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博士論文

The Trajectory of Adolescent Mental Health: The Effects of Parental Divorce and Marital Conflict during Childhood

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ABSTRACT

Using a nationally representative dataset (Taiwan Education Panel Survey, TEPS), this study examined the effect of parental divorce and marital conflict during childhood on adolescent mental health, including happiness and depressed mood. The final sample comprised 3,886 adolescents. Results from Hierarchical Linear Regression (HLM) demonstrated that both parental divorce and marital conflict during childhood reduced the initial level (grade 7^{th}) of adolescent happiness, and increased the initial level (grade 7^{th}) of adolescent depressed mood. Furthermore, adolescents from families with parental divorce (occurring when they were 0~12 years old) with pre-divorce marital conflict have the lowest happiness and highest depressed mood, even worse than adolescents from two-parent families with marital conflict.

Keywords: Adolescent mental health, parental divorce, parental marital conflict, HLM

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CHAPTER 1

INTRODUCTION

Research Motivation

Adolescent mental health has attracted global attention. According to World Health Organization (WHO, 2012), mental well-being is an important indicator of good quality of life, and is related to self-esteem, behavior, educational performance, social skills and life opportunities (Bully, 1991). Mentally healthy adolescents possess problem-solving skills, social competence and a sense of purpose, and all of which can help them overcome difficult circumstances and also avoid risky behaviors (Scales, 1999). Furthermore, happy and confident adolescents are more likely to grow into a happy and confident adults able to contribute their health or well-being to the national good (WHO, 2012). For governments, policy makers and stakeholders everywhere, it is important to understand current adolescent mental health and investigate both positive and negative influences.

Depression is the main cause of mental disability among adolescents. According to a report by the WHO (2012), in any given year, about 20% of adolescents experience a mental health problem, typically depression or anxiety. Moreover, according to a report by the Department of Statistics, Ministry of Interior (DSMI, 2003), 40% of Taiwanese youth experiences depression when facing serious life problem or pressure. Poor mental health is strongly related to other health conditions and development outcomes in young people, including low educational achievement, substance abuse, violence, and poor reproductive and sexual health (WHO, 2012).

In the worst scenario, depression leads adolescents to attempt or commit suicide. With the increasing rate of depression among adolescents, the global suicide rate is increasing for both males and females (WHO, 2002). The global suicide rate has increased 40% in the last 45 years (WHO, 2009),

meaning that currently one person successfully commits suicide every 40 seconds. In Taiwan, according to Department of Health, Executive of Yuan (DHEY, 2009), suicide has ranked as the eighth or ninth leading cause of death since 2001, and the suicide rate has increased approximately 41% over the past decade. Furthermore, suicide is one of the leading causes of death among young people in Taiwan. According to the National Adolescent Health Information Center (2006), suicide was the third leading cause of death in the 10-24 year old age group in the United States in 2003. In Taiwan, suicide is the third and second leading cause of death among young people aged between 15~19 years old and 20~24 years old, with these two groups having suicide rates 85% and 50% higher than the rest of the population, respectively. Suicide is a multidimensional disorder and results from a complex interaction among different factors, [such as OR including] biological, genetic, psychological, sociological and environmental factors (WHO, 2000). However, mental disorders are a major factor associated with suicide (WHO, 2000).

Negative life events or experiences, such as parental divorce/separation or frequent conflicts between parents, are risk factors for suicide in adolescents with depression (WHO, 2000). The negative impact of parental divorce on the mental health of offspring is well-documented. Individuals who experience parental divorce during childhood or adolescence are more likely to have poorer psychological well-being or mental health (Amato, 1988; Paul R. Amato & A. Booth, 1991; Ä ngarne-Lindberg & Wadsby, 2009; Chase-Lansdale, Cherlin, & Kiernan, 1995; Maier & Lachman, 2000; McLanahan & Bumpass, 1988; McLanahan & Sandefur, 1994).

Furthermore, researchers have recently suggested that "divorce" is a continuous process rather than a single event, and should be considered in the context of marital conflict before the dissolution of a marriage. However, the effect of pre-divorced marital parental conflict is not clear yet. Studies suggested that parental divorce can cause serious negative effect on children whose parents have low levels of pre-divorced martial conflict (Amato, Loomis, & Booth, 1995; Booth & Amato, 2001; Hanson, 1999),

but for children of parents with high levels of pre-divorced parental marital conflict, Booth and Amato (2001) and Amato et al. (1995) suggested that parental divorce provides relief for children of high-discord families, and therefore can increase offspring well-being; but Hanson's (1999) result suggest that parental divorce neither increase or decrease offspring well-being. Wheaton (1990) pointed out that the influence of life transition events (such as divorce, losing job etc.) depends on the context of the event occurs. If the event can relieves more existing stress than bringing the new stress, then the event can increase offspring mental health; on the other hand, if the event brings more new stress than relieving existing stress, then the event decreases offspring mental health. In other words, it is important to understand and identify the context of parental divorce occurs.

Research has shown that parental involvement is correlated with positive adolescent outcomes, including better mental health (Astone & McLanahan, 1991; Crouter, MacDermid, McHale, & Perry-Jenkins, 1990), lower internalizing, externalizing, and substance use problems, and higher psychosocial competence (Steinberg, 2001). Moreover, study suggested that parental involvement is also a protective factor for children's adjustment after parental divorce (Leon, 2003). After reviewing twenty-four studies, Leon's (2003) suggested that for adolescents of divorced families, parental monitoring and involvement are important protective factors because children spend more time in school and with peers.

According to a survey by the Department of Statistics of the Ministry of the Interior, the crude divorce rate in Taiwan during 2010 was 2.46%, and has apparently remained stable for the past ten years. However, the low crude marriage rate, which has decreased 39.7% over the past decade, might limit the growth of the crude divorce rate. A study conducted in 2011, examining details of more divorced couples found that 28.7% of divorces occur within five years of marriage, while a further 28.4% occur within five to nine years of marriage, implying that for most offspring of single-parent families involved in divorce, their parents divorced before they reached adolescence. Furthermore, studies suggest that parental

divorce and marital conflict is more harmful to offspring when it occurs during childhood than later in life (Krein & Beller, 1988; Zill, Morrison, & Coiro, 1993).

Despite the above statistics, the links between childhood parental divorce and adolescent mental health in Taiwan are relatively scarce, and most studies have focused on the effect of parental divorce on offsprting educational achievement (Hsieh, 2008; Lau, 2006; Lee & Yu, 2005; Wang, 2009). However, this study focuses on the trajectory of adolescent mental health rather than adolescent educational achievement.

According to the WHO (2001), mental health is defined as a state of well-being in which every individual realizes their own potential, can cope with normal life stresses, work productively and fruitfully, and contribute to the community. That is, mental health is a multi-dimensional concept incorporating both negative and positive measurements. Not only can the positive aspects of mental state reduce mental illness in the future, but can also exert long-lasting positive influences that benefit individual functioning, and enhance quality of life and well-being for both individuals and communities (Parham, 2008; Williams, Saxena, & McQueen, 2005). Therefore, this study used both negative measurements (depressed mood) and positive measurements (happiness) .

Moreover, the trajectories, processes and mechanisms associated with specific issues cannot be understood unless the analytical method considers "time" (Wu, Chang, & Chen, 2008). However, when including repeated measurements of the same individuals in an analysis, observations tend to be similar within individuals. The assumption of traditional linear regression violates the principle that observations of specific individuals are not related to observations of other individuals. Hierarchical Linear Regression (HLM) is a particular regression technique used to consider the hierarchical structure, including repeated measurement within individuals, and to model the nested data structure and provide effects for both individual and multiple levels. In short, longitudinal dataset and HLM are appropriate for observing changes over time, and individual outcome trajectories.

Overall, the current study hopefully can not only provide the missing piece in the puzzle of understanding the effects of parental divorce and parental marital conflict during childhood on adolescent mental health, but can also utilize longitudinal datasets to appropriately describe the trajectory of adolescent mental health during adolescence.

Research Purposes

The main goal of this study is to estimate the effect of parental divorce and parental marital conflict during childhood on adolescent mental health. This study thus has the following objectives:

1. Does the mental health of Taiwanese adolescents (including happiness and depressed mood) change over time? If so, what is the trajectory throughout adolescence?
2. Does parental divorce during childhood negatively affect adolescent mental health?
3. Does parental marital conflict during childhood negatively affect adolescent mental health?
4. Does the effect of parental divorce depend on pre-divorce parental marital conflict?
5. Does parental involvement can decrease the negative effects of parental divorce and marital conflict?

The mechanism and process of the above research purposes was examined.

A longitudinal dataset, Taiwan Education Panel Survey (TEPS), and Hierarchical Linear Regression (HLM) were used to measure changes in adolescent mental health over time.

Definition of Terms

1. Mental health

Mental health is defined as a state of well-being in which every individual realizes their own potential, can cope with normal life stresses, can work productively and fruitfully, and can contribute to their community (WHO, 2001). That is, mental health should include multiple dimensions, and is not simply the absence of mental illness (WHO, 2001). Supporting the perspective of the World Health

Organization, several studies have addressed the importance of both positive and negative measurement of mental health (Keyes, Dhingra, & Simoes, 2010; Norrish & Vella-Brodrick, 2009; Tennant, Joseph, & Stewart-Brown, 2007). Therefore, in this current study, both negative and positive measurement of mental health will be used, the former one is depressed mood, and the later one is global happiness.

2. Adolescents

The World Health Organization defines adolescents as young people aged between 10 and 19 years old. However, the 10 to 19 year old age range crosses four different school stages in Taiwan: the last three years of elementary school, junior high school, senior high school, and the first years of college. Different school stages have a different atmosphere and environment, and may confound the effects of parental divorce. Therefore, to decrease confounding factors, this study limits the sample to adolescents attending junior and senior high school because these two school stages have a similar atmosphere, including pressure to perform well to enter a good school for the next stages of education.

3. Parental divorce during childhood

This is defined as a legal dissolution of the marriage contract of the biological parents of a child by a court or other body with competent authority before the child enters junior high school.

4. Parental marital conflict during childhood

This is defined as frequent severe disagreements or fights between the biological parents of a child before that child entered junior high school.

CHAPTER 2

LITERATURE REVIEW

Why use Life Course Theory as the framework of this study?

Life course is an emerging paradigm, and comprises both macro aspects of age stratification, cultural and intergenerational models, and micro aspects of developmental life span psychology. Elder (1974) drew on generation and age models and adopted life course thinking in a study of California children who grew up during the Great Depression. His study focused on two cohorts of children with different economic and status backgrounds during the Great Depression, traced their development to maturity, and examined how and why they faced the same difficulties while growing up but achieved different outcomes.

The Core Assumption: Life Trajectory

The life course framework has developed over the years. In 2003, Elder *et al.* (2003) summarized five general principles that guide life course research, as follows: life span development, linked lives, timing, agency, and historical time and place. The core assumption linking these five principles of life course theory is that life trajectories, which comprise various transitions or turning points, shape developmental processes and outcomes. Trajectories are the long-term patterns and sequences of that characterize the lives of individuals, and naturally include transition or turning points. Transitions or turning points bring changes, and naturally present life trajectories over time. Social science researchers have tried to estimate the real effects of changes, build up causal models, and understand how prediction variables affect outcome variables. Life course theory highlights that the causal model or the changes displayed by individuals experiencing specific transitions or turning points cannot be determined unless life trajectories are described in detail, and the process of "change" is

appropriately observed and measured.

The Principle of Linked lives

According to Elder, Johnson, and Crosnoe (2003), the principle of linked lives means "lives are linked interdependently and socio-historical influences are expressed through this network of shared relationships" (p.13). Moreover, the principle of linked lives emphasizes the intergenerational connection between parents and children, because it helps clarify how changing parental fortunes can affect the development of their children (Elder, 1994, 1998). Family is the primary setting in which children are born and grow. Despite extensive literature on the influence of family context (such as family structure, family dynamics etc) on mental health outcomes for offspring. Uhlenberg and Mueller (2003) noted that researchers should not consider the consequences of family context for particular life course outcomes to be universal, because the influences of family environment may vary significantly across societies, cultures, and times. Moreover, the process for handling marital discord varies among families. Some couples may exhibit serious conflicts or arguments throughout their marriages, while others may adopt less violent and confrontational ways of managing their marriage. Family context is embedded in social, cultural and historical context, and can have different influences on offspring. Regardless of the nature of the family environment in which they grow up, children are unable to choose it, and inevitably are strongly influenced by those around them.

The Principle of Timing

The principle of timing refers to how "the developmental antecedents and consequences of life transition, events, and behavioral patterns vary according to their timing in a person's life" (Elder, *et al.*, 2003). Moreover, many studies suggest that childhood family experiences (including parental divorce

and marital conflict) strongly [impact OR influence] offspring outcomes (Kalter & Rembar, 1981; Krein & Beller, 1988; Palosaari & Aro, 1994; Zill, *et al.*, 1993).

(1) The impact of childhood parental divorce on outcomes of offspring

Krein and Beller (1988) merged three datasets from the National Longitudinal Survey of Labor Market Experience (NLS) to examine the effect of parental divorce on offspring educational attainment. Krein and Beller (1988) identified three periods of childhood spent in a single-parent family: preschool years (0-5.5 years old), elementary school years (5.5-13.5 years old), and high school years (13.5-18.0 years old). Their findings show that the negative effect of parental divorce is strongest during the preschool years among all age groups and for both males and females. Moreover, the second strongest negative effect occurs during the elementary school years and for males, even after controlling for income.

Zill, Morrison and Coiro (1993) used the longitudinal dataset National Survey of Children (NSC) to investigate the long-term effect of parental divorce on offspring outcomes, such as adjustment and achievement. Zill, Morrison and Coiro (1993) divided the respondents into three groups: those whose parents divorced before the respondent was 6 years old (early divorce), those whose parents divorced when the respondent was aged 6-16 years old (late divorce), and those whose parents did not divorce. Their results suggested that the early divorce group showed higher rates of dropping out from high school and behavioral problems during adolescence.

Kalter and Rembar (1981) showed that both male and female adolescents who experienced childhood parental divorce, including during the age ranges of 0~2.5 years old, 3~5.5 years old, and over 6 years old, are more likely to display aggression towards parents and peers, and are also more likely to have academic problems compared to those who underwent parental divorce during adolescence.

Palosaari and Aro (1994) conducted a Finnish study investigating the timing of parental divorce

and its influence on youth depression. Palosaari and Aro (1994) divided the children into three groups based on their experiences of parental divorce: those who experienced parental divorce before reaching school age (under 7 years old), those who experienced it in latency (7~12 years old), and those who experienced it in adolescence (13~16 years old). Their results showed a statistical association between parental divorce occurring in latency (7~12 years old) and increased risk of subsequent depression.

(2) The influence] of childhood parental conflict on offspring outcomes

Parental conflicts exert both short-term and long-term effects on outcomes in offspring (Enos & Handal, 1986; Stocker & Youngblade, 1999). In a study of the effect of marital conflict and hostility on the relationship of children with peers and siblings, Stocker and Youngblade (1999) suggested that marital conflict is associated with problematic sibling and peer relationships among offspring. Since children tend to interpret and understand parental conflicts rather than simply being passive observers, they are more likely to feel threatened by parental conflict and blame themselves for its occurrence. Their study also demonstrated that parental marital conflict is associated with parental hostility toward children, and parental hostility is negatively related with relationships between children and others.

Moreover, Enos and Handal (1986) recruited adolescents aged between 13 and 18 years old to investigate the effect of parental conflict on their adjustment. The mean length of time since parental divorce was approximately 6 years, implying that most of the adolescents sampled had experienced parental divorce during childhood. Enos and Handal (1986) divided respondents into three groups based on the intensity of parental marital conflict namely low-conflict, medium-conflict and high-conflict groups. Their analytical results showed that the low-conflict group reported better adjustment than the middle- and high-conflict groups, and furthermore reported higher satisfaction with their social life than the high conflict group. Other studies also suggested that the quality of the parental marital relationship during childhood is an important indicator of offspring mental health (Paul R. Amato & Alan Booth,

1991; Rodgers, Power, & Hope, 1997)

Although different studies have focused on parental divorce and marital conflict occurring in different age groups, the limited cognitive ability of children compared to adolescents makes them less able to assess the causes and consequences of parental divorce or marital conflict, and potentially more likely to blame themselves for parental marital conflict or divorce. Furthermore, children are highly dependent on their parents and therefore less able to turn elsewhere, such as to school, peers or social welfare agencies, for protection against harm originating from their family environment (Hetherington, 1989; Zill, *et al.*, 1993). Since the effects of parental divorce and marital conflict may affect offspring more during childhood than subsequently, and since more than half of divorces in Taiwan occur within ten years of marriage, it is important to investigate the effect of childhood parental divorce and marital conflict on adolescent outcomes of mental health.

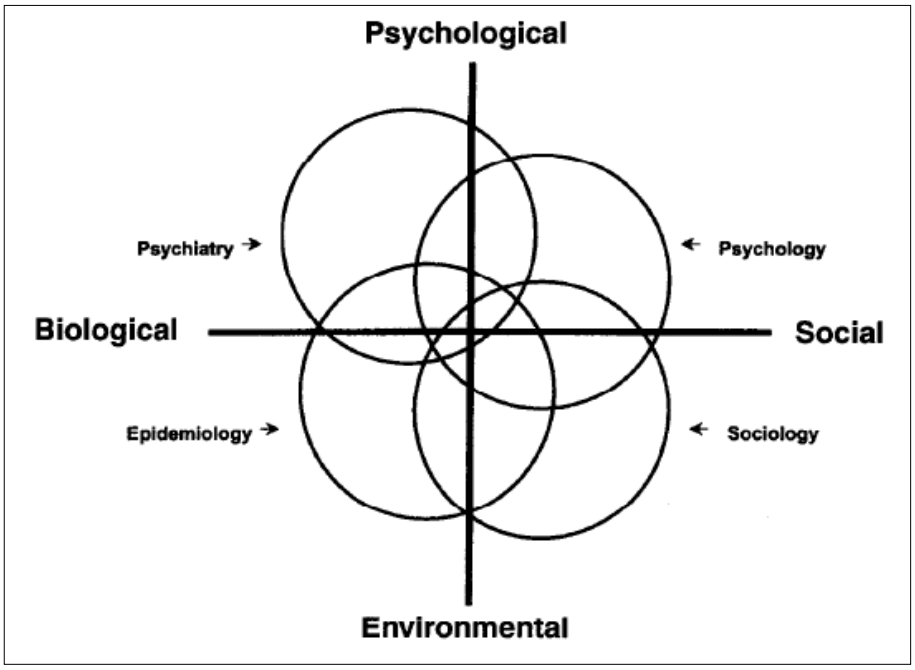
Overall, the timing principle of life course theory guides this study to stress the childhood experience; the principle of linked lives leads this study to stress parental divorce and marital conflict, and to examine outcomes in a specific structural and static context; and the core assumption, that developmental process and outcome are shaped by life trajectories, causes this study to emphasize the importance of dynamic changes over time. This study attempts not only to understand how parental divorce and marital conflict affect adolescent mental health, but also to describe the changes of the development trajectories of mental health. Therefore, life course theory, which incorporates both static and dynamic perspectives, provides a suitable framework for this longitudinal study.

Mental Health

1. A concept defined using multiple disciplines

Mental health is a multi-discipline concept, and different academic disciplines define and

measure it differently. Switzer, Dee, and Bromet (1999) summarized the four main parent disciplines, namely psychology, sociology, environmental studies and biology, and the orientations of psychology, sociology, epidemiology, and psychiatry in relation to mental health related issues (Fig. 1).



Note. Major academic disciplines concerned with mental health issues. Adapted with permission from the *Handbook of the Sociology of Mental Health* (p. 82), by C. S. Aneshensel and J. C. Phelan (Eds.), 1999, New York: Kluwer Academic/Plenum. Copyright 2007 by the Springer Science + Business Media LLC.

Although each of the four main approaches, namely psychology, sociology, epidemiology, and psychiatry, covers all four disciplines, the relative weightings on each of the four disciplines differ among these approaches. Generally, psychology and psychiatry assign a heavier weighting to internal states (the upper part), and assign a lighter weighting to external factors that affect mental health; meanwhile, sociology and epidemiology assign a heavier weighting to external factors when examining mental health issues (the lower part), and a lighter weighting to individual internal states.

In terms of examining internal states, compared to psychiatry, psychology more strongly emphasizes cognitive processes (upper-right), whereas psychiatry focuses on how physical factors relate

to mental disorders (upper-left). These two disciplines typically measure mental health [individually OR at the individual level], for example using clinical interviews, neurological examinations, or behavioral observation to understand the causes of mental disorders.

On the other hand, in terms of examining the relationship between external factors and mental health issues, compared to epidemiology, sociology emphasizes societal-level structures and process (lower-right), whereas epidemiology stresses physical environmental factors, such as environmental conditions or hazards, in mental health issues (lower-left). These two disciplines are more likely to use surveys, interviews, or secondary datasets that are population-based.

Each of the four disciplines provides and contributes overlapping and unique perspectives for understanding mental health issues, and none can exist independently of the others. No clear boundaries or guidelines exist among these four disciplines, the measurements of mental health used in previous lectures sometimes cannot distinguish clearly between psychological and sociological approaches, and the terms describing mental state, such as mental health, mental illness, psychological well-being or depression etc., are frequently interchangeable. While many previous studies (Huang & Lin, 2010) used well-developed questionnaires (e.g., Goodman Strengths and Difficulties Questionnaire 1997) to represent "mental health" content, and to detect symptoms of mental illness or disorder in individuals This study focuses instead on changes in teenager mental state over time, and how different social segments affect that mental state. Therefore, this study adopts a sociological approach, and adopts both positive (global happiness) and negative (depressed mood) measurements of mental health. The reasons this study adopts a sociological approach are addressed in more detail later.

2. The sociological approach to mental health

While all individuals have a mental health status, specific mental health traits are clustered within certain social strata rather than being randomly distributed throughout society (Aneshensel & Phelan,

1999). That is, social status, including gender, race/ethnicity, or socioeconomic status, influence individual mental health, and also influence the expression of mental disorder, such as through depression, drug use or alcoholism, and ways of identification or treatment, such as females being more likely than males to recognize emotional problems (Yokopenic, Clark, & Aneshensel, 1983), or young females being more likely to exhibit sadness, suicidal ideation and suicide attempts, while young males are more likely to actually commit suicide (NAHIC, 2006).

Differences in mental health among social groups are linked to corresponding differences in exposure to the social conditions that affect mental health. The sources of societal systematic differences in mental health do not exist by accidence or happenstance, but rather in the repetition and reproduction of the commonplace. The effect of parental divorce is well-documented in numerous countries, and thus the disadvantages affecting children growing up in families that have undergone parental divorce are concentrated in certain social segments rather than affecting children in all segments of society randomly. Parental divorce is associated with socioeconomic status. Single mothers are more likely to have lower occupational status, and offspring of single parent families are disadvantaged not only in terms of socioeconomic resources, but also in academic performance (Bogenschneider & Steinberg, 1994; Jeynes, 1999; Lee & Yu, 2005; Pallas, 2003; Riala, Isohanni, Jokelainen, Jones, & Isohanni, 2003; Sandefur & Wells, 1999; Sui-Chu & Willms, 1996; Wojtkiewicz, 1993), mental health (Amato, 1988; Paul R. Amato & A. Booth, 1991; Ä ngarne-Lindberg & Wadsby, 2009; Chase-Lansdale, *et al.*, 1995; Maier & Lachman, 2000; McLanahan & Bumpass, 1988; McLanahan & Sandefur, 1994), or delinquency behaviors (Amato & Cheadle, 2008; Amato & Keith, 1991; Brown, 2006; Doherty & Needle, 1991). However, not everyone who experiences parental divorce experiences the same outcomes. Some suffer negative consequences from parental divorce while others remain unscathed. The sociological approach focuses on why the same cause can have different effects on different groups from different societal strata.

To summarize, even mental health seems to be an issue within the development of individuals,

but when the cause, in this case parental divorce, of mental health status is stratified by societal segments, adopting a sociological approach to studying the issue is appropriate.

