

# General Strain Theory in Taiwan: A Latent Growth Curve Modeling Approach

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**Abstract** Agnew's general strain theory (GST) [Agnew R (2001) *Journal of Research in Crime and Delinquency* 38:319–361; Agnew R (2006a) *Pressured Into Crime: An Overview of General Strain Theory*. LA:Roxbury] has been the focus of considerable academic attention and has become an important criminological theory [Cullen et al. (2006) *Taking Stock: The Status of Criminological Theory*. New Brunswick, NJ: Transaction]. However, most previous empirical studies have employed Western samples (e.g., US sample) to test this theory, which hinders the generalizability of GST. Although some studies have used Eastern samples to evaluate GST, these studies are only cross-sectional, which makes drawing any causal relationship problematic, and a cross-sectional study cannot uncover the more dynamic relationship between strain, negative emotion, and delinquency. Furthermore, depression has become epidemic around the world [World Health Organization 2001, [http://www.who.int/whr/2001/en/whr01\\_en.pdf](http://www.who.int/whr/2001/en/whr01_en.pdf)] and many previous studies that test GST focus only on anger. This makes depression a crucial element in testing GST. The present study uses longitudinal data (Taiwan Youth Project) and a latent growth model (LGM) to investigate strain, depression, and delinquent acts among adolescents (12–15 years old). The results generally support GST propositions: both strain and depression increase delinquency, and depression mediates the strain–delinquency relationship. Some cultural-specific influences were also discovered.

**Keywords** General strain theory · Depression · Juvenile delinquency · Latent growth curve model

## Introduction

The adolescent stage of life is a period of high risk for many kinds of problem behaviors, such as substance abuse, deviant acts, and delinquency. Life-course scholars argue that

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involvement in these dangerous behaviors can place youths at increased risk of future criminal involvement or social maladjustment (Moffitt 1993; Sampson and Laub 1993). Increased strain/stress is also common during adolescence. Studies from the stress literature document that the juvenile period is fraught with struggles, distress, and negative emotions (Agnew 1997, 2003; Compas and Wagner 1991; Hoffmann et al. 2000).

These two significant problems—strain and involvement in delinquency—faced by adolescents highlight the importance of studying the effects of strain/stress on delinquency during the adolescent years. Agnew's general strain theory (GST) (2001, 2006a), which provides a rich theoretical background for analyzing the underlying mechanisms that relate strain to crime and delinquency during this period, has been recognized by scholars as an important criminological theory (Cullen et al. 2006) and has been used to examine the strain/delinquency relationship.

Although GST has gained significant academic attention and has generated a substantial number of empirical studies (see Agnew 2006a, b for a review), three important deficits remain. First, relatively few studies have been conducted in non-Western cultures (Bao et al. 2004; Maxwell 2001; Lin and Mieczkowski, *in press*; Moon et al. 2009). This is unfortunate, because the generalizability of a theory and the validity of interpretations of results based on research in a single nation/culture are questionable. Second, previous studies have mostly used a static approach of modeling the strain–delinquency relationship because of data limitations (e.g., cross-sectional design); only a few studies have used a longitudinal design to examine the strain–delinquency relationship (Aseltine and Gore 2000; Hoffmann et al. 2000; Hoffmann and Miller 1998), and none of these have adopted a longitudinal design to examine GST in non-Western countries. Third, although many studies have examined the direct relationship between strain and delinquency (Agnew 2002; Eitle and Turner 2003; Preston 2006), they have failed to incorporate a theoretically important mediating factor—negative emotion. Including negative affects in the statistical model could present a more genuine test of GST.

The goal of this study is three-fold. First, this research evaluates the generalizability of results of studies on the strain–delinquency relationship, using a Taiwanese adolescent sample; it adopts an “*etic*”<sup>1</sup> approach, which purposely tries to find generality. Second, the present study will use a latent growth modeling (LGM) statistical model to examine the strain–delinquency relationship; this approach provides an appropriate developmental model that describes an individual's developmental trajectory and its change over time (Duncan et al. 2006). Finally, the present study will also incorporate depression into the LGM model; depression is understudied although it is known to cause various problems in adolescence.

## A Review of GST

GST defines strain as “events or conditions that are disliked by individuals” (Agnew 2006a, p. 4). According to Agnew (1992), three major types of strain will make individuals feel “bad” and want to do something to correct the condition. These disliked conditions refer to different general types of strain. First, strain may arise because the individual fails to achieve positively valued goals, such as good grades in school. Second, strain may be

<sup>1</sup> The “*emic*” and “*etic*” difference is that the former is more concerned on the study of a phenomenon within a particular culture (“*idiographic*” style), whereas the latter tries to apply a general theoretical model to all different cultures, in an attempt to find universal behavior rules (“*nomothetic*” style) (Hofstede 2001).

generated by the removal of positive valued stimuli, i.e., when the individual loses something valued (e.g., a breakup with a boy/girlfriend). Finally, strain may arise from the presence of noxious stimuli, such as the negative experiences resulting from excessively punitive parental discipline.

These three types of strain increase the likelihood that the individual will experience an array of negative emotions. Studies have documented that life stressors/strains can lead to depression (Olweus 1994; Vaux and Ruggiero 1983), anger (Broidy 2001; De Coster and Kort-Butler 2006), and anxiety (Aseltine et al. 2000). Among the many possible negative emotions, anger is probably the most widely studied emotional response to strain, because anger is particularly potent in predisposing an individual to act criminally. Nevertheless, Agnew (2006a) encouraged future researchers to pay more attention to other negative emotions, such as depression. From the perspective of GST, an individual might turn to delinquency not only to deal with stress but also to resolve negative feelings. For example, depression makes people feel uncomfortable, which might lead them to take drugs (Agnew 1992) or to become involved in delinquency (Beyers and Loeber 2003); through these behaviors, individuals can release negative feelings or make themselves feel better (Brezina 1996).

