Thai Youth-Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health

By

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A dissertation submitted in partial fulfillment of

the requirements for the degree of

Doctor of Philosophy

(Nursing)

at the

UNIVERSITY OF WISCONSIN-MADISON

2015

Date of final oral examination: 01/06/2015

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Dedication

I would like to dedicate this work to my grand-mother Noy Waruttama, grand-fathers White Pirut and Vichit Waruttama, my mother Wannee Jitsue, and my father Aroon Thongchai, for their unconditional love and care. Their loves pushed me to this success.

Acknowledgements

This dissertation could not have been completed without the encouragement, guidance, and support from many people. I would like to express my sincere gratitude and appreciation to my advisor, Dr. Audrey Tluczek. Professor Tluczek, thank you for your most kindness, patience and the time you dedicated for me. I have learned how to be a good researcher, including how to be a great mentor from you. No words can adequately express how much I respect you. Your intellectual guidance and endless support have proved to be my success.

My appreciation also goes to Dr. Susan K Riesch, my former advisor. I would have never come to this point without her support and believe in me. I thank you for your guidance and strengthening my work. Thanks for the invaluable experience you gave me while I was a member of your research team. Your intelligence inspired me to be a good research.

My thanks and appreciated also go to Dr. Diane Lauver. I am thank you for your efforts to help strengthen my work. You are an exemplar professor who always challenged and expanded my idea about research. Thanks for giving me a chance to attend your research group which has contributed to my growth as a researcher. Thanks for the endless support and warm hug you offered me whenever I meet you.

I would like to give a special thanks to Dr. Roger Brown. I truly appreciated your kindness, guidance and your time to help me improve my skills on data analysis. Thanks for boosting my interest and confidence in statistic.

I am also grateful to my committee members Dr. Barbara King and Dr. Sigan Hartley for their guidance, insightful comments, and unique perspective on my research study.

My thanks and appreciation also goes to my colleagues. Thanks to Carol Aspinwall for your help and support since the beginning of my PhD program. Thanks for your warmth hugs

and for helping me solve academic problems. Thanks to Mary Hitchcock, my favorite librarian, for your help throughout my study. Thanks to Sherly Holt for your kindness and for guiding me on my writing. Thanks Dr. Pamela Mcgranahan for your love and care and I loved every moment I worked and talked with you. You are like a big sister to me.

I would have never come to this point if I don't have support from my best friends, Yacob Tedla, Fanglin Kuo, Piyaorn Wajanatinapart, Napaphen Juntacumma and Denica Orlikova. Thanks for sharing your laugh and care that helped me to pass difficult times during my PhD study. Special thanks go to Yacob Tedla for your endless encouragement and support throughout my PhD program. Yacob, you never stop helping and encouraging me to fight for success, thanks you so much.

I also thank to youth and their mothers from two schools in Thailand who agreed to participate in my study. I thank to Jitlada Piriyasart for helping me to collect data in Thailand. I also thank Dr. Wallapa C. Kochapakdee and Dr. Pajongsil Perngmark for inspiring me to be a good researcher and instructor. Thanks you for your encouragement.

I would like to give my very special thanks to my mother Wannee Jitsue and sisters Sawitree Jitsue and Patarawadee Thongchai. Thanks you for your endless support and unconditional love to me.

Finally, I gratefully acknowledge Prince of Songkla University Thailand, Helen Denne Schulte/Shapiro Assistantship, Robert and Heidemann, and Eckburge funding from School of Nursing, University of Wisconsin-Madison for financially supporting my doctoral education and research.

Thai Youth-Mother Communication: A Mediator between

Youth Pubertal Timing and Mental Health

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Research shows increasing rates of externalizing and internalizing problems among adolescents in Thailand. Studies in Western countries indicate that parent-child communication and youth pubertal timing are associated with youth behavioral problems. No studies to date have explored relationships among pubertal timing, parent-youth communication and youth mental health in Thailand.

This study, guided by the Mediated Effect Model and the Circumplex Model, explored the association between, off-time pubertal timing (early and late) and Thai youth externalizing and internalizing problems and whether the quality of youth-mother communication mediated this association.

A cross-sectional and correlational design was used. A total of 306 mother-youth dyads were enrolled from two high schools in Southern Thailand. Thai versions of the pubertal development scale and parent-adolescent communication scale were used to measure pubertal timing and youth-mother communication, respectively. The youth self-report checklist and the child behavioral checklist Thai versions were used to measure youth externalizing and internalizing problems. A path analysis with bootstrapping was used to analyze the data.

Significant negative association was found between late pubertal timing and youth self-ratings of externalizing and internalizing problems among female ($p<.00, p=.014$). There were

no significant associations between: (a) youth-rated pubertal timing and mental health in male, (b) early or late pubertal timing and youth rated problem communication with their mother, (c) early or late pubertal timing and mother rated problem communication with their daughters or sons. When both female and male reported high score of problem communication with mother, males tended to have higher scores than female for externalizing problems ($\beta^*=.377, p= .001$ *vs.* $\beta^*=.240, p=.004$) and internalizing problems ($\beta^*= .401, p<.001$ *vs.* $\beta^*= .217, p=.001$). Quality of youth-mother communication was not a mediator for the association between pubertal timing and youth externalizing and internalizing problems.

The quality of mother-child communication in Thai families has a greater impact on youth mental health than pubertal timing. There are sex differences in the occurrence of mental health symptoms among Thai pubescent youth. This study suggests a critical need for theoretical frameworks that are contextualized for Thai cultures. Further longitudinal studies are needed to confirm findings of this study.

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Chapter 1: Introduction

There are increasing, widespread concerns about mental health problems in Thai youth. Many studies exploring psychiatric disorders among school-aged children have found that the prevalence rates of externalizing and internalizing problems in children and adolescents are increasing in schools in Bangkok (the capital of Thailand) (Panyayong & Wacharasindthu, 2002) and six regions (Department of Mental Health, Ministry of Public Health, 2005) including the three border provinces in the south part of Thailand (Tohkani, 2011). Externalizing problems can be defined as dysregulations in behaviors (i.e., rule-breaking behavior and aggressive behavior), whereas internalizing problems can be defined as emotional problems (i.e., anxious/depressed, withdrawn/depressed, and somatic complaints) (Achenbach, 1966, 1978).

Many studies conducted in Thailand have also found that parenting style is a major factor associated with Thai youth emotional and behavioral problems (Department of Mental Health, Ministry of Public Health, 2005; Panyayong & Wacharasindthu, 2002: Ruangkanchanastr, Plitponkarnpim, Hetrakul & Kongsakorn, 2005). Some studies identified parent-youth communication as an especially important part of parenting style related to youth mental health (Department of Mental Health, Ministry of Public Health, 2005; Panyayong & Wacharasindthu, 2002). Other factors associated with Thai youth mental health problems include Thai youth sex (Tohkani, 2011), family life (e.g., conflict in the family, death of a family member) (Panyayong & Wacharasindthu, 2002), problems with peers and no psychological support (Ruangkanchanastr et al., 2005). Research in Western countries found that pubertal timing, particularly off-timing, was also a factor associated with youth mental health. However, no study has explored this relationship in Thai youth. Additionally, no research has explained why the off-timing of puberty provokes problems with youth mental health.

Understanding these three major variables (i.e., parent-youth communication, onset of puberty, and youth mental health problems) and how they relate to each other may help nurse researchers and clinicians gain insights about how to prevent mental health problems in Thai youth. Therefore, the two aims of this study were to: (1) examine whether pubertal timing is associated with externalizing and internalizing problems and (2) determine whether the quality of youth-mother communication significantly mediates the relationship between youth pubertal timing and youth externalizing/ internalizing problems. The results from this study may help researchers and practitioners understand whether the quality of youth- mother communication can buffer the potential negative effects of pubertal off-timing on youth mental health. If so, future research can evaluate interventions that support the quality of Thai youth-mother communication.

Background and Significance

In this section, youth pubertal timing, the quality of youth-mother communication, and youth mental health, which are the major variables in proposed study, were reviewed.

Puberty and pubertal timing. Puberty, a time period at the beginning of adolescence in which an individual physiologically matures and secondary sexual characteristics begin functioning (Kulik-Rechberger, 2008), is believed to be an important period in youth psychological development (Petersen, 1988; Petersen, Leffert, Graham, Alwin, & Ding, 1997). Although puberty has been found to have a significant influence on youth mental health (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Negriff & Susman, 2011), there is a question about focusing only on pubertal status when interpreting findings because it can be misleading given the wide age range for pubertal timing (Susman & Rogol, 2004). Thus, recent studies have

explored this question and found that pubertal timing, one aspect of puberty, is a significant predictor associated with youth mental health (Negriff & Susman, 2011).

Pubertal timing and youth mental health. Pubertal timing refers to the degree of physical maturation or pubertal status compared to the same age and same sex peers (Susman & Rogol, 2004). Deviation in pubertal timing compared to peers of the same sex and age increases the risk for emotional and behavioral problems and can lead to negative health outcomes among adolescents (Petersen & Taylor, 1980). Many studies have found that youth whose pubertal timing was earlier or later than their peers had high levels of externalizing problems (Crijnen, Achenbach, & Verhulst, 1997; Dorn, Susman, & Ponirakis, 2003; Hsu, Dorn, & Sereika, 2010; Lam, Shi, Ho, Stewart, & Fan, 2002, Lynne, Graber, Nichols, Brooks-Gunn, & Botvin, 2007) and internalizing problems (Carter,Jaccard, Silverman, & Pina, 2009; Conley & Rudolph, 2009; DeRose, Shiyko, Foster, & Brooks-Gunn, 2011; Hsu et al., 2010; Natsuaki, Biehl, & Ge, 2009). Pubertal timing has been explored in a wide range of populations of both male and female youth, particularly in Western countries. Research in Western country has found differences in psychological development between males and females as they enter puberty.

It is important to consider potential differences between Asian and Western cultures regarding the age of puberty. One study research conducted in Asian (Chinese Hong-Kong) reported that Asian youth may enter puberty about the same time as the Western Caucasian youth (Chan et al., 2010). In Thailand, two studies explored the age of puberty. One was cross-sectional study (Jaruratanasirikul, Chanpong, Tassanakijpanich, & Sriplung, 2014), the other was a longitudinal study (Wacharasindhu, Supornsilchai, Aroonparkmongkol, & Sahakitrungrueng, 2010). Both studies explored pubertal onset assessed by the Tanner method (Marshall & Tanner, 1969). The longitudinal study reported the mean age of pubertal onset was 12.2-13.2 years for

females and 10.2 -11.4 years for males (Wacharasindhu et al., 2010) which was similar to the cross-sectional study that found the mean age of pubertal onset for males was 10.6-12 years (Jaruratanasirikul et al., 2014). No studies compared the pubertal timing of Thai youth and Causation Western youth.

