

Life Satisfaction, Positive Youth Development, and Problem Behaviour Among Chinese Adolescents in Hong Kong

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Abstract This paper examines the relationships among life satisfaction, positive youth development, and problem behaviour. A total of 7,975 Secondary One students (4,169 boys and 3,387 girls; with most aged 12) of Chinese ethnicity recruited from 48 schools responded to validated measures of life satisfaction, positive youth development and problem behaviour. While life satisfaction was positively correlated with different measures of positive youth development, these measures were negatively correlated with measures of substance abuse, delinquency and intention to engage in problem behaviour. Based on a series of structural equation models, a non-recursive model was found to best fit the data, which suggests that adolescents having higher levels of positive youth development are more satisfied with life and have fewer problem behaviour, with life satisfaction and problem behaviour negatively reinforcing each other.

Keywords Adolescents · Positive youth development · Life satisfaction · Problem behaviour

1 Introduction

In the past two decades, increasing attention has been paid to positive youth development and adolescent subjective well-being (SWB). Park (2004) pointed out that “SWB serves not only as a key indicator of positive development but also as a broad enabling factor that promotes and maintains optimal mental health” (p. 27). Similarly, based on their work in primary prevention, Meyers and Meyers (2003) proposed that positive youth development could be enhanced by strengthening one’s subjective well-being, competence and social

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support, and at the same time mitigating poor individual predisposition, stress and exploitation. In short, researchers have argued that subjective well-being and its cognitive components (such as life satisfaction, Diener et al. 1999) are factors enabling positive development (Child Trends 2003; Damon 2004). However, before assuming that life satisfaction is an indicator of positive youth development, the operational definition of positive youth development must first be outlined.

In their review of positive youth development programs in North America, Catalano et al. (2004) pointed out that positive youth development comprises fifteen inter-related constructs—bonding, social competence, emotional competence, cognitive competence, behavioural competence, moral competence, self-efficacy, prosocial norms, resilience, self-determination, spirituality, clear and positive identity, beliefs in the future, prosocial involvement, and recognition of positive behaviour (for definitions of these constructs, see Table 1). Among these positive youth development constructs, many were found to associate with life satisfaction: Paxton et al. (2006) showed that bonding to adults and owning meaningful social roles were closely related to adolescent life satisfaction; Stein and Newcomb (1999) reported that intimate relationships formed in early adulthood contributed to life satisfaction in later adulthood; Ciarrochi et al. (2003) found that social and emotional competencies were significant predictors of life satisfaction. Academic and social self-efficacy (Vecchio et al. 2007), prosocial motivation and behaviour (Caprara and Steca 2005; Gebauer et al. 2008), spirituality and religiosity (Laudet and White 2008; Zullig et al. 2006), as well as mastery and ethnic identity (Sam 1998) were also found to be significant predictors of life satisfaction. In sum, using Catalano et al.'s (2004) definition of positive youth development, the above studies demonstrate that positive youth development predicts life satisfaction. Unfortunately, the possible influence of life satisfaction on positive youth development was not examined in these studies.

In addition, positive youth development was found to associate with positive behaviour but negatively relate to problem behaviour, such as substance abuse and delinquency. According to Catalano et al.'s review (2004) on 25 well-evaluated positive youth development programs, about 76% increased adolescents' positive behaviour and about 96% reduced problem behaviour. Since the fifteen positive youth development constructs proposed by Catalano et al. (2004) refer to how individuals' internal and external resources help them deal with challenges, they can be regarded as protective factors alleviating the development of problem behaviour, as proposed in the resilience literature on risk and protective factors (e.g., Jessor et al. 2003). This concept and related theories of protective factors suggest a predictive relationship of positive youth development to problem behaviour.

Empirically speaking, the findings on the predictive effects of positive youth development on life satisfaction and problem behaviour were quite piecemeal because not all the fifteen constructs were examined simultaneously in a single study. Moreover, although integrative models were tested by using structural-equation modelling or hierarchical regressions to demonstrate the predictive effect of positive youth development on problem behaviour (Jessor et al. 2003; Lent et al. 2005), these cross-sectional studies did not examine the *reverse* predictive effect of problem behaviour on positive youth development. This research gap can be filled by testing the predictive relationship of positive youth development to life satisfaction and problem behaviour, as well as possible reverse or even bidirectional relationships.

Studies have shown that life satisfaction is negatively associated with adolescent problem behaviour: sexual risk-taking behaviours (Valois et al. 2002); substance abuse, such as cigarette smoking, chewing tobacco, marijuana, cocaine, regular alcohol use, binge drinking (Desousa et al. 2008; Piko et al. 2005; Zullig et al. 2001); and violence and aggression, such as carrying a gun or weapon, physical fighting, stealing or damaging

Table 1 Definitions of the theoretical constructs, reliability statistics (mean inter-item correlation coefficients and coefficient alphas), and mean and standard deviations