A review of the GST literature suggests a positive and significant relationship between strain and delinquency. Specifically, studies have found that higher levels of strain lead to greater involvement in delinquency or deviance, regardless of how the strain is measured (Agnew and White 1992; Aseltine et al. 2000; Baron 2004; Broidy 2001; Drapela 2006; Eitle and Turner 2003; Froggio and Agnew 2007; Hay 2003; Hoffmann and Cerbone 1999; Hoffmann and Miller 1998; Moon et al. 2008; Piquero and Sealock 2000; Sigfusdottir et al. 2004). Furthermore, some evidence indicates that negative emotions partially mediate the relationship between strain and delinquency. Although most studies find that anger mediates this relationship (Agnew 1985; Aseltine et al. 2000; De Coster and Kort-Butler 2006; Ford and Schroeder 2009), other studies reveal a role for depression or distress (Jang 2007; Jang and Johnson 2003; Jang and Lyons 2006; Sharp et al. 2005). For example, Ford and Schroeder (2009) found that college students who experienced academic strain reported higher levels of depression and were more likely to use prescription stimulants for non-medical purposes.

### **Strain, Negative Emotions and Delinquency in Adolescence**

A well known fact in criminology is that crime peaks during the adolescent years and declines rapidly thereafter (Gottfredson and Hirschi 1990; Steffensmeier et al. 1989). Notwithstanding the criticism that this age–crime relationship cannot be explained by current criminological theory (Hirschi and Gottfredson 1983), much research has attempted to explain this peak in offending phenomena, with attention directed mostly to control theory and social learning theory (Farrington 1986; Esbensen and Elliott 1994; Laub et al. 1998). For example, Sampson and Laub's (1993) life-course theory can be seen as an extension of social control theory (Hirschi 1969), and Warr (1993, 1998) has shown that the peak of offending occurs along with increasing peer involvement. Although these theoretical approaches certainly provide great insights into juvenile delinquency, Agnew's GST may also be useful in explaining this phenomenon. Much research from psychology suggests that stress/strain is an important tool for understanding development during adolescence (Colten and Gore 1991); likewise, some sociological/psychosocial explanations have indicated that strain is critically related to juvenile delinquency (Friday and Hage

1976; Steinberg and Cauffman 1996). Consequently, applying GST to studies into the causes of juvenile delinquency is a reasonable step.

Agnew (1997, 2003) provided explanations of the escalation of strain in adolescence and its connection to delinquency. First, he suggested that because adolescents, especially during early adolescence, are starting to explore the social environment and to take on greater responsibility in school and at home (Eccles et al. 1993), they are at increased risk of experiencing negative treatment by others. Negative treatment by others and stressful life events have been shown to be potential risk factors for deviant behavior (Agnew and White 1992; Hoffmann and Miller 1998). Second, adolescents are more likely to describe an incident as stressful because of certain cognitive changes. Agnew (1997) stated that youths have increased awareness of their environment, higher expectations of themselves and others, and an increased tendency to blame others for their mistakes/faults. These factors can cause the adolescent period to be stress-laden. In fact, some studies have revealed that juveniles do experience more stressful life events than children and adults (Compas et al. 1985), and escalation of stressful life events during this period increases substance use (Hoffmann et al. 2000) and delinquency (Vaux and Ruggiero 1983). Finally, adolescents are more likely to cope with strain in unconventional ways because of their lack of experience and resources (Agnew 2003; Banez and Compas 1990; Osgood et al. 1996). For example, Grisso (1996) argued that adolescents are more likely than adults to choose illegal or antisocial means of coping with strain and negative emotions because of adolescent's decision making is not mature (e.g., it is based on a short time perspective).

In addition to the escalation of strain and delinquency in the adolescent years, negative emotions, which according to GST are an outcome of strain, also increase in the adolescent years. Stressful life events or strain that takes place during these years is more likely to produce negative emotions and mental conditions such as depression (Olweus 1994; Vaux and Ruggiero 1983), anger (Broidy 2001; De Coster and Kort-Butler 2006) and frustration than they could during childhood (Banez and Compas 1990; Hoffmann and Su 1998; Larson and Asmussen 1991). For example, Larson and Asmussen (1991) argued that the development of cognitive ability during early adolescence increases young people's level of stress and makes them more vulnerable to being disappointed and experiencing negative emotions. They further stated that, for some youths, these negative emotions may be a precursor of various problems, including delinquency and psychopathology.

Among many possible negative emotions, depression causes particularly serious problems in adolescents. For example, a report from the World Health Organization (2001) indicated that depression has become a serious mental health problem among youth, and other scholarly research has pointed out the same problem (Petersen et al. 1992). In addition, Beyers and Loeber (2003) reported that elevated levels of depressive mood not only increased delinquency (e.g., shoplifting, vandalism) but was also related to a slower subsequent decline of delinquency. The relationship between depression and various antisocial behaviors is expected on the basis of GST, which has argued that depression makes people feel uncomfortable, which might lead them to take drugs in order to "feel better" (Agnew 1992). Several studies have found that depressed juveniles are more likely than their non-depressed peers to have problem behaviors, including general delinquency (Beyers and Loeber 2003; Petersen et al. 1992) as well as substance use (Ford and Schroeder 2009).