Difference in pubertal timing between female and male youth. Many studies reported similar findings that female youth with early pubertal onset, as compared to their peers of the same sex and age, experienced more psychological distress (Ge, Conger, & Elder,1996), including emotional problems such as depression and anxiety (Graber, Seeley, Brooks-Gunn, & Lewinsohn, 2004). Female youth who reach puberty earlier than their peers also tend to be less satisfied with their height and weight, report poorer body image, and experience eating problems (Stice, Presnell, & Bearman, 2001). Furthermore, studies have found that the increasing rates of physical problems in earlier pubertal timing in females could be linked to problem behavior (Aro &Taipale, 1987; Graber, Lewinsohn, Seeley, & Brooks-Gunn, 1997; Mendle, Turkheimer, & Emery, 2007).

Unlike female youth where earlier pubertal maturation tends to be related to negative outcomes, both earlier and later pubertal maturation among male youth tends to be related to negative consequences. For a long time, it has been thought that there is little psychological risk for males who reach puberty early (Jones & Bayley, 1950; Mussen & Jones, 1957). It was believed that youth who reach puberty earlier are admired by their peers, and in most cultures, the increased athleticism and strength that come from early maturation are viewed positively for men. However, more recent studies have shown psychosocial problems among males who reach puberty early compared to their peers who reach puberty on time or late (Ge, Conger, & Elder, 2001). Some studies have indicated that males who reach puberty earlier than their peers show

hostile behaviors, engage in delinquent behavior, have increased drug and alcohol use and sexual activity, and experience greater depression and anxiety (Huddleston & Ge, 2003; Mendle, & Ferrero, 2012). The negative findings about later maturing youths compared to other peers include male youth greater feelings of inadequacy, inferiority, social rejection (Clausen,1975), display a low level of self-esteem and satisfaction with body image (Benjet & Hernández-Guzmán, 2002).

Relationship among pubertal timing, youth-parent relationship, and youth externalizing and internalizing problems. Youth pubertal timing and youth-parent relationships are two major factors associated with youth mental health. Investigations of these two factors may provide clues about how to decrease youth mental health problems. Since 1980, research based on the Mediated Effects Model (MEM) by Petersen and Taylors (1980) has focused on variables related to youth psychological problems. These studies investigated the relationship among youth child physiological development as they transition from childhood to puberty, youth moderating/ mediating variables (i.e., stimulus factors inside and outside the adolescent influencing the youth personal development or reactions to puberty), and youth psychological problems. The MEM proposes that adolescents who are in off-time (i.e., early or late in their maturation) compared to on-time in their maturation are in a *deviance* position and these adolescents may experience some negative and positive social effects (Petersen & Taylor, 1980). This model also states that youth psychological outcomes are affected by interactions among many mediating and moderating factors as well as pubertal development. Based on the MEM, the mediating and moderating factors can refer to stimulus factors inside and/or outside the youths that influences their development or reaction to puberty (Petersen &Taylor, 1980). Thus, within MEM youth relationships with their parents or quality of youth-parent

communication could be considered a stimulus mediating factor outside the youth. Furthermore, youth's feelings about their pubertal changes, that can vary by youth sex, could be considered a stimulus moderating factor within the youth.

Quality of youth-parents communication and youth pubertal timing and mental health problems. In this study communication between youth and their parents was considered as a mediated variable in the relationship between youth pubertal timing and mental health problems. Youth-parent communication has been found to be affected by pubertal development and can lead to psychological problems in youth. Several studies support this premise with findings that negative or problematic communication between youth and their parents tends to be greater when the youth enter puberty early as compared to their peers who enter puberty on-time or late (Allison & Schultz, 2004; Güre, Uçanok, & Sayil, 2006; Laursen, Coy, & Collins, 1998; Van Doorn, Branje, & Meeus, 2011; Weichold, Büttig, & Silbereisen, 2008). Furthermore, studies have found that negative or problematic communication between youth and their parents significantly correlates with higher rates of youth externalizing and internalizing problems, whereas positive communication correlates with lower rates of youth externalizing/internalizing problems (Davidson & Cardemil, 2009; Frampton, Jenkins, & Dunn, 2010; Hartos & Power, 2000; Houck, Rodrigue, & Lobato, 2007; Shek, 2005; Vuchinich, Ozretich, Pratt, & Kneedler, 2002; Xiao, Li, & Stanton, 2011).

These previous studies have shown that the quality of communication between youths and their parents changes or is influenced when adolescents are in transition from childhood to puberty, specifically with different pubertal timing (early, on-time, or late). Additionally, researchers have found that the quality of communication between youth and their parents influences youth externalizing and internalizing problems. Findings from a longitudinal study

(Shek, 2005) suggested a causal relationship between the parent-child communication and youth mental health. Another longitudinal study (Van Doorn, Branje, & Meeus, 2011) suggested a causal relationship between youth pubertal timing and youth-parent communication. Thus, based on these studies, the quality of communication between youth and parents, either positive or problematic, could be a sociocultural variable that mediates the relationship between youth pubertal timing (early-on time-late) and the development of externalizing and internalizing problems.

Youth-parent communication and parent sex. Youth-parent communication is a complicated process. The parent's sex could influence the youth's perceptions of the quality of their communication. Relatively little research has explored the differences in the quality of communication based on the sex of the parent. In the past 20 years, most studies have explored the quality of communication between youth and parents without separating the findings for mothers and fathers. Few studies have explored differences in the quality of communication based on the parent sex (i.e., only with the mother or father) (Weichold et al., 2008).

Although research in the United States (US) has found that adolescents spend less time and communicate less with their fathers than their mothers (Laursen, Wilder, Noack, & Williams, 2000; Montemayor & Brownlee, 1987; Schock & Gavazzi, 2005), the quality of youth-parent communication were mixed. One group of researchers found that adolescents were quite satisfied and had more positive communication with their mothers than fathers (Jackson, Bijistra, Oostra, & Bosma, 1998; Schock & Gavazzi, 2005). However, another group of researchers found that youth who communicated with their fathers more than with their mothers viewed their fathers as more accepting than their mothers (Jory et al., 1996). However, in most societies, the mother is generally still the primary caregiver with more involvement in

parenting the children than the father (Heller, Robinson, Henry, & Plunkett, 2006). For example, one study showed mothers are more involved with their children's daily activities than fathers, while fathers are more involved with their children's sports or outside activities than mothers (Coakley, 2006). However, the frequency and duration of father involvement with their children may differ in each culture (Davidson & Cardemil, 2009). For example, there is less involvement of fathers in Asian cultures (Juhari, Yaacob, & Talib, 2013; Pinyuchon & Gray 1997; Shek, 2006). No research could be found about fathers' involvement with youth in Thailand. However, one study explored mothers and fathers interactions with pre-school children and found that mothers were significantly more involve in basic activities including general communication with children than fathers (Tulananda & Roopnarine, 2001). In addition, the author of this dissertation observed that Thai mothers were the primary care-givers for their children and fathers were much less involved in activities with their children. Thus, exploring youth-mother communication in daily life may be particularly important to understanding how this relationship influences youth mental health problems.

Scope of youth mental health in this study. This study explored mental health in a non-clinical sample of Thai youths. Assessment of externalizing and internalizing problems was based on Achenbach's system. According to Achenbach and Rescorla (2001), externalizing problems involve dysregulation in behaviors, whereas internalizing problems involve on emotional problems. Achenbach and his colleague (Archenbach & Rescorla, 2001) classifieded externalizing problems into two groups of symptoms: (a) rule-breaking behavior and (b) aggressive behaviors. They classified internalizing problems into three groups of symptoms: a) anxious/ depressed, (b) withdrawn/ depressed, and (c) somatic complaints. The Archenbach

system has been used to categorize clinical and subclinical ranges of symptoms for youth within general populations.

Why this study was conducted in Thailand. Thailand, a Southeast Asian country, is undergoing socio-economic transformation. Rapid changes have influenced the Thai family structure in ways that might affect relationships among members (Limanonda, 1995) and the quality of youth-mother communication and youth mental health. Many studies have found that the prevalence externalizing and internalizing in children and adolescents is increasing in Thailand (Department of Mental Health, Ministry of Public Health, 2005; Panyayong & Wacharasindthu, 2002; Tohkani, 2011). Furthermore many studies have also been found that the parent-adolescent relationship is a major factor associated with Thai youth emotional and behavioral problems (Department of Mental Health, Ministry of Public Health, 2005; Panyayong & Wacharasindthu, 2002). Unfortunately, no studies to date have explored the relationships among pubertal timing, youth-parent communication and youth mental health in Thailand.

Gaps in research literature. There are four major gaps from previous studies. Firstly, a number of studies showed youths whose pubertal timing is earlier or later than their peers have more externalizing problems (Crijnen et al., 1997; Dorn et al., 2003; Hsu et al., 2010, Lam et al., 2002, Lynne et al., 2007) and internalizing problems (Carter et al., 2009; Conley & Rudolph, 2009; Natsuaki et al., 2009; Hsu et al., 2010; DeRose et al., 2011) than those with on-time pubertal timing. Although pubertal timing had been explored in many populations of males and females including different racial/ethnic group, there were few studies conducted in Asian countries. There was inconsistency in the sources of data for pubertal timing and externalizing and internalizing problems. For example, in some studies adolescents were the

only persons who rated all measurements, whereas other studies allowed youth and parents, or youth, parents and teachers to rate the measurements. There could have been measurement bias when the youth or the parents were the only source of data. The use of different sources of data raises questions about the comparability of the findings across the studies.

Secondly, a number of studies found that youth-parent communication was affected by pubertal development (Allison & Schultz, 2004; Güre et al., 2006; Laursen et al., 1998; Van Doorn et al., 2011; Weichold et al., 2008) which in turn can lead to psychological problems in youth (Davidson & Cardemil, 2009; Frampton et al., 2010; Hartos & Power, 2000; Houck, et al., 2007; Shek, 2005; Vuchinich et al., 2002; Xiao et al., 2011). However, there were some limitations to these studies. Some of the studies did not conduct separate analyses for male and female youth or for mothers' or fathers' reports. Thus, it is questionable as to whether the findings of these studies are applicable equally to male and female youth, or mothers and fathers.

Third, few studies explored both the positive and negative qualities of youth-parent communication. Thus, research that focused on both the positive and negative aspects of communication is needed to develop a complete picture of the quality of commutation between youth and parent.

Finally, many studies supported the idea that off-timing in youth puberty (earlier and late pubertal onset) is a potential risk factor to development of mental health problems. Many studies also found that youth-parent communication was affected by pubertal development and can affect the youth mental health. However, no study to date has tested the hypothesis that the quality of youth-parent communication can be a mediating factor between pubertal timing and youth mental health.

Research questions. In sum, the yet to be addressed research questions are: (1) Is pubertal

timing (early, on-time, and late) associated with externalizing and internalizing problems among Thai youth, and does this relationship vary across sex? (2) Does the quality of communication between Thai youth and their parents (mothers) mediate the relationship between pubertal timing and externalizing and internalizing problems? and (3) Does the quality of youth-mother communication and externalizing and internalizing problems differ between female and male youth.