3. Measurements of mental health

Several terms have been used to describe similar concepts to mental health. In a study of the effect of pre-divorce parental relations on offspring outcomes, Amato (2001) and Amato, Loomis & Booth (1995) used the concept of "psychological well-being". The study of Amato (2001) comprised global happiness, life satisfaction, and self-esteem; and the study of Amato, Loomis & Booth (1995) comprised overall happiness and psychological distress. Hanson (1999) also used the term "psychological well-being" to analyze the effect of parental conflict and divorce on children, where "psychological well-being" comprised behavior problems, global quality of life, and self-esteem. Other common used measures of mental health are depression (Aseltine, 1996; Videon, 2002) and emotional problems (Chase-Lansdale, *et al.*, 1995; Cherlin, Chase-Lansdale, & McRae, 1998).

In Taiwan, some scholars have measured mental health using the Taiwanese Educational Panel Study (TEPS). In a study exploring the relationship between educational achievement and adolescent mental health, Yang (2005) used 14 questions to measure mental health, including depression, insomnia, dizzy, loneliness, helplessness, suicidal ideation, etc. Huang & Lin (2010) used 15 questions of TEPS to develop a Mental Health Questionnaire to compare adolescent mental health between Taiwan and the United States, where the questionnaire included four subscales, measuring emotional symptoms, problematic behavior, attention/distraction, and peer relations. The most recent study using TEPS to measure mental health was the investigation of Wei (2008) exploring the influences on mental health. Wei used 16 questions, similar to the study of Yang, to measure mental health, including depression, loneliness, helpless, insomnia, anger, etc.

Although the three domestic studies addressed above all use the term "mental health", the

measurements employed more closely resemble measures of "mental disorder" or "mental illness". That is, the measures employed focus only on the negative side of mental health, and do not sufficiently accurately measure overall mental health (Keyes, *et al.*, 2010; Power, 2010; Tennant, *et al.*, 2007). Keyes, Dhingra, and Simoe (2010) distinguished positive mental health from mental illness. Measurement of positive mental health include such measures as feeling cheerful, in good spirits, happy, calm or peaceful, satisfied, and full of life during the past 30 days. Keyes *et al.* (2010) compared changes of positive mental health and mental illness between 1995 and 2005 in adult population, and suggested that changes in mental health strongly predicted changes in mental illness. Westerhof and Keyes (2010) also distinguished the concepts of mental illness and mental health, and indicated that mental illness (namely distressed) and mental health (namely happy) are related but distinct dimensions of a single concept. Demonstrating the distinctiveness of these two concepts, age has more impact on mental illness, while gender and marital status have more impact on mental health.

Tennant, Joseph, and Stewart-Brown (2007) also proposed the importance of separately measuring negative and positive mental health. Positive psychology is another term similar to positive mental health, and is defined as "seeking to create more understanding of human happiness and optimal functioning"(Norrish & Vella-Brodrick, 2009), and being based on the assumption that "a fulfilling and happy life consists of more than an absence of mental dysfunction" (Keyes, 2005). Norrish and Vella-Brodrick (2009) considered positive measurements of mental health is particularly important for adolescents, because adolescents tend to have moderate or average mental health rather than good mental health. While most adolescents do not fall within the clinical range for mental illness, a large portion of adolescents exhibit mental health issues (namely lack of confidence, feelings of insecurity, etc.), creating a need for measurements that involve more than just mental illness.

The World Health Organization (2001) defines mental health as "a state of well-being in which every individual realizes their own potential, can cope with normal life stresses, can work productively

and fruitfully, and can make a contribution to their community". The concept of mental health is broader than those of mental disorder or illness, and includes more dimensions than the mere absence of illness (Aneshensel & Phelan, 1999; WHO, 2001). Of course mental disorder or illness can decrease the likelihood of achieving good mental health, but measuring only mental disorder or illness does not provide a complete picture of mental health. Furthermore, recent studies demonstrate the need for positive measures of mental health (Keyes, *et al.*, 2010; Norrish & Vella-Brodrick, 2009; Tennant, *et al.*, 2007; Westerhof & Keyes, 2010). Johansson, Burnberg, and Eriksson (2007) investigated mental health from the perspective of adolescents, and the results obtained suggested that adolescents perceived mental health as an emotional experience incorporating both positive and negative aspects.

Therefore, this study uses both negative and positive measures of mental health. The negative measure is depressed mood, while the positive measure is happiness.

(1) Depressed mood

Adolescent depression can be classified using three levels (Petersen *et al.*, 1993): depressed mood, depression syndrome, and clinical depression. Depressed mood is a common emotion that can occur at certain points in life and is typically linked to problems such as anxiety and social withdrawal. Depressed mood is typically measured through adolescents providing self-reports of their emotions, and is the single most powerful symptom for differentiating clinically referred and non-referred youth. Depression syndrome is a constellation of problematic behaviors and negative emotions, including social problems, thought problems, attention problems, etc. Depression syndrome is diagnosed based on reports of adolescents, parents, and school teachers.

Clinical depression is linked to a set of long-term emotion and behavior problems that impair functioning of affected adolescents. Clinical depression can be diagnosed using the categorization of mental disorders developed by the American Psychiatric Association or the World Health Organization. In this study, because it adopts a sociological approach and the main focus is an adolescent population,

and because only self-reported data from adolescents is used, depressed mood is not an appropriate indicator of depression in this study. The measurement of depressed mood is calculated from four items from the student questionnaires, including "do not want to deal with others", "feeling upset", "wanting to yell or throw things", and "feeling lonely".

(2) Happiness

This study considers happiness an appropriate positive measure of mental health because it not only represents an important mental condition identified in numerous studies (Amato, 2001; Amato, *et al.*, 1995; Westerhof & Keyes, 2010), but also has been found to reduce symptoms of psychopathology (Diener, 2002), improve physical health (Dillon, 1995), improve coping ability (Fredrickson, 2002), increase self-control (Aspinwall, 1998), enhance relationships with others (Harker, 2001), increase opportunities for success (Lyubomirsky, 2005), and even contribute to longer lifespan (Diener, 2011).

4. The need for longitudinal research on mental health

According to Life Course Theory, early life experiences or states significantly influence later outcomes. Mental health is an accumulative process, and has the potential to alter subsequent life-course. Furthermore, the mental health of individuals during their the life-course is not static, but rather a dynamic developmental process influenced by individual life experience. The trajectory of individual mental health cannot be understood unless it is possible to investigate "time" and "changes over time". Cross-sectional studies provided valuable information regarding certain issues. However, longitudinal research is required to understand certain phenomena that change over time (namely mental state), and particularly how and why they change.

According to Menard (2002), longitudinal research is defined in terms of both data and method of analysis, and the criteria used in its definition are as follows: (a) data are collected for each item or

variable over two or more different time periods; (b) the subjects analyzed are the same or at least comparable between or among periods; and (c) the analysis involves comparison of data between or among periods. The current study uses the same variables and subjects from four waves of data of the Taiwan Education Panel Survey (TEPS), thus meeting criteria (a) and (b); moreover, Hierarchical Linear Regression (HLM) can measure changes over time and enable the comparison of different time period, meeting criterion (c). Therefore, this study can be considered a longitudinal study, and thus is well suited to describe the trajectory of mental health.

Parental Divorce and Parental Marital Conflict

1.The Effects of Parental Divorce

Adolescence is a unique life stage during which individuals experience major physiological and psychological changes. The mental health of adolescents strongly influences adult outcomes (Amato, *et al.*, 1995; Glenn & Kramer, 1985; Pallas, 2003), and family is the most important determinant of mental health in young people (Johansson, *et al.*, 2007).

Parental divorce during childhood had both short- and long-term negative impacts on offspring mental health, including anxiety and psychological distress (Amato, 1988; Paul R. Amato & A. Booth, 1991; Ä ngarne-Lindberg & Wadsby, 2009; Chase-Lansdale, *et al.*, 1995; Maier & Lachman, 2000; McLanahan & Bumpass, 1988; McLanahan & Sandefur, 1994). Individuals who experienced parental divorce were more likely than those who grew up in two-biological-parent families to have poorer mental health.

Childhood parental divorce was associated with adult psychological state, including] overall happiness (Amato, *et al.*, 1995; Glenn & Kramer, 1985) and depressive symptoms (McLeod, 1991). Cherlin, Chase-Lansdale, and McRae (1998) also suggested that parental divorce during childhood had a long-term effect.

Videon (2002) used longitudinal data to investigate the short-term effects of parental divorce, and found that adolescents with divorced parents are more likely to be depressed within two years of the divorce than are their peers from two-biological-parent families. Chase-Lansdale, Cherlin & Kiernan (1995) suggested that parental divorce had moderate long-term effects on young adults. Young adults who experience parental divorce during childhood have higher total Malaise Inventory scores. A recent Swedish study showed that during the 15 years following divorce, divorced women are more likely than non-divorced women to have lower mental health, including higher depression or anxiety (Ä ngarne-Lindberg & Wadsby, 2009).

Maier and Lachman (2000) examined the influences of early parental experiences on middle-aged adults, and suggested that middle-aged men and women from families that have undergone parental divorce exhibit higher prevalence of physical health problems, and men show higher rates of depression. Using samples from Taipei City, Cheng (2001) analyzed the life adjustment of fifth to eighth graders from two-biological-parent and single-parent families, and found the latter group to be disadvantaged in certain dimensions of social adjustment, including social adjustment. She also noted that the causes of the disadvantaged situation in single-parent families involve more than just the absence of one parent, but rather involve a combination of numerous complex factors.

2.The Effects of Parental Marital Conflict

Studies suggest that that both parental divorce and parental marital conflict, negatively influence outcomes in children. Children and adolescents who experience harmful parental conflict are more likely to [have OR suffer] both internalizing and externalizing problems(Buehler *et al.*, 1997; Lindsey, Chambers, Frabutt, & Mackinnon-Lewis, 2009; Schoppe-Sullivan, Schermerhorn, & Cummings, 2007; Wang & Chen, 2010), and exhibit poor academic performance (Mechanic & Hansell, 1989).

Lindsey *et al.* (2009) used longitudinal data to analyze the effect of marital conflict on

adjustment of children, including internalizing and externalizing symptoms. The children in their study ranged from 8 to 16 years old, and the analytical results indicate that after controlling for parenting process and early adjustment of children, marital conflict still negatively impacts later internalizing symptoms, but not externalizing symptoms. Schoppe-Sullivan *et al.* (2007) also used longitudinal data and included 268 mother-adolescent (fifth grade) dyads in their study analyzing the influences of marital conflict on overt and relational aggression in adolescents. The results demonstrate that marital conflict both directly and indirectly influences adolescent aggression.

Mechanic and Hansell (1989) also used longitudinal data to analyze the influence of marital conflict on adolescent well-being, including depressed mood, anxiety, self-esteem, and physical symptoms. Their results suggested that higher family conflict increased depressed mood, anxiety, and physical symptoms in adolescents.

Amato *et al.* (1995) provided several potential mechanisms for the negative impact of marital conflict on children. First, conflict between parents is a direct stressor, and parental arguments can cause children to experience fear, anger, or aggression. Conflict between parents or between parents and children can cause physical violence and increase the risk of psychological and behavioral problems, and can also reduce child academic performance. The egocentricity of young children makes them likely to blame themselves for parental conflict, resulting in lower levels of psychological well-being. Moreover, children learn some of their social skills from the behavior of their parents, and so parents adopting conflict behaviors rather than communication or compromise, may lead to children learning inappropriate social skills.

3.The Effects of Pre-divorced Parental Marital Conflict

Despite the above literature addressing the influences of parental divorce or marital conflict on offspring, researchers increasingly consider “divorce” a continuous process rather than a single event,

and consequently consider it in the context of parental marital conflict. Studies suggest that martial conflict can contribute partly, but not completely, to subsequent offspring outcomes (Amato, *et al.*, 1995; Booth & Amato, 2001b; Hanson, 1999). Hanson (1999) suggested that children exposed to high levels of pre-divorce marital conflict are neither better nor worse off following parental divorce, but parental divorce can seriously and negatively influence children exposed to low levels of pre-divorce marital conflict. Amato, Loomis and Booth (1995) and Booth and Amato (2001b) obtained similar findings, namely that parental divorce reduces the well-being of offspring in families with low levels of pre-divorce marital conflict, and increases the well-being of offspring in families with high levels of pre-divorce marital conflict. Cherlin (1998) also indicated that some of the negative influences of parental divorce on offspring during childhood or adolescence appeared before parental divorce, and the influences lasted into adulthood.

It is important to distinguish pre-divorced martial conflict from general parental marital conflict is because for two-parent families, the negative influence of parental marital conflict on offspring is well-documented. However, for divorced single-parent families, the role of pre-divorced marital conflict is not clear yet. Amato et al. (1995), Booth and Amato (2001) and Hanson (1999) all suggested that parental divorce decreases offspring well-being of low levels of pre-divorced parental marital conflict families, and the prior two studies suggested that parental divorce increase offspring well-being of high levels of pre-divorced parental marital conflict families, but the Hanson's (1999) study suggested that parental divorce neither increases or decreases offspring well-being of high levels of pre-divorced parental marital conflict families.

Wheaton (1990) pointed out that life transition events (i.e. job loss, divorce, retirement etc.) is a stressor for individuals. However, when the prior chronic stress (before the events occur) exists, and more stress can be relief from the existing stress, and then the life transition event is actually beneficial for individual mental health. On the other hand, when the life transition event relieves less existing stress

than the new stress it brings, and then the life transition event is harmful for individual mental health. His argument can be expressed in Figure 1.

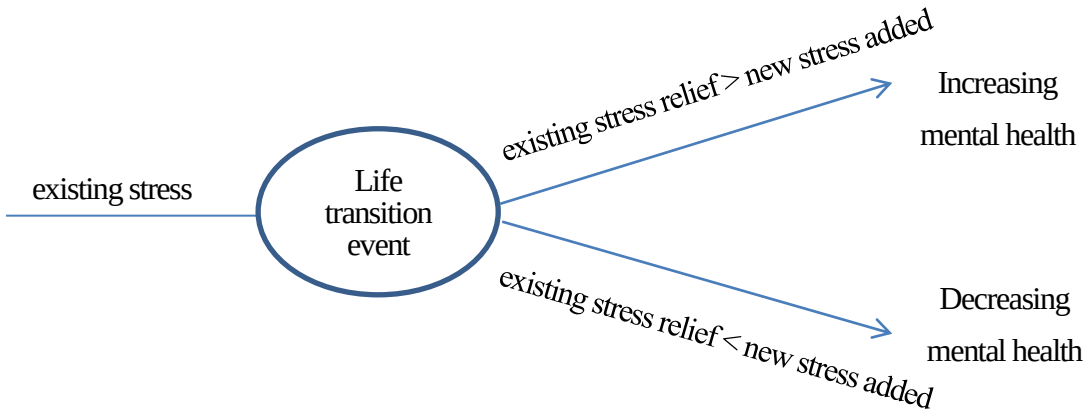


Figure 1. Wheaton's concept of how life transition event affect mental health

The key factor of how life transition event, in this study is parental divorce, can affect individual mental health is depending on the context of the life transition event occurs, and the pre-divorced parental marital quality is one dimension of the context. However, the literatures of pre-divorced marital conflict on offspring mental health is relatively few when comparing with the literatures of marital conflict, and more studies need to be done to understand the context of parental divorce occurs. This study tends to broaden the existing literature of the influences of parental divorce and martial conflict, but also to explore the effects of pre-divorced marital conflict on offspring mental health in Taiwanese context.

Parental Involvement

Research has shown that positive parent-child relations, such as parental caring, acceptance, open parent-child communication, and generally supportive parent-child relations, are correlated with

positive adolescent outcomes, including better mental health (Astone & McLanahan, 1991; Crouter, MacDermid, McHale, & Perry-Jenkins, 1990), lower internalizing, externalizing, and substance use problems, and higher psychosocial competence (Steinberg, 2001). Moreover, Flouri (2004) found that parental involvement with offspring at seven years old can predict psychological functioning feeling (namely unhappy, depressed, or under strain), psychological distress (namely feeling miserable and depressed, getting easily annoyed by others, and suffering a nervous breakdown), and life satisfaction (namely how life has turned out so far, and expectations for the next ten years) of offspring at 42 years old.

Furthermore, parental involvement is also a protective factor for children's adjustment after parental divorce. After reviewing twenty-four studies, Leon's (2003) suggested that parental warmth and responsiveness are important protective factors throughout childhood and adolescence, but parental monitoring and involvement becomes more important in middle childhood and adolescence because children spend more time in school and with peers. Therefore in this study, parental involvement serves as the protective factors to reduce the negative influence of parental divorce and marital conflict on adolescent mental health.

Parental Education and Household Income

Studies have suggested that children or adolescents with higher household income and parental education particularly paternal education are less likely to exhibit emotional or behavioral problems (Bradley & Corwyn, 2002; Carlson & Corcoran, 2001; Morris, 2003). On the other hand, other studies have suggested that students with higher household income and parental education have worse mental health (Luthar & D'Avanzo, 1999). In Western countries, controversy continues regarding the effect of parental education and household income on offspring mental health state. Yang (2005) analyzed the mental health of students in Taiwan, and found that after controlling for educational achievement, neither

parental education nor household income exerted a significant effect.

Gender Differences

Mental health state differs between males and females. Studies have suggested that females are more likely than males to recognize emotional problems (Fletcher, 2008; Yokopenic, *et al.*, 1983), frequently report mental health difficulties, or internalize mental health difficulties (Andersson *et al.*, 2010). According to the National Adolescent Health Information Center (2006), young females are more likely to exhibit sad feelings, suicidal ideation and attempts, while young males are more likely to actually commit suicide

Moreover, Tick, Ende and Verhulst (2008) used samples of Dutch adolescents to analyze trends in emotional and behavioral problems between 1993 to 2003. Their results suggested that thought problems, internalization problems, somatic complaints, suicidal ideation and self-harm were more likely to increase among girls than boys during the ten year study period.

School Program Type, School Type, and School Urbanization

In the East Asian region, the competitive educational system is an unique social background (Yi, Wu, Chang, & Chang, 2009). Educational achievement is highly valued by society, teachers, and parents highly value. Adolescents is expected to study hard and enter good high school and college (Hsu, 1971). Therefore, the pressure of having good educational achievement is high and might decrease adolescent mental health. However, due to the educational tracking system of high school in Taiwan, adolescents who can choose either academic-oriented or vocational-oriented programs or high schools, and the pressure of educational achievement might be decreased for adolescent who choose vocational-oriented programs or schools, because they are not expected to have high academic achievement anymore, but rather to have more practical skills or abilities. Moreover, school type (such as public or private) and

school urbanization (such as rural, sub-urban, and urban) are both correlated with the educational tracking system. In general, school with higher educational pressure tends to be academic-oriented, public, and normally located in urban areas. Therefore these factors need to be controlled for.

Using Hierarchical Linear Modeling in Longitudinal Research

1.Why use Hierarchical Linear Modeling(HLM)?

In the social sciences, data structures are frequently hierarchical (Raudenbush & Bryk, 2002). This study uses variables to describe individuals, but the individuals are grouped into larger units, each comprising numerous individuals, and other variables describe these higher order units. Individuals within a population exist within clusters. For example, students are grouped into classes, classes are grouped into schools, schools are grouped into areas, and so on. Data are often nested within persons, organizational units, and/or communities (O'Connell & McCoach, 2008; Raudenbush & Bryk, 2002). Numerous studies neglect this type of data structure. When the traditional linear regression employs nested data, it violates the assumption that observations of any individual are not systematically related to observations of any other individual. HLM is a particular regression technique used to consider hierarchical structures, and thus can model the nested data structure and provide individual level and cross level effects.

2. Using HLM on longitudinal research

Longitudinal studies involve multiple observations of the same individuals over a period of time. Observations taken repeatedly across individuals tend to be similar, just as is the case for observations taken from individuals within a cluster (O'Connell & McCoach, 2008). Multilevel models, such as HLM, can not only model the nested data but can also examine how individuals change or grow over time, and identify factors related to such growth or change. HLM accommodates intra-individual

correlation among individuals within the longitudinal study to serve as the nesting unit or cluster for each individual (O'Connell & McCoach, 2008), and thus minimizes the treat of unit heterogeneity: one expects more similarity for observations of the same unit at different times than for simultaneous observations of different units (Halaby, 2003). Numerous traditional longitudinal approaches, such as repeated-measures MANOVA, cannot easily handle unbalanced longitudinal data, missing data, or uneven time points (Luke, 2004). Applying HLM to longitudinal research can not only accurately estimate causal effects, but can also describe how the trajectories of development and growth over time vary systematically across groups with different life course experiences (Halaby, 2003). Latent curve analysis (LCA) is another approach for modeling growth, and the two approaches of HLM and LCA are appealing because they both model individual growth as a function of time, compare different growth rates across different groups, and yield comparable results (Chou, Bentler, & Pentz, 2009). Both approaches have different advantages, and HLM can more easily specify models and yield statistical results (Chou, *et al.*, 2009).

CHAPTER 3

METHODOLOGY

Data

Data were obtained from the Taiwan Education Panel Survey (TEPS). TEPS is a nationally representative longitudinal dataset containing data on Taiwanese adolescents from seventh grade to twelfth grade. TEPS was designed, administrated, and supported primarily by Academia Sinica, which is the highest academic institution in Taiwan. TEPS is intended to assess the educational performance of adolescents, including in mathematics, reading, science, and problem-solving. Students answered both the assessment questions and a questionnaire on their background, including learning habits, friends and family. Parents and teachers also completed a questionnaire on the socioeconomic status of their family and the performance of their children or students. TEPS included four waves of surveys - Wave 1 in 2001, Wave 2 in 2003, Wave 3 in 2005 and Wave 4 in 2007 (Table 1). Stratified random sampling was used. The strata were based on urbanization (namely urban, rural etc.), private or public school, and school level (namely junior high school, senior school etc.).

The sample was divided into three groups during the administration of the first survey wave in 2001: junior high school student sample (n=20,077), senior high school student sample (n=14,610), and junior college student sample (4,679). Two waves (2001 and 2003) were conducted for the sample of senior high school student, and only part of junior high school student sample (n=4,000) were followed up to wave 3 and wave 4 surveys (core panel). New sample (n=16,000) were included in wave 3 and wave 4 surveys for the group of junior high school student sample to make the wave 3 and wave 4 samples more comparable with wave 1 and wave 2 samples.

The completion rates for the senior high school students in the wave 1 and wave 2 surveys were 99.6% and 99.7%, respectively; meanwhile, the rates for the junior high school students in waves 1 to 4

were 99.6%, 99.1%, 96.5% and 99.3%, respectively; and the rates for the junior college student sample were 95.8%, 99.4%, 90.8% and 96.9%, respectively. This study selected only the core panel (students from the junior high school sample who had completed all four survey waves).

Survey Research Data Archive (ARDA) provides three database versions: public, members only, and restricted. This study used five data files of member only versions, also used in previous studies (Chang, 2003, 2005, 2007, 2009), obtained from SRDA website (https://srda.sinica.edu.tw/group/scigview/2/8): "w1_j_s_lv6.0" (wave 1 students), "w2_j_s_lv6.0" (wave 2 students), "w3_sf_s_cp_lv6.0" (wave 3 students), "w4_sf_s_cp_lv6.0" (wave 4 students), and "w1_j_p_lv6.0" (wave 1 parents). Five data files were merged, and all results were weighted using the variable "w1stwt3", an approach suggested by ARDA that can be inferred to all 7th grade students in 2001.

This study investigates the effect of pre-divorce parental marital conflict and parental divorce on adolescent mental health following parental divorce. Adolescents who (1) completed surveys in wave 1 ~ wave 4, and (2) whose parents had either never divorced or divorced before or during elementary school were analyzed in SPSS (n=3,958).

Table 1. Data collection in TEPS

year	2001		2002		2003		2004		2005		2006		2007	
	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st
Junior sample (grade)		W1 (7th)				W2 (9th)				W3 (11th)				W4 (13th)
Senior sample (grade)		W1 (11th)				W2 (12th)								
Junior College sample (grade)		W1 (8th)				W2 (9th)								

Several logical errors in the data file were corrected: (1) three respondents checked both "never divorced" and "divorced during elementary school" in the w4 questionnaire. After comparison with previous answers from the w1 questionnaire, these answers were corrected to "never divorce" to maintain consistency with previous answers; (2) one respondent checked both "never divorced" and "divorced during senior high school", and after comparison with the w1 questionnaire for the same respondent the answer "never divorced" was corrected to "divorced during senior high school". (3) three respondents checked both "no parental conflict" and "parental conflict" as their answers for a single time period, and in these cases the answers were recoded as missing values. (4) ten respondents checked parental divorced more than one periods of school (such as before elementary school and during elementary school), and these answers were corrected to only check the initial period of school.

