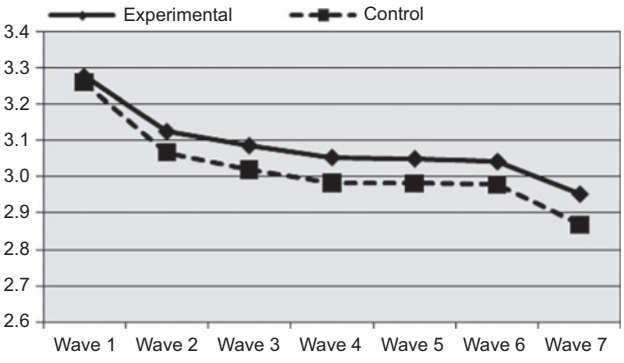

Figure 4 Growth trajectories of the experimental participants and control participants, using SA as an outcome indicator.
SA, school adjustment measures.

Unlike the above mixed model results, cubic term was not significant in these seven indicators ($p>0.05$). This suggested that the initial statuses, linear and quadratic changes of these behaviors differed across individuals, while the growth in cubic slopes of these behaviors remained constant across individuals. As the cubic term was not significant, this parameter was not included in the subsequent model testing procedures.

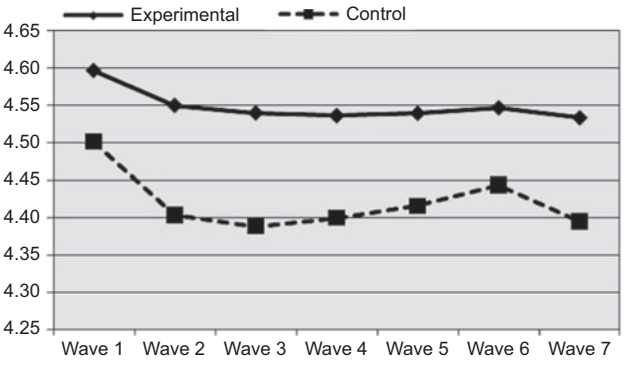

Figure 5 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants, using CPYDS-10 as an outcome indicator.
CPYDS-10, 10 subscales of the Chinese Positive Youth Development Scale.

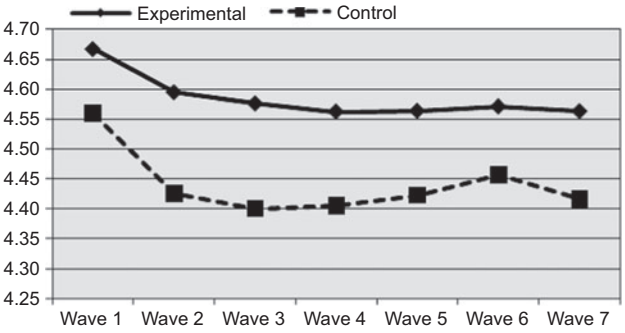

Figure 6 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants, using CPYDS-12# as an outcome indicator.
CPYDS-12, 12 subscales of the Chinese Positive Youth Development Scale.

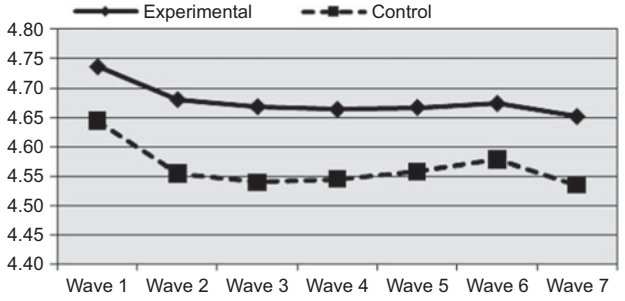

Figure 7 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants using CBC as an outcome indicator.
CBC, cognitive behavioral competencies second-order factor.