Conceptual Framework

The goal of this study was to explore the effects (i.e. helpful or harmful) of youth pubertal timing and quality of youth-mother communication on youth externalizing and internalizing problems. Thus, Figure 1.1 shows a model of hypothesized relationships between youth pubertal timing, youth-mother communication, and youth externalizing and internalizing problems. This hypothesized model was guided by the *Mediated Effects Model* (MEM) (Petersen & Taylor, 1980) and *the Circumplex Model of Marital and Family Systems* (Circumplex model) (Barnes & Olson, 1985). The MEM (Petersen & Taylor, 1980) informed hypotheses about youth pubertal timing, youth-mother communication, and youth externalizing and internalizing problems, whereas the Circumplex model (Barnes & Olson, 1985) informed hypotheses about youth-mother communication and youth externalizing and internalizing problems (see Figure 1.2).

According to this hypothesized model, there are two major factors that influence youth externalizing and internalizing problems: youth pubertal timing and youth-mother communication. The youth pubertal timing refers to the degree of physical maturation compared to the same age and same sex peers (Susman & Rogol, 2004) and generally occurs between ages 10-14 years (Petersen & Leffert, 1995). Youth-mother communication

refers to the quality of communication between pubescent youth and their mothers based on the youth's perceptions and the mothers' perceptions. The quality of youth-mother communication can be measured in terms of "listening skills, speaking skills, self-disclosure, clarity, continuity tracking, and respect, and regard" (Olson & Gorall, 2003, p. 520). The outcomes (dependent variables) of the model include two types of mental health problems in youth: externalizing and internalizing. Externalizing problems refer to under-controlled behavior which have a cause negative social impact (Campbell, Shaw, & Gilliom, 2000) for example, physical aggression, verbal bullying, and rule breaking behaviors (Campbell et al., 2000; Eisenberg et al, 2001; Liu, 2004). Internalizing problems refer to overly controlled behaviors which can have a negative personal impact (Oltmanns & Emery, 2010; Rutherford, Quinn, & Mathur, 2004), such as social withdrawal, depression, anxiety, and somatization problems (Gresham, & Kern, 2004; Oltmanns, & Emery, 2010).

According to the MEM, the psychological effects of youth pubertal development can be mediated by more than one variable (Petersen & Taylor, 1980). In this study, the PI tested whether the quality of youth-mother communication was a significant factor that mediated the effects of youth pubertal timing on youth externalizing and internalizing problems. Youth sex was considered a moderating variable in the hypothesized model to determine whether it was significantly associated with the youth-mother communication (mediating factor) and/or youth externalizing and internalizing problems (outcome/dependent variables). Finally, this hypothesized model tested whether youth with off-timing pubertal maturation (early or late) had more psychological problems (youth externalizing and internalizing problems) than youth with on-time pubertal onset.

Although the MEM acknowledges the potential influence of psychosocial factors on

youth mental health, it does not identify specific family factors. Therefore the PI used the Circumplex model which conceptualizes communication as a critical facilitating factor related to family functioning. This study focused on the communication between mothers and youth as a subsystem within a family unit. The quality of communication between youth and their mothers was hypothesized to be an important factor that supports healthy growth and development in youth mental health.

In conclusion, the major aims and hypotheses of this study which was conducted in a non-clinical sample in Thailand investigated:

Aim 1: Explore whether pubertal timing is significantly associated with externalizing and internalizing problems in Thai youth.

H1a: Among Thai female youth, early pubertal timing is associated with more externalizing and internalizing problems than on-time and late pubertal timing.

H1b: Among Thai male youth, early and late pubertal timing are associated with more externalizing and internalizing problems than on-time maturation.

Aim 2: Explore whether the quality of youth-mother communication mediate the relationship between youth pubertal timing and youth externalizing and internalizing problems in Thai youth

H2a: The quality of daughter-mother communication is a mediating factor between youth pubertal timing and youth externalizing and internalizing problems.

H2b: The quality of son-mother communication is a mediating factor between youth pubertal timing and youth externalizing and internalizing problems.

H2c: Problems in the quality of youth-mother communication are associated with more externalizing problems among male youth than female youth.

H2d. Problems in the quality of youth-mother communication are associated with more internalizing problems among female youth than male youth

Definition of Term

Youth. Youth refers to male and female children age 12-14 years.

Youth sex. Youth sex refers to the biological status of male or female self-defined by youth in this study.

Youth pubertal timing. Youth pubertal timing refers the degree of physical maturation compared to the same age and same sex peers (Susman & Rogol, 2004). Youth who experience puberty sooner or later when compared to the same age and sex peers are called earlier-onset and later-onset respectively (Graber, Petersen, & Brooks-Gunn, 1996).

Youth externalizing problems. Youth externalizing problems refer to under-controlled behaviors that can a negative social impact (Campbell et al., 2000), for example, physical aggression, verbal bullying, and rule breaking behaviors (Campbell et al., 2000; Eisenberg et al, 2001; Liu, 2004).

Youth internalizing problems. Youth internalizing problems refer to overly controlled behaviors that can have a negative personal impact (Oltmanns & Emery, 2010; Rutherford et al., 2004), for example, social withdrawal, depression, anxiety, and somatization problems (Gresham & Kern, 2004; Oltmanns & Emery, 2010).

Youth mental health. Youth mental health refers to youth externalizing and internalizing problems.

Youth mother communication. Youth mother communication refers to the quality of communication between youth and their mothers (Olson & Gorall, 2003, p.520). Youth ratings were based on their perceptions about their communication with mothers; while and mothers' ratings were based on their perceptions about their communication with their youth children.

Figure 1.1

Operational Model of the Hypothesized Relationships among Youth Pubertal Timing and Quality of Youth-Mother Communication on Youth Mental Health.

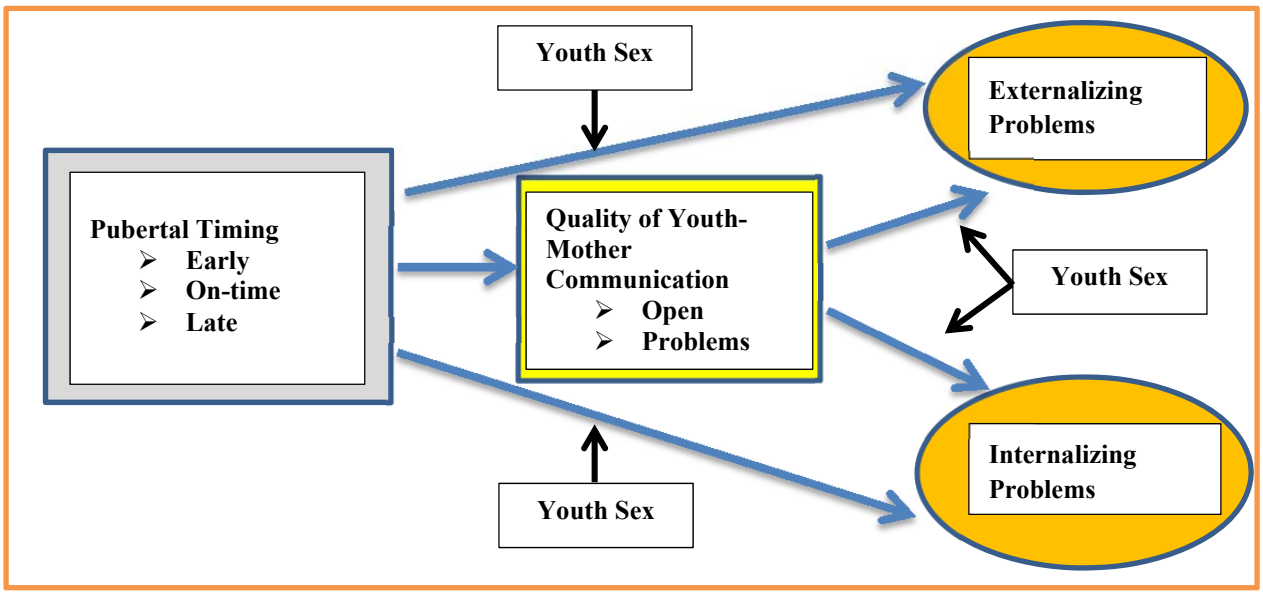
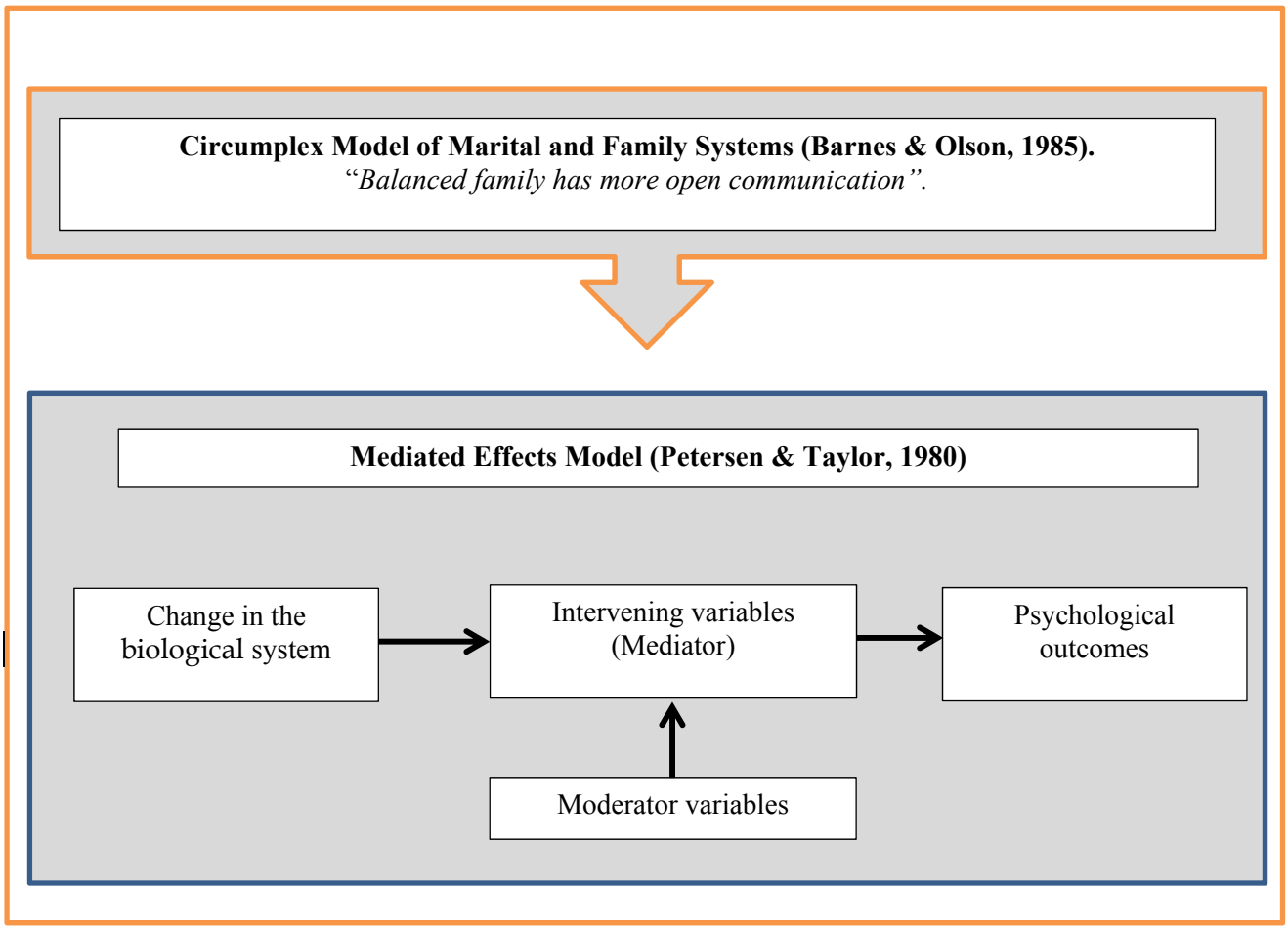


Figure 1.2

Conceptual Framework based on Mediated Effected Model and Circumplex Model of Marital and Family Systems



Chapter 2: Review of the Literature

In this chapter, first, an overview of Thai families and mental health problems in Thai youth is presented. Then a review of the literature related to the concepts of externalizing and internalizing problems, pubertal timing, parent-adolescent communication are examined. Finally, the conceptual framework and theory that guided this study are discussed.