The escalation of strain, delinquency, and negative emotions, especially depression, in adolescence all suggest that applying GST to explain the development of relationships between these three phenomena could be fruitful. Moreover, the

reviewed empirical research, which provides relatively favorable evidence for this use of GST, also raises the possibility of promoting further understanding of the development of adolescent well-being in general and juvenile delinquency in particular. Unfortunately, only a few studies have been devoted to this issue. Hoffmann and colleagues (Hoffman et al. 2000; Hoffmann and Cerbone 1999), employing a growth curve model to explore the relationship between strain and adolescent drug use, found that escalation of strain (stressful life events) is related to a significant “growth” in drug use and delinquency. Aseltine and Gore (2000), using a similar approach, found that increased strain, stressful life events and conflict with parents occurred along with “growth” in frequency of drinking and intensity of alcohol use. Harrell (2007), who also used a growth curve model, found that increased strain (victimization) increased juvenile delinquency. Finally, Hoffmann and Miller (1998), using an autoregressive model, found that strain (stressful life events) increased delinquency, even after the researchers had controlled for prior delinquency.

### The Present Study

The aforementioned theoretical and empirical evidence suggests that GST is a suitable theory to explain, at least partially, increased delinquency in adolescence. Agnew (2003) argued that the peak of offending during adolescence is seen in most modern industrial societies. In Taiwan, a developed country, the juvenile peak in offending can be seen in the results of several public polls and scholarly investigations. For example, a public poll conducted in Taiwan in 2002 revealed that the most worrisome serious crime problem is juvenile delinquency (27%). Another government report painted the same picture; Taiwanese citizens regarded juvenile delinquency as a serious social problem (Ministry of the Interior 2002). Similarly, an academic survey showed that “juvenile delinquency” was ranked among the five most serious social problems during 1985–2001 (Taiwan Social Change Survey). Furthermore, a report in Taiwan indicated that youths in Taiwan suffer from increased levels of depression (John Tung Foundation 2004), and depression has been found to be the most frequent reported emotional response to life strain/stress in Taiwanese youth (Department of Statistics 2003). In addition, scholars have shown the co-occurrence of depression and delinquency among youths in Taiwan (Wu and Lee 2008). Consequently, applying GST to explaining the relationships between strain, depression, and delinquency in Taiwan seems to be reasonable.

For example, Moon and Morash (2004) successfully used GST in explaining juvenile delinquency in South Korea (Morash and Moon 2007) similarly, Bao and associates (2004) also successfully applied GST in China. In addition, several studies have found that strain is related to juvenile delinquency (Lin and Mieczkowski, *in press*), violent crime (Tung 2007), and self-mutilation (Tung and Wu 2008) in Taiwan. However, these studies are cross-sectional; thus, they can not identify the proper causal order between strain and consequent behavior nor can they take into account a more developmental view toward the dynamic relationship between strain and delinquency in adolescence.

The present study will address three limitations of previous studies. First, some studies, although providing informative insights into the dynamic relationship between strain and juvenile delinquency, failed to incorporate depression into their models (Harrell 2007; Hoffmann et al. 2000). The present study will include strain (stressful life events), negative emotions (depression), and delinquency, thus providing a full test of GST. Second, a latent

growth curve model will be employed to capture not only the causal relationships between strain, negative emotions, and delinquency but also the developmental trajectory between strain and depression and the effects of strain and depression on delinquency, so as to obtain a more dynamic view of GST and the proper causal order between all variables. Finally, all the research will be conducted with a panel sample of Taiwanese junior high school students, which extends the application of GST to a non-Western country. This will greatly enhance the generalizability of GST, which has been studied mostly in Western countries (e.g., the US, Canada).

The following four hypotheses will be tested in the present study:

- Hypothesis 1: Experiencing a high level of strain over time during adolescence is related to a higher level of delinquency
- Hypothesis 2: Experiencing a high level of depression over time during adolescence is related to a higher level of delinquency.
- Hypothesis 3: Experiencing a high level of strain over time during adolescence is related to the growth of depression.
- Hypothesis 4: Strain affects delinquency indirectly through depression.

## Data and Methods

### Sample

Data for the present study will be drawn from the Taiwan Youth Project (TYP; The Institute of Sociology, Academic Sinica, Taiwan), an 8-year longitudinal research project that began in 2000. This study included two student cohorts: 2,696 first-year junior high school students (in 2000) and 2,890 third-year junior high school students (in 2000). This research project focused on how the social environment, especially family and school, affect the life trajectory of adolescents. Consequently, this project provides rich information about adolescents from self-reports of students, interviews with their parents, and reports from homeroom teachers.

The TYP used a two-stage stratified and clustering sampling design. In the first stage, the TYP team employed two steps. The first step was to select the first level strata: two counties (Taipei county and Yi-Lan county) and one city (Taipei) from northern Taiwan. Taipei, the capital, is a well developed metropolitan city in Taiwan; Yi-Lan is a mostly agriculture-based county; and Taipei County is a well developed area in which many cities can be considered as satellite cities of the city of Taipei. The second step was to decide on the strata for further sampling; consequently, the research team divided the city of Taipei and Taipei County into three strata each and Yi-Lan County into two strata, based on differences in the level of urbanization. After the strata were decided upon, the clustering sampling method was employed. To select representative student samples, the project followed three principles. First, the number of students that each second-level stratum would supply was based on the proportion of students registered in each stratum, compared to the whole student body in that county/city. Second, the research team divided the number of students by average size in that stratum to determine the number of classes to be selected. Finally, on the basis of two classes for each school, the team decided on the number of schools to be chosen. After all these calculation and decisions has been made; the number of schools selected was 40: 16 from Taipei City, 15 from Taipei County, and 9 from Yi-Lan County. Following the random selection of these numbers of schools and of two classes for each selected school, all the students in each selected class were recruited into the project.