Theoretical construct	Definition	Mean inter-item correlation	Alpha	Mean (SD)
Life satisfaction (LS): 5 items	Global judgment of one's quality of life.	.49	.81	4.12 (1.04)
Bonding (BO): 6 items	Development of positive relationship with healthy adults and positive peers.	.45	.83	4.82 (.79)
Resilience (RE): 6 items	Capacity for adapting to changes and stressful events in healthy and adaptive ways.	.44	.82	4.70 (.81)
Social competence (SC): 7 items	Interpersonal skills such as communication and conflict resolution skills.	.42	.83	4.63 (.77)
Recognition for positive behaviour (RB): 4 items	Systems for rewarding, recognizing or reinforcing positive behaviour.	.44	.76	4.50 (.88)
Emotional competence (EC): 6 items	Skills to recognize feelings in oneself and others and emotional self-management strategies.	.44	.83	4.25 (.90)
Cognitive competence (CC): 6 items	Cognitive skills such as problem solving and goal setting.	.47	.84	4.46 (.84)
Behavioural competence (BC): modified 5 items	Behavioural skills such as taking action skills and provision of reinforcement for effective behaviour choices and action pattern.	.38	.76	4.72 (.77)
Moral competence (MC): 6 items	Ability to differentiate right and wrong and respect for rules and standards as well as social justice.	.37	.78	4.47 (.81)
Self-determination (SD): 5 items	Sense of autonomy, independent thinking, or self-advocacy.	.40	.76	4.74 (.77)
Self-efficacy (SE): modified 2 items	Skills for coping and mastery.	.34	.50	4.33 (1.03)
Clear and positive identity (ID): 7 items	Development of healthy identity formation and achievement.	.43	.84	4.19 (.89)
Beliefs in the future (BF): modified 3 items	Ability to develop future potential goals, choices, or options.	.61	.82	4.45 (1.09)
Prosocial involvement (PI): 5 items	Activities and events to make positive contribution to groups.	.49	.83	4.54 (.91)
Prosocial norms (PN): 5 items	Development of clear and explicit standards for prosocial engagement.	.40	.77	4.68 (.86)
Spirituality (SP): 7 items	Sense of purpose and meaning in life, hope, or beliefs in a higher power.	.51	.88	5.24 (1.21)
Positive youth development (PYD): 80 items	Positive adolescent development defined in terms of healthy, holistic, and valuable developmental attributes, assets, and potentials.	.54	.94	4.58 (.67)
Substance abuse (SA): 8 items	Consumption of alcohol and drugs.	.51	.88	NA
Delinquency (DE): 12 items	Engagement in antisocial behaviour.	.56	.76	NA
Intention to engage in problem behaviour (BI): 5 items	Purpose of involving in high-risk behaviour.	.47	.76	NA

Table 1 continued

Theoretical construct	Definition	Mean inter-item correlation	Alpha	Mean (SD)
Problem behaviour (PB): 25 items	Problem behaviour defined in terms of substance abuse, delinquency and intention to engage in problem behaviour.	.53	.75	NA

property at school, and drinking and driving (MacDonald et al. 2005; Valois et al. 2001). In addition, life satisfaction was found to act as a predictor of suicide ideation (Heisel and Flett 2004). Theoretically, adolescents who were dissatisfied with life might have had poor strategies to cope with life stress and thus engaged in sexual behaviours, substance abuse and even delinquency and suicide attempts (Kim and Kim 2008). On the other hand, longitudinal research also pointed out that heavy substance or tobacco use in adolescence was a precursor of lower levels of life satisfaction, relationship satisfaction, and physical and mental health in adulthood (Fergusson and Boden 2008; Georgiades and Boyle 2007). Since research findings on the relationships between life satisfaction and problem behaviour are equivocal, investigation of the predictive contribution of life satisfaction to problem behaviour, as well as that of problem behaviour to life satisfaction, and even their bidirectional relationship, is needed.

The picture of the relationships among positive youth development, life satisfaction and adolescent problem behaviour becomes more complicated when researchers treat life satisfaction as a mediator. While most of the existing studies treated life satisfaction either as an outcome variable (e.g., Gebauer et al. 2008; Laudet and White 2008; Vecchio et al. 2007) or as a predictor (e.g., Heisel and Flett 2004; Swami et al. 2007), several studies examined the mediating influence of life satisfaction on problem behaviour. For instance, McKnight et al. (2002) found that life satisfaction partially mediated the relationship between stressful life events and adolescent problem behaviour. Suldo and Huebner (2004) also demonstrated that life satisfaction had not only a partial mediating effect between authoritative parenting and adolescent problem behaviour, but also a full mediating effect between parental involvement and adolescent problem behaviour. Based on these findings, further examination of the mediating role of life satisfaction to problem behaviour is needed.

In the Hong Kong context, studies on life satisfaction among adolescents have commonly used the correlational method (e.g., Shek 1998a, 1998b; Shek et al. 2006a). A few used multivariate statistical analyses, like multiple regression (Chan 2007; Chang et al. 2003) and structural equation modelling (Leung and Zhang 2000), but predictors were limited to family factors (such as parent-adolescent relationship, parental warmth and emotional detachment) and intrapersonal factors (such as self-concept and perfectionism). No study has been conducted in Hong Kong to examine positive youth development involving the fifteen constructs developed by Catalano et al. (2004) as predictors of life satisfaction, though there is an emerging body of positive youth development literature.

From a Hong Kong perspective, there are four reasons to examine the relationships among life satisfaction, positive youth development and adolescent problem behaviour. First, since harmonious relationships, moral values, prosocial norms and behaviours are highly valued in Chinese culture, it is interesting to study how these factors are related to adolescent life satisfaction and problem behaviour. Second, despite problem behaviour being less common among Chinese adolescents than among their Western counterparts

(Jessor et al. 2003), there is a rising trend of adolescent developmental problems, such as abuse of psychotropic substances (Shek 2007), adolescent suicide (Sun and Hui 2007) and school violence (Wong 2004). Third, because of the addictive nature of problem behaviour, it is valuable to examine adolescents' intention of engaging in problem behaviour such as substance abuse and delinquency. Finally, while Western studies show that positive youth development predicts life satisfaction and problem behaviour (e.g., Catalano et al. 2004), relevant studies are almost non-existent in the Chinese contexts and it remains unknown whether isolated Western findings can be generalized to the Chinese culture.

Against this background, the main goal is to test the structural models of the predictive relationships among positive youth development, life satisfaction and problem behaviour. Theoretically, with structural equation modelling, a model could clearly delineate predictive relationships between the predictor and criterion variables. From the literature review, it is hypothesized that positive youth development is positively related with life satisfaction, and that both of them are negatively related with problem behaviour.

To answer the research question of whether there would be direct, indirect, mediating, reverse or bidirectional paths among the three variables, six hypothetical models were proposed with reference to the positive youth development theoretical framework (Catalano et al. 2004), empirical research findings, and logical deductions. First, with structural equation modelling, the possible partial or full mediation role of life satisfaction (Model 1 and Model 2) was tested. Second, due to the cross-sectional nature of the present data, a possible reverse predictive relationship (Model 3) was examined to further demonstrate the predictive directionality of the variables. Third, alternative bidirectional relationships among the variables based on logical reasoning were also tested (Models 4 and 5), though the bidirectional relationship between life satisfaction and problem behaviour (Model 6) was rather clearly shown by the previous studies. After model testing and comparison, the model with the most optimal fit indices would be considered.