TRESPASSES In Table 6, the control group showed a slower rate of linear change compared with the experimental

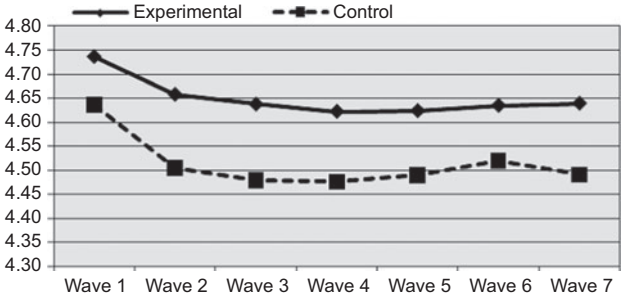

Figure 8 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants using GPYDQ as an outcome indicator.
GPYDQ, general positive youth development qualities second-order factor.

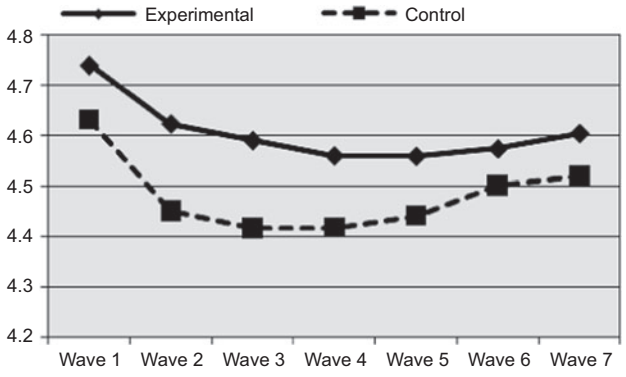

Figure 9 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants using PA as an outcome indicator.
PA, prosocial attributes second-order factor.

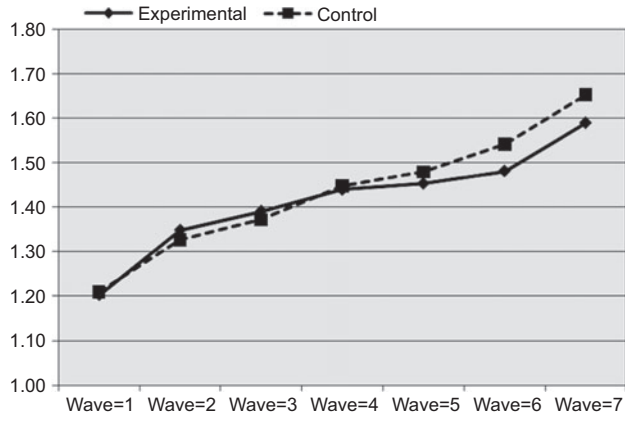

Figure 10 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants using BEINT as an outcome indicator.
BEINT, problem behavioral intention.

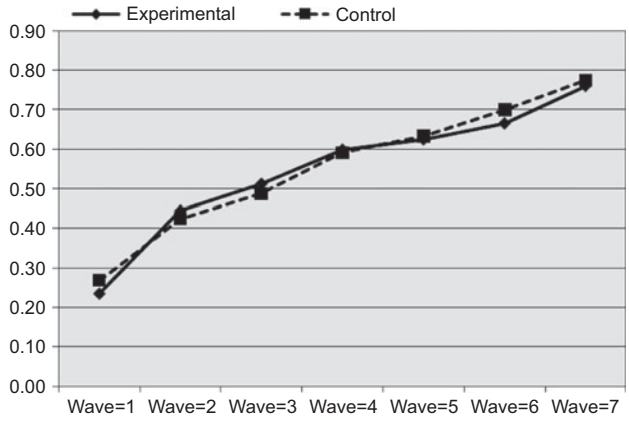

Figure 11 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants using CAS as an outcome indicator.
CAS, commercially available substance use (alcohol and tobacco)