The present study analyzed results obtained with the first student cohort, which consisted of students in the 1st year of junior high school in 2000 (wave 1), and their two follow-ups (wave 2 and 3). The information about all the variables used in subsequent analyses was from the students' self-report survey. In wave 1, the selected students received in-class self-administered questionnaires, which about 2,690 of them completed<sup>2</sup>. The same panel was then surveyed again in the 2nd year (wave 2) and 3rd year (wave 3). At wave 3, about 98% of the original sampled students had been retained; however, because of missing samples and listwise deletion, the sample available for analysis had been decreased to 2,166. Among these adolescents, there were slightly more male students (51.3%,  $n=1,112$ ) than female students (48.7%,  $n=1,054$ ).

## Measures of Delinquency

### *Delinquency*

In the present study, delinquency was measured at wave 1 and wave 3. These two measures captured minor deviant behavior and substance use, such as skipping class/school, and smoking. Although similar delinquent behaviors were measured, the items were slightly different from wave 1 to wave 3. Nevertheless, we used the wave 1 composited delinquent scale as a control, and wave 3 delinquent scale as the outcome to be predicted. Specifically, in each wave, four items were used to ask students whether they had smoked cigarettes, used alcohol or illegal drugs, skipped class/school, violated school rules or gotten into trouble in school (e.g., fighting) in the past year. For wave 1, the responses ranged from no (1) to always (5); for wave 3, the response categories ranged from never (1) to often (4). It was to be expected that the majority of students would report never or no, which made the measure highly skewed. Consequently, each individual item was dichotomized into yes (1) and no (0). The final delinquent scale, in which all four items were added for each wave, ranged from 1 to 4. Higher scores indicated higher involvement in delinquency.

## Measures of Strain

### *Stressful Life Events*

Agnew (2006a) defined strain as “events or conditions that are disliked by individuals” (p. 4). Consequently, strain was measured through a stressful life event checklist that included a variety of events reported by the adolescents<sup>3</sup>. The life event approach, a standard measure in

<sup>2</sup> One reviewer raised a question about the high completion rate of the in-class survey. Although the author did not participate in this project, some information from the research project can provide insights. According to the project's description, the research team not only carefully screens the field workers who will conduct the survey, but also trains these selected field workers extensively. Second, the project requires the field workers to screen answers before they return to the research center. Thus, field workers can greatly reduce the incomplete rate. Moreover, as is commonly true in Asian cultures, students in junior high school are usually highly disciplined and are told to respect those in authority. Consequently, students are likely to follow the field workers' instructions to complete the survey.

<sup>3</sup> The stressful life events check list used in the present study does not include all possible stressful life events that occur in one's life (e.g., victimization). Three reasons render this scale useful. First, this scale captures a variety of events that are disliked by youths in this age group, such as financial difficulty of one's family, or breakups with good friends. These events are consistent with Herbert and Cohen's (1996) suggestion that scales should be tailored to fit the studied population. Second, many of these events are commonly used in previous studies (Aseltine and Gore 2000; Hoffmann et al. 2000; Lin and Mieczkowski, *in press*). Third, as Turner and Wheaton (1995) argued, there is no advantage in using one particular scale rather than another. Hence, although this scale is not exhaustive, it captures the concept well.

stress research, is commonly used in studies that set out to test GST (Eitle and Turner 2003; Hoffmann and Cerbone 1999; Mazerolle and Maahs 2000; Mazerolle and Piquero 1997). The checklist included 11 incidents that could have happened in the past 12 months, such as the death of a close relative or financial difficulties in the family. The items used in each wave were identical. The response categories were yes (1) and no (0). Because previous research and GST indicate that the cumulative number of stressful life events consistently predicts psychological distress and delinquency (Agnew 1992, 2001; Hoffmann et al. 2000; Mirowsky and Ross 1989), the total number of life events that adolescents had experienced in the past year was the scale score for each wave. In addition, the present study did not weight the events differently, because previous research has shown that weighting did not affect analysis or provide a superior measure (Cohen and Wills 1985; Herbert and Cohen 1996). The higher the score on this scale, the larger the number of stressful life events in the past 12 months. The reliability for wave 1, 2, and 3 were 0.54, 0.55, and 0.52, respectively. The low reliability, which is to be expected because life events often reflect independent incidents (Hoffmann and Miller 1998; Mazerolle and Maahs 2000), is similar to reliability estimates of previous studies (Drapela 2006; Mazerolle and Maahs 2000).

## Measure of Depression

### *Depression*

In the present study, depression was measured through a check list. The items captured three categories of depression symptoms that often appear on commonly used depression scales, such as the Beck Depression Inventory (Beck et al. 1996), CES-D (Radloff 1977), or Symptom Checklist (Derogatis 1983). The scale asked adolescents to indicate whether they had experienced physical conditions or depressive symptoms such as headache, change of sleeping habit (e.g., difficulty in falling asleep), feeling depressed or lonely, being easily irritated (e.g., fighting with others more often), having outbursts (e.g., wanting to scream), and having suicidal thoughts during the past week. The scale consisted of 11 items, with responses ranging from 1 (Never) to 5 (Yes, extremely seriously), and these same items were used in each wave. However, as with many other scales of psychological symptoms and delinquency, each individual item yielded highly skewed results. Each individual item was therefore dichotomized so that youths who reported “never” were in one group (0) and all others were in another group (1). The depression scale was then a composited scale that summed across these 11 items for each wave. A higher score on this scale indicated a higher level of depression (see Table 1 for descriptive statistics for all variables). The reliability is 0.78 for wave 1, 0.77 for wave 2, and 0.79 for wave 3.