- Model 1: It was hypothesized that positive youth development would have a positive effect on life satisfaction but a negative effect on problem behaviour, with life satisfaction partially mediating the impact of positive youth development on problem behaviour relationship. (i.e., partial mediation model)
- Model 2: It was hypothesized that positive youth development would have a positive effect on life satisfaction, and that life satisfaction would have a negative effect on problem behaviour. (i.e., full mediation model)
- Model 3: It was hypothesized that adolescent problem behaviour would have negative effects on positive youth development as well as life satisfaction, and that life satisfaction would have a positive effect on positive youth development. (i.e., reverse effect model)
- Model 4: It was hypothesized that positive youth development and life satisfaction would have a bidirectional relationship. Both positive youth development and life satisfaction would have negative effects on problem behaviour. (i.e., non-recursive model with a bidirectional path between exogenous and one endogenous variables)
- Model 5: It was hypothesized that positive youth development would have a bidirectional relationship on life satisfaction and a negative effect on problem behaviour. Also, life satisfaction and problem behaviour would have a bidirectional relationship. (i.e., non-recursive model with two bidirectional paths)
- Model 6: It was hypothesized that positive youth development would have a positive effect on life satisfaction and a negative effect on problem behaviour, with life satisfaction and problem behaviour having a bidirectional relationship. (i.e., non-recursive model with a bidirectional path between two endogenous variables)

2 Method

2.1 Participants and Procedure

Project Positive Adolescent Training through Holistic Social Programmes (P.A.T.H.S.) is a pioneering positive youth development program designed for junior secondary-school students in Hong Kong, with the aim of promoting holistic development among adolescents. In the first year of the Full Implementation Phase (the 2006–2007 school year), a total of 24 experimental schools ($n = 4,121$ students) and 24 control schools ($n = 3,854$ students) were randomly selected to join a longitudinal study. In Wave 1 of the data collection, all the Secondary One students ($N = 7,975$) completed the objective outcome questionnaire prior to program implementation. Of these, 4,169 (52.3%) were boys and 3,387 (42.5%) were girls, with the remaining 5.2% not reporting their gender. A majority of the students reported their age as 12 (60.5%), 13 (14.9%) or 11 (12.5%). Further details of the project can be seen in studies by Shek and Ma (2006) and Shek and Sun (2009).

Data were collected at the schools by trained research staff and/or school teachers with adequate advance briefings. Parental and school consent were obtained prior data collection. At the time of data collection, student consent was sought, the purpose of the study was mentioned, and the confidentiality of the data collected was repeatedly emphasized to all students. After giving instructions, adequate time was provided for all participants to respond to all scales in the questionnaires in a self-administration format. No students refused to complete the questionnaires.

2.2 Instruments

The study used an objective outcome evaluation questionnaire (Shek et al. 2006b) in Chinese, containing measures of positive youth development, life satisfaction, adolescent problem behaviour and demographic characteristics.

2.2.1 Assessment of Positive Youth Development

Positive youth development was measured by the modified Chinese Positive Youth Development Scale (Shek et al. 2008). A detailed description of the scale, as well as its items and psychometric properties, can be found in Shek et al.'s study (2007). The scale includes 15 subscales: bonding, social competence, emotional competence, cognitive competence, behavioural competence, moral competence, self-efficacy, prosocial norms, resilience, self-determination, spirituality, clear and positive identity, beliefs in the future, prosocial involvement, and recognition of positive behaviour (see Table 1). Except spirituality, which was measured by a seven-point rating scale, all categories had a six-point rating scale. Positive youth development was represented by these 15 indicators—a final score was obtained by averaging the items in each subscale.

2.2.2 Assessment of Life Satisfaction

Life satisfaction was measured by the five-item Life Satisfaction Scale on a 6-point rating scale (Diener et al. 1985), which assesses one's own global judgment of one's quality of life. The Chinese translation was found to have acceptable psychometric properties (Shek 2004).

2.2.3 Assessment of Problem Behaviour

Problem behaviour was measured by three subscales. The first was an eight-item measure of substance abuse, examining via a seven-point rating scale the respondent's frequency of using alcohol, tobacco, ketamine, cannabis, cough mixture, organic solvent, pills, and narcotics. The second subscale is a 12-item measure of delinquency, examining via a seven-point rating scale the respondent's frequency of engaging in antisocial behaviour such as stealing, cheating, truancy, running away from home, damaging property, assault, having sexual relationship with others, gang fighting, speaking foul language, staying away from home without parental consent, strong-arming others, and breaking into residences. The third subscale uses a four-point rating scale and is a five-item measure of intention to engage in problem behaviour, including consuming alcohol, smoking, consuming illicit drugs, engaging in sexual behaviour, and gambling. These subscales were found to have acceptable construct validity (Shek 2004). Problem behaviour was represented by these three indicators, which were obtained by averaging the items in each subscale.

2.3 Data Analyses

The hypothetical models were tested by structural equation modelling (LISREL 8, linear structural relations; Jöreskog and Sörbom 1999). Since the present study was based on a community adolescent sample, it was predicted that the problem behaviour data would be positively skewed and kurtotic (i.e., not normally distributed). To tackle the issue of data non-normality, maximum likelihood (ML) in the latest version of LISREL 8.80 and PRELIS 2.54 was used to estimate the free parameters in the models. PRELIS 2.80 gives the estimations of polychoric covariance and asymptotic covariance matrices, which allow ML to provide the Satorra–Bentler scaled chi-squares in the LISREL 8.80 solutions for estimating the non-normal data. Evaluation of model fit was based on multiple criteria, including the theoretical meaningfulness of the model, absolute-fit indices (how well a model fits the data, without comparing to a baseline model), incremental fit measures (how much better the model fits than a baseline model) and model cross-validation (how the model can be replicated with an independent sample). Absolute fit indices include Satorra–Bentler scaled chi-square (χ^2), root mean square error of approximation (RMSEA), goodness-of-fit index (GFI), and standardized root mean residual (SRMR). Incremental fit measures include the non-normed fit index (NNFI) and the comparative fit index (CFI). For model cross-validation, the total sample was split randomly into two sub-samples for model exploration and validation, respectively, and a cross-validation index (CVI) was computed to indicate discrepancies among the sub-samples.