Because HLM will delete the cases with missing level-2 variables, and respondents with missing vales of in level-2 variables, including "parental education", "household income", and "parental conflict" were automatically deleted in HLM. The final sample obtained via HLM thus comprised 3,886 subjects (including respondents whose parents had never divorced, and those whose parents divorced during and before elementary school).

Hypotheses

1. Guided by life course theory, the mental health state of adolescents changes over time.

1-1. The happiness of adolescents changes over time.

1-2. The depressed mood of adolescents changes over time.

2. Parental divorce negatively affects the trajectory of adolescent mental health.

2-1. Adolescents who experience parental divorce have lower happiness than those who do not.

2-2. Adolescents who experience parental divorce have higher depressed mood than those who do not.

3. Parental marital conflict negatively affects adolescent mental health.

3-1. Adolescents who experience parental marital conflict have lower happiness than those who do not.

3-2. Adolescents who experience parental marital conflict have higher depressed mood than those who do not.

4. The effects of parental divorce on adolescent mental health partially depend on the extent of pre-divorce marital conflict.

4-1. Adolescents whose parents did not have frequent and severe pre-divorce conflict have lower levels of happiness than adolescents whose parents did.

4-2. Adolescent whose parents did not have frequent and severe pre-divorce conflict have higher levels of depressed mood than adolescents whose parents did.

5. **Parental involvement will affect the trajectory of adolescent mental health.**

5-1. Adolescents with higher levels of parental involvement will have higher levels of happiness than those with lower levels of parental involvement.

5-2. Adolescents with higher levels of parental involvement will have lower levels of depressed mood than those with lower levels of parental involvement.

6. Gender, parental education, household income, school program type, school type, and school urbanization partially explain the trajectory of adolescent mental health.

Data Analysis

This study uses HLM 7.0 to analyze the influences of family experiences on adolescent mental health over time, and uses SPSS to describe sample characteristics.

1. Level-1 and Level-2 Variables

One advantage of HLM is in modeling changes in individual trajectory over time and between

individual differences, with the former being considered the level-1 variables, and the latter being considered the level-2 variables. Figure 2 shows the study framework. Level-1 variables were measured in all four waves and thus created variance within individuals; these variables included happiness, depressed mood, and paternal and maternal involvement. Level-2 variables were measured in only one wave, and included parental divorce, parental marital conflict, perceived fulfillment of parental expectations, respondent gender, parental education, and household income.

Notably, in the investigation of the effect of parental divorce on adolescent mental health, "parental divorce" was recoded in two dummy variables (model 1: no parental divorce, parental divorce occurring when the children were aged 0~12 years old), and three dummy variables (model 2: no parental divorce, parental divorce occurring when children aged 0~6 years old, and parental divorce occurring when the children were aged 7~12 years old).

In the analysis of the effect of parental marital conflict on adolescent mental health, "parental marital conflict" was recoded in two dummy variables (mode 1: no conflict, conflict at 0~12 years old), and 4 dummy variables (model 2: no conflict, conflict at 0~6 years old, conflict only at 7~12 years old, and conflict at both 0~6 and 7~12 years old).

In investigating the effect of family types on adolescent mental health, "parental divorce" and "parental marital conflict" were recoded using 4 dummy variables (model 1: two parent family without marital conflict, two parent family with marital conflict, divorced family with children aged 0~12 years old without pre-divorce marital conflict, and divorced family with children aged 0~12 years old with pre-divorce marital conflict, and 6 dummy variables (model 2: two parent family without marital conflict, two parent family with marital conflict, divorced family with children aged 0~6 years old without pre-divorce marital conflict, divorced family with children aged 0~6 years old with pre-divorce marital conflict, divorced family with children aged 7~12 years old without pre-divorce marital conflict, and divorced family with children aged 7~12 years old with pre-divorced marital conflict).

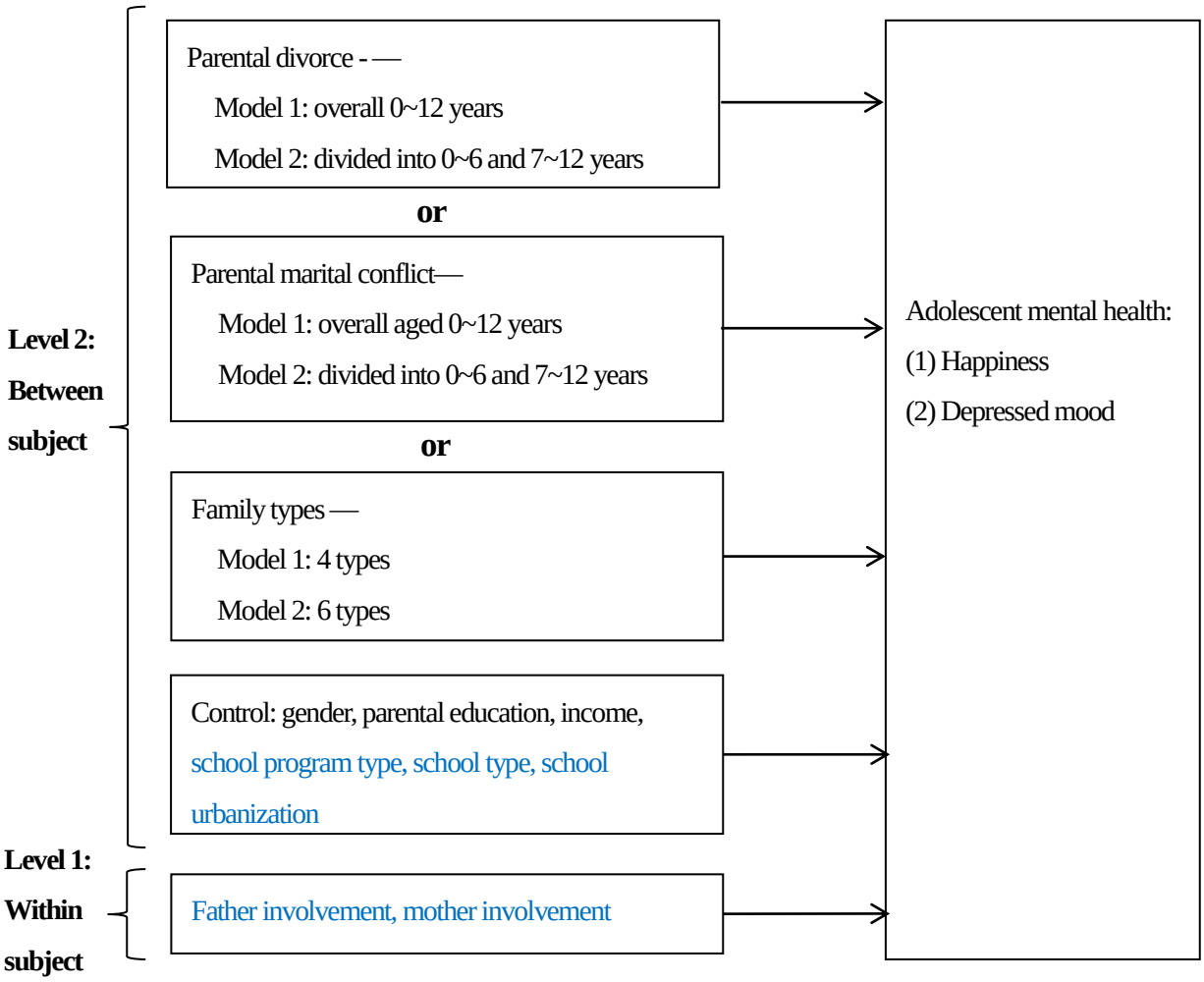


Figure 2. Study framework

2. Definition of "Time" and its centering

"Time" is a crucial variable when applying multilevel analysis to longitudinal data. "Time" can be measured in different ways, including using interview wave, adolescent age, adolescent grade etc., and the researchers should select whichever measure best fits the research purpose. Furthermore, consideration should be given to "centering" the predictor variable (in this case, "time" is the predictor variable). Typically centering can be performed in three ways (Luke, 2008): (1) by subtracting a meaningful constant; (2) by subtracting a grand mean; or (3) by subtracting a group mean. In growth

modeling (time-squared, time cubed), centering is encouraged (Luke, 2008): (1) because the interpretation of intercepts is more meaningful; and (2) to reduce problem of multi-collinearity. Singer and Willett (2003) also noted that data representation without centering is less attractive because: (1) predictions can exceed the temporal limits of the data; and (2) the trajectory shape may or may not be the same when the time extends to zero. This study of individuals attempts to understand how changes in family experiences affect changes in adolescent mental health, and because the timing of data collection of TEPS is based on educational grades (namely first year of junior high school, last year senior high school, etc.), and thus "grade" is an appropriate representation of "time".

To achieve "grade" centering, survey times and the intervals between pairs of surveys must be clarified. The interviews are performed in four waves: during the first semester of grade 7th, the first semester of grade 9th, the first semester of grade 11, and the second semester of grade 12th (Table 2) To improve interpretation of the results and reduce multi-collinearity in growth models, the grade is being centered by subtracting the initial survey grade, which is 7, and dividing by 2 to shorten the time interval from 2 to 1. Therefore every unit increase in time represents a 2 grade increase in adolescent schooling level which corresponds with the survey years.

Table 2. Time Centering

Interview wave	Grade (before centering)	Time (after centering)
1	7.0	0
2	9.0	1
3	11.0	2
4	12.5	2.75

3. Defining the linear and non-liner models

Model 1 to provides evidence supporting the determination of proper specifications for the individual growth equation and baseline statistics for evaluating the level 2 models. To identify the most

appropriate model for data fitting, it is important to understand the patterns of change in adolescent mental health (Luke, 2008), with the central question being whether change is linear or nonlinear.

3-1 The linear model

Level 1 explores changes in mental health over time for individuals]. The linear model includes only Time. Appendix A lists the equation used in the linear model

$$Y_{ti} = \beta_{0i} + \beta_{1i}(Time)_{ti} + r_{ti}$$

For the notations of the above equation please see Appendix A.

Level 2 explores the growth in changes in individual-level mental health over time. The following equations express this individual-level change]:

$$\beta_{0i} = \gamma_{00} + u_{0i}$$

$$\beta_{1i} = \gamma_{10} + u_{1i}$$

For the notations of the above equations please see Appendix B.

3-2 The quadratic model

Level 1 explores changes in mental health over time for individuals. The quadratic model includes Time, and Time-squared, and the equation is

$$Y_{ti} = \beta_{0i} + \beta_{1i}(Time)_{ti} + \beta_{2i}(Time)_{ti}^2 + r_{ti}$$

For the notations of the above equation please see Appendix C.

Level 2 explores changes in individual mental health over time. The equations expressing individual change in mental health are as follows:

$$\beta_{0i} = \gamma_{00} + u_{0i}$$

$$\beta_{1i} = \gamma_{10} + u_{1i}$$

$$\beta_{2i} = \gamma_{20} + u_{2i}$$

For the notations of the above equation please see Appendix D.

3-3 The Comparison of Linear and Quadratic Models

The deviance statistics determine whether the linear or quadratic model more accurately represents happiness or depressed mood, because Singer and Willett (2003) indicated that the model deviance is more important than the significance of single variables. Singer and Willett (2003) also suggested that two requirements exist when applying deviance statistics: (1) each model must be estimated using identical data; and (2) one model must be nested within the other. In this study, the observations of the two models are the same, and one model is nested within the other (only one parameter, namely time^2, is added). Therefore the deviance statistics are appropriate for comparing linear or quadratic models.

Table 3 lists the deviance of the linear and quadratic models for happiness. The difference in deviance statistics, (28174.44-28108.15) = 66.29, exceeds 18.47, the .001 critical value of a chi-square distribution on 4 (10-6) d.f., and thus the null hypothesis is rejected. Therefore the quadratic model is more accurate than the linear model in modeling adolescent happiness.

Table 3. The Deviance of Linear and Quadratic Model for Happiness

	Linear	Quadratic
For INTRCPT1, π0 INTRCPT2, β00	3.20***	3.21***
For TIME slope, π1 INTRCPT2, β10	-.10***	-.13***
For TIME2 slope, π2 INTRCPT2, β20	---	.01
Deviance	28174.44	28108.15

Number of estimated parameters	6	10

Table 4 lists the deviance of the linear and quadratic models for depressed mood. The difference in deviance statistics, (71329.10-70400.89) = 928.21, far exceeds 18.47, the .001 critical value of a chi-square distribution on 4 (10-6) d.f., and thus the null hypothesis is rejected. Therefore the quadratic model models adolescent depressed mood more accurately than the linear model.

Table 4. The Deviance of Linear and Quadratic Model for Depressed Mood

	Linear	Quadratic
For INTRCPT1, π0 INTRCPT2, β00	6.64***	6.18***
For TIME slope, π1 INTRCPT2, β10	.59***	2.18***
For TIME2 slope, π2 INTRCPT2, β20	---	-.58***
Deviance	71329.10	70400.89
Number of estimated parameters	6	10

4. Models with predictive variables: Full model

The full model examines the influence of predictors on mental health over time. The within-person trajectory of mental health using repeated measures of mental health and the time-varying covariates for each adolescent. The individual growth model of mental health at time t for student *i* is (models 1 ~ 4)

$$Y_{ti} = \beta_{0i} + \beta_{1i}(Time)_{ti} + \beta_{2i}(Time)_{ti}^2 + \beta_{3i}(Paternal\ involvement)_{ti} + \beta_{4i}(Maternal\ involvement)_{ti} + r_{ti}$$

See Appendix E for the notations of the above equation.

Level 2 Full Model: the equation models mental health change in individuals.

(1) Parental divorce

Model 1 —Parental divorce for respondents aged 0~12 years old. Appendix F presents equations and notations.

Model 2 —Parental divorce for respondents aged 0~6 years old or 7~12 years old. Appendix G presents equations and notations.

(2) Parental marital conflict:

Model 1 — Parental marital conflict for respondents aged 0~12 years old. For equations and notations please see Appendix H.

Model 2 —Parental marital conflict for respondents aged 0~6 years old or 7~12 years old. For equations and notations please see Appendix I.

(3) Family type

Model 1— Four family types: two parent family without marital conflict, two parent family with marital conflict, divorced family without pre-divorce marital conflict, divorced family with pre-divorce marital conflict. For equations and notations please see appendix J.

Model 2 — Six family types: two parent family without marital conflict, two parent family with marital conflict, divorced family with children aged 0~6 years old without pre-divorce marital conflict, divorced family with children aged 0~6 years old with pre-divorce marital conflict, divorced family with children aged 7~12 years old without pre-divorce marital conflict, and divorced family with children aged 7~12 years old with pre-divorce marital conflict. For equations and notations please see appendix K.

Dependent Variables

Mental health

Two indicators from W1 to W4 students' questionnaire will represent students' mental health: global happiness and depressed mood, and these two indicators were analyzed separately in HLM.

Dependent Variables

Mental health

Two indicators from the W1 to W4 student questionnaires represent student mental health: global happiness and depressed mood, and these two indicators were analyzed separately in HLM.

1. Global happiness

Happiness was measured using one question "overall, are you happy with your life to date?", with the response options including "very happy" (coded 4), "happy" (coded 3), "unhappy" (coded 2), and "very unhappy" (coded 1).

2. Depressed mood

Depressed mood was measured by four questions. The respondents were asked how frequently they had experienced the following feelings during the current semester: "I did not want to deal with others", "I felt upset", "I wanted to yell or throw things", and "I felt lonely". The response options were "never" (coded 1), "occasionally" (coded 2), "sometimes" (coded 3), and "always" (coded 4). The average Cronbach alpha of the four waves was .77 (.73 in W1; .75 in W2; .81 in W3; and .79 in W4).

Independent Variables

1. Parental divorce during childhood

One question from the student questionnaire in w4 was "when did your parents separate or divorce?", with the response options being "they have never separated or divorced", "before elementary school", "during elementary school", "during junior high school" and "during senior high school". Respondents responding with "during junior high school" or "during senior high school" was deleted from this study, and responses of "never" were coded "0".

Model 1— Respondents selecting the response options "before elementary school" or "during elementary school" were coded "1".

Model 2 — Respondents selecting the response options "before elementary school" and "during elementary school" were separately recoded into 2 dummy variables.

2. Parental marital conflict during childhood

One question from the student questionnaire in w4 was "When have your parents most frequently had severe conflict with each other?", with response options being "never", "before elementary school", "during elementary school", and "during junior high school" and "during senior high school".

Model 1—The responses "before elementary school" or "during elementary school" were recoded into "1".

Model 2 — The responses "before elementary school" only, "during elementary school" only, and both "before elementary school" and "during elementary school" were separately recoded into three dummy variables.

3. Family types

The above two questions ("when did your parents separate or divorce?" and "When have your parents most frequently had severe conflict with each other?") were used to create four and six family types further treated using separate models.

(1) Four types

Table 5 lists the sample selection for four types of families. Adolescents who answered "never" to both questions were classified as "**two parent families without frequent severe parental marital conflict (type 1)**"; adolescents who answered "never" to the question regarding parental divorce but not to the question regarding parental marital conflict, were classified as "**two parent families with frequent and severe parental marital conflict (type 2)**". Type 3 "**divorced single-parent family without pre-divorced conflict**" included respondents: (A) whose parents divorced before elementary school, and did not engage in frequent and severe marital conflict before elementary school, or (B) whose parents divorced during elementary school, and did not engage in frequent and severe marital conflict before or during elementary school. Type 4 "**divorced single-parent family with pre-divorced conflict**" included respondents (A): whose parents divorced before elementary school, and engaged in frequent and severe marital conflict before elementary school, or (B) whose parents divorced during elementary school, and engaged in] frequent and severe marital conflict before or during elementary school.

Adolescents who experienced parental divorce during junior high school and senior high school were not included in this study. Adolescents who experienced only post-divorce parental marital conflict are also excluded, not only because the sample size is too small (i.e. just 14 cases of adolescents whose parents divorced before elementary school and subsequently engaged in conflict) but also because post-divorced parental marital conflict is not as influential as pre-divorced marital conflict (Booth &

Amato, 2001a).

Table 5. Sample Selections for Four Family Types

Q and A		Q: when did your parents have frequent severe conflict?				
		Never	Before elementary	During elementary	During junior high	During senior high
Q: when did your parents get separated or divorced?	Never	**Type 1**	**Type 2**	**Type 2**	**Type 2**	**Type 2**
	Before elementary	**Type 3**	**Type 4**	Not included: postdivorce conflict (14 cases)		
	During elementary	**Type 3**	**Type 4**	**Type 4**	Not included: postdivorce conflict (29 cases)	
	During junior high	Not included (106 cases)				
	During senior high	Not included (109 cases)				

(2) Six types

Table 6 lists the sample selection for four types of families. Types 1 and 2 are the same as in four types of families. Type 3 "**Parents divorced when the child was 0~6 years old without pre-divorce marital conflict**" includes respondents whose parents divorced before elementary school, without frequent severe marital conflict before elementary school. Type 4 "**Parents divorced when the child was 0~6 years old with pre-divorce marital conflict**" includes respondents whose parents divorced before elementary school, with frequent and severe marital conflict before elementary school. Type 5 "**Parents divorced when the child was 7~12 years old without pre-divorce marital conflict**" includes respondents whose parents divorced during elementary school, without frequent severe marital conflict before and during elementary school. Type 6 "**Parents divorced when the child was 7~12 years old with pre-divorce marital conflict**" includes respondents whose parents divorced during

elementary school with frequent severe marital conflict before or during elementary school.

Table 6. Sample Selections for Six Family Types

Q and A		Q: when did your parents have frequent severe conflict?				
		Never	Before elementary	During elementary	During junior high	During senior high
Q: when did your parents get separated or divorced?	Never	**Type 1**	**Type 2**	**Type 2**	**Type 2**	**Type 2**
	Before elementary	**Type 3**	**Type 4**	Not included: postdivorce conflict (14 cases)		
	During elementary	**Type 5**	**Type 6**	**Type 6**	Not included: postdivorce conflict (29 cases)	
	During junior high	Not included (106 cases)				
	During senior high	Not included (109 cases)				

4. Paternal and maternal involvement

Because pursuing academic success is the main goal for most Taiwanese adolescents and their parents, the measurement of parental involvement includes academic involvement. Fan and Chen (2001) proposed commonly used indicator variables of parental involvement that correlated with academic achievement. Four items from the adolescent questionnaire of both the W1 and W3 surveys were selected to measure paternal involvement: (1) "How often does your father talk with you about obtaining employment or advancing your education?" (2) "How often does your father listen to you talk about your thoughts?" (3) "How often does your father check your homework and tests and understand your achievements?" (4)"How often does your father participate in school activities?". Four identical items from the adolescent questionnaire of both the W1 and W3 surveys were selected to measure

maternal involvement: (1) “How often does your mother talk with you about future employment opportunities or advancing your education?” (2) “How often does your mother listen to you discuss your thoughts?” (3) “How often does your mother check your homework and test scores and try to understand how well you are doing academically?” (4)“How often does your mother participate in school activities?”. All items were rated on a 4-point Likert-type scale (1 = never, 2 = occasionally, 3=sometimes, 4=always). One additional response option existed, “I do not talk about this to my father (or mother)”, which appears only in the W3 questionnaire, but not the W1 questionnaire, for the question “How often does your father (or mother) listen to you talk about] your thoughts?”. The percentage of respondents choosing this response option was 32.1% for paternal involvement and 17.4% for maternal involvement. To have comparable data for this question in both W1 and W3, respondents in W3 selecting this option have their data combined into “never”. Respondents from divorced single-parent families providing the response options “no answer” or “not applicable” for paternal or maternal involvements were recoded using the code 0, while those from two-parent families with these two response options were recorded as missing values. Moreover, because the parental involvement items only appear on the w1 and w3 questionnaires, but not on the w2 and w4 questionnaires, the parental involvement status for respondents in the w1 survey (first year of junior high) also represents the status of parental involvement in the w2 survey (third year of junior high), and the status of parental involvement for respondents in the w3 survey (second year of senior high) also represents the status of parental involvement in w4. The Cronbach’s alpha for paternal involvement is .63 and .63 in W1 and W3, respectively; moreover, that for maternal involvement is .64 and .63 in W1 and W3 respectively.

Control Variables

1. Parental education

Parental education is measured using one question in the W1 parent questionnaire: “what is your

education level?", with the response options being "Did not graduate from high school", "High school graduate", "Associate junior collage", "Bachelor's degree", "Graduate degree". Parental education was recoded using a dummy variable, and the reference group was "did not graduate from high school" which is the lowest among all the options.

2. Household income

Household income is measured using one question in the W1 parent questionnaire: "what is your total household income per month?", with response options being "less than NT$20,000", "NT$20,000~NT$49,999", "NT$50,000~NT$99,999", "NT$100,000~NT$149,999", "NT$150,000~NT$199,999", and "more than NT$200,000". Household income was recoded as a dummy variable?, and the reference group was "less than NT$20,000" which is the lowest income among all the options.

3. Respondent gender

One question is used to determine respondent gender, namely "what is your gender?", with the response options being "male" (coded 1) or "female" (coded 0).

4. School program type

TEPS includes the information of school program types which was provided by Ministry of Education (MOE), and the program types include: "general type", "comprehensive type", "vocational type", and "junior college type". The reference group is the "general type".

5. School type

TEPS includes the information of school type which was provided by MOE, and the school

types include: ‘‘private’’ (coded 1) and ‘‘public’’ (coded 0).

6. School urbanization

TEPS includes the information of school urbanization which was provided by MOE, and the urbanization includes: ‘‘rural’’, ‘‘sub-urban’’, and ‘‘urban’’. The reference group is ‘‘rural’’.

CHAPTER 4

RESULTS

Descriptive Results

Table 7 lists sample characteristics for level-2 variables. The gender ratio is approximately 1:1. Almost 75% of respondents came from families with incomes ranging between $20,000 and $99,999; 43% of parents are high school graduates, with the next largest group (24%) not having graduated from high school. Over 70% of respondents were in public school, over 60% of their schools located in city, and over 60% of respondents were in general program. Furthermore, approximately 9% and 15% of adolescents experienced parental divorce and parental marital conflict, respectively, during childhood.