## Analytical Strategy

Latent growth curve modeling (Duncan et al. 2006) was used to examine growth in two constructs, strain and depression, across 3 years, spanning early- to mid-adolescence. The advantages of LGM are several: it is flexible, which allows researchers to discover intra- as well as inter-individual differences and to include time-varying and time-invariant covariates; it controls for measurement error; and it provides the capacity to test the adequacy of the hypothesized growth (Duncan et al. 2006; Preacher et al. 2008). Duncan et al. (2006, p. 5) stated that “modeling growth or development within the latent variable SEM framework is a potentially valuable methodology...” The LGM analyses were completed using Mplus Version 5.0 (Muthen and Muthen 2007), a multivariate statistical modeling program that



**Table 1** Descriptive statistics for all variables. Subjects were students in the 1st year of junior high school in 2000 (wave 1; W1), and their two follow-ups [waves 2 (W2) and 3 (W3)] ( $N=2,166$ )

	Minimum	Maximum	Mean	SD
W1Strain	0	11	1.71	1.547
W2Strain	0	11	1.75	1.615
W3Strain	0	11	1.80	1.597
W1Depression	0	11	3.27	2.703
W2Depression	0	11	3.48	2.666
W3Depression	0	11	4.27	2.865
W1Crime	0	4	0.15	0.462
W2Crime	0	4	0.85	1.104

estimates a variety of models for continuous and categorical, observed and latent variables. Because LGM is carried out using a SEM framework, several fit indices were used to evaluate the model. Mplus calculates a  $\chi^2$  test to gauge the fit of a model to its data. Lack of significance indicates an acceptable model fit. However, because the  $\chi^2$  test is sensitive to sample size, scholars have suggested that investigators report multiple fit indices and specify the “critical value” for each (Brown 2006; Hoyle and Panter 1995). Along with  $\chi^2$ , the comparative fit index (CFI), Tucker-Lewis coefficient (TLI), and root mean square error of approximation (RMSEA) measures are used to evaluate the goodness of fit<sup>4</sup>.

Four steps were taken to build models and to examine the three hypotheses. First, this study began analyses by estimating two univariate latent growth curve models to examine whether there was change, or “growth,” in the mean level of strain and depression over time and whether there was variation in this construct over time. For this construct, the intercept (i.e., initial level of strain) and slope (i.e., rate of change) factors were estimated across 3 consecutive years. After the univariate LGMs were confirmed, the simple autoregressive model within which wave 3 delinquency was regressed on wave 1 delinquency was added into the LGM of strain. Doing this allowed the relationship between strain and delinquency to be examined. Third, an interlocking LGM (multivariate LGM) was built by combining the two univariate LGM models, to examine the dynamic relationship between strain and depression during this time period. Finally, the autoregressive model was added into the multivariate LGM to explore the relationships between these three variables and to test the full GST process (strain→depression→delinquency).

## Results

### Univariate LGM of Strain and its Relationship to Delinquency

The initial analysis of the strain model indicated a good fit ( $\chi^2=.031$ ,  $df=1$ ,  $P=.086$ , CFI=1.000, TLI=1.004, RMSEA=0.000). Both the level (1.709) and the trend (0.047) of the analysis were statistically significant. The significant and positive trend indicated that juveniles in this sample experienced “growth” of strain as time went by, a result consistent with results of

<sup>4</sup> The critical value for each of these three fit indexes is based on the related literature. For CFI and TLI, values that are close to 0.95 indicate an acceptable fit (Hu and Bentler 1999). For RMSEA, values that are close to 0.06 or less suggest a good fit (Brown and Cudeck 1993).

previous studies that used longitudinal data and stressful life events as measures of strain (Hoffmann et al. 2000). However, the correlation between level and trend was negative ( $r=-0.21$ ), which suggested that in individuals who had a high level of strain at the beginning, the rate of change was slower than that of those with lower initial levels of strain.

When crime was added into this model, the fit index remained at an acceptable level ( $\chi^2=12.86$ ,  $df=4$ ,  $P=0.12$ ,  $CFI=0.993$ ,  $TLI=.0.982$ ,  $RMSEA=.0.032$ ). In this model, both level ( $b=.0.167$ ) and trend ( $b=.0.352$ ) significantly affected wave 3 delinquency after wave 1 delinquency was controlled; however, wave1 crime still exerted a positive and significant effect on wave 3 delinquency (see Table 2). As in previous studies (Aseltine and Gore 2000; Hoffmann et al. 2000) conducted in the US, the present study also found that the “growth” of strain in Taiwanese adolescents increased the probability of delinquency later in life. Consequently, hypothesis 1 found support.

### Univariate LGM of Depression and its Relationship to Delinquency

The initial LGM of depression did not fit the data well. Upon close inspection of the modification index, it could be seen that the lack of fit was the result of the significant increase in the intercept or mean score of depression from wave 3. After this parameter was freed, the model fit the data perfectly, because the model was saturated. The estimate level (3.269) and trend (0.207) were both statistically significant. These results indicated that the students not only experienced high initial levels of depression but also experienced a positive “growth” of depression. The result was consistent with previous studies that have found puberty to be a period of growth of experiencing of many negative emotions, including depression (Beyers and Loeber 2003; Olweus 1994).