An Overview of Thai Families

Thailand, a Southeast Asian country, is undergoing rapid socio-economic changes that are influencing family structure and relationships between members. In the past three decades, Thai culture has changed from primarily agricultural to industrial with a large increase in consumerism (Limanonda, 1995). This industrial shift has compelled more Thai adults to move to urban areas changing the traditional Thai family structure from extended, rural families to nuclear, urban families. Within these newly formed nuclear families, there is an increasing rate of separation and divorce. From 1999 to 2009, the divorce rate in Thailand doubled from the previous ten years. In 2009, about 2.5 million adolescents lived in divorced families with a single parent (Population Information Center College of Population studies, Chulalongkorn University, 2011). Thailand's need for workers has encouraged women, whose traditional roles were wife and mother, to take on additional responsibilities by becoming employed outside the home (Limanonda, 1995). These sociocultural changes could affect the quality of youth-mother communication and youth mental health. Although Thailand and the US differ in many aspects of their cultures, studies have found similar subclinical mental health problems (i.e., somatic and depressive symptom) in Thai and American youth. Researchers found that Thai and the US youth did not differ significantly on internalizing problem (Weisz, et al, 2009) and externalizing problems (i.e., rates of delinquency) (Miller et al., 2011). Unfortunately, no studies have

explored the relationship between pubertal timing, the quality of parent-youth communication and youth mental health in Thailand.

Mental Health in Thai Youth

Declining fertility has changed the age distribution in the Thai population. There is an increasing number of elderly and a decreasing number of young people including adolescents. In Thailand adolescence refers to individuals ages 10-19, and in 1999, there were approximately 10.5 million adolescents in Thailand (Population Information Center College of Population studies, Chulalongkorn University, 2011). Despite the decline in the adolescence population, there are numerous concerns about their changing behavior and mental health condition.

One study explored the prevalence of different mental health outcomes and anti-social behavior in Thai youth (Weisz, Suwanlert, Chaiyasit, & Walter,1987). The sample included 376 youth ages 11-17 years who were referred to metal health clinics. The three most common of symptoms characterized as externalizing problems included aggressive behavior (11.7%), disobedience at home (6.1%), and stubbornness and irritability (4.7%). The three most common symptoms classified as internalizing problems included somatic complaints (6.3%), anxiety and fear (3.4%), and worry (2.6%).

The prevalence of clinical levels of mental health problems in Thai youth are difficult to find. Research findings with community samples of youth, rather than clinical samples, revealed that externalizing and internalizing problems tend to be increasing (Department of Mental Health, Ministry of Public Health, 2005; Panyayong & Wacharasindthu, 2002; Tohkani, 2011). The Department of Mental Health Ministry of Public Health (2005) conducted an epidemiological study that found Thai adolescent females ages 13-18 years had a higher a rate of emotional and behavioral problems (8.1%) than same age adolescent males (7.5%). Of the 3,132

female youth in this study, the three most common externalizing problems were delinquency or rule breaking behavior (25.2%), verbal aggression/immaturity (24.0%), and aggression behavior (15.5%). The three most common internalizing problems were somatic complaints, (25.2%), depressed/suicidal ideas (24.4%), and depressed/anxiety (23.8%). Of the 3, 225 male youth in the study, the three most common externalizing problems were delinquency or rule breaking behavior (31.6%), aggression behavior (28.9%), and verbal aggression/immaturity (25.1%). The three most common internalizing problems were depressed/anxiety (29.1%), somatic complaints (28.5%), and withdrawn (27.0 %).

Three research teams documented the geographical prevalence of mental health problems among Thai youth. The Department of Mental Health Ministry of Public Health (2005) found that youth living in the southern part of Thailand had the highest rates of emotional and behavioral problems compared to Bangkok province (the capital of Thailand), north, north-east, and the middle parts of Thailand. The southern region with the highest mental health problem was experiencing violence from political unrest during the time of this data collection while the other regions remained more politically stable (Apakupakul, Apakupaku, Kosalwat, & Charoonsak, 2013).

Another study explored the prevalence of psychiatric disorders among school-aged children in Bangkok schools (the capital of Thailand). Panyayong and Wacharasindthu (2002) found that among 1,698 children ages 8-11 years, the prevalence of specific child psychiatric disorders included subclinical levels of anxiety (10.77%), specific phobias (9.73%), depressive symptoms (7.11%), conduct problems (5.5%), attention deficit hyperactive disorder (5.09%), and anxiety disorders (5.01%). Yet another study (Tohkani, 2011) from the three southern border provinces, found that among youth ages 15-18 years, the prevalence of emotional

problems was 8.30% and male youth had higher rates of emotional problems than females. These studies indicate differences in the rates of mental health problems among Thai youth based on sex and the region in which the youth resides. A possible explanation for these regional and sex differences is that male youth might have been disproportionately affected by long time stress due to the political unrest in the three southern border provinces (Tohkani, 2011).

Many factors have been found to be associated with the psychological development of youth in in Thailand. Some studies have found that the parent-adolescent relationship was a major factor associated with youth emotional and behavioral problems (Department of Mental Health, Ministry of Public Health, 2005; Panyayong & Wacharasindthu, 2002). Stressful family life events (e.g., conflict in the family, death of a family member, not living with the biological parents, and living with parental mental illness or substance abuse) was another factor found to play an important role in the development of psychological problems among youth (Panyayong & Wacharasindthu, 2002). Other factors contributing to emotional maladjustment included poor peer relationships, lack of psychological support (Ruangkanchanastr, Plitponkarnpim, Hetrakul, & Kongsakorn, 2005), youth sex, and the area that youth reside (Tohkani, 2011).

Culture could potentially play an important role in youth psychosocial development. Weisz et al. (1987) compared adolescent behavioral and emotional problems in the US and Thailand. Thai adolescents were found to have significantly more "over-controlled" problems (i.e., shyness, compulsivity, inhibition of talking, and tearfulness) than American adolescents. American adolescents were found to have significantly more "under-controlled" problems (i.e., fighting and bullying) than Thai adolescents. Although this study showed significant

differences between Thai and American youth, it was conducted 27 years ago. A more recent study by Weiss and colleagues (2009) found that Thai and US youth had similar rates of internalizing problems. Miller and colleagues (2011) also found similar rates of youth externalizing problems in Thai and US. As Thailand has become more industrialized and Westernized, Thai adolescents have been increasingly exposed to technology and Western cultures which might account for fewer differences in psychological problems between American and Thai youth than previously found. Therefore, in light of these cultural changes research needs to examine factors that affect the development of psychological problems in Thai youth.

Since the 1990s sexual trends of young people in Thailand have shifted toward earlier and premarital sex (Podhisita & Pattaravanich, 1995). Although it is difficult to obtain accurate information about the age of first intercourse, the best estimates suggest that male adolescents have their first sexual encounters at 16 and female adolescents at 18 (Podhisita & Pattaravanich, 1995). Research indicates that externalizing and internalizing problems are factors associated with sexual behavior at an early age (Boislard, Dussault, Brendgen, & Vitaro, 2013). Half of the 300,000- 400,000 abortions in Thailand each year are estimated to be among adolescents (Gray & Sartsara, 1999). Adolescent females who become pregnant are increasingly likely to have abortions which, at such a young age, pose an added health risk. Many factors influence sexual behavior in youth (e.g., family peers, and social environment); however, problems in family relationships are widely accepted as a significant influencing factor (Le´vesque, Bigras, & Pauze, 2010). There have been no studies conducted in Thailand that explored whether pubertal timing influences sexual activities in youth. Many studies from Western and other Asian countries have found that females with early pubertal onset are likely to begin dating younger (Lam, Shi, Ho,

Stewart, & Fan, 2002; Moore, Harden, & Mendle, 2014; Natsuaki, Biehl, & Ge, 2009,) and have sexual intercourse at a younger age than females with on-time or late pubertal onset (Rowe, 2002; Zimmer-Gembeck & Helfand, 2008).

In summary, all of these Thai studies indicate an increasing rate of psychological problems in Thai youth that deserve more attention. Research focusing on parent-youth relationships and youth pubertal timing may help us better understand the factors associated with Thai youth mental health.

Externalizing and Internalizing Problems

This section discusses the constructs of externalizing and internalizing problems in youth and presents empirical studies that examined factors related to externalizing and internalizing problems in youth in the US and other countries. None of the following studies were conducted in Thailand.

The Construct of Externalizing and Internalizing Problems

Externalizing and internalizing problems are two broad domains of childhood problems which have been identified in the field of child psychology and psychiatry by Achenbach (1966, 1978). Achenbach's studies pioneered the conceptualization of externalizing problems and internalizing problems though psychometric analysis of problems of children in the general population (Achenbach, 1966, 1978). Factor analysis revealed a distinction between child and adolescent behavioral and emotional functioning that he termed externalizing and internalizing respectively (Crijnen, Achenbach, & Verhulst, 1997). Based on Achenbach's studies since 1966, the construct of externalizing problems focuses on dysregulations in behaviors, whereas internalizing problems focus on emotional problems. Achenbach and his colleague (Archenbach & Rescorla, 2001) described two types of externalizing problems: (a) rule-breaking behavior and

(b) aggressive behaviors and three types of internalizing problems: (a) anxious/depressed, (b) withdrawn/depressed, and (c) somatic complaints.