Regarding family type, the majority of respondents are from two-parent families without frequent severe marital conflict (72.0%), followed by two-parent families with frequent severe marital conflict (19.2%), divorced single-parent families without frequent severe marital conflict (4.4%), and divorced single-parent families with frequent severe marital conflict (4.0%).

Table 7 Sample Characteristics: Level 2 variables (N=3,958) (no weighting)

Variables	Frequency	Percentage (%)
Gender		
Male	1,967	49.7
Female	1,991	50.3
Household income (per month, in NT)		
<$19,999	267	6.7
$20,000~$49,999	1,409	35.6
$50,000~$99,999	1,539	38.9
$100,000~$149,999	480	12.1
$150,000~$199,999	128	3.2
>$200,000	103	2.6

missing	32	0.8
Parental education		
Less than senior high school	962	24.3
Senior high school graduate	1,709	43.2
Associate junior collage	698	17.6
Bachelor's degree	429	10.8
Graduate degree	113	2.9
missing	47	1.2
School program type		
General type	2,375	60
Comprehensive type	567	14.3
Vocational type	884	22.3
Junior college type	132	3.3
School type		
Private	1,183	29.9
Public	2,775	70.1
School urbanization		
Rural	125	3.2
Sub-urban	1,415	35.8
Urban	2,418	61.1
Parental divorce		
No divorce	3,621	91.5
Divorce		
0~6 years	177	4.5
7~12 years	160	4.0
Parental marital conflict		
No conflict	3,340	84.4
Conflict		
Conflict 0~6 years only	194	4.9
Conflict 7~12 years only	290	7.3
Conflict both 0~6 and 7~12 years	118	3.0
Missing	16	0.4
Family types		

Two-parent family without conflict	2,850	72
Two-parent family with conflict	759	19.2
Divorced family without pre-divorced conflict		
Divorce 0~6 years without pre-divorced conflict	124	3.1
Divorce 7~12 years without pre-divorced conflict	52	1.3
Divorced family with pre-divorced conflict		
Divorce 0~6 years with pre-divorced conflict	68	1.7
Divorce 7~12 years with pre-divorced conflict	92	2.3
missing	13	0.3

Table 8 lists sample characteristics for level-1 variables. Over 86% of students considered themselves "happy" or "very happy" in wave 1, decreasing slightly to 81% in wave 4. Notably, although the percentage of students who were "happy" increased 27% from wave 1 (54.9%) to wave 4 (69.7%), the percentage of students who were "very happy" decreased 63% from wave 1 (31.5%) to wave 4 (11.5%), and the percentage of students who were "unhappy" increased 100% from wave 1 (7.9%) to wave 2 (16.1%).

Only one in five respondents considered themselves to have "never" or only "occasionally" experienced depressed mood during their adolescence. Moreover, adolescents who considered themselves to "sometimes" and "always" have depressed mood increased significantly from w1 to w4: increases were 97% for "do not want to deal with others", 104% for "feeling upset", 58% for "wanting to yell or throw things", and 198% for "feeling lonely".

Generally, the frequency of paternal and maternal involvement decreased slightly from junior high school to senior high school. Respondents responding "always" or "sometimes" to the item "discussing future employment opportunities or education" increased 24.8% for paternal involvement (from 41.6% to 51.9%) and decreased 1.9% for maternal involvement (from 70.6% to 69.3%); such responses to the item "listening to your thoughts" decreased 5.4% for paternal involvement (from 24.2%

to 22.9%) and 1.7% for maternal involvement (from 54.0% to 53.1%); such responses to the item "supervising homework or exams to understand your academic achievements" decreased 4.3% for paternal involvement (from 48.7% to 46.6%) and 1.8% for maternal involvement (from 70.4% to 69.1%); and such responses to the item "participating in school activities" decreased 11.3% for paternal involvement (from 15.0% to 13.3%) and 5.7% for maternal involvement (from 24.7% to 23.3%).

Table 8. Sample Characteristics: Level 1 variables (N=3,958) (Percent/Mean Reporting, no weighting)

survey waves	**Depressed mood (%)**																			
	(1) Don't want to deal with others					(2) Feeling upset					(3) Wanting to yell or throw things					(4) Feeling lonely				
	Never	Occa-sionally	Some-times	Always	Missing	Never	Occa-sionally	Some-times	Always	Missing	Never	Occa-sionally	Some-times	Always	Missing	Never	Occa-sionally	Some-times	Always	Missing
W1	69.6	23.0	4.9	2.2	0.3	48.9	35.9	10.5	4.3	0.5	58.3	28.5	8	4.8	0.4	67	23.8	5.6	3.1	0.5
W2	43.8	38.3	13.9	3.5	0.6	18.7	44	27	9.7	0.6	24.9	45.1	21.5	7.8	0.4	32.3	39.3	18.9	8.8	0.7
W3	47.6	36.8	11.8	3.1	0.7	17.4	46.6	24.3	10.9	0.8	28.8	45.4	17.8	7.8	0.2	26.1	44.4	19.3	0.4	0.4
W4	38.3	47.2	10.9	3.1	0.5	14.3	55.1	22.2	8.1	0.3	32.8	46.5	15.6	4.7	0.4	26	47.9	17.7	8.2	0.3

survey waves	**Paternal Involvement (%)**																			
	(1) Discussing future employment or education					(2) Listening to your thinking					(3) Supervising homework or exams to understand achievements					(4) Participating school activities				
	Never	Occa-sionally	Some-times	Always	Missing	Never	Occa-sionally	Some-times	Always	Missing	Never	Occa-sionally	Some-times	Always	Missing	Never	Occa-sionally	Some-times	Always	Missing
W1, 2	14.8	36.2	28.5	17.6	1.4	48.3	25.8	16	8.2	1.7	12.4	37.3	27.8	20.9	1.6	55.3	27.6	11.1	3.9	2
W3, 4	10.8	31.9	34.3	17.6	5.5	46.1	24.1	15.3	7.6	7	11.4	35.5	26.9	19.7	6.5	51.1	25.9	9.9	3.4	9.6

(continued) Table 8. Sample Characteristics: Level 1 variables (N=3,958) (Percent/Mean Reporting, no weighting)

survey waves	Maternal Involvement (%)																			
	(1) Discussing future employment or education					(2) Listening to your thinking					(3) Supervising homework or exams to understand achievements					(4) Participating school activities				
	Never	Occa-sionally	Some-times	Always	Missing	Never	Occa-sionally	Some-times	Always	Missing	Never	Occa-sionally	Some-times	Always	Missing	Never	Occa-sionally	Some-times	Always	Missing
W1, 2	5.6	23.2	37.8	32.8	0.6	23.5	22	29.6	24.4	0.5	5.9	23.2	33.9	36.5	0.5	41.5	33	16.5	8.2	0.8
W3, 4	4.6	22.2	37.1	32.2	3.9	22.7	21.3	29	24.1	3	5.2	22.7	33.4	35.7	3	39.2	31.5	15.7	7.6	6

survey waves	Happiness (%)				
	Very unhappy	Unhappy	Happy	Very happy	Missing
W1	2.0	7.9	54.9	31.5	3.7
W2	2.9	12.8	64.3	18.8	1.3
W3	1.9	10.7	65.7	19.6	2.1
W4	2.0	16.1	69.7	11.5	0.7

HLM Results

Tables 9 to 12 list results from models estimating the trajectories of adolescent happiness from 7^{th} to 12^{th} grade. The unconditional model (Table 9) contains no predictors but time and was used to test Hypothesis 1, which hypothesized that adolescent mental health changes over time; Table 10 introduced variables reflecting the relationship status and tested Hypothesis 2, which hypothesizes that parental divorce negatively affects adolescent mental health; Table 11 introduced variables reflecting the relationship status and tested Hypothesis 3, which hypothesizes that parental marital conflict negatively affects adolescent mental health; Table 12 introduced variables reflecting the relationship status and tested Hypothesis 4, which hypothesizes that the effects of parental divorce partly depend on the degree of parental pre-divorce marital conflict. The control variables and parental involvement are included in table 10 to 12, and test Hypothesis 5, which hypothesizes that parental involvement can affect adolescent mental health, and Hypothesis 6, which hypothesizes that gender, parental education, household income, school program type, school type, and school urbanization can explain the trajectory of adolescent mental health. The Bayesian Information Criterion (BIC; Schwarz, 1978) is used to compare the relative goodness-of-fit of alternative models with different subsets of predictors(Singer & Willett, 2003). The formula for BIC in the HLM is as follows:

$$\mathbf{BIC = D + qLn(N)}$$

D: Deviance based on FIML (full maximum likelihood) estimation

q: number of estimated parameters

N: overall number of observations

1. The Trajectory of Happiness

(1) The Unconditional Model

First, an unconditional model with a random intercept and random slope over time was estimated, including the linear and quadratic function of time, which was measured using respondent centering grade. During middle adolescence, happiness trajectories were curvilinear (Table 9). The negative coefficient (-0.13, p<.001)) for the time variable and the positive coefficient (0.01) for the quadratic time measure reveal a linear decrease in happiness over time, which is offset by exponentially increasing rate of decline in later middle adolescence.

Table 9. *The Unconditional Model—Happiness*

Effects	**Unconditional model**
Fixed effects	
Model for the intercepts (β_0)	
Intercept	3.21***
	(.02)
Model for Time slope (β_1)	
Intercept	-.13***
	(.03)
Model for Time^2 slope (β_2)	
Intercept	.01
	(.01)
Random effects	
τ_{00}	.17509***
τ_{11}	.08494***
τ_{22}	.00487*
Deviance	28204.46
BIC	28234.11
No. of parameter	10

Note: Total observations in level 1are 15,240; total observations in level 2 are 3,886.
* p < .05. ** p < .01. *** p <.001.

Figure 3 shows the trajectory of adolescent happiness from 7th grade to 12th grade. The dotted line represents the level of happiness when the equation only includes time, and the solid line represents

the level of happiness when the equation includes both time and control variables (including: gender, household income, parental education, school program type, school type, and school urbanization). The vertical axle ranged from 1.5 to 3.5 (1 to 4 originally) in all trajectory figures (Figs. 3 to 15) to enable easier distinguishing of the different lines. Both lines indicate that the trajectory of happiness in adolescents changed over time, supporting hypothesis 1-1.

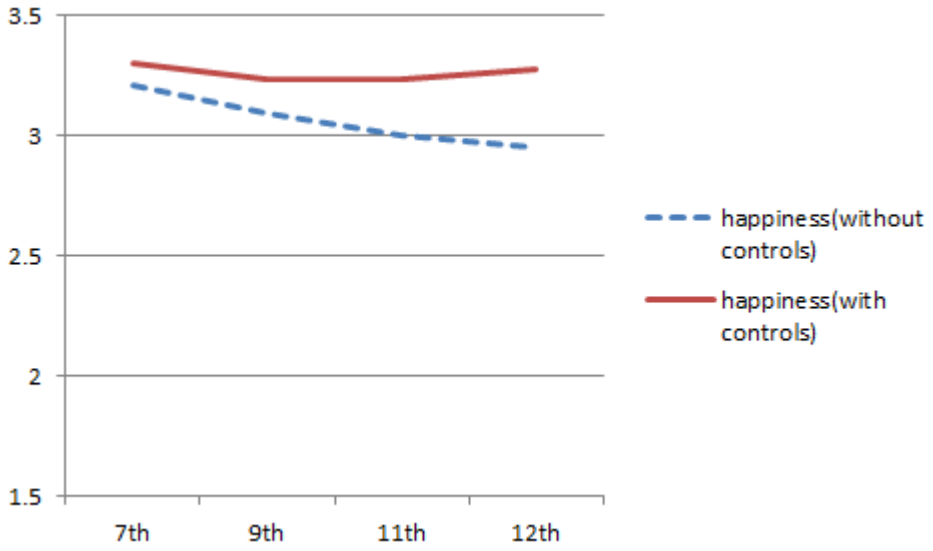


Figure 3. The trajectory of adolescent happiness

(2)The Effects of Parental Divorce

Table 10 lists the effects of parental divorce on adolescent happiness. In model 1, adolescents who experienced parental divorce during the ages of 0~12 years old were recoded using the code 1, and the reference group comprised adolescents without such experience of parental divorce. The result shows that parental divorce during childhood initially reduces adolescent happiness (-.14, p<.05). This result is consistent with previous studies suggesting that parental divorce negatively affects youth outcomes (Kalter & Rembar, 1981; Krein & Beller, 1988; Palosaari & Aro, 1994; Zill, *et al.*, 1993). Hypothesis 2-1 thus is supported. However, neither the linear coefficients (-.17) nor the quadratic

coefficients (.07) are statistically significant, implying that parental divorce during childhood does not affect the increase in adolescent happiness.

Model 2 examines whether parental divorce occurring in early childhood (0~6 years old) or late childhood (7~12 years old) is more damaging to adolescent happiness compared with the situation of two parent families. The analytical result shows that adolescents whose parents divorced when they were 7~12 years old initially have lower happiness than those from two-parent families (-.25, p<.01), but neither the linear (-.14) nor the quadratic (.08) coefficient are statistically significant, implying the rate of growth of happiness does not differ relative to two parent families. These results surprisingly do not support those of Kerin and Beller (1988), and Zill *et al.* (1993) which suggested that parental divorce at an early age (0~5.5 years old, and 0~6 years old, respectively) is more harmful for children, but their outcomes are educational attainment rather than mental health.

Table 10. HLM Result: The Effect of Parental Divorce on Adolescent Happiness

Effects	Conditional	
	Model 1 (Divorce)	Model 2 (Age at Divorce)
Fixed effects		
Model for the intercepts (β_0)		
Intercept	2.84*** (.16)	3.08*** (.16)
Parental divorce (=1)	-.14* (.07)	
Age at parental divorce		
No divorce (=0)		---
Divorce 0~6 years		-.04 (.09)
Divorce 7~12 years		-.25** (.08)
Male	.09* (.04)	.09* (.04)
Parental education		
Less than senior high school (=0)	---	

Senior high school graduate	.02 (.06)	.03 (.06)
Associate junior collage	-.07 (.06)	-.07 (.06)
Bachelor's degree	-.14 (.10)	-.14 (.10)
Graduate degree	-.13 (.10)	-.12 (.10)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~NT$49,999	-.21 (.14)	-.22 (.14)
NT$50,000~NT$99,999	-.14 (.14)	-.15 (.14)
NT$100,000~NT$149,999	-.20 (.15)	-.20 (.15)
NT$150,000~NT$199,999	-.09 (.16)	-.10 (.16)
>NT$200,000	.21 (.25)	.21 (.25)
School program type		
General program (=0)	---	---
Comprehensive program	-.06 (.08)	-.07 (.08)
Vocational program	-.02 (.05)	-.02 (.05)
Junior college program	-.09 (.10)	-.10 (.10)
Private school (=1)	.02 (.04)	.02 (.04)
School urbanization		
Rural (=0)	---	---
Sub-urban	.02 (.12)	.02 (.12)
Urban	-.03 (.12)	-.03 (.12)
Model for Time slope (β_1)		
Intercept	-.01 (.19)	-.01 (.20)
Parental divorce (=1)	-.17 (.11)	
Age at parental divorce		

No divorce (=0)		---
Divorce 0~6 years		-.18 (.16)
Divorce 7~12 years		-.14 (.15)
Male (=1)	-.06 (.06)	-.06 (.06)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	-.13 (.07)	-.13 (.07)
Associate junior collage	.03 (.10)	.03 (.10)
Bachelor's degree	.06 (.14)	.06 (.14)
Graduate degree	.05 (.15)	.05 (.15)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~49,999	.18 (.10)	.18 (.11)
NT$5,000~$99,999	.02 (.11)	.02 (.11)
NT$100,000~NT$149,999	.16 (.12)	.16 (.12)
NT$150,000~NT$199,999	-.12 (.20)	-.12 (.20)
>NT$200,000	-.19 (.20)	-.19 (.20)
Program type		
General program (=0)	---	---
Comprehensive program	.20* (.09)	.20* (.09)
Vocational program	.08 (.07)	.08 (.07)
Junior college program	-.03 (.15)	-.03 (.15)
Private school (=1)	-.04 (.07)	-.04 (.07)
School urbanization		
Rural (=0)	---	---
Sub-urban	-.17 (.17)	-.17 (.17)
Urban	-.12 (.17)	-.12 (.17)
Model for Time^2 slope (β_2)		
Intercept	-.01	-.01

	(.06)	(.06)
Parental divorce (=1)	.07 (.04)	
Age at parental divorce		
No divorce (=0)		---
Divorce 0~6 years		.05 (.06)
Divorce 7~12 years		.08 (.06)
Male	.01 (.02)	.02 (.02)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	.04 (.02)	.04 (.02)
Associate junior collage	.00 (.03)	-.00 (.03)
Bachelor's degree	-.02 (.05)	-.02 (.05)
Graduate degree	.02 (.05)	.02 (.05)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~49,999	-.04 (.04)	-.04 (.04)
NT$50,000~NT$99,999	.01 (.04)	.01 (.04)
NT$100,000~NT$149,999	-.03 (.04)	-.03 (.04)
NT$150,000~NT$199,999	.03 (.07)	.03 (.07)
>NT$200,000	-.02 (.05)	-.02 (.05)
Program type		
General program (=0)	---	---
Comprehensive program	-.07* (.03)	-.07* (.03)
Vocational program	-.02 (.02)	-.02 (.02)
Junior college program	.02 (.05)	.02 (.05)
Private school (=1)	.01 (.02)	.01 (.02)
School urbanization		
Rural (=0)	---	---
Sub-urban	.02 (.06)	.02 (.06)
Urban	.01	.01

	(.06)	(.06)
Model for Paternal Involvement		
Intercept	.01(.01)	.01 (.01)
Model for Maternal Involvement		
Intercept	.02*** (.00)	.02*** (.00)
Random effects		
τ_{00}	.16992***	.16874***
τ_{11}	.11342*	.11374*
τ_{22}	.00683	.00686
Deviance	23340.74	23329.87
BIC	23937.12	23954.65
No. of parameter	63	66

Note: Total observations in level 1are 12,918 (model 1~model 2); total observations in level 2 are 3,748 (model 1~model 2). * $p < .05$. ** $p < .01$. *** $p < .001$. Standard error is in (parentheses).

Figure 4 shows the trajectory of happiness of adolescents from divorce and no-divorce families. The figure shows that adolescents from divorced families have lower happiness than those from two parent families in 7th grade, but the rate of decrease does not differ statistically significantly between the two groups. The small solid triangles above the notation in all trajectory figures represent the statistical significance relative to the reference group (the solid blue line), and the hollow triangles represent that the coefficient is not statistically significant, but does closely approach statistical significance relative to with the reference group.

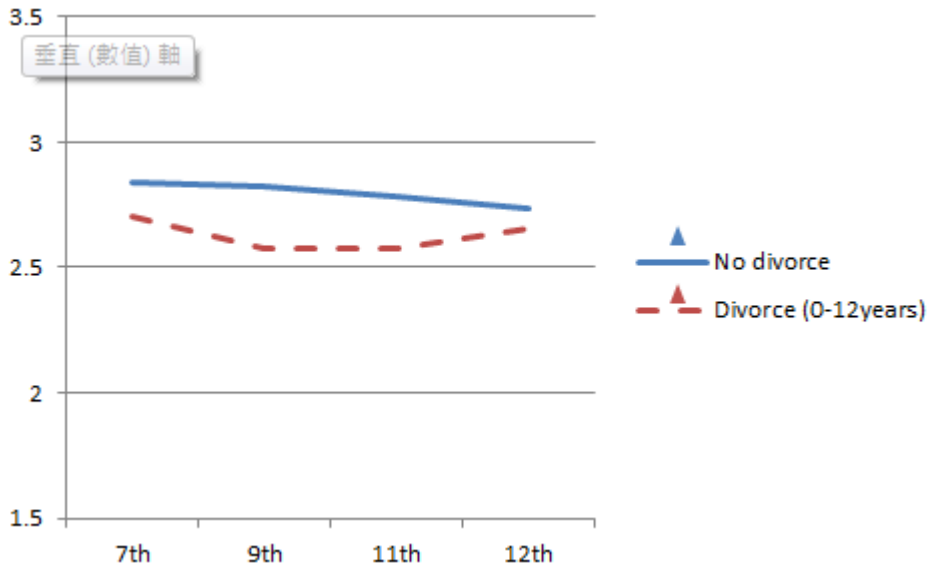


Figure 4. The trajectory of adolescent happiness – by parental divorce (two groups)

Figure 5 illustrates the trajectory of happiness of adolescents from two parent families, families where the parents divorced when the children were aged 0~6 years old, and families where the parents divorced when the children were aged 7~12 years old. The figure shows that adolescents from families in which parents divorced when their children were in late childhood (7~12 years old) have lower levels of happiness than adolescents in two parent families in 7th grade, but the growth rate does not differ.

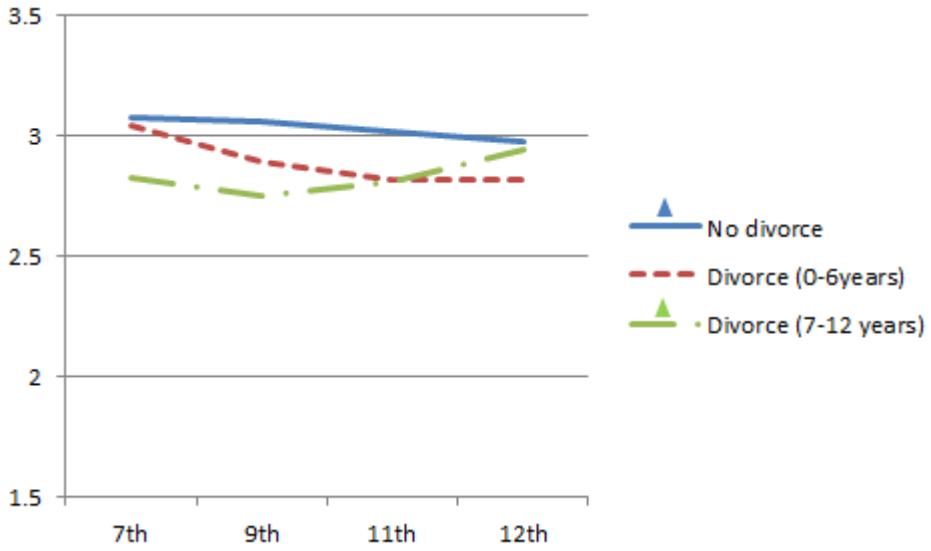


Figure 5. The trajectory of adolescent happiness – by parental divorce (three groups)

(3)The effects of parental marital conflict

Table 11 lists the effects of parental marital conflict on adolescent happiness. In model 1, adolescents who experienced parental marital conflict during 0~12 years old were recorded using the code 1, while the reference group comprised adolescents who had not experienced this. The analytical result shows that parental marital conflict during childhood reduces the adolescent happiness initially (-.15, p<.01), supporting previous studies (Lindsey, *et al.*, 2009; Mechanic & Hansell, 1989). Hypothesis 3-1 thus is supported. However, neither the linear (-.03) nor quadratic coefficients (.03) are statistically significant, implying that parental marital conflict during childhood does not affect the increase in adolescent happiness.

Model 2 examines whether parental conflict occurring only during early childhood (0~6 years old), during late childhood (7~12 years old), or during the whole of childhood (both age 0~6 years and 7~12 years) in families that have undergone divorce is more damaging for adolescent happiness compared with that occurring in two parent families. The comparison results show that adolescents whose parents display conflict in late childhood (7~12 years old) have lower levels of happiness than

those of two-parent families (-.18, p<.01) in the initial level, but neither the linear (-.04) nor quadratic (.04) coefficients are statistically significant, implying that the growth rate of happiness does not differ from that in two parent families.