Although GST did not provide a reason to free the parameter, the cultural background offered a justification. In Taiwan, students are assigned to high schools according to their scores on the National Entrance Examination. Some public high schools are more prestigious than others because they are well-known to prepare their students to be

**Table 2** Latent growth modeling (LGM) of strain and its relationship with delinquency (standardized coefficients are in parentheses).  $N=2,166$

	Estimate	SE	<i>t</i> -value
Means			
Level <sup>a</sup>	1.709	0.032	53.56
Trend <sup>b</sup>	0.047	0.021	2.27
Correlations			
Level with trend <sup>c</sup>	-0.286	0.043	-9.52
Prediction			
Level→W3delinquency	0.352 (0.203)**	0.058	6.02
Trend→W3delinquency	0.167 (0.163)**	0.029	5.69
Level→W1delinquency	0.127 (0.298)**	0.013	9.78
W1 delinquency→W3delinquency	0.738 (0.308)**	0.053	14.04

\*\* $P<0.01$

<sup>a</sup> The estimated value is 1.709 when delinquency is not in the model

<sup>b</sup> The estimated value is 0.047 when delinquency is not in the model

<sup>c</sup> The estimated value is -0.213 when delinquency is not in the model

successful on the College Entrance Examination and to “escort” their students into prestigious universities. Consequently, students at wave 3 were expected to have high levels of depression because of examination-related pressure.

When the autoregressive model of delinquency was added into the LGM of depression, the model fit the data only marginally ( $\chi^2=39.36$ ,  $df=3$ ,  $P<.0.01$ ,  $CFI=.0.982$ ,  $TLI=.0.941$ ,  $RMSEA=.0.07$ ). In this model, both the initial level and the trend had significant effects on wave 3 delinquency. The effects of trend on delinquency indicated that as students’ depression escalated, their risk of being involved in deviance and substance use later in life increased. In addition, the initial level of depression had a contemporary effect on wave 1 delinquency (see Table 3). These results supported hypothesis 2. Although previous studies that applied GTS have obtained mixed results regarding the depression–delinquency relationship, many of the authors argued that the mixed results were due to a specific effect. That is, depression was more, sometimes even exclusively, related to inner-directed antisocial behavior, such as substance use (Ford and Schroeder 2009; Jang 2007; Jang and Johnson 2003) than to outer-directed delinquent acts (e.g., violence). Consequently, the significant effect of level and trend on delinquency found in this study is consistent with this assertion.

### Multivariate LGM

GST argues that strain makes an individual feel some negative emotions. From the perspective of GST and the stress literature, strain should lead to subsequent negative emotion, and, as strain increases, so should the negative emotion. Consequently, the level of strain would affect both the level and the trend of depression, and the trend of strain should be in tandem with the trend of depression. To evaluate this hypothesis, the two univariate latent growth models were combined and the causal relationships among levels and trends were specified. The initial interlocking LGM did not fit the data, because the variance/covariance was not positive, causing the estimation of variance to be negative or the correlation between variables to be greater than 1. The modification index suggested that

**Table 3** LGM of depression and its relationship with delinquency (standardized coefficients are in parentheses).  $N=2,166$

	Estimate	SE	<i>t</i> -value
Means			
Level <sup>a</sup>	3.27*	0.058	56.77
Trend <sup>b</sup>	0.207*	0.058	3.57
Correlation			
Level with trend <sup>c</sup>	−0.219**	0.130	−1.68
Prediction			
Level→W3delinquency	0.052 (0.092)*	0.015	3.38
Trend→W3delinquency	0.285 (0.210)*	0.060	4.72
Level→W1delinquency	0.048 (0.204)*	0.006	7.89
W1 delinquency→W3delinquency	0.779 (0.325)*	0.051	15.40

\* $P<.0.01$ ; \*\* $P<0.1$

<sup>a</sup> The estimated value is 3.269 when delinquency is not in the model

<sup>b</sup> The estimated value is .207 when delinquency is not in the model

<sup>c</sup> The estimated value is not significant when delinquency is not in the model

there was a strong correlation between wave 2 strain and wave 2 depression ( $r=.021$ ). After allowing for such a correlation, the model fit the data well ( $\chi^2=8.35$ ,  $df=6$ ,  $P=.021$ ,  $CFI=.0999$ ,  $TLI=.0998$ ,  $RMSEA=.013$ ). As expected, the trend of strain positively affected the trend of depression ( $b=0.82$ ). This result suggests that, as adolescents experienced more strain, they experienced a “growth” of depression. Another important result was that the initial level of strain also significantly predicted the initial level of depression ( $b=1.338$ ); juveniles who experienced high levels of strain, or a larger number of stressful life events, were more likely to have higher initial levels of depression than students who did not (see Fig. 1). Consequently, hypothesis 3 found support.

### Multivariate LGM and Delinquency

The final model to be explored was the combination of both the multivariate LGM and the autoregressive model of delinquency. GST argues that strain would cause negative emotions, which in turn would lead the individual to act so as to correct this negative feeling. The combined model<sup>5</sup> fit the data acceptably ( $\chi^2=44.14$ ,  $df=13$ ,  $P<.01$ ,  $CFI=.0991$ ,  $TLI=.0982$ ,  $RMSEA=0.033$ ) (see Fig. 2<sup>6</sup>). As can be seen, the trend of strain had positive and significant effects on the trend of depression ( $b=0.821$ ), and the initial level of strain also significantly affected the initial level of depression ( $b=1.306$ ). Turning to the paths between strain, depression and delinquency, the results indicate that the trend of depression exerted a significant and positive effect on wave 3 crime ( $b=0.237$ ), which indicates that an escalation of depression in adolescence increased later involvement in delinquency. Although the trend of strain still had only marginal effects on wave 3 delinquency ( $b=.0169$ ), the magnitude was only half that of the original model, where only strain predicted delinquency. All these results, combined with the univariate LGM, suggested that the strain did, as GST suggests, cause juveniles to have negative feelings, and that these feelings, in turn, did increase delinquency. This result supported hypothesis 4. In addition to these results, the level of strain and wave 1 crime were, as expected, significantly related to wave 3 crime.