3 Results

Reliability analyses showed that all the scales and subscales except the self-efficacy subscale were highly reliable, i.e., they had alpha coefficients above .75 (Table 1). Results in Table 2 showed that the prevalence of problem behaviour was very low among Chinese early adolescents. More than 90% of the respondents reported that they had never smoked or abused drugs (other than drinking alcohol) in the previous 6 months. While about half of the respondents reported that they had cheated somebody and/or spoken foul language, a majority had never been involved in other kinds of delinquent behaviours, such as a sexual relationship in the previous 6 months. However, some respondents did intend to drink

Table 2 Summary table of the reported frequency and percentage of problem behaviour

	Never	1–2 times	3–5 times	>5 times	Several times per month	Several times per week	Every day	Missing	Total
Substance abuse in past 6 months									
Tobacco	7,356 (92.2%)	283 (3.5%)	79 (1.0%)	77 (1.0%)	25 (.3%)	30 (.4%)	56 (.7%)	69 (.9%)	7,975 (100%)
Alcohol	5,921 (74.2%)	1,090 (13.7%)	356 (4.5%)	330 (4.1%)	128 (1.6%)	41 (.5%)	21 (.3%)	88 (1.1%)	7,975 (100%)
Ketamine	7,867 (98.6%)	20 (.3%)	10 (.1%)	4 (.1%)	2 (.0%)	1 (.0%)	8 (.1%)	63 (.8%)	7,975 (100%)
Cannabis	7,869 (98.7%)	8 (.1%)	2 (.0%)	11 (.1%)	2 (.0%)	1 (.0%)	10 (.1%)	72 (.9%)	7,975 (100%)
Cough mixture	7,708 (96.7%)	40 (.5%)	15 (.2%)	20 (.3%)	4 (.1%)	3 (.0%)	10 (.1%)	175 (2.2%)	7,975 (100%)
Organic solvent	7,626 (95.6%)	104 (1.3%)	22 (.3%)	18 (.2%)	6 (.1%)	3 (.0%)	11 (.1%)	185 (2.3%)	7,975 (100%)
Pills	7,772 (97.5%)	13 (.2%)	3 (.0%)	5 (.1%)	3 (.0%)	3 (.0%)	11 (.1%)	165 (2.1%)	7,975 (100%)
Narcotics	7,777 (97.5%)	6 (.1%)	1 (.0%)	4 (.1%)	0 (0%)	3 (.0%)	10 (.1%)	174 (2.2%)	7,975 (100%)
Delinquency in past 6 months									
Stealing	7,270 (91.2%)	403 (5.1%)	70 (.9%)	17 (.2%)	18 (.2%)	3 (.0%)	22 (.3%)	172 (2.2%)	7,975 (100%)
Cheating	4,405 (55.2%)	2,025 (25.4%)	619 (7.8%)	250 (3.1%)	79 (1.0%)	26 (.3%)	368 (4.6%)	203 (2.5%)	7,975 (100%)
Truancy	7,479 (93.8%)	163 (2.0%)	47 (.6%)	35 (.4%)	10 (.1%)	4 (.1%)	47 (.6%)	190 (2.4%)	7,975 (100%)
Running away from home	7,438 (93.3%)	232 (2.9%)	43 (.5%)	21 (.3%)	12 (.2%)	6 (.1%)	21 (.3%)	202 (2.5%)	7,975 (100%)
Damaging others' properties	7,066 (88.6%)	517 (6.5%)	86 (1.1%)	39 (.5%)	16 (.2%)	13 (.2%)	39 (.5%)	199 (2.5%)	7,975 (100%)
Assault	7,176 (90.0%)	388 (4.9%)	93 (1.2%)	35 (.4%)	19 (.2%)	10 (.1%)	60 (.8%)	194 (2.4%)	7,975 (100%)
Having sexual relationship with others	7,720 (96.8%)	58 (.7%)	15 (.2%)	5 (.1%)	1 (.0%)	1 (.0%)	14 (.2%)	161 (2.0%)	7,975 (100%)
Gang fighting	7,509 (94.2%)	178 (2.2%)	42 (.5%)	21 (.3%)	8 (.1%)	2 (.0%)	31 (.4%)	184 (2.3%)	7,975 (100%)
Speaking foul language	3,666 (46.0%)	2,093 (26.2%)	608 (7.6%)	295 (3.7%)	123 (1.5%)	62 (.8%)	929 (11.6%)	199 (2.5%)	7,975 (100%)
Staying away from home without parental consent	7,462 (93.6%)	167 (2.1%)	59 (.7%)	29 (.4%)	10 (.1%)	11 (.1%)	50 (.6%)	187 (2.3%)	7,975 (100%)
Strong-arming others	7,010 (87.9%)	483 (6.1%)	121 (1.5%)	63 (.8%)	21 (.3%)	17 (.2%)	89 (1.1%)	171 (2.1%)	7,975 (100%)
Breaking into others' places	7,579 (95.0%)	137 (1.7%)	29 (.4%)	9 (.1%)	10 (.1%)	3 (.0%)	28 (.4%)	180 (2.3%)	7,975 (100%)

Table 2 continued

	Absolutely not	Probably not	Probably yes	Absolutely yes	Missing	Total
Intention to engage in problem behaviour in coming 2 years						
Consuming alcohol	5,027 (63.0%)	1,019 (12.8%)	1,327 (16.6%)	336 (4.2%)	266 (3.3%)	7,975 (100%)
Smoking	6,925 (86.8%)	424 (5.3%)	241 (3.0%)	112 (1.4%)	273 (3.4%)	7,975 (100%)
Consuming illicit drugs	7,461 (93.6%)	133 (1.7%)	43 (.5%)	69 (.9%)	269 (3.4%)	7,975 (100%)
Engaging in sexual behaviour	7,113 (89.2%)	345 (4.3%)	159 (2.0%)	91 (1.1%)	267 (3.3%)	7,975 (100%)
Gambling	6,616 (83.0%)	579 (7.3%)	361 (4.5%)	142 (1.8%)	277 (3.5%)	7,975 (100%)

alcohol (20.8%), gamble (6.3%), smoke (4.4%), have sex (3.1%), and consume illicit drugs (1.4%) in the subsequent 2 years.