Table 11. HLM Result: The Effect of Parental Marital Conflict on Adolescent Happiness

Effects	Conditional	
	Model 1 (Conflict)	Model 2 (Age at Conflict)
Fixed effects		
Model for the intercepts (β_0)		
Intercept	3.06*** (.16)	3.06*** (.16)
Parental marital conflict (=1)	-.15** (.05)	
Age at parental marital conflict		
No conflict (=0)		---
Conflict 0~6 years only		-.12 (.09)
Conflict 7~12 years only		-.18** (.07)
Conflict both 0~6 and 7~12 years		-.12 (.08)
Male	.09* (.04)	.09* (.04)
Parental education		
Less than high school (=0)	---	---
High school graduate	.02 (.06)	.02 (.06)
Associate junior collage	-.08 (.06)	-.08 (.06)
Bachelor's degree	-.16 (.10)	-.16 (.10)
Graduate degree	-.14 (.10)	-.14 (.10)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~NT$49,999	-.21 (.14)	-.21 (.14)

NT$50,000~NT$99,999	-.13 (.14)	-.13 (.14)
NT$100,000~NT$149,999	-.17 (.15)	-.18 (.15)
NT$150,000~NT$199,999	-.07 (.16)	-.07 (.16)
>NT$200,000	.21 (.25)	.21 (.25)
School program type		
General program (=0)	---	---
Comprehensive program	-.06 (.08)	-.07 (.08)
Vocational program	-.03 (.05)	-.03 (.05)
Junior college program	-.09 (.10)	-.09 (.10)
Private school (=1)	.02 (.04)	.02 (.04)
School urbanization		
Rural (=0)	---	---
Sub-urban	.03 (.12)	.03 (.12)
Urban	-.02 (.12)	-.02 (.12)
Model for Time slope (β_1)		
Intercept	-.04 (.20)	-.04 (.20)
Parental marital conflict (=1)	-.03 (.07)	
Age at parental marital conflict		
No conflict (=0)		---
Conflict 0~6 years only		.04 (.13)
Conflict 7~12 years only		-.04 (.10)
Conflict both 0~6 and 7~12 years		-.14 (.13)
Male (=1)	-.06 (.06)	-.06 (.06)
Parental education		
Less than high school (=0)	---	---
High school graduate	-.14	-.13

	(.07)	(.07)
Associate junior collage	.02	.02
	(.10)	(.10)
Bachelor's degree	.05	.05
	(.14)	(.14)
Graduate degree	.04	.05
	(.15)	(.15)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~49,999	.20	.20
	(.11)	(.11)
NT$5,000~$99,999	.03	.03
	(.11)	(.11)
NT$100,000~NT$149,999	.18	.18
	(.13)	(.13)
NT$150,000~NT$199,999	-.11	-.11
	(.20)	(.20)
>NT$200,000	-.18	-.18
	(.20)	(.20)
Program type		
General program (=0)	---	---
Comprehensive program	.20*	.20*
	(.10)	(.09)
Vocational program	.07	.07
	(.07)	(.07)
Junior college program	-.03	-.02
	(.15)	(.15)
Private school (=1)	-.04	-.04
	(.07)	(.07)
School urbanization		
Rural (=0)	---	---
Sub-urban	-.16	-.16
	(.17)	(.17)
Urban	-.11	-.11
	(.16)	(.16)
Model for Time^2 slope (β_2)		
Intercept	.00	.00
	(.06)	(.06)
Parental marital conflict (=1)	.03	
	(.03)	
Age at parental marital conflict		
No conflict (=0)		---
Conflict 0~6 years only		.00
		(.04)
Conflict 7~12 years only		.04
		(.04)
Conflict both 0~6 and 7~12 years		.06
		(.04)

Male	.01 (.02)	.01 (.02)
Parental education		
Less than high school (=0)	---	---
High school graduate	.05 (.02)	.05 (.02)
Associate junior collage	.00 (.03)	.00 (.03)
Bachelor's degree	-.01 (.05)	-.01 (.05)
Graduate degree	.03 (.05)	.03 (.05)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~49,999	-.05 (.04)	-.05 (.03)
NT$50,000~NT$99,999	-.00 (.04)	-.00 (.04)
NT$100,000~NT$149,999	-.04 (.05)	-.04 (.05)
NT$150,000~NT$199,999	.02 (.07)	.02 (.07)
>NT$200,000	-.02 (.05)	-.02 (.05)
School program type		
General program (=0)	---	---
Comprehensive program	-.07* (03)	-.07* (.03)
Vocational program	-.01 (.02)	-.01 (.02)
Junior college program	.02 (.05)	.02 (.05)
Private school (=1)	.01 (.02)	.01 (.02)
School urbanization		
Rural (=0)	---	---
Sub-urban	.01 (.06)	.01 (.06)
Urban	.00 (.05)	.00 (.05)
Model for Paternal Involvement		
Intercept	.01 (.01)	.01 (.01)
Model for Maternal Involvement		
Intercept	.02*** (.01)	.02*** (.01)
Random effects		

	τ_{00}	.16820***	.16805***
	τ_{11}	.11271*	.11235*
	τ_{22}	.00687	.00683
Deviance		23351.04	23346.41
BIC		23947.42	23999.59
No. of parameter		63	69

Note: Total observations in level 1are 12,918 (model 1~model 2); total observations in level 2 are 3,748 (model 1~model2). * $p < .05$. ** $p < .01$. *** $p < .001$. Standard error is in (parentheses).

Figure 6 shows the trajectory of happiness for adolescents from parental conflict and no parental conflict families. The Figure shows that adolescents from conflict families have lower happiness than those from two parent families in 7th grade, but the rate of decrease is also quite similar between the two groups.

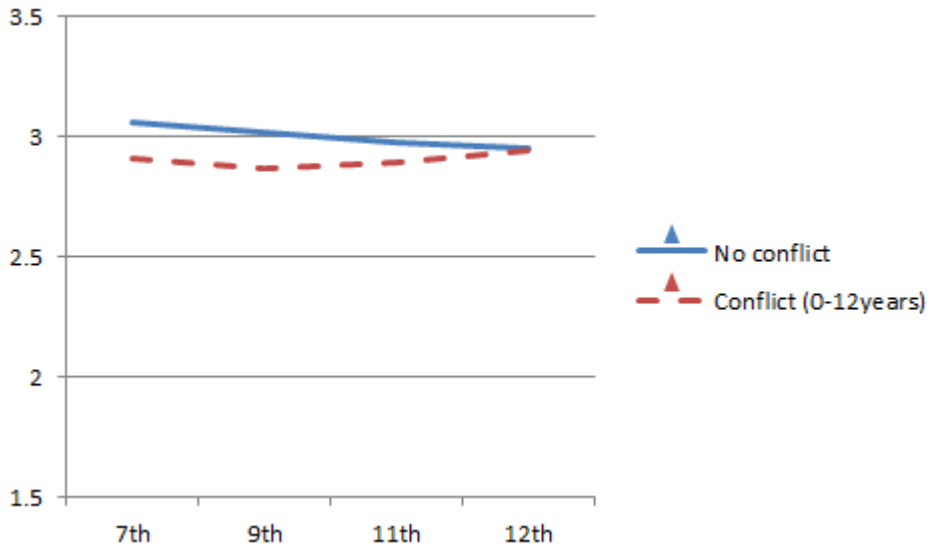


Figure 6. The trajectory of adolescent happiness – by parental marital conflict (two groups)

Figure 7 shows the trajectory of happiness of adolescents from no parental conflict families, families with conflict occurring when the children are 0~6 years old, families with conflict occurring at

7~12 years old, and families with conflict occurring at both 0~6 years old and 7~12 years old. The figure shows that adolescents of families with parental conflict when children are 6~12 years old have lower happiness than those of two parent family in 7th grade, but the rate of decrease is not significant different.

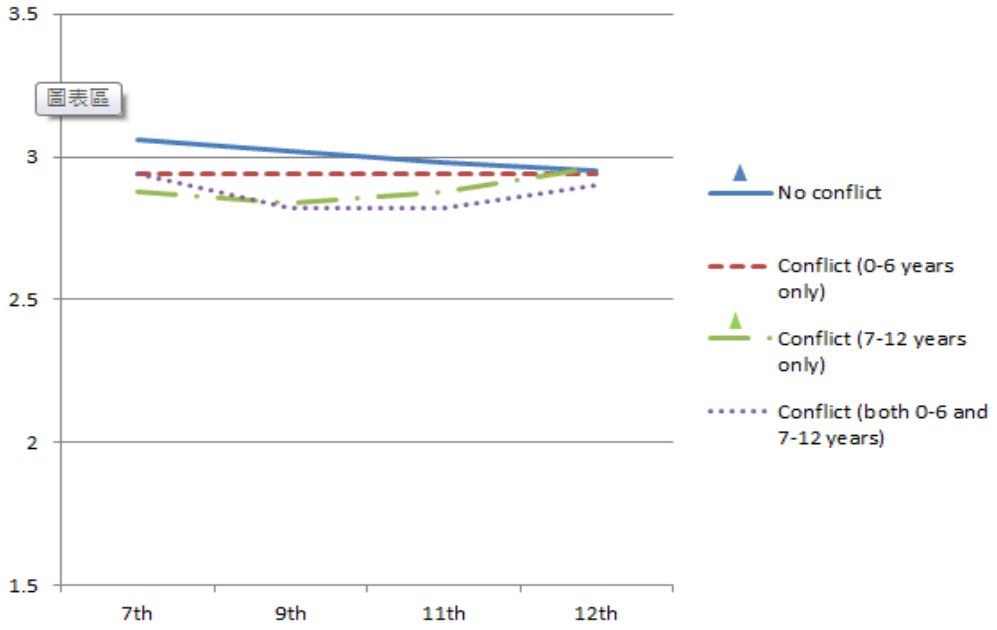


Figure 7. The trajectory of adolescent happiness – by parental marital conflict (four groups)

(4)The effects of family types

Table 12 lists the effects of family types on adolescent happiness by combining the items of "parental divorce" and "parental marital conflict". Model 1 creates four family types: two parent family without conflict, two parent family with conflict, divorced family (with divorce occurring when the child was 0~12 years old) without pre-divorce marital conflict, and divorced family (with divorce occurring when the child was 0~12 years old) with pre-divorced marital conflict. The result shows that adolescents from divorced families with pre-divorce marital conflict have the lowest happiness (-.32, p<.001) among all family types in terms of initial level, and the negative linear coefficient (-.26, p<.05) indicates that rate of decrease of happiness for adolescents from divorced families with pre-divorce marital conflict is faster than for two-parent families. Hypothesis 4-1 thus is not supported. This unexpected result does not

correspond with previous studies, suggesting that parental divorce is more harmful for offspring in the absence of parental marital conflict (Amato, *et al.*, 1995; Hanson, 1999). Adolescents from two parent families with marital conflict exhibit the second lowest levels of happiness (-.18, p<.001), supporting previous studies finding that long-term pressure and hostility between parents harms offspring.

Six family types were created in model 2: two parent family without conflict, two parent family with conflict, divorced family (with divorce occurring when the child was 0~6 years old) without pre-divorce marital conflict, divorced family (with divorce occurring when the child was 0~6 years old) with pre-divorce marital conflict, divorced family (with divorce occurring when the child was 7~12 years old) without pre-divorce conflict, and divorced family (with divorce occurring when the child was 7~12 years old) with pre-divorce conflict. Model 2 separately examines the effects of pre-divorce conflict on early childhood (0~6 years old), and late childhood (7~12 years old). The results show that adolescents from families that have undergone divorce (with divorce occurring when the child was 7~12 years old) with pre-divorce conflict have the lowest level of happiness among all family types initially (-.42, p<.001), but do not differ statistically in linear (-.07) or quadratic growth rate (.07).

Table 12. HLM Result: The Effect of Family Types on Adolescent Happiness

Effects	Conditional	
	Model 1 (age 0~12 yrs)	Model 2 (age 0~6 and 7~12 ys)
Fixed effects		
Model for the intercepts (β_0)		
Intercept	3.12*** (.16)	3.11*** (.16)
Family type (overall age 0~12 years)		
Two-parent without conflict (=0)	---	
Two-parent with conflict	-.18*** (.05)	
Divorced 0~12 years without predivorced conflict	-.04 (.07)	
Divorced 0~12 years with predivorced conflict	-.32*** (.10)	

Family type (divided to age 0~6 and 7~12 years)		
Two-parent without conflict (=0)		---
Two-parent with conflict		-.18*** (.05)
Divorced 0~6 years without pre-divorced conflict		-.03 (.08)
Divorced 0~6 years with pre-divorced conflict		-.15 (.20)
Divorced 7~12 years without pre-divorced c		-.05 (.10)
Divorced 7~12 years with pre-divorced conflict		-.42*** (.09)
Male	.09* (.04)	.09* (.04)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	.03 (.06)	.03 (.06)
Associate junior collage	-.07 (.06)	-.07 (06)
Bachelor's degree	-.16 (.10)	-.16 (.10)
Graduate degree	-.13 (.11)	-.13 (.11)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~NT$49,999	-.21 (.14)	-.22 (.14)
NT$50,000~NT$99,999	-.14 (.14)	-.14 (.14)
NT$100,000~NT$149,999	-.18 (.15)	-.19 (.15)
NT$150,000~NT$199,999	-.09 (.16)	-.09 (16)
>NT$200,000	.21 (.24)	.20 (.24)
School program type		
General program (=0)	---	---
Comprehensive program	-.07 (.08)	-.07 (.08)
Vocational program	-.02 (.04)	-.02 (.04)

Junior college program	-.09 (.10)	-.09 (.10)
Private school (=1)	.02 (.04)	.02 (.04)
School urbanization		
Rural (=0)	---	---
Sub-urban	.02 (.12)	.03 (.12)
Urban	-.04 (.12)	-.04 (.12)
Model for Time slope (β_1)		
Intercept	-.02 (.19)	-.03 (.20)
Family type (overall age 0~12 years)		
Two-parent without conflict (=0)	---	
Two-parent with conflict	.03 (.07)	
Divorced 0~12 years without pre-divorced conflict	-.26* (.12)	
Divorced 0~12 years with pre-divorced conflict	-.07 (.19)	
Family type (divided to age 0~6 and 7~12 years)		
Two-parent without conflict		---
Two-parent with conflict		.03 (.07)
Divorced 0~6 years without pre-divorced conflict		-.30 (.16)
Divorced 0~6 years with pre-divorced conflict		.06 (.31)
Divorced 7~12 years without pre-divorced c		-.18 (.16)
Divorced 7~12 years with pre-divorced conflict		-.12 (.23)
Male (=1)	-.06 (.06)	-.07 (.06)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	-.13 (.07)	-.13 (.07)
Associate junior collage	.02 (.10)	.03 (.10)
Bachelor's degree	.06 (.14)	.06 (.14)

Graduate degree	.04 (.15)	.04 (.15)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~49,999	.18 (.11)	.18 (.11)
NT$5,000~$99,999	.02 (.11)	.02 (.11)
NT$100,000~NT$149,999	.16 (.13)	.16 (.12)
NT$150,000~NT$199,999	-.11 (.20)	-.11 (.20)
>NT$200,000	-.19 (.20)	-.19 (.20)
School program type		
General program (=0)	---	---
Comprehensive program	.20* (.09)	.20* (.09)
Vocational program	.08 (.07)	.07 (.07)
Junior college program	-.02 (.15)	-.02 (.15)
Private school (=1)	-.04 (.07)	-.04 (.07)
School urbanization		
Rural (=0)	---	---
Sub-urban	-.17 (.17)	-.16 (.17)
Urban	-.11 (.16)	-.11 (.16)
Model for Time^2 slope (β_2)		
Intercept	-.01 (.06)	-.01 (.06)
Family type (overall age 0~12 years)		
Two-parent without conflict (=0)	---	
Two-parent with conflict	.01 (.02)	
Divorced 0~12 years without pre-divorced conflict	.08† (.04)	
Divorced 0~12 years with pre-divorced conflict	.06 (.07)	
Family type (divided to age 0~6 and 7~12 years)		
Two-parent without conflict (=0)		---
Two-parent with conflict		.01 (.02)
Divorced 0~6 years without pre-divorced conflict		.09 (.06)
Divorced 0~6 years with pre-divorced		-.00

conflict		(.10)
Divorced 7~12 years without pre-divorced c		.07 (.05)
Divorced 7~12 years with pre-divorced conflict		.09 (.09)
Male	.02 (.02)	.02 (.02)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	.04 (.02)	.04 (.02)
Associate junior collage	.00 (.03)	.00 (.03)
Bachelor's degree	-.02 (.05)	-.01 (.05)
Graduate degree	.03 (.05)	.03 (.05)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~49,999	-.04 (.04)	-.04 (.04)
NT$50,000~NT$99,999	.00 (.04)	.00 (.04)
NT$100,000~NT$149,999	-.03 (.04)	-.03 (.04)
NT$150,000~NT$199,999	.03 (.07)	.03 (.07)
>NT$200,000	-.02 (.05)	-.02 (.05)
School program type		
General program (=0)	---	---
Comprehensive program	-.07* (.03)	-.07* (.03)
Vocational program	-.02 (.02)	-.01 (.02)
Junior college program	.02 (.05)	.02 (.05)
Private school (=1)	.01 (.02)	.01 (02)
School urbanization		
Rural (=0)	---	---
Sub-urban	.02 (.06)	.01 (.06)
Urban	.01 (.05)	.00 (.05)
Model for Paternal Involvement		
Intercept	.01 (.01)	.01 (.01)

Model for Maternal Involvement			
Intercept		.02*** (.01)	.02*** (.00)
Random effects			
	τ_{00}	.16375***	.16300***
	τ_{11}	.11244*	.11348*
	τ_{22}	.00682	.00688
Deviance		23274.86	23258.57
BIC		23928.04	23968.55
No. of parameter		69	75

Note: Total observations in level 1are 12,918 (model 1~model 2); total observations in level 2 are 3,748 (model 1~model2). * $p < .05$. ** $p < .01$. *** $p < .001$. Standard error is in (parentheses).

Figure 8 illustrates the trajectory of happiness for adolescents from the four family types. The figure shows that adolescents from divorced families with pre-divorce conflict have lower happiness than those from two parent families in 7th grade, but the rate of decrease is also quite similar for the two groups.

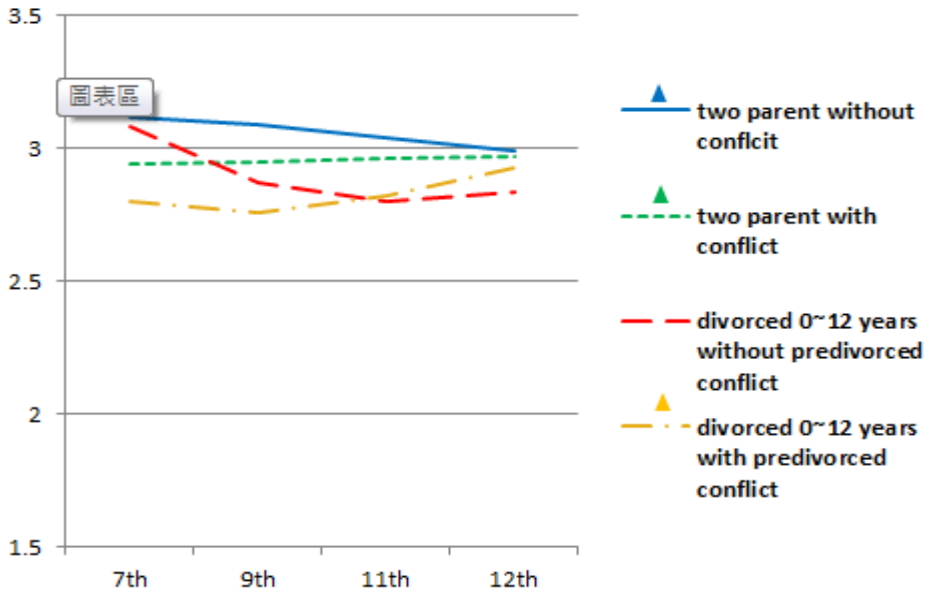


Figure 8. The trajectory of adolescent happiness – by four family types

Figure 9 shows the trajectory of happiness of adolescents from six family types: including two parent families without marital conflict, two parent families with marital conflict, families with parental divorce occurring when the child was 0~6 years old without pre-divorce conflict, families with parental divorce occurring when the child was 0~6 years old with pre-divorce conflict, families with divorce occurring when the child was 7~12 years old without pre-divorced conflict, and families with divorce occurring when the child was 7~12 years old with pre-divorce conflict. The figure shows that adolescents from two parent families with marital conflict and divorce occurring when the child was 7~12 years old with pre-divorce conflict have significantly lower happiness in grade 7.

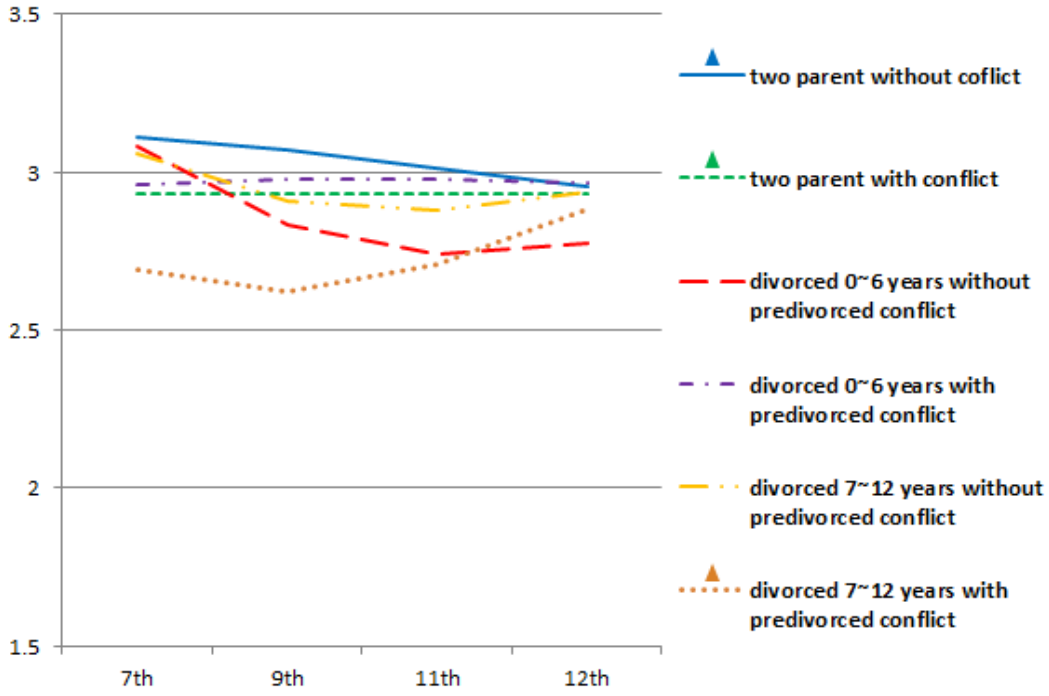


Figure 9. The trajectory of adolescent happiness – by six family types

Male adolescents have higher happiness at the initial point (.09, p<.05 in Table 10 to 12) than female adolescents, but do not differ in growth rate. On the other hand, school program types affect the growth rate of happiness but do not differ at the initial level. In general, the linear growth rate of

happiness of adolescents in comprehensive program increases slightly more rapid (.20, p<.05 in table 10 ~ table 12), and the quadratic growth rate decreases slightly less rapid (-.07, p<.05 in table 10 ~ table 12) than those in general program. Despite the coefficient being minor, maternal involvement is positively associated with adolescent happiness (.02, p<.001 in Table 10~12). Household income, parental education, school type, and school urbanization do not explain the trajectory of happiness for adolescents. Hypothesis 5 thus is only partially supported. The τ_{00} of the unconditional model is 0.17509, and therefore the within individual variance changed overtime for happiness and explained all predictors (including parental divorce, marital conflict, parental involvement and control variables) which ranged from 3.0% [(0.17509-0.16992)/0.17509] to 6.9% [(0.17509-0.16300)/0.17509].

2. The Trajectory of Depressed Mood

(1) The Unconditional Model

First, an unconditional model with a random intercept and random slope over time was estimated, including the linear and quadratic functions of time, which were measured uing the centering grade of adolescent. Adolescent depressed mood displayed an opposite trajectory to happiness (Table 13). The positive coefficients (2.18, p<.001) for the time variable and negative coefficients (-0.58, p<.001) for the quadratic time measure indicate that depression increased over time but the rate of increase slowed.

Table 13. The Unconditional Model—Depressed Mood

Effects	Unconditional model
Fixed effects	
Model for the intercepts (β_0)	
Intercept	6.18*** (.08)
Model for Time slope (β_1)	

Intercept	2.18*** (.12)
Model for Time^2 slope (β_2)	
Intercept	-.58*** (.04)
Random effects	
τ_{00}	1.46486***
τ_{11}	1.05425
τ_{22}	.08024
Deviance	70400.89
BIC	70497.30
No. of parameter	10

Note: Total observations in level 1are 15,380; total observations in level 2 are 3,886.