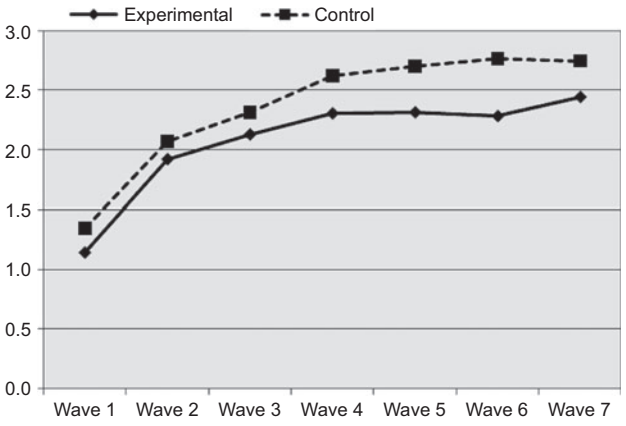

Figure 12 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants using FOUL as an outcome indicator.
FOUL, delinquent behavior (foul language).

group (β=–0.02, SE=0.01, $p<0.01$). In terms of decelerated growth, the control group had a faster rate of deceleration in TRESPASSES when compared with the experimental group (β=0.01, SE=0.00, $p<0.05$). These results reveal that both groups had similar initial status at the beginning. The differences in growth changes between groups became large in waves 2–6, but gradually diminished at the end (Figure 13).

Additional analyses were performed to examine the positive treatment effects on risk and problematic behaviors by comparing the control and experimental participants who found the program to be beneficial. Among the six indicators (CANNABIS, COUGH, ECSTASY, HEROIN, DAMAGE, FIGHTS), group significantly predicted linear and quadratic slopes ($p<0.05$), except in DAMAGE (linear slope: β=–0.02, SE=0.01, $p>0.05$). As shown in Figures 14–19, the control group had a rapid growth in these behaviors as compared with the experimental group (i.e., an inverted U-shaped curve), even though the growth curves of both groups increased across time.

To explore the effects of treatment on all outcome variables, the amount of variance in related to the initial status and linear slope were examined (Tables 3 and 4). Based on the reduction of total variance from Model 1 (M1: baseline growth model) and Model 2 (M2: model with predictors only), treatment had stronger predictive effects in the within-individual variance (4%–33%) and the variances in initial status (5%–82%), but lower in linear slope (1%–50%). Among the between-individual variability of the growth parameters, treatment explained almost half of the variance of linear slope. It is noteworthy that these results did not change much after entering the initial age and gender as covariates (Model 3: model with predictor and covariates).

Lastly, based on Feingold's (32) suggestions, the effect sizes of all IGC models were calculated. The value of effect sizes ranged from 0.00 to 0.03 (linear slope: 0.00–0.08; quadratic slope: 0.00–0.09; cubic slope: 0.00–0.02) which were on the low side.

Table 6 Results of growth curve models for all risk and delinquent behaviors.

	Subjects joining the Tier 1 Program as experimental subjects				Subjects joining the Tier 1 Program and regarded the program as beneficial					
	BEINT	CAS	FOUL	TRESPASSES[a]	CANNABIS[a]	COUGH[a]	ECSTACY[a]	HEROIN[a]	DAMAGE[a]	FIGHTS[a]
Intercept										
Initial status	1.21[b]	0.25[b]	1.25[b]	0.04[b]	0.00	0.01[b]	0.01	0.00	0.11[b]	0.04[b]
Group	0.00	–0.02	–0.10[b]	0.00	0.00	0.00	0.00	0.00	–0.01	0.00
Gender	–0.05[b]	–0.05[b]	–0.17[b]	–0.01	–0.00	0.00	0.00	0.00	–0.05[b]	–0.03[b]
Age	0.06[b]	0.13[b]	0.25[b]	0.02[b]	0.01[b]	0.02[b]	0.01[c]	0.00	0.05[b]	0.04[b]
Linear slope										
Initial status	0.25[b]	0.33[b]	1.46[b]	0.03[b]	0.01[b]	0.01[c]	0.02[b]	0.01[b]	0.11[b]	0.06[b]
Group	0.04[b]	0.07[b]	0.12[c]	–0.02[b]	–0.01[c]	–0.01[c]	–0.01[c]	–0.01[b]	–0.02	–0.03[c]
Gender	0.03	0.06[b]	0.12[c]	–0.01	0.00	–0.01[c]	–0.01[c]	–0.01[c]	–0.03[b]	-0.04[b]
Age	0.02	0.04	–0.22[b]	–0.01	0.00	–0.01	0.00	0.01	–0.03[c]	–0.03[b]
Quadratic slope										
Initial status	–0.08[b]	–0.09[b]	–0.55[b]	–0.01[b]	0.00	0.00	0.00	0.00	–0.02[b]	–0.01[b]
Group	–0.04[b]	–0.05[b]	–0.14[b]	0.01[c]	0.01[c]	0.01[c]	0.01[c]	0.01[b]	0.01[c]	0.01[c]
Gender	–0.02[c]	–0.04[c]	–0.13[b]	0.00	0.00	0.00	0.00	0.01	0.00	0.01[b]
Age	–0.02	–0.03[c]	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.01[b]
Cubic slope										
Initial status	0.01[b]	0.01[b]	0.07[b]							
Group	0.01[b]	0.01[b]	0.03[b]							
Gender	0.00	0.00	0.02[b]							
Age	0.00	0.01[c]	–0.01							