## Discussion and Conclusion

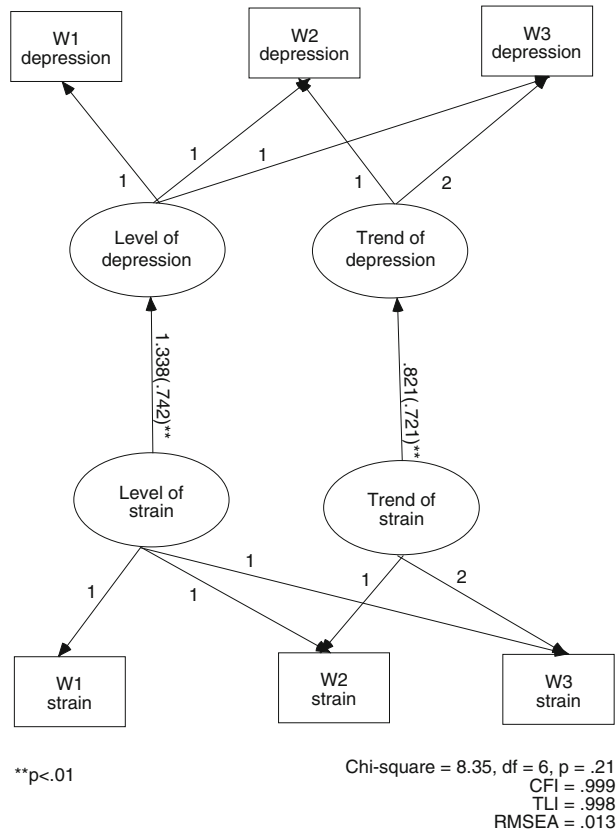
The present study set out to examine how GST can help to explain the relationship between three phenomena during adolescence: the escalation of stress/strain, the increase of delinquency, and the high level of depression. Moreover, the present study also tries to extend GST to a non-Western country (Taiwan) so as to increase the generalizability of GST. By use of the latent growth curve modeling approach, three general results were found.

First, the study found support for hypotheses 1 and 2, i.e., the escalation of life stress or strain is in tandem with the growth of depression, and increased strain and depression are related in the aggregate to delinquency. In addition to the dynamic relationship between

<sup>5</sup> The model includes all the aforementioned freed parameters: relaxing the mean or intercept of the wave3 depression measure and the correlation between wave2 depression and wave2 strain.

<sup>6</sup> For ease of presentation, not all correlations that were estimated for Fig. 2 are shown in the figures. For Fig. 2, three correlations were estimated: between level and trend of strain ( $r=-0.36$ ,  $P<.05$ ), between level and trend of depression ( $r=0.47$ , NS), and between wave2 strain and wave2 depression, as reported in the text. For Fig. 1, two correlations were estimated: between level and trend of strain ( $r=-0.39$ ,  $P<.05$ ), and between wave2 strain and wave2 depression ( $r=0.219$ ,  $P<.05$ ).

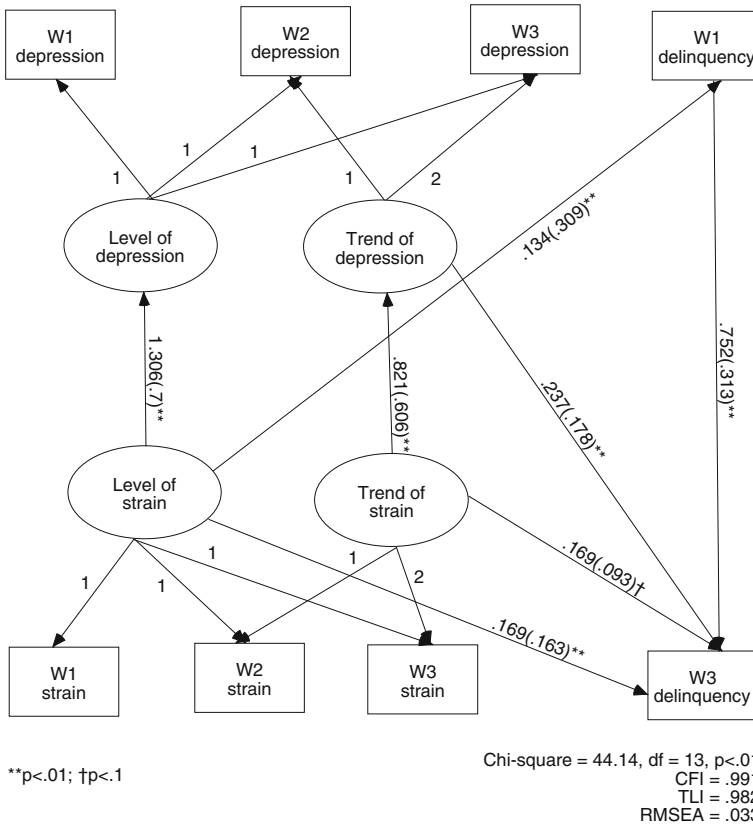
**Fig. 1** Multivariate latent growth modeling (LGM); standardized regression coefficients are in parentheses. Subjects were students in the 1st year of junior high school in 2000 (wave 1; W1), and their two follow-ups [waves 2 (W2) and 3 (W3)] ( $N=2,166$ )