Externalizing and internalizing terms have also been included in the Diagnostic and Statistical Manual (DSM) system, developed by the American Psychiatric Association and used to diagnose specific disorders in clinical childhood populations since the development of the DSM III (American Psychiatric Association, 1980). According to the current DSM-V, when persons externalize their emotional distress they can show specific signs and report symptoms that are classified as: (a) substance dependence, (b) antisocial personality disorder, (c) conduct disorder, (d) attention deficit hyperactivity disorder (ADHD), and (e) the impulsivity aspects of borderline personality disorder (BPD) (Krueger & South, 2009). When individuals internalize their emotional distress they can show specific sign and report symptoms that are classified as: (a) generalized anxiety disorder (GAD), (b) unipolar depression, (c) panic disorder, (d) phobic disorders, (e) obsessional states, (f) dysthymic disorders, (g) post-traumatic stress disorder (PTSD), and (h) somatoform disorders (Goldberg, Krueger, Andrew, & Hobbs, 2009).
There is one important difference between the Achenback system and the DSM system in the conceptualization of externalizing and internalizing problems. Achenbach's system focuses on signs and symptoms of behavior and emotions in children that can vary from normal to deviations in need of further assessment and diagnosis by mental health specialists (Bongers, Koot, Van der Ende, & Verhulst, 2003). Achenbach's system can be applied in the early detection or screening of children with sub-clinical and clinical levels of behavioral and emotional dysregulation. In contrast, externalizing and internalizing, as conceptualized by the DSM system, are used by mental specialists to diagnose children whose signs and symptoms persist for over time and interfere with their functioning. Because the major intent of this study

wass to address externalizing and internalizing phenomena in a non-clinical sample of Thai youth which can be screened by health care providers and nurse researcher, the Achenbach conceptualization was chosen for this study.

Definition: Externalizing Problems

The current study defines externalizing and internalizing terms based on Achenbach's system. Externalizing problems in children or adolescents have been defined as "under-controlled" behavior which causes negative social impacts to their environment (Campbell, Shaw, & Gilliom, 2000). For this study, externalizing problems were classified as Aggressive Behavior or Rule-breaking Behavior based on the Achenbach system (Achenbach & Rescorla, 2001). Liu (2004) stated that aggressive behavior in youth can be referred to as behavioral problem such as verbal or physical acts which can harm or threaten themselves or others (children or peers, including adults and animals) and can range from mild behavioral manifestations of emotional dysregulation to severe manipulative behavior. For example, characteristics of verbal aggression are arguing, swearing, bragging, and teasing, whereas physical aggression mostly relates to physically threatening another person in an aggressive way, fighting, or using physical contact with another person to get something that they want.
There is a high co-occurrence of rule-breaking and aggressive behavior in youth (Bartels et al., 2003). However, these rule-breaking can be occur with or without aggression (Liu, 2004). Examples of rule breaking with aggressive behavior are fighting, cruelty, and bullying, whereas rule breaking without aggressive behavior might include lying, cheating and stealing (Liu, 2004). In summary, externalizing problems in youth can be defined as two kinds of behavior: aggressive behavior and rule-breaking behavior. Aggression in youth can be classified into verbal and

physical aggression ranging from minor to severe. Rule-breaking in youth can be observed with or without aggressive behavior.

Definition: Internalizing Problems

Internalizing problems have been defined as "over-controlled" behavior which can have a negative personal impact on the youth (Oltmanns & Emery, 2010; Rutherford, Bruce, Quinn, & Mathur, 2004). Oltmanns and Emery (2010) described children's internalizing symptoms as sadness, fears, somatic complaints, and feelings of feeling worthless or tenseness. For this study Archanbach's system was used to classify internalizing symptoms into three categories: Anxious/Depressed, Withdrawn/Depressed, and Somatic Complaints. Anxious/Depressed symptoms within Archanbach's system include a mix of a negative effect in both anxiety and depressed behavior because anxiety and depression are believed to have similar negative emotional features. The key emotion in anxiety is fear, whereas the key emotion in depression is sadness or emotional pain (Blumberg & Izard, 1986). Anxiety can also be defined as a feeling of fear and worry, and can be accompanied by restlessness, fatigue, dwelling on problems, and muscular tension (Kring, Johnson, Davison, & Neale, 2012). Depressive symptoms can also include a negative mood, characterized by feelings of sadness, hopelessness, helplessness, guilt, or irritability. Other symptoms can include decreased functioning in various life roles, loss of interest in activities that are usually pleasurable, loss of appetite or overeating, loss of energy or aches and pain, or problem with concentration or decision making (Kring et al., 2012).

According to the Archanbach system, withdrawn and depressed are combined into one category because a depressed mood can lead to negative or impaired relationships with family and friends causing the depressed person to withdraw from socializing (Daley, Rizzo, & Gunderson, 2006). Withdrawal is as specified as social withdrawal, having interpersonal

difficulties with social interaction, or not having friends. Youth with high Withdrawn/Depressed scores have been observed to lack close friendships, or have fewer friends, lower quality of friendships as compared to youth with low Withdrawn/Depressed scores (Katz, Conway, Hammen, Brennan, & Najamn, 2011).

Based on Archanbach's system, Somatic Complaints can be defined as physical problems that have no medical explanation such as gastrointestinal problems, migraines, headaches, or other aches and can lead to taking drugs that are not prescribed by a physician. Somatic complaints are difficult to treat because there are no other underlying medical issues. Somatic complaints are associated with anxiety, depression, and psychiatric disorders (Bernstein & Shaw, 1997).

In summary, within the Archanbach system internalizing problems can be classified into three categories of symptoms: Anxious/Depressed, Withdrawn/Depressed, and Somatic Complaints. These three groups of symptoms reflect over-controlled moods in youth which are associated with changes in behavior.

Pubertal Status and Timing

Puberty is a period at the beginning of adolescence characterized by physiological changes and development of secondary sexual characteristics. This process involves the maturation of a child's sexual and physical characteristics due to hormonal changes (Kulik-Rechberger, 2008). Puberty is an important marker of the transition into adolescence and is accompanied by social and emotional changes in adolescents (Mendle & Ferrero, 2012). It often leads to transformations in family relationships (Steinberg, 1981). Two aspects of puberty, pubertal status and timing, have been associated with adolescent bio-psycho-social functioning and mental health.

Susman and Rogol (2004) suggested that pubertal timing should be considered as a factor associated with youth mental health. Studies that focus only on pubertal status when interpreting findings can be misleading given the wide age range in the timing of puberty (Susman & Rogol, 2004). Therefore the following section contains a review of empirical studies examining pubertal timing and status related to youth externalizing and internalizing problems.

Pubertal Timing and Externalizing and Internalizing Problems

Pubertal timing is a significant predictor of adolescents' mental health and adult lifestyle health status (Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Negriff, & Susman, 2011). Many studies have found a relationship between youth pubertal timing and externalizing problems (Crijnen et al., 1997; Dorn, Susman, & Ponirakis, 2003; Hsu, Dorn, & Sereika, 2010; Lam et al., 2002; Lynne et al., 2007) and internalizing problems (Carter, Jaccard, Silverman, & Pina, 2009; Conley & Rudolph, 2009; DeRose, Shiyko, Foster, & Brooks-Gunn, 2011; Hsu et al., 2010; Natsuaki et al., 2009). In these studies, the participants were drawn from the US, Australia, South-America, Europe, and Asia. Participants of different ethnic groups were evaluated, including Caucasians, African Americans, Hispanics-Americans, and Asians. Researchers in all of these studies categorized pubertal timing into three types (early, on-time, and late) based on sexual maturation (age of menarche in females or the first conscious ejaculation in males) and development of secondary sexual characteristic changes (i.e., breast curviness in females or facial hair and lowering of the voice in males) compared to peers of the same age and same sex. Most studies found early pubertal timing in both females and males to be associated with higher externalizing and internalizing problems more than on-time or late pubertal timing. However, some studies also found late pubertal timing associating with externalizing problems specifically among males (Dorn et al., 2003).

Pubertal Timing, Sex, and Psychological Development

As physical appearances change during puberty, adolescents face changes in social norms and expectations that require them to redefine their self-identities and self-perceptions (Mendle, Turkheimer, & Emery, 2007). Undesirable outcomes of early pubertal timing have been documented across multiple domains, including psychological, medical, sexual, social, and academic domains (Mendle & Ferrero, 2012; Mendle et al., 2007).

There are several theoretical perspectives that tried to explain the mechanisms by which pubertal timing relates to adverse outcomes. Mendle and Ferrero (2012) described three mechanisms by which pubertal timing relates to adverse outcomes. These are psychosocial, biological, and selection. Furthermore, research shows racial and ethnic variations in pubertal status and timing, as well as associations between pubertal development and youth mental health (Carter et al., 2009; Cota-Robles, Neiss, & Rowe, 2002; Hayward et al., 1997; Hsu et al., 2010; Lam et al., 2002; Obeidallah, Brennan, Brooks-Gunn, & Earls, 2004; Siegel, Yancey, Aneshensel, & Schuler, 1999; Stice, Presnell, Bearman, 2001).

Psychosocial perspective. According to Mendle and Ferrero (2012), as physical appearance changes during puberty, individuals are faced with new social expectations. Adolescents who reach puberty earlier than peers are confronted with new social expectations before they are emotionally or cognitively ready to manage such situations which subject them to higher stress than their peers who reach puberty at a later age. This mismatch between physical appearance and emotional or cognitive development in early adolescents has been termed "maturational disparity'' (Ge & Natsuaki, 2009).

Early and late pubertal timing can be psychologically distressing to adolescents because they are atypical in their development compared to peers of the same age and sex. This perceived

atypical state can trigger low self-esteem and difficulties in adjusting their body images. Females who experience late pubertal timing tend not to show the difficulties observed in those with early pubertal timing (Mendle & Ferrero, 2012).

Biological perspective. Susman (1997) stated that the rapid increase in adrenal and gonadal hormones during puberty increases risk of psychological difficulties. This is because the different hormones that increase during puberty can be associated with depression, social dominance, aggressive behavior, and frustration (Mazur & Booth, 1998; Olweus, Mattsson, Schalling, & Low, 1988; Rowe, Maugham, Worthman, Costello, & Angold, 2004). The biological perspective has been criticized because the level and pattern of hormonal increase is not different between males who reach puberty early or those who reach puberty late. Thus, it is difficult to determine whether it is the timing of puberty or puberty itself that causes emotional and behavioral change among males.

Selection effects. According to the selection effects perspective, the relationship between early pubertal timing and social- emotional functioning is due to interplay of genes and environment. Belsky et al., (2007) found that youth with early pubertal onset were likely to grow up in an environment with chronic stressors, parental conflict, socioeconomic adversity, and absent fathers. Genetic studies among twin have also found genetic differences to be a predictor of variation in pubertal timing (Kaprio et al., 1995). The interplay of genes and environment may play a role in the harmful effect of early pubertal timing. Genes can stimulate early on-set of puberty, whereas the social environment can influence how the youth adapts to these physical changes. For example, Mendle et al. (2007) stated peers, parents, or teachers may behave differently towards children who appear visibly older or younger than their chronological age.

Also, adolescent with early pubertal timing may socialize with older adolescents who are likely to engage in delinquent behavior which tends to occur later in adolescence (Mendle et al., 2007).

Racial and Ethnic Variations

Racial and ethnic variations are important factors that can moderate the relationship between youth pubertal timing and psychological problems. Recent studies have explored pubertal maturation and timing across racial and ethnic groups, however most of these studies focused on female youth. After controlling for socioeconomic status, several studies found that the onset of puberty among African-American females occurred earlier than Mexican-American and Caucasian American females, respectively (Chumlea et al., 2003; Kaplowitz, 2006; Wu, Mendola, & Buck, 2002).