As shown in Table 3, analyses based on Pearson correlation showed that all variables were correlated in the expected directions (with a two-tailed multistage Bonferroni correction). Life satisfaction was positively correlated with different measures of positive youth development and global positive youth development, while negatively correlated with substance abuse, delinquency, intention to engage in problem behaviour, and global problem behaviour.

As expected, variables were normally distributed, except the values of drug and delinquency of problem behaviour variables which showed positive skewness and kurtosis. In two-step modelling (Anderson and Gerbing 1988), the measurement models of the positive youth development, life satisfaction, and problem behaviour were tested first. Results showed that the fifteen-indicator positive youth development fit the data [Satorra–Bentler scaled χ^2 (90, $n = 3,987$) = 1,580.48; RMSEA = 0.06; GFI = 0.89; SRMR = 0.041; NNFI = 0.99; CFI = 0.99; CVI = 0.95] and that the three-indicator problem behaviour had excellent fit indices [Satorra–Bentler scaled χ^2 (0, $n = 3,987$) = 0; CVI = 0.02]. The construct validity of both scales was supported. For the five-indicator life satisfaction, the goodness-of-fit indices indicated that the model did not fit well. Since item 5 had a relatively lower loading and measures a hypothetical situation which is different from the other items, item 5 was dropped. The modified four-indicator life satisfaction had a significant χ^2 -difference ($\Delta\chi^2 = 199.7$, $\Delta df = 3$, $p < 0.01$), and good fit [Satorra–Bentler scaled χ^2 (2, $n = 3,987$) = 9.14; RMSEA = 0.03; GFI = 1.00; SRMR = 0.010; NNFI = 1.00; CFI = 1.00; CVI = 0.95], which indicated that the scale would be better represented by four items which measure life satisfaction in similar contexts.

To examine the structural model of quality of life, the proposed models were tested and compared. The one showing optimal fit was selected to represent the final model.

3.1 Step (1): Testing Model 1

As shown in Table 4, the fit indices of Model 1 were adequate [Satorra–Bentler scaled χ^2 (206, $n = 3,987$) = 2,230.55; RMSEA = 0.05; GFI = 0.90; SRMR = 0.041; NNFI = 0.99; CFI = 0.99; CVI = 21.75] (see Fig. 1).

3.2 Step (2): Testing Model 2 with Model 1

The fit indices of Model 2 were adequate [Satorra–Bentler scaled χ^2 (207, $n = 3,987$) = 2,264.01; RMSEA = 0.05; GFI = 0.90; SRMR = 0.049; NNFI = 0.99; CFI = 0.99; CVI = 21.43] (Table 4; see Fig. 2). When compared with Model 1, although Model 2's CVI was a bit lower, its fit indices were not better than those of Model 1. Therefore, Model 1 was preferred. The findings suggested that life satisfaction partially mediated the relationship of positive youth development to problem behaviour. This was used as a baseline model for further model comparison.

3.3 Step (3): Testing Model 3 with Model 1

The fit indices of Model 3 were also adequate [Satorra–Bentler scaled χ^2 (206, $n = 3,987$) = 2,230.55; RMSEA = 0.05; GFI = 0.90; SRMR = 0.041; NNFI = 0.99; CFI = 0.99; CVI = 34.47] (Table 4; see Fig. 3), but it had a higher CVI, when compared

Table 3 Intercorrelation matrix for variables of positive youth development, life satisfaction, and problem behaviour

Variables	LS	BO	RE	SC	RB	EC	CC	BC	MC	SD	SE
Life satisfaction (LS)	1										
Bonding (BO)	.47**	1									
Resilience (RE)	.47**	.60**	1								
Social competence (SC)	.43**	.60**	.62**	1							
Recognition for positive behaviour (RB)	.45**	.63**	.56**	.59**	1						
Emotional competence (EC)	.52**	.57**	.61**	.65**	.56**	1					
Cognitive competence (CC)	.52**	.54**	.68**	.66**	.57**	.72**	1				
Behavioural competence (BC)	.45**	.54**	.59**	.64**	.53**	.64**	.70**	1			
Moral competence (MC)	.49**	.56**	.58**	.61**	.56**	.63**	.66**	.65**	1		
Self-determination (SD)	.44**	.51**	.57**	.59**	.48**	.60**	.65**	.64**	.60**	1	
Self-efficacy (SE)	.36**	.33**	.40**	.39**	.35**	.39**	.46**	.41**	.40**	.48**	1
Clear and positive identity (ID)	.59**	.52**	.55**	.58**	.51**	.62**	.64**	.57**	.58**	.61**	.48**
Beliefs in the future (BF)	.51**	.47**	.57**	.54**	.45**	.54**	.61**	.54**	.53**	.58**	.46**
Prosocial involvement (PI)	.51**	.59**	.55**	.57**	.59**	.56**	.60**	.57**	.60**	.54**	.39**
Prosocial norms (PN)	.43**	.50**	.52**	.51**	.51**	.50**	.54**	.54**	.59**	.51**	.36**
Spirituality (SP)	.57**	.53**	.54**	.46**	.45**	.53**	.52**	.46**	.48**	.45**	.33**
Positive youth development (PYD)	.64**	.74**	.78**	.78**	.73**	.80**	.84**	.78**	.79**	.77**	.59**
Substance abuse (SA)	-.10**	-.18**	-.16**	-.14**	-.17**	-.13**	-.14**	-.13**	-.14**	-.10**	-.07**
Delinquency (DE)	-.20**	-.28**	-.24**	-.20**	-.25**	-.24**	-.23**	-.21**	-.26**	-.16**	-.11**
Intention to engage in problem behaviour (BI)	-.18**	-.24**	-.21**	-.15**	-.21**	-.19**	-.19**	-.19**	-.23**	-.15**	-.09**
Problem behaviour (PB)	-.21**	-.29**	-.25**	-.20**	-.26**	-.23**	-.24**	-.22**	-.27**	-.17**	-.11**