[a]Cubic term is not significant in the unconditional growth curve model. [b]$p<0.01$. [c]$p<0.05$. BEINT, problem behavioral intention; CANNABIS, substance use (cannabis); CAS, commercially available substance use (alcohol and tobacco); COUGH, substance use (cough mixture); DAMAGE, delinquent behavior (property damage); ECSTACY, substance use (ecstasy); FIGHTS, delinquent behavior (group fights); FOUL, delinquent behavior (foul language); HEROIN, substance use (heroin); TRESPASSES, delinquent behavior (trespasses).

Discussion

The purpose of this paper is to examine the effectiveness of a positive youth development program (Project P.A.T.H.S.) in Hong Kong by using individual growth curve modeling. This is the first known scientific study that adopted a randomized group trial design using longitudinal data involving seven waves of data to evaluate a positive youth development program in the Chinese context. In addition, other strengths were found in this study. First, the sample size was large and randomly drawn which could help to generalize the findings. Second, a validated measure of positive youth development – the Chinese Positive Youth Development Scale was used in the study. Finally, individual growth curve modeling, which was superior to generalized linear models, was used in this study.

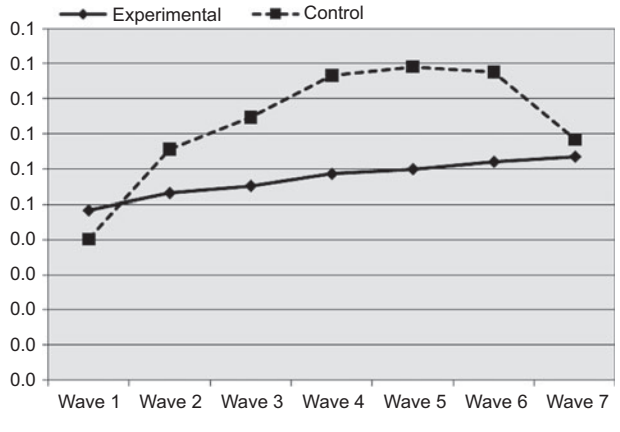

Figure 13 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants using TRESPASSES as an outcome indicator.
TRESPASSES, delinquent behavior (trespasses).

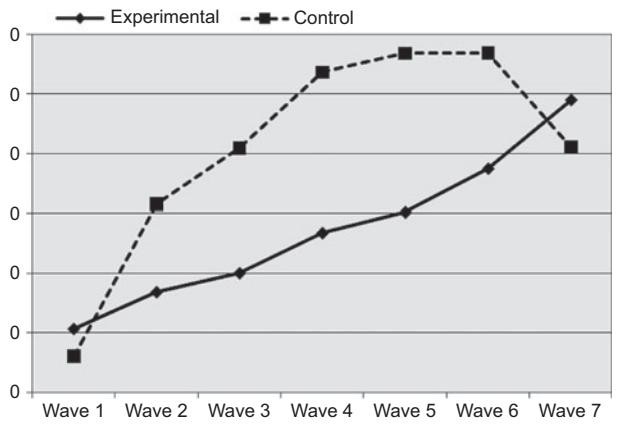

Figure 14 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants using CANNABIS as an outcome indicator.
CANNABIS, substance use (cannabis).