However, data focusing on pubertal timing in Asian-American female youth compared with other races is very limited and shows mixed results. One study conducted with different ethnic groups in the US found that Asian-American females had an earlier onset of puberty than Caucasian American females (Koprowski, Ross, Mack, Henderson, & Bernstein, 1999). Two other studies found a younger onset for Caucasian females than Asian-American females (Novotny et al., 2007; Weaver et al., 2007).

Racial and ethnic variations have been studied related to externalizing and internalizing problems in youth. Research within specific racial and ethnic groups consistently supports the finding that early pubertal timing is associated with more psychological problems in youth (male and female) than on-time or late pubertal onset (Carter et al., 2009; Cota-Robles et al., 2002; Hsu et al., 2010; Lam et al., 2002). Additionally, ethnicity can be considered as both protective and risk factors for youth mental health (Negriff & Susman, 2011). For example, African-Americans females with early pubertal onset had more positive body images and tended to have fewer

depressive symptoms compared to Caucasian and Hispanic female youth with early pubertal onset (Siegel et al., 1999). In other research, Caucasian female youth with early pubertal onset tended to have higher rates of depression as compared to Hispanic and African-American female youth with early pubertal onset (Hayward et al., 1997; Stice et al., 2001).

Although early maturing African-American female youth tend to have low levels of depression compared to other ethnic groups, Obeidallah, et al., (2004) found that African-American and Hispanic female youth who had early pubertal onset also had a higher rate of violent delinquency than Caucasian female youth with early pubertal onset. This finding is similar to that of early maturing African-American male youth who have been found to have higher levels of delinquency compared to male youth in other ethnic groups with early pubertal onset. Based on these findings, ethnic and racial variations differences could be a moderating factor between youth pubertal timing and mental health. However, researchers should also consider youth sex and youth environment (e.g., level of stressful life events within the family and community) which also have been found to have strong associations with each racial and ethnic variations group (Negriff & Susman, 2011).

Pubertal Timing and Psychological Development among Females

Many studies investigated the influence of the onset of puberty on females' psychosocial development. All studies showed that females who reach puberty early compared to peers of same sex and age have difficulty adjusting to the physical changes because their cognitive, social, and emotional functioning are not synchronous with physical development (Caspi & Moffitt, 1991; Ge et al., 1996). Ge et al. (1996) stated that females who reached puberty earlier experience higher levels of psychological distress, peer pressures and were more vulnerable to psychological problems. Stice et al. (2001) also stated that females who reached puberty earlier

became less satisfied with their height, weight, and body image, and reported more eating problems than their same age and sex peers with on-time or late pubertal timing. Because early maturing females tend to gain more weight than same-age females they often feel different than their friends and are less satisfied with their body images (Simmons & Blyth, 1987). This issue could be due to the social pressures that force females to want to be thin.

Females who reached puberty early tend to make friends with older and more mature females who can have an adverse influence on the less experienced and mentally immature individuals. Involvement with older friends can put early maturing females at risk for negative behavior (i.e., smoking and alcohol consumption) (Wiesner & Ittel, 2002), illicit drug experimentation (Stice et al., 2001), early sexual activity, and teen pregnancy (Lam et al., 2002; Udry, 1979). Research also showed that females who reach puberty early were at increased risk for adverse health outcomes, such as obesity (Wellens et al., 1992), abdominal pain, sleep disturbances, headache, upset stomach, and heart palpitations (Aro & Taipale, 1987), emotional problems, such as depression and anxiety (Graber, Seeley, Brooks-Gunn, & Lewinsohn, 2004), and poor academic performance, high absenteeism, trouble in school, and were less likely to pursue college educations than peers who reached puberty on-time or late (Graber, Lewinsohn, Seeley, & Brooks-Gunn, 1997; Stattin & Magnusson, 1996). These findings suggest a link between early maturation and problem behavior (Mendle et al., 2007).

Although there are many studies regarding the association between early pubertal timing and adverse behavioral, social and psychological functioning, there are few studies explaining how late pubertal timing influences problems in females. Mendle and Ferrero (2012) stated that females with late pubertal timing tended to show fewer social and emotional difficulties than those with early pubertal timing. For example, Stattin and Magnusson (1996) found females who

reached puberty late remained abstinent well beyond the end of puberty. Dubas, Graber, & Petersen (1991) reported that females who reached puberty late had higher grades than females who reached puberty early. Mendle et al. (2007) speculated that the difference in the academic performance between these two groups of females was not due to differences in their cognitive abilities but was because the late pubertal onset females were likely to be less popular and less attractive to males and thus they devoted more time to schoolwork.

Pubertal Timing and Psychological Development among Males

Although early pubertal timing has been associated with many negative outcomes in females, the consequences of pubertal timing in male remains less clear (Ge, Conger, & Elder, 2001). Early research suggested that there was little psychological risk associated with reaching puberty early among males (Jones & Bayley, 1950; Mussen & Jones, 1957), because males who reached puberty earlier are admired by their peers and in most cultures athleticism and strength is viewed positively for men. However, later studies have shown psychosocial problems among males who reached puberty early compared to peers who reached puberty on-time or late (Ge et al., 2001). Males who reached puberty early showed hostile and/or delinquent behavior, used drug and alcohol, engaged in sexual activity and experienced greater depression and anxiety than males who reached puberty on time or late (Huddleston & Ge, 2003; Mendle, & Ferrero, 2012). The negative behavioral and psychological functioning associated with early maturation in males was also found among many racial and ethnic variations groups, such as Whites, African-Americans, and Mexican- Americans (Cota-Robles et al., 2002).

However, early pubertal timing among males was also associated positively with psychological outcomes. Males who reached puberty early reported higher satisfaction with their height and body image (Simmons & Blyth, 1987), considered themselves better looking and

better in athletics than late pubertal onset males (Crocket & Petersen, 1987). Simmons and Blyth (1987) found that even after controlling for height and body image, early maturing males were found to be happier than males who reached puberty on time and late. Given the mixed psychosocial findings among males with early pubertal onset, environmental factors (e.g., neighborhood and family stress) most likely contribute to and mediate youth mental health during the transition from childhood to adolescence.

Unlike in females where late puberty tended to have positive outcomes, late puberty among males had negative consequences. Clausen (1975) reported that later maturing males showed greater feelings of inadequacy, inferiority, and social rejection, whereas early maturing males were more confident, popular, relaxed and independent. Males who reached puberty late also displayed low levels of self-esteem and satisfaction with body image (Benjet & Hernández-Guzmán, 2002). Jones (1965) stated that the effect of early and late maturity in males continued into early adulthood. Early maturing males were viewed as more poised, responsible, sociable and more compliant to social roles during early adulthood than peers who reached puberty late (Jones,1965). These findings also suggest that social-cultural expectations for males relative to body size and strength could contribute to the negative self-appraisals reported by late maturing males.

Youth-Parent Communication

Youth-parent communication had been suggested as a mediator between pubertal timing and the outcome, externalizing and internalizing problems. Davidson and Cardemil (2009) referred to youth-parent communication as the quality of communication between the adolescent and his/her parent that shapes family life and family functioning. Olson and colleagues (1979) also stated that good youth-parent communication encourages more adaptability and flexibility in

solving problems within the family. In this study, youth-parent communication referred to adolescents' views of the quality of verbal and non-verbal communication with their mothers, and their mothers' views about the quality of verbal and non-verbal communication with their adolescent children.

Youth Pubertal Timing and Quality of Youth-Parent Communication

Only five studies addressed the relationship between youth pubertal timing and the quality of youth-parent communication. Samples were limited to Western cultures (Allison & Schultz, 2004; Güre, Uçanok, & Sayil, 2006; Laursen, Coy, & Collins, 1998; Van Doorn, Branje, & Meeus, 2011; Weichold, Büttig, & Silbereisen, 2008); none were conducted in Asian countries. Two of the five studies were conducted in the US and the other three were conducted in Turkey (Güre et al., 2006), Netherlands (Van Doorn et al., 2011) and Germany (Weichold et al., 2008) respectively. Racial and ethnic variations groups included Caucasians, African Americans, Hispanics-Americans, Asian-Americans, Turkish, and Dutch. No study included Asian participants.

Two of the studies (Güre et al., 2006; Weichold et al., 2008) categorized pubertal timing into three levels (i.e., early, on-time, and late) based on development of secondary sexual characteristic changes (i.e., menarche and breast curviness in females; first conscious ejaculation, facial hair, and deeper voice in males) in comparison to the same age and same sex peers. The other two studies (Allison & Schultz, 2004; Van Doorn et al., 2011) categorized youth pubertal timing by adolescent age (i.e., early, middle, late adolescence). The fifth study was a meta-analysis that used both categorizations of pubertal timing. In all of these studies youth pubertal timing was reported and rated only by the youth.

In all five studies youth-parent communication was described as either negative or positive. Two studies explored both positive and negative type of communication (Güre et al., 2006; Van Doorn et al., 2011), whereas three studies focused only negative or conflicted type of communication (Allison & Schultz, 2004; Laursen et al., 1998; Weichold et al., 2008). Negative communication was referred to as conflicted or unsupportive communication styles, whereas positive communication was referred to as problem solving or supportive communication styles. In all five studies, youth with early maturation had higher levels of negative communication with their parents, whereas youth with late maturation showed less negative communication with their parents (Allison & Schultz, 2004; Güre et al., 2006; Laursen et al., 1998; Van Doorn et al., 2011; Weichold et al., 2008).

Youth-Parent Communication and Adolescent Mental Health

Seven studies were found that examined the relationship between youth-parent communication and externalizing and internalizing problems among youth (Davidson & Cardemil, 2009; Frampton, Jenkins, & Dunn, 2010; Hartos & Power, 2000; Houck, Rodrigue, & Lobato, 2007; Shek, 2005; Vuchinich, Ozretich, Pratt, & Kneedler, 2002; Xiao, Li, & Stanton, 2011). All of the studies found that negative or lower quality youth-parent communication was associated with higher externalizing and internalizing problems, whereas positive or higher quality of youth-parent communication was associated with lower externalizing and internalizing problems. In all the studies, parents reported better communication and fewer problems than youth, whereas youth reported lower communication and more problems than their parents. Only one of the seven studies analyzed the relationship between quality of communication and mental health separately for males and females (Shek, 2005). Their findings showed that female youth who perceived low communication with their parents at Time 1 (age 12-16 years old) reported

to have negative mental health and externalizing problem at Time 2 (age 13-17 years old) or one year after (Shek, 2005).

Critique of Past Research

The major strengths of previous studies were that most of the studies were used standardized measurement tools with established reliability and validity to measure pubertal status (e.g., Güre et al., 2006; Weichold et al., 2008), youth-parent communication (e.g., Davidson & Cardemil, 2009; Hartos & Power, 2000; Xiao, Li & Stanton, 2011), and youth externalizing/ internalizing problems (e.g., Davidson & Cardemil, 2009; Hartos & Power, 2000; Vuchinich et al., 2002). For example, researchers used Tanner's stages (Marshall & Tanner, 1969) which is a standardized tool that measures pubertal developmental status based observation of youth physical characteristics, and the Pubertal Development Scale (PDS; Petersen, Crockett, Richards, & Boxer, 1988) which is a self-report completed by youth to that to measure physical changes associated with pubertal development. Externalizing and internalizing problems were measured either by the Youth Self Report (YSR), the Child Behavior Checklist (CBCL) or the Teacher Report Form (TRF) by Achenbach and colleages (1991, 2001, 2008). Most study designs (i.e., longitudinal), included measurements of pubertal timing and mental health outcome at multiple time points. Such designs (e.g., Frampton et al., 2010; Shek, 2005) were able to show the changing relationship between youth-parent communication and externalizing and internalizing problems across time. Some studies also (Güre et al., 2006; Weichold et al., 2008) controlled potential confounding factors (mother's education and mother's age) which could help clarify the true relationship between pubertal timing and youth mental health. Another strength was that raters of youth-parent communication in six of seven

studies included the youth and one parent which allowed for the perspectives of both members of the communication dyad.