Table 3 continued

Variables	ID	BF	PI	PN	SP	PYD	SA	DE	BI	PB
Life satisfaction (LS)										
Bonding (BO)										
Resilience (RE)										
Social competence (SC)										
Recognition for positive behaviour (RB)										
Emotional competence (EC)										
Cognitive competence (CC)										
Behavioural competence (BC)										
Moral competence (MC)										
Self-determination (SD)										
Self-efficacy (SE)										
Clear and positive identity (ID)	1									
Beliefs in the future (BF)	.72**	1								
Prosocial involvement (PI)	.59**	.56**	1							
Prosocial norms (PN)	.48**	.51**	.65**	1						
Spirituality (SP)	.54**	.52**	.50**	.42**	1					
Positive youth development (PYD)	.80**	.77**	.78**	.71**	.70**	1				
Substance abuse (SA)	-.10**	-.12**	-.14**	-.18**	-.17**	-.18**	1			
Delinquency (DE)	-.19**	-.22**	-.23**	-.28**	-.28**	-.30**	.63**	1		
Intention to engage in problem behaviour (BI)	-.16**	-.19**	-.21**	-.26**	-.27**	-.26**	.47**	.49**	1	
Problem behaviour (PB)	-.19**	-.22**	-.24**	-.30**	-.30**	-.31**	.80**	.87**	.81**	1

Note: ** Significant when a two-tailed multistage Bonferroni procedure was used (210 pairs)

Table 4 Goodness-of-fit indices of structural models

Structural Model	$\chi^2(df)$	$\Delta\chi^2(\Delta df)$	RMSEA	GFI	SRMR	NNFI	CFI	CVI
(1) Model 1	2,230.55 (206)		0.05	0.90	0.041	0.99	0.99	21.75
(2) Model 2	2,264.01 (207)		0.05	0.90	0.049	0.99	0.99	21.43
Model 2 vs. Model 1		33.51 (1)**						
(3) Model 3	2,230.55 (206)		0.05	0.90	0.041	0.99	0.99	34.47
Model 3 vs. Model 1		0 (0)						
(4) Model 4	2,275.99 (206)		0.05	0.89	0.20	0.99	0.99	1.40
Model 4 vs. Model 1		45.44 (0)**						
(5) Model 5	2,263.09 (206)		0.05	0.89	0.19	0.99	0.99	1.40
Model 5 vs. Model 1		32.54 (0)**						
(6) Model 6	2,214.19 (206)		0.05	0.90	0.044	0.99	0.99	21.88
Model 6 vs. Model 1		16.36 (0)**						

Note: A better fitting model was judged by Satorra–Bentler scaled χ^2 , RMSEA < 0.08, GFI, NNFI and CFI > 0.90, SRMR < 0.05, a low CVI value, and a significant χ^2 -difference (** $p < 0.01$)

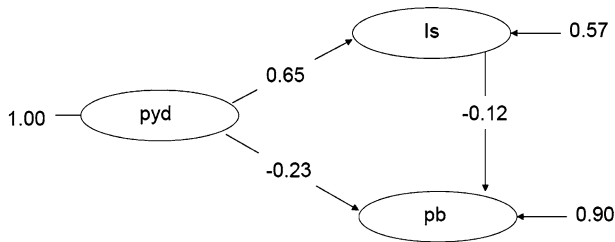


Fig. 1 Tested model 1: partial mediation model

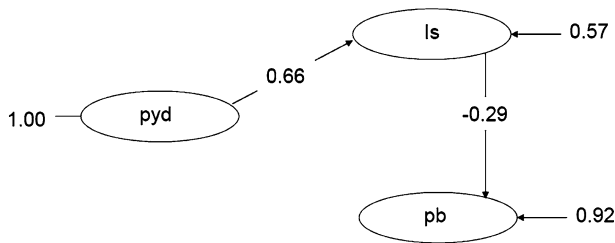


Fig. 2 Tested model 2: full mediation model

with Model 1. The model suggested that the directionality from problem behaviour to life satisfaction and positive youth development could not be easily replicated across sub-samples. Therefore, Model 3 was rejected.

3.4 Step (4): Testing Model 4 with Model 1

When compared with Model 1, although Model 4 had a lower CVI, it had higher Satorra–Bentler scaled χ^2 (206, $n = 3,987$) = 2,275.99 and SRMR = 0.20 (Table 4; see Fig. 4). It suggested that the bidirectional relationship between positive youth development and life satisfaction was not preferred. Therefore, Model 4 was rejected.

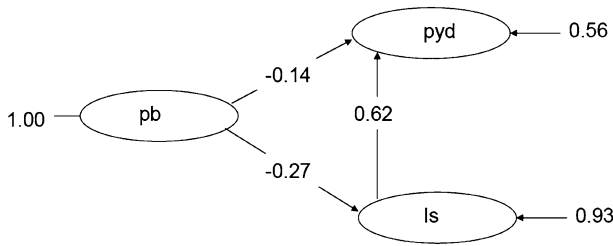


Fig. 3 Tested model 3: reverse effect model

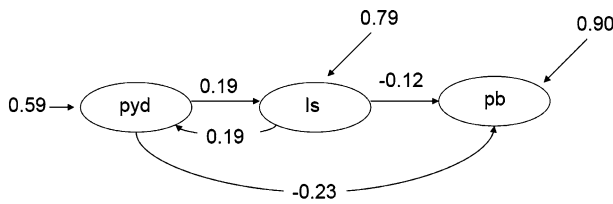


Fig. 4 Tested model 4: non-recursive model with a bidirectional path between exogenous and one endogenous variables

3.5 Step (5): Testing Model 5 with Model 1

When compared with Model 1, although Model 5 had a lower CVI, it had higher Satorra–Bentler scaled χ^2 (206, $n = 3,987$) = 2,263.09 and SRMR = 0.19 (Table 4; see Fig. 5). It suggested that the non-recursive model with two bidirectional paths was not preferred. Therefore, Model 5 was rejected.