strain-delinquency and depression-delinquency, simultaneous relationships between these variables were also found, i.e., levels of strain and depression both exert significant effects on wave 1 delinquency. Second, the interlocking LGM provides support for hypothesis 3. The trend of strain is significantly related to the trend of depression; in other words, cumulative stress is associated with the “growth” of depression. Finally, the trend of strain, although having only marginal effects on wave 3 delinquency, increases delinquency through its effect on the “growth” of depression. These findings support results in the literature that show adolescence to be a period of increasing delinquency, negative emotions, and strain (Agnew 1997, 2003; Colten and Gore 1991; Compas and Wagner 1991), and are consistent with results of studies that have examined GST in the US (Aseltine and Gore 2000; Broidy 2001; Hoffmann and Miller 1998; Hoffmann et al. 2000; Jang 2007; Paternoster and Mazerolle 1994).

The results provide strong support for GST and its usefulness in explaining the complex relationships between life stresses, negative emotions, and delinquency. Given the many studies that have found that negative emotions play a central role in influencing youngsters’ well-being (Agnew 2003; Beyers and Loeber 2003; Colten and Gore 1991; Hoffmann et al. 2000), utilizing GST to understand how the adolescent’s life unfolds with time is a promising endeavor.

The results presented here were obtained in a sample of Taiwanese youths whose cultural background is different from that of previous samples (e.g., US juveniles). Although Taiwan may be considered a developed country, with a social environment similar to that of Western countries, it still conserves some deep-rooted cultural heritages, such as the Confucian ethos



**Fig. 2** Multivariate LGM with delinquency (standardized regression coefficients are in parentheses). Sample as in Fig. 1

and a collectivistic view of the world. This difference greatly enhances the generalizability of GST. However, some cultural influences, although not examined in the present study may offer an explanation. Studies from the US often find mixed support for the mediating effect of depression; the results of the present study provide support for the argument that these mixed results may very likely be due to cultural influences. In the cultural framework of East Asia, the goal is the alignment of one’s reactions and actions with those of others (relational harmony). The most common negative emotions, such as anxiety, shame, or even depression, are most likely to be related to relationships or a faltering of interdependence (Markus and Kitayama 1994; Yang 1995). For example, Yu (1996) argued that for the Chinese, failure to achieve a goal is usually blamed on the self, which is more likely to lead to negative emotions such as anxiety, depression, or guilt. On the other hand, Markus and Kitayama (1994) observed that in the United States (an example of individualistic culture), emotional states that have the individual’s internal attributes (e.g., one’s needs), such as anger or frustration, as the primary referent are more commonly manifested. Consequently, whereas depression may play a central role in the GST process in the East, anger may be the focal emotion in the West.

Although the model presented here advances research on strain, depression, and delinquency in youth, identification of several limitations is in order. First, as mentioned in the Results section, the high level of depression for the present sample at the ninth grade



may be due to stress related to the High School Entrance Examination, which the present study does not include. Studies in other East Asian countries, such as in Korea, with similar entrance examinations have reported the negative effect of examination-related stress on adolescents (Lee and Larson 2000). However, Moon and Morash (2004) did not find that examination-related strain exerted positive effects on delinquency among youths in Korea, and Agnew (2006a) also indicated that the strain from a conventional society should be less criminogenic. Hence, whether the “jump” in the depression level at the ninth grade in the present study is due to examination-related stress or other strain is unclear.

Second, and related, the measure of strain is not comprehensive. Although stressful life events can be a useful measure of strain, only two major types of strain—loss of positively valued stimuli, and presentation of noxious stimuli—were included. Another important criminogenic strain, unfair or unjust treatment from others, is not included. Future studies should try to use a similar statistical approach to model the dynamic relationships between strain, negative emotions and delinquency during adolescence but at the same time include a more comprehensive measure of strain.

Finally, because the present study, unlike many other studies, employs longitudinal panel data to examine GST, the causal sequence among the variables is secure. Nevertheless the study includes only three waves of data, and this precludes modeling more complex relationships between variables. For example, in the absence of more waves of data, possible non-linear “growth” cannot be modeled (e.g., including a quadratic term in LGM). Future research should continue the present effort to use similar statistical modeling with more waves to explore GST. This will greatly enhance our understanding of the complex interrelations between strain, negative emotions and delinquency in puberty or even later in life.

In conclusion, Liu (2009, p. 6) stated that “[G]eneral criminological theories can be examined under more diverse contexts and conditions, and new theoretical elaborations and new theories based on evidence supplied from Asian context can be established, enriching knowledge based on Asian context.” This statement, along with others (Karstedt 2001), encourages researchers to continually examine theories from the West in Asia and expand these theories to incorporate the diverse Asian contexts. The present study and some previous studies have responded to this advice and found that the GST model provides a reasonable explanation of how strain significantly affects delinquency and negative emotions in adolescents, and this model is applicable in an Asia context (Bao et al. 2007; Lin and Mieczkowski 2010; Moon et al. 2008). With increasing supporting evidence, GST may gradually achieve greater generalizability and applicability in explaining the trajectory of individual development. All these endeavors not only help criminologists to obtain a better understanding of crime but also make evident the indispensable value of research in Asian societies.

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