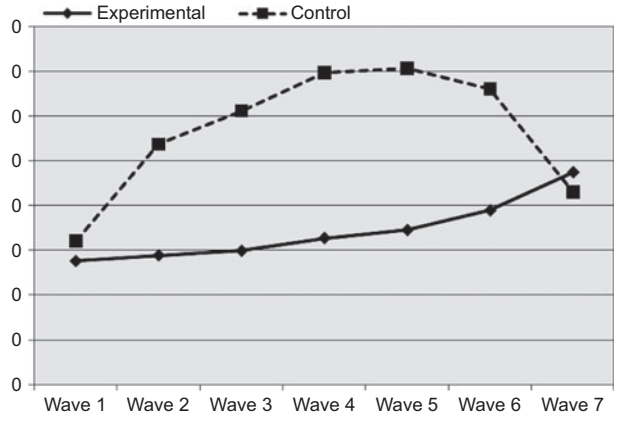

Figure 15 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants using COUGH as an outcome indicator.
COUGH, substance use (cough mixture).

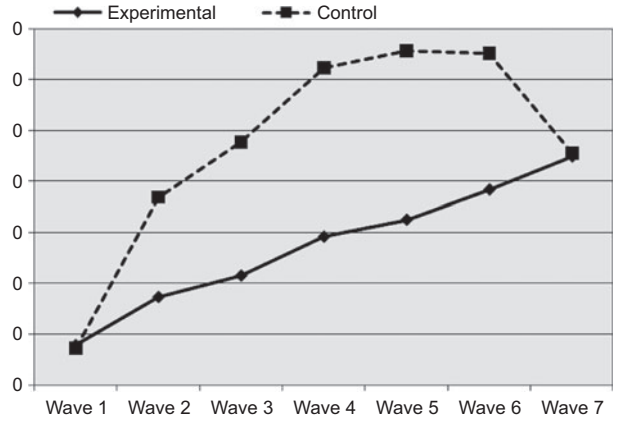

Figure 16 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants using ECSTACY as an outcome indicator.
ECSTACY, substance use (ecstasy).

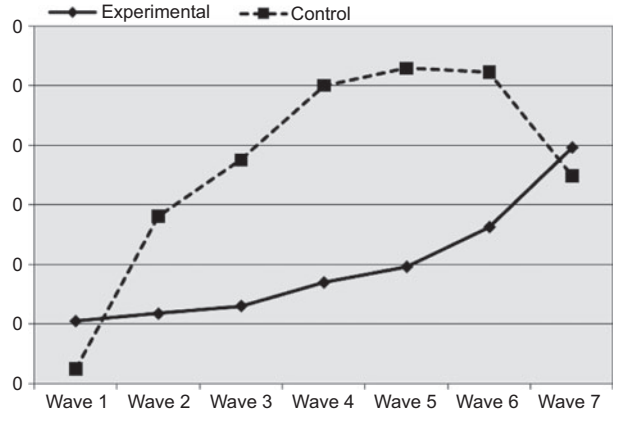

Figure 17 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants using HEROIN as an outcome indicator.
HEROIN, substance use (heroin).

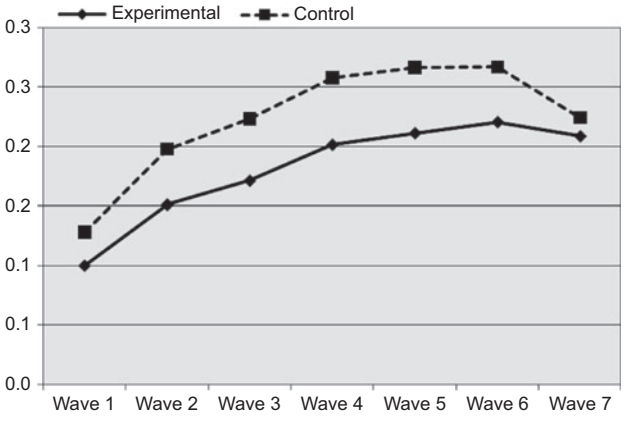

Figure 18 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants using DAMAGE as an outcome indicator.
DAMAGE, delinquent behavior (property damage).