3.6 Step (6): Testing Model 6 with Model 1

The fit indices of Model 6 were adequate [Satorra–Bentler scaled χ^2 (206, $n = 3,987$) = 2,214.19; RMSEA = 0.05; GFI = 0.90; SRMR = 0.044; NNFI = 0.99; CFI = 0.99; CVI = 21.88] (Table 4; see Fig. 6). When compared with Model 1, although Model 6’s CVI was a bit higher, its fit indices were better than those of Model 1, and it had a significant χ^2 difference. Model 6 was preferred and accepted as the model of quality of life in the present study because it had the most optimal fit indices, although it is noteworthy that it is only slightly better than Model 1. Moreover, the direct effects of positive youth development on both life satisfaction and problem behaviour, and the reciprocal relationship between life satisfaction and problem behaviour, have been supported by different studies (e.g., Catalano et al. 2004; Desousa et al. 2008; Fergusson and Boden

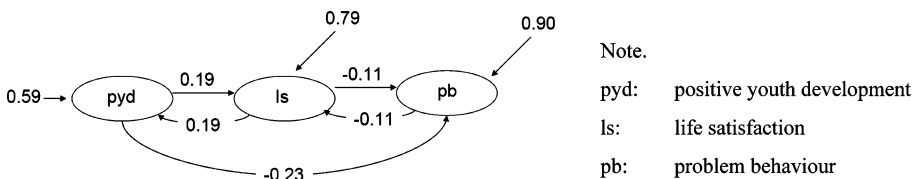
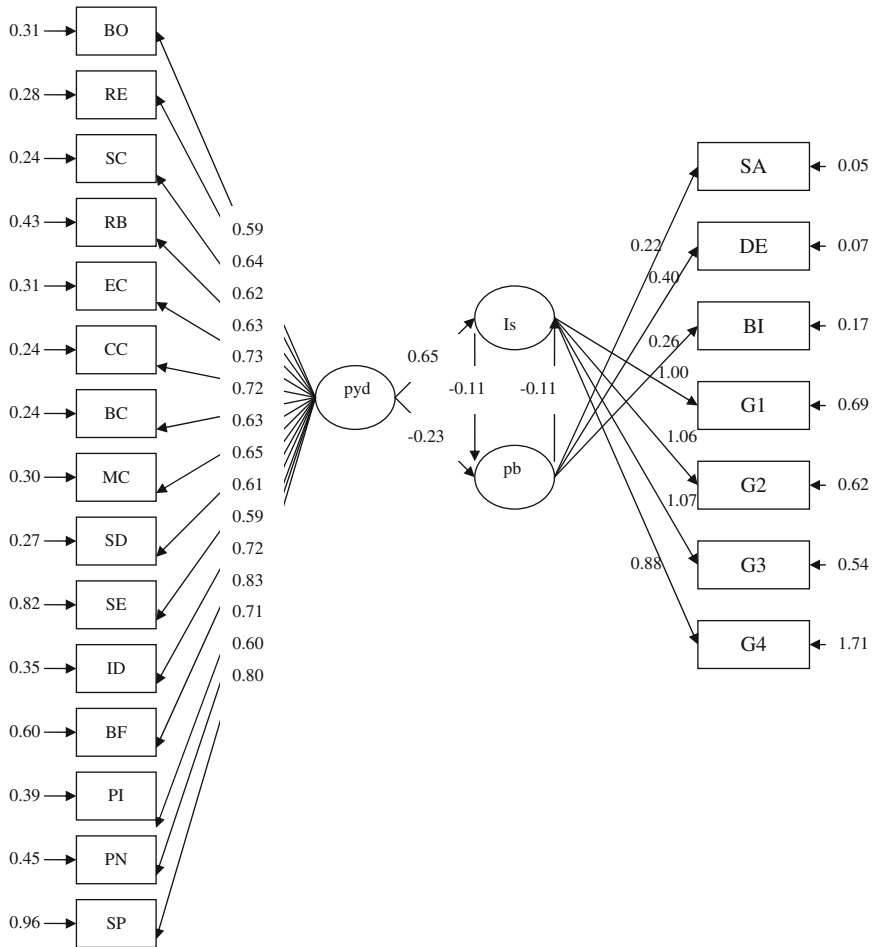


Fig. 5 Tested model 5: non-recursive model with two bidirectional paths



Note.
 pyd: positive youth development
 ls: life satisfaction
 pb: problem behaviour
 BO: bonding
 RE: resilience
 SC: social competence
 RB: recognition for positive behaviour
 EC: emotional competence
 CC: cognitive competence
 BC: behavioural competence
 MC: moral competence
 SD: self-determination
 SE: self-efficacy
 ID: positive identity
 BF: beliefs in the future
 PI: prosocial involvement
 PN: prosocial norms
 SP: spirituality
 SA: substance abuse
 DE: delinquency
 BI: intention to engage in problem behaviour
 G1-G4: 4 indicators of Life Satisfaction Scale

Fig. 6 Tested model 6: non-recursive model with a bidirectional path between two endogenous variables

2008). Such a non-recursive model explained 46% of the variance in life satisfaction and 12% of the variance in problem behaviour.

4 Discussion

The main goal of the present study was to test the different models pertinent to the relationships among positive youth development, life satisfaction, and problem behaviour

in Chinese early adolescents. There were several unique features of this study. First, the present study is a positive response to the observation that there are few related studies in this area, particularly in the Chinese context. Second, because of the paucity of studies on adolescent quality of life (Shek et al. 2005; Shek and Lee 2007), Chinese adolescents were recruited in the present study. Third, a large sample was used in this study. Fourth, validated assessment tools were employed. Finally, latent variables analyses were performed which permit comparison of different models.

Apart from generating findings on the internal consistency of the scales of positive youth development, life satisfaction, and problem behaviour, the present study further demonstrated the validity of these constructs via confirmatory factor analyses. First, the present study affirmed that positive youth development is comprised of fifteen inter-related constructs, namely, bonding, social competence, emotional competence, cognitive competence, behavioural competence, moral competence, self-efficacy, prosocial norms, resilience, self-determination, spirituality, clear and positive identity, beliefs in the future, prosocial involvement, and recognition for positive behaviour (Catalano et al. 2004), with beliefs in the future having the strongest influence on positive youth development, followed by spirituality (Fig. 6). Therefore, future studies can compute global positive youth development, instead of using separate sub-scales, in order to have a complete picture of how positive development relates to adolescent growth and health.