However, there are also limitations in these previous studies. Many studies were conducted with convenience and purposive sampling. Most studies had a small sample size which limits the generalizability of the findings to a larger adolescent population. Additionally, there was inconsistency in the source of data for pubertal timing and externalizing and internalizing problems in these studies. For example, in some studies adolescents were the only person who rated all measurements, whereas other studies allowed youth and parents, or youth, parents and teacher to rate the measurements. The use of different sources of data raises questions about the comparability of the findings across the studies.

Not all researchers conducted separate analyses based on the sex of the youth or parents when examining the relationship between quality of youth-parent communication and mental health outcomes. Most of the studies combined fathers and mothers together in the analysis; some combined male and female youth. Thus, it is questionable as to whether the findings of these studies are applicable equally to male and female youth or mothers and fathers. The quality of communication can be considered a proxy for the quality of the relationship between youth and their parents. Children tend to have different relationship with their mothers and fathers. Therefore, researchers need to conduct separate analyses of daughter-mother, son-mother, and daughter-father, son-father communication to understand the implication of parent sex as well as youth sex as possible moderating factors relative to communication and youth mental health.

Furthermore, few studies explored both the positive and negative qualities of youth-parent communication. The concept of youth-parent communication in these studies mostly focused on the negative quality or conflicted communication between youth and their parents.

Only two studies examined both positive and negative qualities of communication. Their focus was mainly on problem–solving, rather than the other aspects of communication between youth and their parents (Güre et al., 2006; Van Doorn et al., 2011). Thus, research focusing on both the positive and negative aspects of communication is needed to develop a complete picture of the quality of commutation between youth and parent, particularly within the context of pubertal timing.

Although raters of youth-parent communication in all the studies were dyads (the youth and one parent), two out of the seven studies (Frampton et al., 2010; Hartos & Power, 2000) included step-mothers and female guardians as raters of youth-parent communication. The nature of the quality of communication between adolescent and biological mother could be different from the quality of communication between adolescents and their step-mothers or guardians. Thus, analyses should be conducted separately for biological mothers and step-mothers or guardians.

Conceptual Framework: The Mediated Effects Model

The Mediated Effects Model (MEM) was selected as one of the two conceptual frameworks in this study. This model addresses several factors that are congruent with this study: the youth sex, pubertal timing, perception of the relationship with his or her family, and the process showing how these variables affect the youth psychological problems.

Focus and Scope of the Mediated Effects Model

Petersen and Taylor (1980) were among the first scientists to develop a conceptual model to explain psychological adaptation in puberty. The MEM is based on a psychoanalytic and biological paradigms related to puberty (Petersen & Taylor, 1980). According to Petersen and Taylor (1980) adolescent socio-emotional development during puberty is a function of

relationship among the biological, sociocultural, and psychological aspects of individuals. This concept matches the nursing perspective that conceptualizes a person as bio-psycho-social being and nurses take holistic approaches to assessing and addressing individual needs within these multiple domains.

Biological Factors. Petersen (1986) stated that complex systematic biological changes that occur during puberty are important variables that influence youth physiological development. Petersen and Taylor (1980) identified the following key biological developmental process of puberty:

Neuroendocrine changes. These changes involve increasing level of gonadotropic and sex hormones including changes in the central nervous system (e.g., hypothalamus).

Morphological changes. These changes consist of visible secondary sex characteristics (e.g., breasts in females, facial hair in males) as well as increase in height, weight and body shape (Alsaker, 1995; Susman & Rogol, 2004).

Reproductive organ changes. These changes indicate onset of reproductive capacities include onset of menses in females, seminal emissions in males, and increased sexual arousal and responsiveness.

Pubertal timing or pubertal status refers to morphological changes on an individual in comparison to same age and same sex peers (Alsaker, 1995; Susman & Rogol, 2004). Pubertal timing is often identified as early, on-time, or late as compared to peers of the same sex and age.

Sociocultural Factors. According to this model (Petersen & Taylor, 1980) perceptions about body image and physical attractiveness are influenced by sociocultural values. Therefore, how a youth thinks about his/her development of secondary sexual characteristics is also influenced by these values and can influence the youth psychological development.

Psychological Factors. Petersen and Taylor (1980) focus on three concepts of the psychoanalytic theory. First, puberty marks the transition from childhood to adolescence. According to this model, during this time, the "id" becomes stronger resulting in increased "sex drive" while the "ego" becomes weaker which leads to psychological conflict and stress. Second, puberty is a time of high conflict with parents due to *unresolved oedipal fantasies* (Petersen & Taylor, 1980, p.131). Youth resolve such psychological conflicts by directing their natural sexual drives towards peers outside the family. Third, puberty produces changes in physical appearance that affect adolescences' gender identity and body image.

Moderating/ Mediating Factors. According to the MEM, youth psychological outcomes are affected by interactions among many mediating and moderating factors as well as pubertal development. Petersen and Taylor (1980) stated that youth might change their emotional states or moods in both positive and negative emotions (e.g., pleasure or pride; and depressed or stressed) based on their experiences with other mediating variables (e.g., attitude towards body changes), or moderating (e.g., sex). Petersen and Taylor (1980) described two psychological factors believed to serve as moderators or mediators between biological changes and psychological development during the pubertal process.

Endogenous factors. These factors refer to stimuli within youth that influence their reactions to the pubertal process. Examples include thoughts and feeling about body changes, attitudes towards growing up, gender identity, self-esteem and body image.

Exogenous factors. These factors refer to stimuli outside the youth that influence youth ideas, beliefs, or reaction to their overall pubertal development and influence youth psychological development. Petersen and Taylor (1980) classified these factors into two levels: (a) peers and family (e.g., positive or negative attitude within family or parents toward youth pubertal

development or attitude of peer groups related to youth pubertal development); and (b) sociocultural levels (e.g., social and cultural attitudes about the physical characteristics considered attractive particularly related to pubertal development).

Psychological outcomes. According to this model, youth psychological outcomes are affected by interactions among many mediating and moderating factors as well as pubertal development. Petersen and Taylor (1980) suggested that mediating factors (e.g., attitude towards body changes), or moderating factors (e.g., sex) can affect youth emotional states or mood in positive (e.g., pleasure or pride) or negative directions (e.g., depressed or stressed) during puberty.

Propositions

The maturational deviance proposition (originally called *deviance hypothesis)* proposes that youth with off time maturation (e.g., early or late) may experience negative and positive social consequences (Petersen & Taylor, 1980). Many studies support this proposition with findings that early maturating females and males have psychological adjustment problems (Carter et al., 2009; Conley & Rudolph, 2009; Crijnen, et al., 1997; DeRose et al., 2011; Dorn et al., 2003; Hsu et al., 2010; Lam et al., 2002; Lynne et al., 2007; Mrug, et al., 2008; Natsuaki et al., 2009; Weichold et al., 2008). However, some studies also found late pubertal timing was associated with externalizing problems, especially among males (Dorn et al., 2003; Petersen & Taylor, 1980).

The developmental readiness proposition (originally called the stage termination hypothesis or early timing hypothesis) proposes that adolescents, especially females, with early maturation experience problems adjusting to their physiological changes (Negriff & Susman, 2011; Petersen & Taylor, 1980; Susman & Rogol, 2004). Petersen and Taylor (1980) noted that this proposition as articulated by Peskin and Livson (1972) and Peskin (1973), explained that

females who experience early maturation may miss the opportunity to achieve their tasks of middle childhood (Brooks-Gunn, Petersen, & Eichorn, 1985), for example, developing positive peer relationships and a “sense of industry" based on Erickson’s theory child development (Miller, 2011). Furthermore, females who experience early maturation may be expected to behave as if they were older and thus have fewer opportunities to engage in child-like play activities (Susman & Rogol, 2004).

In summary, the MEM (Petersen & Taylor, 1980) was congruent with this study by testing the maturation deviance proposition to see whether pubertal development influenced psychological health. Additionally, the “exogenous” factor of youth relationship with mother served as a mediating variable and endogenous factor of youth sex was used as a moderating factor.

Finally the MEM was appropriate for this research within the Thai culture because the major variables were about psychosocial effects of the pubertal process which can be universally applied to different cultures. For example, Thai youth go through the same process of growth and development during puberty as youth in Western cultures. Moreover, youth in Thai families face similar psychosocial issues (e.g., culturally based challenges related to body image, parent-youth conflicts) and psychological problems (e.g., depression and aggressive behavior) as in Western countries.

Conceptual Framework: The Circumplex Model of Marital and Family Systems

The Circumplex model of marital and family systems was also selected as a theoretical framework for this study. This model addresses the quality of youth-mother communication, which is a factor congruent with this study but not specifically addressed in the Mediated Effects Model. Consistent with the Mediated Effects Model, quality of youth-mother communication

was included as a mediating (exogenous) variable between youth pubertal timing and youth mental health. The Circumplex Model provides a conceptual framework and instrument for measuring the quality of youth-mother communication.

Focus and Scope of the Circumplex Model of Marital and Family Systems

The Circumplex model was originally developed to fill the gap between research, theory, and practice (Olson, Russell, & Sprenkle, 1983). This model was developed over three decades from systems theory including its roots, basic concepts, and dimensions. Olson et al. (1980) developed this model, publishing their first textbook in 1989 and then continuing to develop the concepts over the next 30 years.

The Circumplex Model is developed from systems theory in family research. The construct of systems theory was based on the general systems theory which was first developed by Von Bertalanffy, an Austrian biologist, in the 1930s in his publications after World War II (Friedman, Bowden, & Jones, 2003; Ludwig Von, 1972). Because general systems theory is a broad theoretical framework, the term system defined by Von Bertalanffy has been applied to numerous phenomena in biology, physics, and other science areas (e.g., systems engineering, computer information, communication fields) (Friedman et al., 2003; White & Klein, 2008). Furthermore, according to Friedman et al. (2003), general systems theory is a broad useful theory for researchers, many middle-range theoretical perspectives such as an ecological perspective (Bronfenbrenner, 1995) was developed based on the general system theory.

Systems theorists have been applied to family research to explain bidirectional relationships with subsystems of the family and their interactions with the environment (Friedman et al., 2003; White & Klein, 2008). According to Goldenberg and Goldenberg (2004), “circular causality” is similar to bi-directionality in that an entire family is affected by the activities of

other members of the family, and what occurs in the family may not be the result of a single event that causes the action of the next event. The idea of viewing family therapy from the systems theory perspective was a pioneer concept which led David Olson and his colleagues to develop the Circumplex Model of marital and family systems.