Compared with the control group, the experimental group generally performed better when various positive youth development indicators were assessed. For example, the findings revealed that experimental participants scored better than the control participants in the areas of psychosocial competencies. In addition, results based on GPYDQ (general positive youth development qualities second-order factor) suggest that the experimental subjects displayed higher scores on eight subscales of the CPYDS (i.e., resilience, social competence, self-efficacy, moral competence, bonding, recognition for positive behavior, spirituality and emotional competence) than their control counterparts. Furthermore, the experimental subjects performed better than the control subjects in PID (positive identity second-order factor, including beliefs in the future and clear and positive identity). As psychosocial competencies are very important to the holistic development of adolescents, the present findings are encouraging. Participants from the experimental group had a slower decline in school

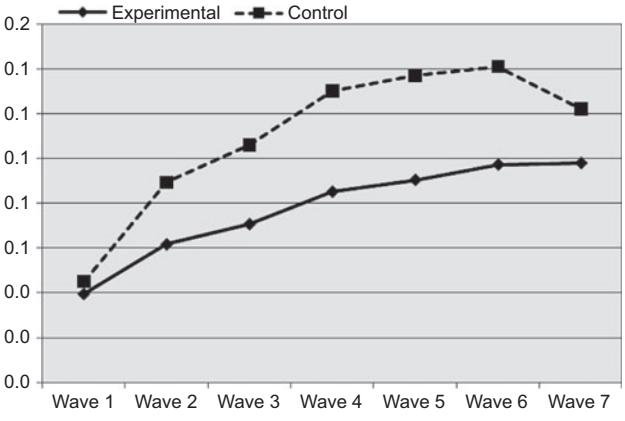

Figure 19 Growth trajectories of the experimental participants who regarded the program as beneficial and control participants using FIGHTS as an outcome indicator.
FIGHTS, delinquent behavior (group fights).

adjustment than those from the control group. Finally, subjects from the control group reported higher levels of intention to engage in substance use and problem behaviors than did those from the experimental group.

Further analyses based on the experimental subjects who found the program to be beneficial to their development (i.e., response to SOS-20 in the positive direction) showed similar but stronger results. Experimental participants performed better than the control participants in KEY15 and KEY36. In particular, the decline in overall positive youth development was slower in the experimental participants than in the control participants in terms of CPYDS-10 (global measure of psychosocial competence and strengths which includes resilience, social competence, emotional competence, cognitive competence, behavioral competence, moral competence, self-determination, self-efficacy, beliefs about the future and clear and positive identity) and CPYDS-12 (all subscales excluding behavioral competence, self-determination and prosocial norms). This suggests that the subjective experience of the participants is paramount important. Researchers should examine this factor when examining the effectiveness of adolescent prevention and positive youth development programs.

The above results basically reinforce previous objective outcome evaluation findings based on general linear models (12). In conjunction with previous work using various approaches, such as objective outcome evaluation, subjective outcome evaluation, qualitative evaluation via focus groups, qualitative evaluation via diaries, process evaluation, and interim evaluation (11, 17, 12, 33–35), the existing evaluation findings from Project P.A.T.H.S. further illustrate the positive impact of the program on youth developmental changes. In view of the paucity of outcome studies in Hong Kong, the present study contributes to evidence-based youth work in Hong Kong (36).

Nevertheless, one interesting observation is that there was a general decline in positive youth developmental attributes across time. While this result is consistent with the finding that adolescent mental health deteriorated across time (37), the decline in "perceived" psychosocial competence is an enigma deserving further investigation. One possibility is that when adolescents mature across time, they have more realistic perceptions about their own development.

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