Second, although the psychometric properties of the Chinese translation of the Life Satisfaction Scale had been proved (Shek 2004), the present study indicated that a scale item, "If I could live my life over, I would change almost nothing" assesses a hypothetical situation that is different from the other items, which assess present situations, e.g., "I am satisfied with my life". It is possible that a person who is dissatisfied with life does not want to change things if s/he is also helpless and hopeless. The present study showed that removal of this item could contribute to a better measurement of life satisfaction, with a better alpha value (0.83, mean inter-item correlation = .56). Third, the present study showed that three indicators—substance abuse, delinquency, and intention to commit problem behaviour—could represent problem behaviour, with delinquency having the strongest loading (Fig. 6). Besides examining substance abuse and delinquency as indicators of problem behaviour, this study added to the literature by examining "intention to engage in problem behaviour" as another indicator. It suggests that a better measurement of problem behaviour could be obtained by assessing both past behaviour and intention for future behaviour.

Consistent with previous studies, positive youth development was positively related to life satisfaction, and both were negatively associated with problem behaviour as hypothesized. Since most existing studies have focused on bonding, social competence, emotional competence, behavioural competence, prosocial behaviour, and spirituality (e.g., Ciarrochi et al. 2003; Laudet and White 2008; Paxton et al. 2006), this study demonstrated that other positive youth development constructs, including resilience and beliefs in the future, also have significant correlations with life satisfaction. In particular, adolescents having more positive identity were more likely to have higher life satisfaction. Furthermore, problem behaviour was found to have weak, yet significant, correlation with positive youth development and life satisfaction. Interestingly, we found that adolescents are less likely to be involved in problem behaviour when they are more satisfied with life, have strong relationship with healthy adults and peers (i.e., bonding), have a sense of purpose and meaning in life (i.e., spirituality), and have clear standards for prosocial engagement (i.e., prosocial norms).

Most importantly, the present study contributed to existing knowledge by proposing a predictive model (Model 6), which demonstrates that positive youth development predicts life satisfaction and problem behaviour, with life satisfaction and problem behaviour having a bidirectional relationship. It showed that early adolescents having poor positive development have lower life satisfaction and higher levels of substance abuse, delinquency, and intention to engage in problem behaviour. These unidirectional paths from positive youth development to life satisfaction and problem behaviour were in line with Western literature on resilience and positive youth development (e.g., Catalano et al. 2004). Since existing local studies have mainly looked at family factors (bonding) and self-concept (identity) as determinants of life satisfaction (e.g., Chan 2007; Leung and Zhang 2000), the present study contributed by underscoring the contribution of positive youth development to adolescent life satisfaction. As positive youth development directly affects adolescents' behaviour and appraisal of life, the present findings suggest that promoting positive youth development is of paramount importance in enabling satisfaction with life and mitigating risk-taking behaviour among early adolescents. Furthermore, consistent with previous literature (Fergusson and Boden 2008; Georgiades and Boyle 2007), this study highlights the relationship of life dissatisfaction and problem behaviour, with lower levels of life satisfaction encouraging adolescents to engage in problem behaviour, and vice versa. As life satisfaction is a cognitive appraisal of the quality of one's life, it is understandable that adolescents having negative appraisal of life would engage in various kinds of problem behaviour as an outlet. Nevertheless, continuous involvement in problem behaviour would also strengthen the negative evaluation of one's life, resulting in a vicious cycle between life dissatisfaction and problem behaviour. In short, the contribution of the present findings is twofold: (i) unidirectional path models may not be adequate in delineating the relationships among positive youth development, life satisfaction, and adolescent problem behaviour; and (ii) the non-recursive model demonstrates a reciprocal causation between problem behaviour and life satisfaction.

Although the full and partial mediating role of life satisfaction (Model 1 and Model 2) was not supported by the present findings, this is not to say that the mediating role of life satisfaction should be denied—these models still showed adequate fit indices, but both models were slightly poorer when compared with Model 6. Also, the mediating effects of life satisfaction on problem behaviour are supported by Western studies in which stressful life events and parenting were treated as exogenous variables (McKnight et al. 2002; Suldo and Huebner 2004). As the present study used positive youth development as an antecedent variable, the mediating effect of life satisfaction on problem behaviour might not be prominent. In addition, this cross-sectional study did not support the reverse impact of problem behaviour on life satisfaction and positive youth development (Model 3) or that of life satisfaction on positive youth development proposed by the researchers (e.g., Meyers and Meyers 2003), and thus further demonstrated the directionality from positive youth development to life satisfaction and problem behaviour. Furthermore, this study did not support bidirectional relationships between positive youth development and life satisfaction or between positive youth development and problem behaviour (Model 4 and Model 5), which were logically deduced from the literature. In sum, the structural equation modelling analyses and model comparisons indicated that positive youth development was a strong exogenous variable having predictive contributions to life satisfaction and problem behaviour, with the latter two endogenous variables reciprocally related. Selection of this non-recursive model as the final model was not arbitrary. Adoption of the model was based on both the theoretical meaningfulness of the model and fit indices. However, as

other competing models were only slightly inferior, it is necessary to replicate the present findings in the future.

There are several limitations of the present study. First, although the present model was based on a large sample collected in the Hong Kong Chinese context, the generalizability and replicability of the preferred model should be further examined. Second, causal inferences based on this cross-sectional study should proceed with caution. As the present study was based on Wave 1 data of a longitudinal study, future studies utilizing the data from several waves is necessary to validate the directionality of the variables in the model. Third, as there are certain percentages of unexplained variance in the model, it indicates that other potential variables should be included in the model to give a better prediction. Nevertheless, the amount of variance explained could not be regarded as low. Fourth, as the data were collected by students' self-reporting, the effects of social desirability and self-serving biases should be taken into consideration. Despite these limitations, the present study demonstrates that positive youth development plays an important role in the quality of life of Chinese adolescents. The present findings represent an important advance in the literature on positive youth development, particularly in the Chinese context.

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