* p < .05. ** p < .01. *** p <.001. Standard error is in (parentheses).

Figure 10 shows the trajectory of adolescent depressed mood from 7th grade to 12th grade. The dotted line represents depressed mood when the equation includes only time, and the solid line represents the levels of happiness when the equation includes both time and control variables (including gender, parental education, household income, school program type, school type, and school urbanization). Both lines indicate that the trajectory of adolescent happiness changed over time, and thus hypothesis 1-2 is supported.

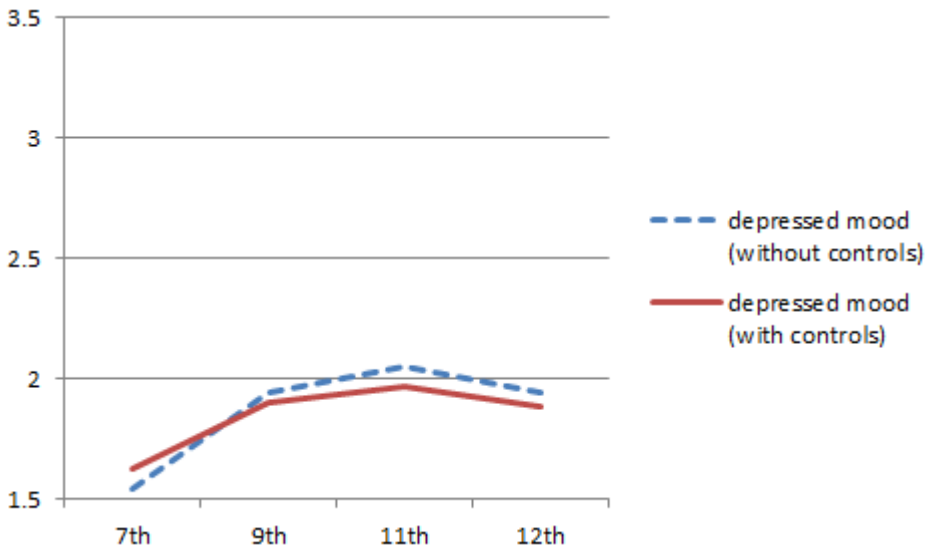


Figure 10. The trajectory of adolescent depressed mood

(2)The Effects of Parental Divorce

Table 14 lists the effects of parental divorce on adolescent depressed mood. In model 1, adolescents who had experienced parental divorce at 0~12 years old were recorded using the code 1, and the reference group comprised those who had not experienced this. The analytical result shows that parental divorce during childhood increases adolescent depressed mood in initial level (.78, $p<.001$). This result is consistent with previous studies suggesting that parental divorce negatively affects youth outcome (Kalter & Rembar, 1981; Krein & Beller, 1988; Palosaari & Aro, 1994; Zill, *et al.*, 1993). Hypothesis 2-2 thus is supported. However, neither the linear coefficient (.82) nor the quadratic coefficient (-.30) statistically significant, implying that parental divorce during childhood does not influence growth of adolescent depressed mood.

Model 2 examines whether parental divorce occurring in early childhood (0~6 years old) or late childhood (7~12 years old) is the more damaging for adolescent depressed mood compared with adolescents from two parent families. The result shows that adolescents whose parents divorced when they were 0~6 years old had higher depressed mood than adolescents from two-parent families. (.66, $p<.05$) in the initial level, but neither the linear (.08) nor quadratic (-.02) coefficient are statistically significant, implying that increase of depressed mood does not differ compared to adolescents from two parent families. These results support the findings of Kerin and Beller (1988), and Zill *et al.* (1993) which suggested that parental divorce at a young age (0~5.5 years, and 0~6 years respectively) is more harmful for children than when it occurs at a later age.

Table 14. HLM Result: The Effect of Parental Divorce on Adolescent Depressed Mood

Effects	Conditional	
	Model 1 (Divorce)	Model 2 (Age at Divorce)

Fixed effects		
Model for the intercepts (β_0)		
Intercept	6.35*** (.53)	6.35*** (.52)
Parental divorce (=1)	.78** (.30)	
Age at parental divorce		
No divorce (=0)		---
Divorce 0~6 years		.66* (.31)
Divorce 7~12 years		.90 (.48)
Male	-.69*** (.15)	-.69*** (.15)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	-.21 (.20)	-.21 (.20)
Associate junior collage	-.11 (.22)	-.12 (.22)
Bachelor's degree	.08 (.25)	.07 (.25)
Graduate degree	-.06 (.36)	-.06 (.36)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~NT$49,999	.49 (.33)	.50 (.34)
NT$50,000~NT$99,999	.56 (.37)	.57 (.37)
NT$100,000~NT$149,999	.48 (.38)	.49 (.38)
NT$150,000~NT$199,999	.71 (.48)	.73 (.48)
>NT$200,000	1.02* (.45)	1.03* (.45)
School program type		
General program (=0)	---	---
Comprehensive program	-.12 (.25)	-.12 (.25)
Vocational program	-.18 (.17)	-.18 (.17)

Junior college program	-.13 (.39)	-.12 (.39)
Private school (=1)	.18 (.17)	.17 (.17)
School urbanization		
Rural (=0)	---	---
Sub-urban	-.37 (.45)	-.37 (.45)
Urban	-.50 (.46)	-.49 (.46)
Model for Time slope (β_1)		
Intercept	1.68* (.76)	1.63* (.76)
Parental divorce (=1)	.82 (.57)	
Age at parental divorce		
No divorce (=0)		---
Divorce 0~6 years		.11 (.52)
Divorce 7~12 years		1.44 (.95)
Male (=1)	-.30 (.24)	-.30 (.24)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	.00 (.33)	-.00 (.33)
Associate junior collage	-.27 (.42)	-.28 (.42)
Bachelor's degree	.17 (.43)	.17 (.42)
Graduate degree	-.15 (.59)	-.18 (.59)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~49,999	.01 (.56)	.05 (.53)
NT$5,000~$99,999	.01 (.58)	.04 (.55)
NT$100,000~NT$149,999	.17 (.62)	.20 (.59)
NT$150,000~NT$199,999	.92 (.76)	.99 (.73)
>NT$200,000	-.33	-.31

	(.73)	(.71)
School program type		
General program (=0)	---	---
Comprehensive program	-.55 (.37)	-.53 (.37)
Vocational program	-.06 (.33)	-.07 (.33)
Junior college program	-.30 (.67)	-.25 (.67)
Private school (=1)	-.19 (.28)	-.22 (.28)
School urbanization		
Rural (=0)	---	---
Sub-urban	.63 (.61)	.63 (.61)
Urban	1.13 (.63)	1.16 (.63)
Model for Time^2 slope (β_2)		
Intercept	-.46 (.25)	-.44 (.25)
Parental divorce (=1)	-.30 (.19)	
Age at parental divorce		
No divorce (=0)		---
Divorce 0~6 years		-.02 (.18)
Divorce 7~12 years		-.55 (.30)
Male	.13 (.08)	.13 (.08)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	.03 (.11)	.03 (.11)
Associate junior collage	.13 (.14)	.14 (.14)
Bachelor's degree	-.01 (.14)	-.01 (.14)
Graduate degree	.09 (.20)	.10 (.20)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~49,999	-.11 (.21)	-.13 (.20)
NT$50,000~NT$99,999	-.10 (.21)	-.11 (.20)
NT$100,000~NT$149,999	-.17 (.23)	-.18 (.22)

NT$150,000~NT$199,999	-.43 (.28)	-.46 (.27)
>NT$200,000	.06 (.27)	.05 (.27)
School program type		
General program (=0)	---	---
Comprehensive program	.22 (.13)	.21 (.13)
Vocational program	.00 (.11)	.00 (.11)
Junior college program	.09 (.24)	.07 (.24)
Private school (=1)	.01 (.10)	.02 (.09)
School urbanization		
Rural (=0)	---	---
Sub-urban	-.05 (.21)	-.06 (.21)
Urban	-.22 (.21)	-.23 (.22)
Model for Paternal Involvement		
Intercept	-.00 (.02)	-.00 (.02)
Model for Maternal Involvement		
Intercept	.01 (.02)	.01 (.02)
Random effects		
τ_{00}	1.19180***	1.19642***
τ_{11}	1.54371	1.54117
τ_{22}	.10801	10692
Deviance	58932.94	58916.51
BIC	59529.92	59541.92
No. of parameter	63	66

Note: Total observations in level 1are 13,042 (model 1~model 2); total observations in level 2 are 3,747 (model 1~model 2). * $p < .05$. ** $p < .01$. *** $p < .001$. Standard error is in (parentheses).

Figure 11 shows the trajectory of depressed mood of adolescents from divorce and no-divorce families. The figure shows that adolescents from divorced families have higher levels of depressed mood than those from two parent families in 7th grade, but the rate of increase is similar.

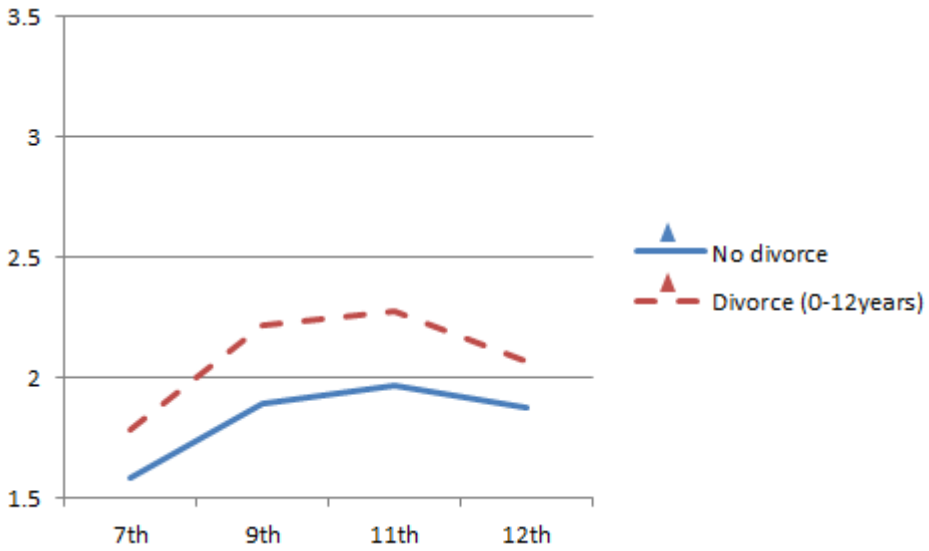


Figure 11. The trajectory of adolescent depressed mood – by parental divorce (two groups)

Figure 12 shows the trajectory of depressed mood of adolescents from two parent families, adolescents from families where divorce occurred when they were 0~6 years old, and those from families where divorce occurred when they were 7~12 years old. The figure shows that adolescents from families where parents divorced during early childhood (0~6 years old) had higher depressed mood than two parent families with children in 7th grade.

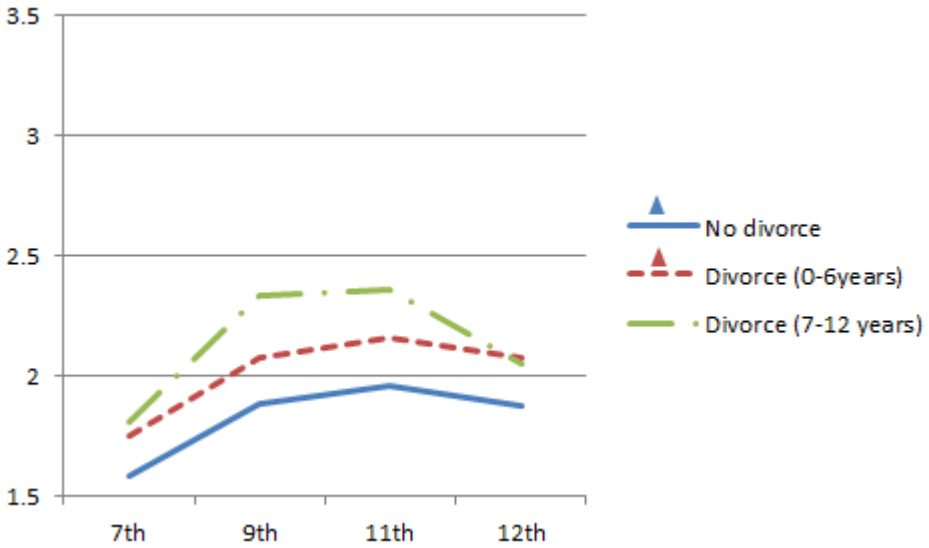


Figure 12. The trajectory of adolescent depressed mood – by parental divorce (three groups)

(3)The effects of parental marital conflict

Table 15 lists the effects of parental marital conflict on adolescent depressed mood. In model 1, adolescents who had experienced parental marital conflict during the past 0~12 years were recoded using the code 1, while the reference group comprised adolescents without this experience. The analytical result shows that parental marital conflict during childhood initially increases adolescent happiness (.48, p<.05), supporting previous studies (Lindsey, *et al.*, 2009; Mechanic & Hansell, 1989). Hypothesis 3-2 thus is supported. However, neither the linear coefficient (.66) nor the quadratic coefficient (-.24) are statistically significant, implying that parental marital conflict during childhood does not affect growth of adolescent depression.

Model 2 examines whether parental conflict occurring during early childhood (0~6 years old) only, during late childhood (7~12 years old) only, or throughout the whole of childhood (both 0~6 years old and 7~12 years old) is more damaging for adolescent happiness compared to the situation for two parent families. The analytical result shows that when age groups are more specific, the effect of parental marital conflict disappears. However, the coefficient of conflict is highest for the 0~6 year old and 7~12 year old age groups (.63) and is almost statistically significant (p=.069), implying that long-term severe parental marital conflict is most harmful for offspring.

Table 15. HLM Result: The Effect of Parental Marital Conflict on Adolescent Depressed Mood

Effects	Conditional	
	Model 1 (Conflict)	Model 2 (Age at Conflict)
Fixed effects		
Model for the intercepts (β_0)		
Intercept	6.50*** (.53)	6.51*** (.53)
Parental marital conflict (=1)	.48* (.21)	
Age at parental marital conflict		
No conflict (=0)		---

Conflict 0~6 years only		.38 (.26)
Conflict 7~12 years only		.48 (.34)
Conflict both 0~6 and 7~12 years		.63 (.35)
Male	-.70*** (.15)	-.70*** (.15)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	-.17 (.20)	-.18 (.21)
Associate junior collage	-.06 (.23)	-.07 (.23)
Bachelor's degree	.14 (.26)	.13 (.26)
Graduate degree	-.03 (.36)	-.03 (.36)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~NT$49,999	.44 (.34)	.44 (.34)
NT$50,000~NT$99,999	.49 (.37)	.49 (.37)
NT$100,000~NT$149,999	.37 (.39)	.37 (.39)
NT$150,000~NT$199,999	.62 (.49)	.62 (.49)
>NT$200,000	.97* (.45)	.97* (.45)
School program type		
General program (=0)	---	---
Comprehensive program	-.13 (.26)	-.12 (.25)
Vocational program	-.15 (.17)	-.14 (.17)
Junior college program	-.16 (.39)	-.16 (.39)
Private school (=1)	.19 (.17)	.19 (.17)
School urbanization		

Rural (=0)	---	---
Sub-urban	-.41 (.46)	-.41(.46)
Urban	-.55 (.46)	-.55(.46)
Model for Time slope (β_1)		
Intercept	1.71* (.77)	1.70* (.76)
Parental marital conflict (=1)	.66 (.39)	
Age at parental marital conflict		
No conflict (=0)		---
Conflict 0~6 years only		.86 (.55)
Conflict 7~12 years only		.60 (.64)
Conflict both 0~6 and 7~12 years		.49 (.48)
Male (=1)	-.31 (.24)	-.31 (.24)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	.04 (.35)	.04 (.35)
Associate junior collage	-.21 (.43)	-.21 (.43)
Bachelor's degree	.24 (.44)	.24 (.45)
Graduate degree	-.11 (.60)	-.11 (.60)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~49,999	-.03 (.59)	-.02 (.58)
NT$5,000~$99,999	-.05 (.61)	-.04 (.61)
NT$100,000~NT$149,999	.06 (.65)	.07 (.64)
NT$150,000~NT$199,999	.85 (.77)	.85 (.76)
>NT$200,000	-.36 (.74)	-.36 (.74)
School program type		
General program (=0)	---	---
Comprehensive program	-.56	-.56

	(.37)	(.37)
Vocational program	-.03	-.04
	(.33)	(.34)
Junior college program	-.32	-.30
	(.67)	(.67)
Private school (=1)	-.18	-.18
	(.29)	(.28)
School urbanization		
Rural (=0)	---	---
Sub-urban	.57	.58
	(.60)	(60)
Urban	1.07	1.07
	(.62)	(.62)
Model for Time^2 slope (β_2)		
Intercept	-.48	-.47
	(.25)	(.25)
Parental marital conflict (=1)	-.24	
	(.13)	
Age at parental marital conflict		
No conflict (=0)		---
Conflict 0~6 years only		-.34
		(.18)
Conflict 7~12 years only		-.20
		(.21)
Conflict both 0~6 and 7~12 years		-.19
		(.17)
Male	.13	.13
	(.08)	(.08)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	.01	.01
	(.11)	(.12)
Associate junior collage	.11	.11
	(.14)	(.14)
Bachelor's degree	-.04	-.04
	(.15)	(.15)
Graduate degree	.07	.07
	(.21)	(.21)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~49,999	-.10	-.10
	(21)	(21)
NT$50,000~NT$99,999	-.08	-.08
	(.22)	(.22)
NT$100,000~NT$149,999	-.13	-.13
	(.24)	(.23)
NT$150,000~NT$199,999	-.40	-.40
	(.28)	(.28)

>NT$200,000	.07 (.28)	.07 (.28)
School program type		
General program (=0)	---	---
Comprehensive program	.22 (.13)	.22 (.13)
Vocational program	-.01 (.11)	-.01 (.11)
Junior college program	.10 (.24)	.09 (.24)
Private school (=1)	.00 (.10)	.00 (.10)
School urbanization		
Rural (=0)	---	---
Sub-urban	-.03 (.20)	-.04 (.20)
Urban	-.20 (.21)	-.20 (.21)
Model for Paternal Involvement		
Intercept	-.00 (.02)	-.00 (.02)
Model for Maternal Involvement		
Intercept	.00 (.02)	.00 (.02)
Random effects		
τ_{00}	1.20972 ***	1.21010 ***
τ_{11}	1.52901	1.53537
τ_{22}	.10751	.10813
Deviance	58954.56	58951.08
BIC	59551.54	59604.92
No. of parameter	63	69

Note: Total observations in level 1 are 13,042 (model 1~model 2); total observations in level 2 are 3,747 (model 1~model2). * $p < .05$. ** $p < .01$. *** $p < .001$. Standard error is in (parentheses).

Figure 13 shows the trajectory of depressed mood of adolescents from families with and without parental conflict. The figure shows that adolescents from families with marital conflict have lower happiness than those from two parent families in 7th grade, but the rate of decrease is similar.

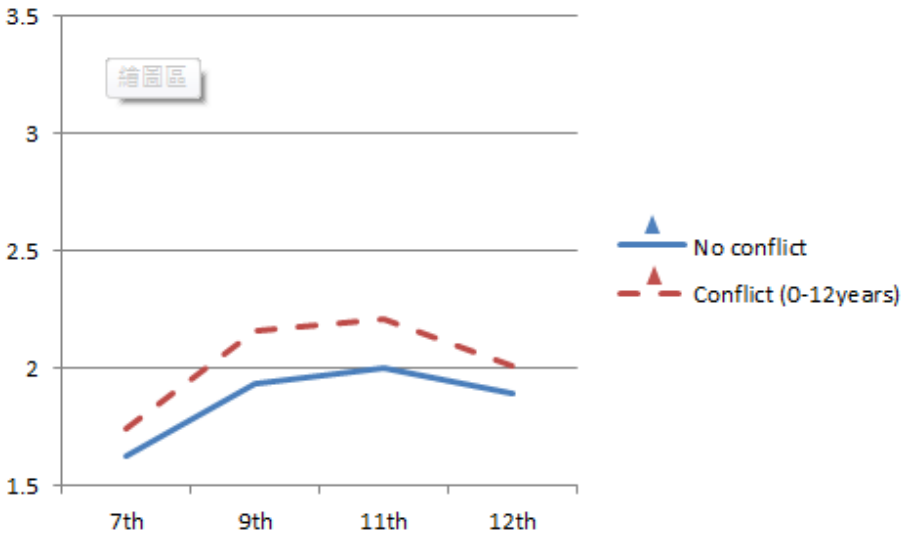


Figure 13. The trajectory of adolescents depressed mood – by parental marital conflict (two groups)

Figure 14 illustrates the trajectory of depressed mood of adolescents from families with no parental conflict, families with parental conflict when respondents were 0~6 years old, families with conflict when respondents were 7~12 years old, and families with conflict when respondents were aged both 0~6 years old and 7~12 years old. The figure shows that adolescents from families that underwent parental conflict when children were 0~6 years old and 7~12 years old have higher levels of depressed mood than those from two parent families in 7th grade, but the growth rate in depressed mood is not significant.

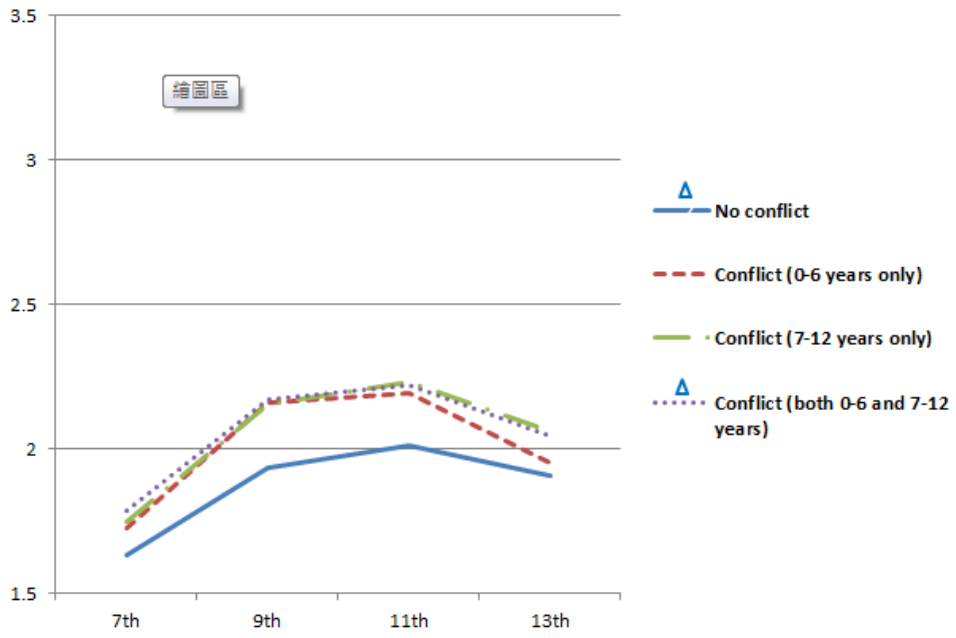


Figure 14. The trajectory of adolescent depressed mood – by parental marital conflict (four groups)

(4)The effects of family types

Table 16 lists the effects of family types on adolescent depressed mood by combing items of "parental divorce" and "parental marital conflict". Model 1 creates four family types: two parent family without marital conflict, two parent family with marital conflict, divorced family (with divorce occurring when the child was 0~12 years old) without pre-divorce conflict, and divorced family (with divorce when the child was 0~12 years old) with pre-divorce conflict. The [result NOTE *Best if you can further clarify what type of results.*] shows that adolescents from [divorced family OR families that have undergone divorce] with pre-divorce conflict have the highest level of depressed mood (1.12, $p<.05$) among all family types initially, followed by divorced families without pre-divorce conflict (.59, $p<.05$) and two parent families without pre-divorce conflict (.36, $p<.05$). Hypothesis 4-2 therefore is not supported. Just like the pattern for happiness, the pre-divorce parental marital conflict does not decrease the negative impact on adolescent mental health; [on the other hand OR instead], parental divorce itself appears harmful regardless of whether parents have pre-divorce conflict.

Six family types were created in model 2: two parent family without marital conflict, two parent family with marital conflict, family with divorce having occurred (divorce occurring when the child was 0~6 years old) without pre-divorce conflict, divorced family (divorce occurring when the child was 0~6 years old) with pre-divorce conflict, divorced family (divorce occurring when the child was 7~12 years old) without pre-divorce conflict, and. divorced family (divorce occurring when the child was 7~12 years old) with pre-divorced conflict.

Model 2 is to separately examine the effects of pre-divorced conflict on early childhood (0~6 years old), and late childhood (7~12 years old). Adolescents of two-parent families with conflict have statistically significant higher levels of depressed mood than those of two-parent families without conflict (.36, p<.05). Although not statistically significant (1.28, p=.09), adolescents of divorced family divorce occurring when the child was 7~12 years old) with pre-divorced conflict have the highest depression among all family types in initial level. Moreover, adolescents of parental divorce (divorce occurring when the child was 0~6 years old) without pre-divorced conflict (.67, p=.063) and those of parental divorce (divorce occurring when the child was 7~12 years old) without pre-divorced conflict (.47, p=.067) have higher depression than those of two parent family without conflict.

Table 16. HLM Result: The Effect of Family Types on Adolescent Depressed Mood

Effects	Conditional	
	Model 1 (age 0~12 yrs)	Model 2 (age 0~6 and 7~12 ys)
Fixed effects		
Model for the intercepts (β_0)		
Intercept	6.25*** (.53)	6.27*** (.54)
Family type (overall age 0~12 years)		
Two-parent without conflict (=0)	---	
Two-parent with conflict	.36* (.16)	
Divorced 0~12 years without predivorced conflict	.59* (.25)	

Divorced 0~12 years with predivorced conflict	1.12* (.53)	
Family type (divided to age 0~6 and 7~12 years)		
Two-parent without conflict (=0)		---
Two-parent with conflict		.36* (.16)
Divorced 0~6 years without pre-divorced conflict		.67 (.36)
Divorced 0~6 years with pre-divorced conflict		.83 (.56)
Divorced 7~12 years without pre-divorced c		.47 (.26)
Divorced 7~12 years with pre-divorced conflict		1.28 (.75)
Male	-.69*** (.15)	-.68*** (.14)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	-.21 (.20)	-.21 (.20)
Associate junior collage	-.11 (.23)	-.12 (.23)
Bachelor's degree	.10 (.26)	.10 (.26)
Graduate degree	-0.05 (.36)	-.05 (.36)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~NT$49,999	.50 (.33)	.51 (.33)
NT$50,000~NT$99,999	.55 (.37)	.56 (.37)
NT$100,000~NT$149,999	.46 (.38)	.47 (.38)
NT$150,000~NT$199,999	.71 (.48)	.72 (.48)
>NT$200,000	1.03* (.45)	1.05* (.45)
School program type		
General program (=0)	---	---
Comprehensive program	-.11 (25)	-.11 (.25)

Vocational program	-.18 (.17)	-.18 (.17)
Junior college program	-.14 (.38)	-.15 (.38)
Private school (=1)	.17 (.17)	.17 (.17)
School urbanization		
Rural (=0)	---	---
Sub-urban	-.36 (.45)	-.39 (.46)
Urban	-.48 (.45)	-.49 (.46)
Model for Time slope (β_1)		
Intercept	1.68* (.76)	1.64* (.76)
Family type (overall age 0~12 years)		
Two-parent without conflict (=0)	---	
Two-parent with conflict	-.03 (.28)	
Divorced 0~12 years without pre-divorced conflict	.23 (.45)	
Divorced 0~12 years with pre-divorced conflict	1.40 (.02)	
Family type (divided to age 0~6 and 7~12 years)		
Two-parent without conflict (=0)		
Two-parent with conflict		-.03 (.28)
Divorced 0~6 years without pre-divorced conflict		-.32 (.59)
Divorced 0~6 years with pre-divorced conflict		.89 (.97)
Divorced 7~12 years without pre-divorced c		1.07 (59)
Divorced 7~12 years with pre-divorced conflict		1.65 (.49)
Male (=1)	-.30 (.24)	-.30 (24)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	-.02 (.33)	-.01 (.32)
Associate junior collage	-.29 (.42)	-.29 (.42)

Bachelor's degree	.18 (.43)	.17 (.43)
Graduate degree	-.17 (.59)	-.18 (.59)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~49,999	.03 (.54)	.04 (.51)
NT$5,000~$99,999	.02 (.56)	.03 (.54)
NT$100,000~NT$149,999	.17 (.60)	.19 (58)
NT$150,000~NT$199,999	.97 (.73)	1.02 (.71)
>NT$200,000	-.34 (.72)	-.32 (.70)
School program type		
General program (=0)	---	---
Comprehensive program	-.54 (.37)	-.52 (.37)
Vocational program	-.07 (.33)	-.07 (.33)
Junior college program	-.25 (.67)	-.21 (.67)
Private school (=1)	-.22 (.28)	-.23 (.28)
School urbanization		
Rural (=0)	---	---
Sub-urban	.61 (.61)	.64 (.61)
Urban	1.14 (.63)	1.18 (.63)
Model for Time^2 slope (β_2)		
Intercept	-.47 (.25)	-.45 (.25)
Family type (overall age 0~12 years)		
Two-parent without conflict (=0)	---	
Two-parent with conflict	.05 (.09)	
Divorced 0~12 years without pre-divorced conflict	-.02 (.15)	
Divorced 0~12 years with pre-divorced conflict	-.57 (.33)	
Family type (divided to age 0~6 and 7~12 years)		
Two-parent without conflict (=0)		---
Two-parent with conflict		.05 (.09)

Divorced 0~6 years without pre-divorced conflict		.17 (.19)
Divorced 0~6 years with pre-divorced conflict		-.35 (.36)
Divorced 7~12 years without pre-divorced c		-.32 (.23)
Divorced 7~12 years with pre-divorced conflict		-.67 (.46)
Male	.13 (.08)	.13 (.08)
Parental education		
Less than senior high school (=0)	---	---
Senior high school graduate	.04 (.11)	.03 (.11)
Associate junior collage	.14 (.14)	.14 (.14)
Bachelor's degree	-.01 (.15)	-.01 (.14)
Graduate degree	.09 (.20)	.10 (.20)
Household income per month		
<NT$19,999 (=0)	---	---
NT$20,000~NT$49,999	-.12 (.20)	-.13 (.19)
NT$50,000~NT$99,999	-.11 (.21)	-.11 (.20)
NT$100,000~NT$149,999	-.17 (.22)	-.18 (.22)
NT$150,000~NT$199,999	-.45 (.27)	-.47 (26)
>NT$200,000	.07 (.27)	.06 (.26)
School program type		
General program (=0)	---	---
Comprehensive program	.21 (.13)	.21 (.13)
Vocational program	.00 (.11)	.00 (.11)
Junior college program	.07 (.24)	.05 (.24)
Private school (=1)	.02 (.09)	.03 (.09)
School urbanization		
Rural (=0)	---	---
Sub-urban	-.05 (.20)	-.06 (.21)
Urban	-.23 (.21)	-.24 (.21)

Model for Paternal Involvement			
Intercept		.00 (.02)	.00 (.02)
Model for Maternal Involvement			
Intercept		.01 (02)	.01 (.02)
Random effects			
	τ_{00}	1.17424 ***	1.17648***
	τ_{11}	1.56076	1.55453
	τ_{22}	.10981	.10892
Deviance		58941.65	58858.75
BIC		59595.49	59569.44
No. of parameter		69	75

Note: Total observations in level 1 are 13,042 (model 1 and model 2); total observations in level 2 are 3,747 (model 1~model2). * $p < .05$. ** $p < .01$. *** $p < .001$. Standard error is in (parentheses).

Figure 15 shows the trajectory of depressed mood of adolescents from four family types. The figure shows that adolescents from divorced families with pre-divorce conflict have higher depressed mood than those from two parent families in 7th grade, but the rate of increase does not differ statistically significantly between the two groups.

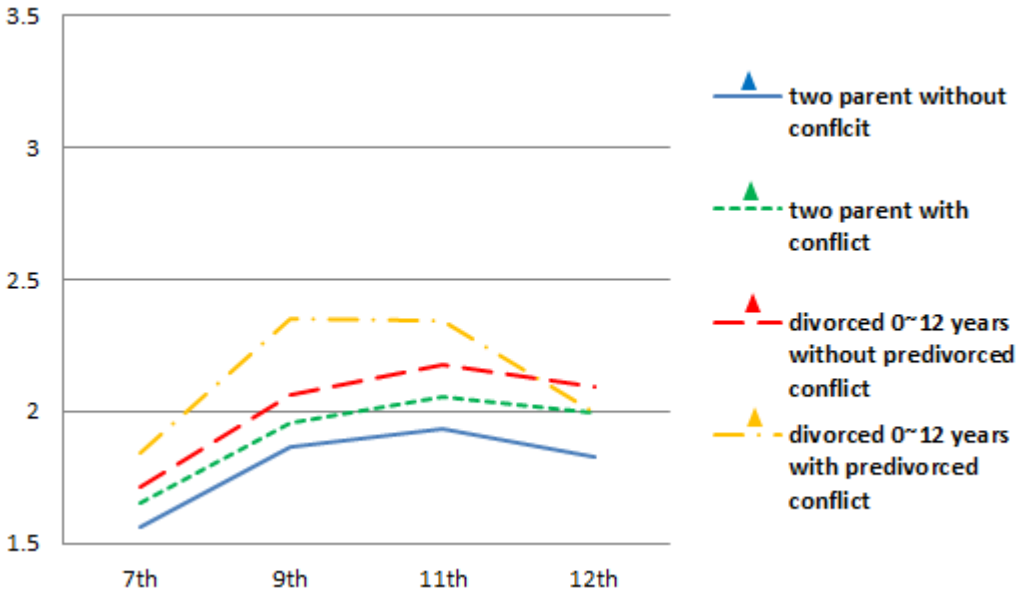


Figure 15. The trajectory of adolescent depressed mood – by four family types

Figure 16 shows the trajectory of depressed mood of adolescents from six family types: including two parent families without marital conflict, two parent families with marital conflict, families that underwent divorce when the child was 0~6 years old without pre-divorce conflict, families that underwent divorce when the child 0~6 years old with pre-divorce conflict, families that underwent divorce when the child was 7~12 years old without pre-divorce conflict, and families that underwent divorce when the child was 7~12 years old with pre-divorce conflict. The figure shows that adolescents from two parent families with marital conflict and those from families that underwent divorce at 0~6 year old without pre-divorce conflict have significantly higher depressed mood in grade 7th. The coefficient of adolescents from families that underwent divorce when they were 7~12 years old with pre-divorce conflict was highest, but did not differ statistically from two parent families without conflict (p=.0.67).

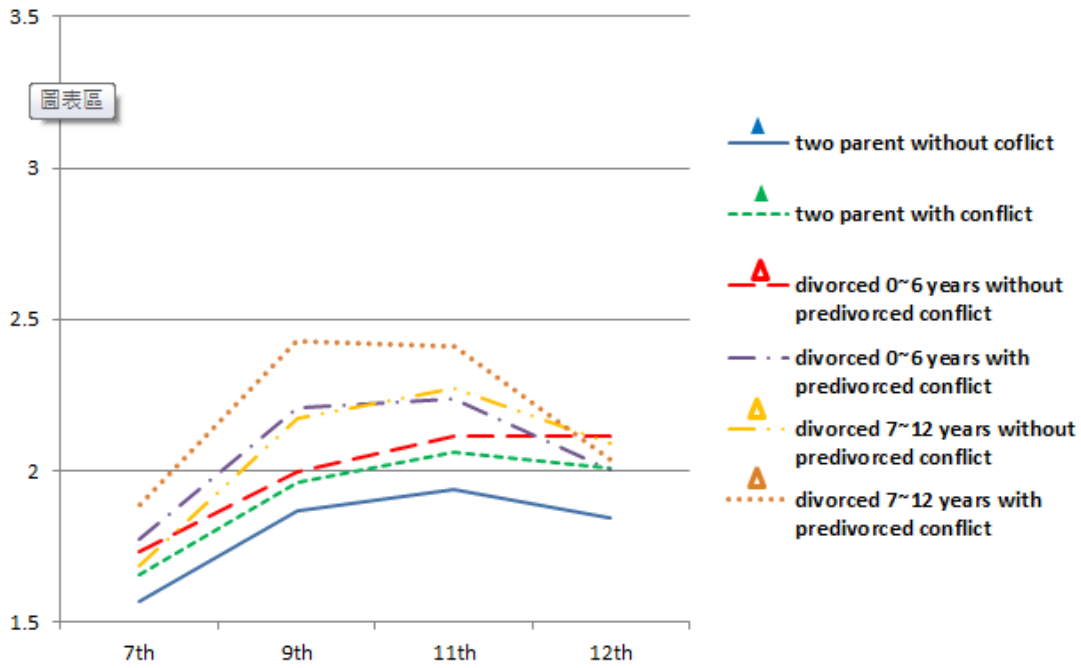


Figure 16. The trajectory of adolescent depressed mood – by six family types

Male adolescents have lower [level of OMIT?] depressed mood [at the initial point TRY SIMPLY initially] (-.69, p<.001 in table 14; -.70, p<.001 in table 15; and -.68 or -.69, p<.001 in table 16) than female adolescents but do not differ in growth rate. Adolescents with household income exceeding NT$200,000 has higher depressed mood initially initial level (1.02 or 1.03, p<.05 in table 14; .97 in table 15; and 1.03 or 1.05, p<.05 in table 16). Parental education, school program type, school type, and school urbanization do not explain the trajectory of adolescent depressed mood. Hypothesis 5-2 is not supported and hypothesis 6 is only partially supported. The τ_{00} of the unconditional model is 1.46486, and thus the within individual variance changed with time in happiness and explained all predictor (including parental divorce, marital conflict, parental involvement, and control variables), and ranged from 17.4% [(1.46486-1.21010)/1.46486] to 19.8% [(1.46486-1.17424)/1.46486].

CHAPTER 5

DISSCUSSION

The Main Findings

This study examines] the effect of parental divorce and parental marital conflict during childhood on adolescent mental health (including happiness and depressed mood). Furthermore, these two items were used to create four and six family types, separately, to examine the influence of pre-divorced parental marital conflict on adolescent post-divorce mental health.

The results indicate that both parental divorce and marital conflict during childhood reduced the initial level (grade 7th) of adolescent happiness, and increased the initial level (grade 7th) of adolescent depressed mood. More specifically, parental divorce when the respondent child was 0~6 years old can increased adolescent depress mood, and parental divorce and marital conflict when the respondent child was 7~12 years old reduced adolescent happiness.

Maternal involvement only slightly positively correlated with adolescent happiness, and does not eliminate the negative effects of parental divorce or martial conflict. In other words, the negative influences of parental divorce and marital conflict cannot be compensated by parental involvement. The principle "linked lives" of life course theory states the importance of other people who live in our lives, and the family system theory especially points out the dyadic relationships within families. The sub-systems (such as husband/wife, mother and children etc.) in families are mutual-interactive and inter-dependency, and each sub-system has its own characteristics and can provide unique function in families. When the sub-system of husband and wife is broken, the function of this sub-system is disappeared as well, and cannot be replaceable by other sub-systems.

Regarding family types, adolescents from families with parental divorce (occurring when they were 0~12 years old) with pre-divorce marital conflict have the lowest happiness and highest depressed

mood, even worse than adolescents from two-parent families with marital conflict. More specifically, parental divorce occurring at 7~12 years old for children in families with pre-divorce marital conflict is most harmful for adolescent happiness among all family groups.

This study makes three main contributions. First, by taking the advantage of the national representative longitudinal dataset TEPS, the trajectories of adolescence of 7th graders in 2001 in Taiwan were observed. Early adolescence (approximately the ages of attending junior high school) is a very challenging period for the adolescents surveyed (even those from two parent families without marital conflict): their happiness keeps decreasing throughout the study period (Fig. 3), while depressed mood keeps increasing (Fig. 10). The reasons are complicated, and include physical, psychological and environmental factors. Until late adolescence (around the ages of senior high school), the decrease in happiness and increase in depressed mood are slowing, but are not yet returning to their initial levels. Overall, mental health during adolescence first reduces and then gradually bounces back, but this pattern is not observed when the longitudinal dataset is unavailable.

Second, the mechanisms of the negative impacts of parental divorce and marital conflict were provided. Parental divorce and marital conflict are well known to negatively influence adolescent mental health (Buehler *et al.*, 1997; Lindsey, Chambers, Frabutt, & Mackinnon-Lewis, 2009; Schoppe-Sullivan, Schermerhorn, & Cummings, 2007; Wang & Chen, 2010), and this study suggests that these negative influences exist during early adolescence (initial level), but did not affect the rate of change (growth rate) throughout adolescence. That is, adolescents suffer parental divorce and marital conflict before they reach adolescence. Frequent and severe marital conflict creates a highly hostile atmosphere in families (Stocker & Youngblade, 1999), and places heavy pressures on the daily lives of children. Children may feel fearful, scary, or even blame themselves for parental conflict or divorce (Enos & Handal, 1986), and these feelings may become internalized as part of their character or personality.

Finally, results of this study suggested that for adolescents of parental divorced families without

pre-divorced conflict, parental divorce does decrease their mental health, this corresponding with previous studies (Amato, et al., 1995; Booth & Amato, 2001; Hanson, 1999); but for adolescents of parental divorced families with pre-divorced conflict, results of this study suggested that parental divorce is even more harmful for their mental health. Adolescents who experienced both parental divorce and marital conflict generally have the lowest happiness and highest depressed mood among all family types. It seems that parental divorce appears harmful for offspring, regardless of whether parents have severe conflict or not, and if they do have conflict, then the offspring suffer more. This result differs from Amato et al.(1995), and Booth and Amato (2001) which suggested that parental divorce could increase offspring well-being, and from Hanson (1999) which suggested that parental divorce did not increase or decrease offspring well-being in high-discord families. So, for offspring living in high-discord families, is parental divorce a cure or a poison to adolescent mental health?

Wheaton (1990) pointed out that the influence of a life transition event is not universal for everyone, but depends on the context of the event when it occurs. For example, losing a job is a life transition event and could bring lots of stress to an individual (such as no income, having to find a new job etc.), but if the chronic existing stress at work (such as terrible relationship with co-workers, or the job duty is too heavy to handle) is more than the new stress which the event brings, and then losing a job might be beneficial to individual mental health. Parental divorce is a life transition event, and surely could being new stress to adolescent. However, for adolescent living in a high-discord families, when the existing stress from parental marital conflict is more than the new stress which parental divorce could bring, and then parental divorce might be a cure to relieve adolescent from the existing stress; on the other hand, when the new stress which parental divorce could bring is more than the existing stress parental divorce could relieve, and then parental divorce might be a poison to adolescent mental health.

The family condition prior to parental divorce is one facet of the context (Amato, et al., 1995). Moreover, Brown, Seller, Brown and Jackson (1999) suggested that race, ethnicity, and culture can also

influence important predictors of mental health, such as how and whether life transition is perceived and how particular culture coped with it. In other words, how martial conflict and parental divorce are perceived and coped in different race, ethnicity or culture? In western countries, the divorce rate exceeds that in Taiwan and the idea of divorce may be more acceptable. When "parental divorce" carries no stigma for children, its negative impact might be less than in societies that prioritize the ideal of the "intact" family. Another reason might lie in fundamental cultural ideals. In western culture, individualism encourages individuals to pursue their well-being, whereas in Taiwanese culture collectivism instead prioritizes the well-being of groups (such as family, school etc.). While children in Taiwanese families suffer from seeing their parents continuously fighting, rather than providing relief, parental divorce only worsens their mental health, as the extra negative impact of parental divorce compounds the existing negative impact of parental conflict.

Divorce is not a single event, but a continuous process that depends on the lives linked to it, corresponding to the principle of linked lives from life course theory. From the item in the wave 4 parent questionnaire "will you avoid marital conflict in front of your children?", 10% of parents answered "no conflict", while 45% answered "always avoid" and "mostly avoid". Only about 10% of parents answered "never avoid". This result suggests that most Taiwanese parents seek to protect their children by avoiding marital conflict or arguments in front of them.

Recommendations

Several recommendations are provided in this study:

1. Regarding academic research

Life trajectories cannot be observed unless the repeated measures can be obtained, and more longitudinal datasets should be built. There are several longitudinal datasets which are available, such as

Panel Study of Family Dynamics (PSFD) and Taiwan Youth Project (TYP), but due to the limited number of divorced families, more national representative longitudinal datasets should be built.

Secondly, the items of questionnaires in different surveys should be consistent. For example, although there are 14 items measuring mental state in wave 1 questionnaire, but only four items which appear from wave 1 to wave 4 questionnaires.

2. Regarding practical implication

(1)For parents with children

Communication is always difficult. Parents should be aware that the consequences of frequent severe marital conflict are not limited to themselves, but that their children also suffer. Parents should avoid frequent severe conflict or at least avoid such conflict in front of their children. When the argument or conflict between husband and wife cannot be dissolved by themselves, it is the right thing to seek for the professional help, such as marriage counselor or marriage therapist.

(2)For school and teachers

Every student has an equal right to learn and study in school, and should not be treated differently based on family background or socioeconomic status. Furthermore, in the case of children from disadvantaged families, teachers should be encouraged to actively provide assistance. School is another important setting for children, and when family does not function well, teachers and schools are crucial to child development.

(3)For government

Children and adolescents are the future of society. Children and adolescents with better well-being (both physical and psychological) can contribute to a more healthy society in the future.

Owing to the low birth rate, the Taiwanese government has implemented numerous policies to encourage married couples to have children, However, more efforts need to be made to ensure children grow up in a healthy family environment.

Limitations

This study has several limitations. First, the specific timing ([i.e. OR that is OR namely] 19XX or 3rd grade etc.) of parental divorce and marital conflict cannot be determined owing to the limitations of the dataset, and thus this study estimated pre-divorce parental marital conflict based on grade periods (namely during elementary school, before elementary school, etc.).

Second, retrospective data might be less accurate than prospective data, and thus questions regarding childhood experiences (namely parental marital conflict before elementary school) might result in the prevalence of target phenomena being underestimated.

Thirdly, owning to limitation of dataset, the number of adolescent from divorced families is relative fewer (n=337) than those from two parent families (n=3,621), therefore the results of this study might be skewed and should be carefully interpreted.

Finally, only adolescents who never experienced parental divorce and whose parents divorced before junior high school exhibited notable trends in this study, and the analysis failed to distinguish notable trends for other family types.

Future Direction

This study observed the mental health trajectories of adolescents. Future studies should extend these trajectories into adulthood, and trace mental health trajectories back to childhood, thus describing the mental health of individuals more completely.

The impact of parental divorce and marital conflict should be examined in other countries with

similar cultures to Taiwan, thus enabling the mechanisms of pre-divorce parental marital conflict to be better understood.

Moreover, researchers should investigate more closely the effect of family experiences on adolescent mental health, such as the relationship with siblings or other family, and try to identify the protective factors for children of families with divorce or parental marital conflict.

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APPENDIX A

$$Y_{ti} = \beta_{0i} + \beta_{1i}(Time)_{ti} + r_{ti}$$

Where

Y_{ti} is the mental health score at time *t* for student *i*;

$(Time)_{ti}$ is the time *t* for student *i*, centered around the earliest time;

β_{0i} is student i's true mental health score at the earliest grade;

β_{1i} is the linear growth rate in mental health for student i;

r_{ti} is the residual error at time t.

APPENDIX B

$$\beta_{0i} = \gamma_{00} + u_{0i}$$

$$\beta_{1i} = \gamma_{10} + u_{1i}$$

where

γ_{00} is the average mental health score for the population;

γ_{10} is the population average of the true linear growth rate in mental health;

u_{0i} is the residual error for student *i* on average mental healths;

u_{1i} is the residual error for student i on linear growth in mental health;

APPENDIX C

$$Y_{ti} = \beta_{0i} + \beta_{1i}(Time)_{ti} + \beta_{2i}(Time)_{ti}^2 + r_{ti}$$

Where

Y_{ti} is the mental health score at time *t* for student *i*;

$(Time)_{ti}$ is the time *t* for student *i*, centered around the earliest time;

$Time_{ti}^2$ is the square of time *t* for student *i*, centered around the earliest time;

β_{0i} is student i's true mental health score at the earliest grade;

β_{1i} is the linear growth rate in mental health for student i;

β_{2i} is the quadratic growth rate in mental health for student i;

r_{ti} is the residual error at time t.

APPENDIX D

$$\beta_{0i} = \gamma_{00} + u_{0i}$$

$$\beta_{1i} = \gamma_{10} + u_{1i}$$

$$\beta_{2i} = \gamma_{20} + u_{2i}$$

Where

γ_{00} is the average mental health score for the population;

γ_{10} is the population average of the true linear growth rate in mental health for individuals;

γ_{20} is the population average of the true quadratic growth rate in mental health for individuals;

u_{0i} is the residual error for student *i* on average mental health after controlling for all other variables;

u_{1i} is the residual error for student i on linear growth in mental health after controlling for all other variables;

u_{2i} is the residual error for student i on quadratic growth in mental health after controlling for all other variables;

APPENDIX E

$$Y_{ti} = \beta_{0i} + \beta_{1i}(Time)_{ti} + \beta_{2i}(Time)_{ti}^2 + \beta_{3i}(Paternal\ involvement)_{ti} + \beta_{4i}(Maternal\ involvement)_{ti} + r_{ti}$$

Where

Y_{ti} is the mental health score at time t for student i;

$(Time)_{ti}$ is the time t for student i, centered around the earliest time point;

$(Time)_{ti}^2$ is the square of time t for student i, centered around the earliest time point;

$(Paternal\ involvement)_{ti}$ is the status of paternal involvement at time t for student i;

$(Maternal\ involvement)_{ti}$ is the status of maternal involvement at time t for student i;

β_{0i} is student i's true mental health score at the earliest time point;

β_{1i} is the linear growth rate in mental health for student i;

β_{2i} is the quadratic growth rate in mental health for student i;

β_{3i} is the strength of the longitudinal relationship between paternal involvement and mental health for student i;

β_{4i} is the strength of the longitudinal relationship between maternal involvement and mental health for student i;

r_{ti} is the residual error at time t.

APPENDIX F

$$\beta_{0i} = \gamma_{00} + \gamma_{01}(\boldsymbol{Divorce\ 0{\sim}12\ years})_i + \gamma_{02}(Male)_i + \gamma_{03}(PEdu2)_i + \gamma_{04}(PEdu3)_i + \gamma_{05}(PEdu4)_i + \gamma_{06}(PEdu5)_i + \gamma_{07}(Income2)_i + \gamma_{08}(Income3)_i + \gamma_{09}(Income4)_i + \gamma_{010}(Income5)_i + \gamma_{011}(Income6)_i + \gamma_{012}(Prgm2)_i + \gamma_{013}(Prgm3)_i + \gamma_{014}(Prgm4)_i + \gamma_{015}(Priv)_i + \gamma_{016}(Suburb)_i + \gamma_{017}(Urban)_i + u_{0i}$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}(\boldsymbol{Divorce\ 0{\sim}12\ years})_i + \gamma_{12}(Male)_i + \gamma_{13}(PEdu2)_i + \gamma_{14}(PEdu3)_i + \gamma_{15}(PEdu4)_i + \gamma_{16}(PEdu5)_i + \gamma_{17}(Income2)_i + \gamma_{18}(Income3)_i + \gamma_{19}(Income4)_i + \gamma_{110}(Income5)_i + \gamma_{111}(Income6)_i + \gamma_{112}(Prgm2)_i + \gamma_{113}(Prgm3)_i + \gamma_{114}(Prgm4)_i + \gamma_{115}(Priv)_i + \gamma_{116}(Suburb)_i + \gamma_{117}(Urban)_i + u_{1i}$$

$$\beta_{2i} = \gamma_{20} + \gamma_{21}(\boldsymbol{Divorce\ 0{\sim}12\ years})_i + \gamma_{22}(Male)_i + \gamma_{23}(PEdu2)_i + \gamma_{24}(PEdu3)_i + \gamma_{25}(PEdu4)_i + \gamma_{26}(PEdu5)_i + \gamma_{27}(Income2)_i + \gamma_{28}(Income3)_i + \gamma_{29}(Income4)_i + \gamma_{210}(Income5)_i + \gamma_{211}(Income6)_i + \gamma_{212}(Prgm2)_i + \gamma_{213}(Prgm3)_i + \gamma_{214}(Prgm4)_i + \gamma_{215}(Priv)_i + \gamma_{216}(Suburb)_i + \gamma_{217}(Urban)_i + u_{2i}$$

$\beta_{Xi} = \gamma_{X0}$

Where

$(Divorce\ 0{\sim}12\ years)_i$	is the experience of parental divorce;
(Male)	is the gender of individuals;
(PEdu2~Pedu5)	is the levels of parents' highest education;
(Income 2~Income 6)	is the status of household income;
γ_{00}	is the average mental health score for the population;
γ_{01}	is the effect of parental divorce on the population average of mental health;
γ_{02}	is the effect of gender on the population average of mental health;
$\gamma_{03}{\sim}\gamma_{06}$	is the effect of parental education on the population average of mental health;
$\gamma_{07}{\sim}\gamma_{011}$	is the effect of household income on the population average of mental health;
$\gamma_{012}{\sim}\gamma_{014}$	is the effect of school program type on the population average of mental health;
γ_{015}	is the effect of private school on the population average of mental health;
$\gamma_{016}{\sim}\gamma_{017}$	is the effect of school urbanization on the population average of mental health;
γ_{10}	is the population average of the true linear growth rate in mental health for individuals;

γ_{11}	is the effect of parental divorce on the population average of the true linear growth rate in mental health for individuals;
γ_{12}	is the effect of gender on the difference in the population average of true linear growth in mental health;
γ_{13}~γ_{16}	is the effect of parental education on the difference in the population average of true linear growth in mental health;
γ_{17}~γ_{111}	is the effect of household income on the difference in the population average of true linear growth in mental health;
γ_{112}~γ_{114}	is the effect of school program type on the difference in the population average of true linear growth in mental health;
γ_{115}	is the effect of private school on the difference in the population average of true linear growth in mental health;
γ_{116}~γ_{117}	is the effect of school urbanization on the difference in the population average of true linear growth in mental health;
γ_{20}	is the population average of the true quadratic growth rate in mental health for individuals;
γ_{21}	is the effect of parental divorce on the population average of the true quadratic growth rate in mental health for individuals;
γ_{22}	is the effect of gender on the difference in the population average of true quadratic growth in mental health;
γ_{23}~γ_{26}	is the effect of parental education on the difference in the population average of true quadratic growth in mental health;
γ_{27}~γ_{211}	is the effect of household income on the difference in the population average of true quadratic growth in mental health;
γ_{212}~γ_{214}	is the effect of school program type on the difference in the population average of true quadratic growth in mental health;

γ_{215}	is the effect of private school on the difference in the population average of true quadratic growth in mental health;
γ_{216}~γ_{217}	is the effect of school urbanization on the difference in the population average of true quadratic growth in mental health;
γ_{X0}	is the effect of other level 1 covariates (i.e. pa/maternal involvements) and were fixed across people;
u_{0i}	is the residual error for student *i* on average mental health after controlling for all other variables;
u_{1i}	is the residual error for student *i* on linear growth in mental health after controlling for all other variables;
u_{2i}	is the residual error for student *i* on quadratic growth in mental health after controlling for all other variables;

APPENDIX G

$$\beta_{0i} = \gamma_{00} + \gamma_{01}(\boldsymbol{Divorce\ 0{\sim}6\ years})_i + \gamma_{02}(\boldsymbol{Divorce\ 7{\sim}12\ years})_i + \gamma_{03}(Male)_i + \gamma_{04}(PEdu2)_i + \gamma_{05}(PEdu3)_i + \gamma_{06}(PEdu4)_i + \gamma_{07}(PEdu5)_i + \gamma_{08}(Income2)_i + \gamma_{09}(Income3)_i + \gamma_{010}(Income4)_i + \gamma_{011}(Income5)_i + \gamma_{012}(Income6)_i + \gamma_{013}(Prgm2)_i + \gamma_{014}(Prgm3)_i + \gamma_{015}(Prgm4)_i + \gamma_{016}(Priv)_i + \gamma_{017}(Suburb)_i + \gamma_{018}(Urban)_i + u_{0i}$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}(\boldsymbol{Divorce\ 0{\sim}6\ years})_i$$
$$+ \gamma_{12}(\boldsymbol{Divorce\ 7{\sim}12\ years})_i + \gamma_{13}(Male)_i + \gamma_{14}(PEdu2)_i$$
$$+ \gamma_{15}(PEdu3)_i + \gamma_{16}(PEdu4)_i + \gamma_{17}(PEdu5)_i + \gamma_{18}(Income2)_i$$
$$+ \gamma_{19}(Income3)_i + \gamma_{110}(Income4)_i + \gamma_{111}(Income5)_i + \gamma_{112}(Income6)_i$$
$$+ \gamma_{113}(Prgm2)_i + \gamma_{114}(Prgm3)_i + \gamma_{115}(Prgm4)_i + \gamma_{116}(Priv)_i$$
$$+ \gamma_{117}(Suburb)_i + \gamma_{118}(Urban)_i + u_{1i}$$

$$\beta_{2i} = \gamma_{20} + \gamma_{21}(\boldsymbol{Divorce\ 0{\sim}6\ years})_i$$
$$+ \gamma_{22}(\boldsymbol{Divorce\ 7{\sim}12\ years})_i + \gamma_{23}(Male)_i + \gamma_{24}(PEdu2)_i$$
$$+ \gamma_{25}(PEdu3)_i + \gamma_{26}(PEdu4)_i + \gamma_{27}(PEdu5)_i + \gamma_{28}(Income2)_i$$
$$+ \gamma_{29}(Income3)_i + \gamma_{210}(Income4)_i + \gamma_{211}(Income5)_i + \gamma_{212}(Income6)_i$$
$$+ \gamma_{213}(Prgm2)_i + \gamma_{214}(Prgm3)_i + \gamma_{215}(Prgm4)_i + \gamma_{216}(Priv)_i$$
$$+ \gamma_{217}(Suburb)_i + \gamma_{218}(Urban)_i + u_{2i}$$

$$\beta_{Xi} = \gamma_{X0}$$

APPENDIX H

$$\beta_{0i} = \gamma_{00} + \gamma_{01}(\boldsymbol{Conflict\ 0{\sim}12\ years})_i$$
$$+ \gamma_{02}(Male)_i + \gamma_{03}(PEdu2)_i + \gamma_{04}(PEdu3)_i + \gamma_{05}(PEdu4)_i$$
$$+ \gamma_{06}(PEdu5)_i + \gamma_{07}(Income2)_i + \gamma_{08}(Income3)_i + \gamma_{09}(Income4)_i$$
$$+ \gamma_{010}(Income5)_i + \gamma_{011}(Income6)_i + \gamma_{012}(Prgm2)_i + \gamma_{013}(Prgm3)_i$$
$$+ \gamma_{014}(Prgm4)_i + \gamma_{015}(Priv)_i + \gamma_{016}(Suburb)_i + \gamma_{017}(Urban)_i + u_{0i}$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}(\boldsymbol{Conflict\ 0{\sim}12\ years})_i$$
$$+ \gamma_{12}(Male)_i + \gamma_{13}(PEdu2)_i + \gamma_{14}(PEdu3)_i + \gamma_{15}(PEdu4)_i$$
$$+ \gamma_{16}(PEdu5)_i + \gamma_{17}(Income2)_i + \gamma_{18}(Income3)_i + \gamma_{19}(Income4)_i$$
$$+ \gamma_{110}(Income5)_i + \gamma_{111}(Income6)_i + \gamma_{112}(Prgm2)_i + \gamma_{113}(Prgm3)_i$$
$$+ \gamma_{114}(Prgm4)_i + \gamma_{115}(Priv)_i + \gamma_{116}(Suburb)_i + \gamma_{117}(Urban)_i + u_{1i}$$

$$\beta_{2i} = \gamma_{20} + \gamma_{21}(\boldsymbol{Conflict\ 0{\sim}12\ years})_i$$
$$+ \gamma_{22}(Male)_i + \gamma_{23}(PEdu2)_i + \gamma_{24}(PEdu3)_i + \gamma_{25}(PEdu4)_i$$
$$+ \gamma_{26}(PEdu5)_i + \gamma_{27}(Income2)_i + \gamma_{28}(Income3)_i + \gamma_{29}(Income4)_i$$
$$+ \gamma_{210}(Income5)_i + \gamma_{211}(Income6)_i + \gamma_{212}(Prgm2)_i + \gamma_{213}(Prgm3)_i$$
$$+ \gamma_{214}(Prgm4)_i + \gamma_{215}(Priv)_i + \gamma_{216}(Suburb)_i + \gamma_{217}(Urban)_i + u_{2i}$$

APPENDIX I

$$\beta_{0i} = \gamma_{00} + \gamma_{01}(\boldsymbol{Conflict\ 0{\sim}6\ years\ only})_i + \gamma_{02}(\boldsymbol{Conflict\ 7{\sim}12\ years\ only})_i$$
$$+ \gamma_{03}(\boldsymbol{Conflict\ both\ 0{\sim}6\ and\ 7{\sim}12\ years})_i$$
$$+ \gamma_{04}(Male)_i + \gamma_{06}(PEdu2)_i + \gamma_{07}(PEdu3)_i + \gamma_{08}(PEdu4)_i$$
$$+ \gamma_{09}(PEdu5)_i + \gamma_{010}(Income2)_i + \gamma_{011}(Income3)_i + \gamma_{012}(Income4)_i$$
$$+ \gamma_{013}(Income5)_i + \gamma_{014}(Income6)_i + \gamma_{015}(Prgm2)_i + \gamma_{016}(Prgm3)_i$$
$$+ \gamma_{017}(Prgm4)_i + \gamma_{018}(Priv)_i + \gamma_{019}(Suburb)_i + \gamma_{020}(Urban)_i + u_{0i}$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}(\boldsymbol{Conflict\ 0{\sim}6\ years\ only})_i + \gamma_{12}(\boldsymbol{Conflict\ 7{\sim}12\ years\ only})_i$$
$$+ \gamma_{13}(\boldsymbol{Conflict\ both\ 0{\sim}6\ and\ 7{\sim}12\ years})_i$$
$$+ \gamma_{14}(Male)_i + \gamma_{16}(PEdu2)_i + \gamma_{17}(PEdu3)_i + \gamma_{18}(PEdu4)_i$$
$$+ \gamma_{19}(PEdu5)_i + \gamma_{110}(Income2)_i + \gamma_{111}(Income3)_i + \gamma_{112}(Income4)_i$$
$$+ \gamma_{113}(Income5)_i + \gamma_{114}(Income6)_i + \gamma_{115}(Prgm2)_i + \gamma_{116}(Prgm3)_i$$
$$+ \gamma_{117}(Prgm4)_i + \gamma_{118}(Priv)_i + \gamma_{119}(Suburb)_i + \gamma_{120}(Urban)_i + u_{1i}$$
$$\beta_{2i} = \gamma_{20} + \gamma_{21}(\boldsymbol{Conflict\ 0{\sim}6\ years\ only})_i + \gamma_{22}(\boldsymbol{Conflict\ 7{\sim}12\ years\ only})_i$$
$$+ \gamma_{23}(\boldsymbol{Conflict\ both\ 0{\sim}6\ and\ 7{\sim}12\ years})_i$$
$$+ \gamma_{24}(Male)_i + \gamma_{26}(PEdu2)_i + \gamma_{27}(PEdu3)_i + \gamma_{28}(PEdu4)_i$$
$$+ \gamma_{29}(PEdu5)_i + \gamma_{210}(Income2)_i + \gamma_{211}(Income3)_i + \gamma_{212}(Income4)_i$$
$$+ \gamma_{213}(Income5)_i + \gamma_{214}(Income6)_i + \gamma_{215}(Prgm2)_i + \gamma_{216}(Prgm3)_i$$
$$+ \gamma_{217}(Prgm4)_i + \gamma_{218}(Priv)_i + \gamma_{219}(Suburb)_i + \gamma_{220}(Urban)_i + u_{2i}$$

APPENDIX J

$$\beta_{0i} = \gamma_{00} + \gamma_{01}(Two\ with\ conflict)_i + \gamma_{02}(Divorce\ without\ conflict)_i$$
$$+ \gamma_{03}(Divorce\ with\ conflict)_i$$
$$+ \gamma_{04}(Male)_i + \gamma_{05}(PEdu2)_i + \gamma_{06}(PEdu3)_i + \gamma_{07}(PEdu4)_i$$
$$+ \gamma_{08}(PEdu5)_i + \gamma_{09}(Income2)_i + \gamma_{010}(Income3)_i + \gamma_{011}(Income4)_i$$
$$+ \gamma_{012}(Income5)_i + \gamma_{013}(Income6)_i + \gamma_{014}(Prgm2)_i + \gamma_{015}(Prgm3)_i$$
$$+ \gamma_{016}(Prgm4)_i + \gamma_{017}(Priv)_i + \gamma_{018}(Suburb)_i + \gamma_{019}(Urban)_i + u_{0i}$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}(Two\ with\ conflict)_i + \gamma_{12}(Divorce\ without\ conflict)_i$$
$$+ \gamma_{13}(Divorce\ with\ conflict)_i$$
$$+ \gamma_{14}(Male)_i + \gamma_{15}(PEdu2)_i + \gamma_{16}(PEdu3)_i + \gamma_{17}(PEdu4)_i$$
$$+ \gamma_{18}(PEdu5)_i + \gamma_{19}(Income2)_i + \gamma_{110}(Income3)_i + \gamma_{111}(Income4)_i$$
$$+ \gamma_{112}(Income5)_i + \gamma_{113}(Income6)_i + \gamma_{114}(Prgm2)_i + \gamma_{115}(Prgm3)_i$$
$$+ \gamma_{116}(Prgm4)_i + \gamma_{117}(Priv)_i + \gamma_{118}(Suburb)_i + \gamma_{119}(Urban)_i + u_{0i}$$

$$\beta_{2i} = \gamma_{20} + \gamma_{21}(Two\ with\ conflict)_i + \gamma_{22}(Divorce\ without\ conflict)_i$$
$$+ \gamma_{23}(Divorce\ with\ conflict)_i$$
$$+ \gamma_{24}(Male)_i + \gamma_{25}(PEdu2)_i + \gamma_{26}(PEdu3)_i + \gamma_{27}(PEdu4)_i$$
$$+ \gamma_{28}(PEdu5)_i + \gamma_{29}(Income2)_i + \gamma_{210}(Income3)_i + \gamma_{211}(Income4)_i$$
$$+ \gamma_{212}(Income5)_i + \gamma_{213}(Income6)_i + \gamma_{214}(Prgm2)_i + \gamma_{215}(Prgm3)_i$$
$$+ \gamma_{216}(Prgm4)_i + \gamma_{217}(Priv)_i + \gamma_{218}(Suburb)_i + \gamma_{219}(Urban)_i + u_{0i}$$

where

$(Two\_conflict)_i$	is the two-parent family with frequent severe parental marital conflict;
$(Divorce\_no\ conflict)_i$	is the divorced single-parent family without predivorce frequent severe parental marital conflict;
$(Divorce\_conflict)_i$	is the divorced single-parent family with predivorce frequent severe parental marital conflict;
γ_{01}	is the effect of two-parent family with frequent severe parental marital conflict on the population average of mental health;
γ_{02}	is the effect of divorced single-parent family without severe parental marital conflict on the population average of mental health;
γ_{03}	is the effect of divorced single-parent family with severe parental

marital conflict on the population average of mental health;

γ_{11} is the effect of two-parent family with frequent severe conflict on the difference in the population average of true linear growth in mental health;

γ_{12} is the effect of divorced single-parent family without predivorce frequent severe conflict on the difference in the population average of true linear growth in mental health;

γ_{13} is the effect of divorced single-parent family with predivorce frequent severe conflict on the difference in the population average of true linear growth in mental health;

γ_{21} is the effect of two-parent family with frequent severe parental marital conflict on the population average of the true quadratic growth rate in mental health for individuals;

γ_{22} is the effect of divorced single-parent family without predivorce frequent severe parental marital conflict in the population average of true quadratic growth in mental health;

γ_{23} is the effect of divorced single-parent family with predivorce frequent severe parental marital conflict in the population average of true quadratic growth in mental health;

APPENDIX K

$$\beta_{0i} = \gamma_{00} + \gamma_{01}(Two\ with\ conflict)_i$$
$$+ \gamma_{02}(Divorce\ 0{\sim}6\ years\ without\ predivorced\ conflict)_i$$
$$+ \gamma_{03}(Divorce\ 0{\sim}6\ years\ with\ predivorced\ conflict)_i$$
$$+ \gamma_{04}(Divorce\ 7{\sim}12\ years\ without\ predivorced\ conflict)_i$$
$$+ \gamma_{05}(Divorce\ 7{\sim}12\ years\ with\ predivorced\ conflict)_i$$
$$+ \gamma_{06}(Male)_i + \gamma_{07}(PEdu2)_i + \gamma_{08}(PEdu3)_i + \gamma_{09}(PEdu4)_i$$
$$+ \gamma_{010}(PEdu5)_i + \gamma_{011}(Income2)_i + \gamma_{012}(Income3)_i + \gamma_{013}(Income4)_i$$
$$+ \gamma_{014}(Income5)_i + \gamma_{015}(Income6)_i + \gamma_{016}(Prgm2)_i + \gamma_{017}(Prgm3)_i$$
$$+ \gamma_{018}(Prgm4)_i + \gamma_{019}(Priv)_i + \gamma_{020}(Suburb)_i + \gamma_{021}(Urban)_i + u_{0i}$$

$$\beta_{1i} = \gamma_{10} + \gamma_{11}(Two\ with\ conflict)_i$$
$$+ \gamma_{12}(Divorce\ 0{\sim}6\ years\ without\ predivorced\ conflict)_i$$
$$+ \gamma_{13}(Divorce\ 0{\sim}6\ years\ with\ predivorced\ conflict)_i$$
$$+ \gamma_{14}(Divorce\ 7{\sim}12\ years\ without\ predivorced\ conflict)_i$$
$$+ \gamma_{15}(Divorce\ 7{\sim}12\ years\ with\ predivorced\ conflict)_i$$
$$+ \gamma_{16}(Male)_i + \gamma_{17}(PEdu2)_i + \gamma_{18}(PEdu3)_i + \gamma_{19}(PEdu4)_i$$
$$+ \gamma_{110}(PEdu5)_i + \gamma_{111}(Income2)_i + \gamma_{112}(Income3)_i + \gamma_{113}(Income4)_i$$
$$+ \gamma_{114}(Income5)_i + \gamma_{115}(Income6)_i + \gamma_{116}(Prgm2)_i + \gamma_{117}(Prgm3)_i$$
$$+ \gamma_{118}(Prgm4)_i + \gamma_{119}(Priv)_i + \gamma_{120}(Suburb)_i + \gamma_{121}(Urban)_i + u_{1i}$$

$$\beta_{2i} = \gamma_{20} + \gamma_{21}(Two\ with\ conflict)_i$$
$$+ \gamma_{22}(Divorce\ 0{\sim}6\ years\ without\ predivorced\ conflict)_i$$
$$+ \gamma_{23}(Divorce\ 0{\sim}6\ years\ with\ predivorced\ conflict)_i$$
$$+ \gamma_{24}(Divorce\ 7{\sim}12\ years\ without\ predivorced\ conflict)_i$$
$$+ \gamma_{25}(Divorce\ 7{\sim}12\ years\ with\ predivorced\ conflict)_i$$
$$+ \gamma_{26}(Male)_i + \gamma_{27}(PEdu2)_i + \gamma_{28}(PEdu3)_i + \gamma_{29}(PEdu4)_i$$
$$+ \gamma_{210}(PEdu5)_i + \gamma_{211}(Income2)_i + \gamma_{212}(Income3)_i + \gamma_{213}(Income4)_i$$
$$+ \gamma_{214}(Income5)_i + \gamma_{215}(Income6)_i + \gamma_{216}(Prgm2)_i + \gamma_{217}(Prgm3)_i$$
$$+ \gamma_{218}(Prgm4)_i + \gamma_{219}(Priv)_i + \gamma_{220}(Suburb)_i + \gamma_{221}(Urban)_i + u_{2i}$$