The Circumplex Model includes the concept of systemic change ranging from *morphogenesis* (continual change) to *morphostasis* (no change) (Olson et al., 1983). Olson et al. (1979) stated that system morphogenesis is positive feedback which supports the family to change and develop, whereas system morphostasis is negative feedback which attempts to maintain stability within the family system. However, no family in a development cycle can control its function by continuing to change its system or remaining still in a stable state for a long time. Too much change can cause chaos, whereas maintaining too much stability can cause rigidity in a system. Olson et al. (1989) believed that a family that is in a normal growth and development cycle should maintain a state of equilibrium in both morphogenesis and morphostasis systems. In addition, the three dimensions in the Circumplex model, *family cohesion*, *family flexibility*, and *family communication*, are important factors related to the process of how to maintain such a balance in the family system. Olson's Circumplex model of marital and family systems has now been accepted in a broad range of applications both in clinical and nonclinical families (Olson, 2011).

Key Concepts: Family Cohesion

Olson (2011) defined family cohesion as the feeling of connectedness that family members have towards one other. Within the Circumplex model, concepts used to assess family cohesion are "emotional bonding, boundaries, coalitions, time, space, friends, decision-making, interests, and recreation" (Olson, 2000, p.145). The degree to which family members are

separated or connected to their families is an indicator of the level of family cohesion. Olson and Gorall (2003) described three levels for the cohesion dimension: disengaged, balanced cohesion, and enmeshed. The closer the family's cohesion rating is to balance the better the family functions. Conversely, the more extreme the family cohesion rating is the less well the family functions. In general, a family system will not be stable in the same degree of cohesion forever, but will change over time according to any inputs that come into the family system.

Key Concepts: Family Flexibility

Family flexibility, was defined (Olson, 2000; Olson & Gorall, 2003) as the willingness to share or exchange power (e.g., family responsibilities or duties), with another family member (Olson, 2011). The degree to which the family system balances stability or change is an indicator of the level of family flexibility. There are three levels for the flexibility dimension: chaotic, flexibility balance, and rigid (Olson & Gorall, 2003). The closer the family flexibility rating is to a balanced level, the better the family functions. Conversely, the closer the family flexibility rating is to the extreme degree, the less well the family functions. Flexible family leadership (mostly from parents) is generally associated with democratic decision-making about family issues. This style of leadership allows children in the family to share or defend their ideas about family issues. In addition, family rules and roles can change when needed to keep a balanced level of family functioning.

Key Concepts: Family Communication

Olson (2011) defined communication as constructive conversation between members of a couple or other dyads within the family. Communication is a critical facilitating dimension that helps families adjust to the other two dimensions of flexibility and cohesiveness. Olson

and Gorall (2003) hypothesized that successful and efficient communication is desirable and useful for achieving and keeping the required degree of adaptability and cohesion.

Propositions

Olson (2011) stated the following three main propositions: (a) balanced levels of cohesion and flexibility are necessary for a family to function well, (b) extreme levels of cohesion and flexibility (too low or too high) lead to difficulties and challenges within a family, and (c) family systems in a state of equilibrium have more open communication and are better able to fulfill the needs of members as well as the family as a whole.

Family as a system. The Circumplex Model was chosen for this study because it focuses on relationships among family members. Family refers to a system in which members are interdependent and interconnected. Additionally, each family system contains subsystem based on roles and generation. There can also be cross-generational dyadic relationships (e.g., a young mother and her children, or a young mother and her aging father, etc.). In this study, the quality of youth-mother communication was used as a proxy of the quality of relationship between youth and mothers within the family system. Examining youth-mother communication during the puberty is particularly important because the transition from childhood to adolescence is often associated with changes in the family system that requires each member to adapt. Therefore, inability to adjust to the youth emerging development can lead to youth-parent communication difficulties and youth psychological problems.

Another proposition of this model is that there is a bi-directional relationship between each member in the family system in functional domains (adaptability, cohesion, and communication) that influences the functioning of the family. Communication is the modifiable domain to achieving and maintaining balanced levels of adaptability and cohesion.

Therefore, family communication plays the important role of maintaining function within the family which can ultimately affects the youth psychological development. Therefore, this study included the quality of youth-mother communication as a mediating factor between the youth pubertal timing and youth externalizing/internalizing problems.

Cultural Relevance

Although the Circumplex Model was developed within Western cultures, the conceptualization of family communication has been applied and supported empirically to studiesin Asian cultures, such as India (Bhushan & Shirali, 1992), Korean (Cha, Kim, & Erlen, 2007; Shin, Choi, Kim, & Kim, 2010), and Japan (Nagamatsu, Saito, & Sato, 2008). However, one must be cautious about applying Olson's Circumplex Model to the Thai culture. Western perspectives about family cohesion and adaptability differ from Eastern attitudes about these concepts. Research in anthropology shows that the dominant cultural perspective in the West is one of individualism, whereas the dominant cultural perspective in non-Western cultures is collectivism (Christopher, Christopher, & Dunnagan, 2000). Families in individualistic cultures encourage their children to focus on the personal self and to develop autonomy, freedom, and honesty. By contrast, families in collectivistic cultures raise their children to be concerned about society more than themselves. Parents encourage their children to be obedient to adults and develop a sense of peaceful balance with others (Christopher et al., 2000). Thai families live in a collectivistic culture that has many complex differences from Western cultures, particularly, within the context of the family and how parents raise their children. Although the Circumplex Model has been studied and the concepts and standard instruments have been developed for more than three decades, the target populations have primarily been drawn from Western cultures, rather than Eastern cultures. This Western basis

for the model might pose a limitation to exploring and assessing the two dimensions of family cohesion and flexibility in Thai families. Thai people believe that information inside the family should not be revealed outside the family. It is also not acceptable for children to criticize their parents directly to others. Therefore, only communication was operationalized in this study. The two dimensions of family cohesion and flexibility were not used in this study.

Moderating Factor: Youth Sex

A moderating factor is a variable that influences a relationship between the independent and dependent variable (Polit & Beck, 2012). Youth sex has also been found to have a moderating role in the relationship between youth pubertal timing and youth-mother communication. Several studies showed that early maturing males and females had more negative communication or conflict with their parents than youth with on time or late pubertal timing (Allison & Schultz, 2004; Güre et al., 2006; Laursen et al., 1998; Van Doorn et al., 2011; Weichold et al., 2008). Early maturing females, in particular, were more likely to have negative communication with their parents (mostly with mothers) than early maturating males. These findings underscore the need to investigate sex as a potential moderator in the relationship between the pubertal timing and the quality of youth-parent communication. Youth sex can also be an important moderating factor associated with the quality of youth-parent relationship and development of youth externalizing/internalizing symptoms (Davies & Lindsay, 2004; Grych & Fincham, 1990; Snyder, 1998). Several other studies also found a moderating effect of sex on the relationship between a proxy measure of youth-parent communication (such as mother-adolescent conflict, quality of mother-adolescent relationship) and externalizing/internalizing problems (Deković, Buist, & Reitz, 2004; Gunlicks-Stoessel & Powers, 2008; Powers, Battle, Dorta, & Welsh, 2010). These studies found female youth who had negative communication with

their parents were more likely to develop internalizing problems than male youth (Deković, et al., 2004; Gunlicks-Stoessel & Powers, 2008; Powers, et al., 2010), whereas male youth who had negative communication with their parents were more likely to develop externalizing problems than female youth (Deković et al., 2004). However, another study found that female youth who reported poor communication with their parents showed more externalizing/internalizing problems than males (Shek, 2005). Youth sex is an important variable that needs to be explored as a moderating factor among youth-parent communication and mental health.

Youth sex has been found to have a moderating role in the relationship between youth pubertal timing and youth mental health. Many recent studies found that early maturing females and males had more externalizing problems (Hsu et al., 2010; Lam et al., 2002, Lynne et al., 2007) and internalizing problems (Carter et al., 2009; Conley & Rudolph, 2009; DeRose et al., 2011; Hsu et al., 2010; Natsuaki et al., 2009) compared to same age and sex peers. However, one study found that later maturation in both females and males was associated with more behavioral problems than early and on-time pubertal timing (Dorn et al., 2003). Although many studies found that early maturing females tended to have more internalizing problems and early maturing males tended to have more externalizing problems, there is few studies compared externalizing and internalizing problems in males and females during puberty. One study found that early maturing males are more likely to have externalizing problems than females (Crijnen et al., 1997). Thus, it is important to examine sex as a moderating factor in the relationship between youth pubertal timing and youth externalizing and internalizing problems. In this study, youth sex was a used as a moderating variable that influences the strength of the relationships among youth pubertal timing, youth-mother communication, and youth mental health.

Mediating Factor: Youth-Parent Communication

Mediating factors are variables that stands between two causal relationship variables and can partially or completely bridge the relationship between these two variables (Polit & Beck, 2012). Youth-parent communication could be a mediator in the relationships between youth pubertal timing and youth mental health status. Several studies have shown that conflict or negative communication between youth and parents tend to increase when the youth pubertal maturation occurs early (Allison & Schultz, 2004; Güre et al., 2006; Laursen et al., 1998; Van Doorn et al., 2011; Weichold et al., 2008). Other studies found conflict or negative communication between youth and parent significantly correlated with a higher rate of youth externalizing and internalizing problems. Open or positive communication correlated with a lower rate of youth' externalizing/ internalizing problems (Davidson,& Cardemil, 2009; Frampton et al., 2010; Hartos & Power, 2000; Houck et al., 2007; Shek, 2005; Vuchinich et al., 2002; Xiao et al., 2011). No studies explored the mediating role of youth-parent communication in the relationship between pubertal timing and externalizing and internalizing problems. These findings informed the decision to investigate the mediating influence of the quality of youth-parent communication on the relationship between youth pubertal timing and youth externalizing and internalizing problems.

Confounding Factors

A confounding variable is a variable associated with independent variable(s) that can affect the dependent variable or outcome (Kamangar, 2012, Polit & Beck, 2012). However, confounding variables are not considered part of the causal pathway in the same way that mediating or moderating variables are. Confounding factors need to be controlled in the analysis because they can lead to misleading interpretations of their effects on other variables or outcomes (Kamamgar, 2012, Polit & Beck, 2012).

In this study, the potential confounding factors include: youth' stressful life events, mother's marital status, family socioeconomic status (mother's education and family income), and mother's physical and mental health. As described in the following section, each of these potential confounding factors have been associated with youth internalizing/externalizing problem (dependent variable or outcome) and pubertal timing (independent variable or exposure) in previous studies and thus could distort the association between pubertal timing and youth externalizing and internalizing problems.

Youth stressful family life events. Youth, as members of their families, face challenges in normative events that occur in everyday life and at each stage of family development (e.g., birth or death of family member, child's school entry, family member retirement) (Olson, et al 1989). They also can face unexpected non-normative events for which the youth and family have no opportunity to prepare (e.g., natural disasters, loss of parent's job, car accident, or parent's job promotion) (Hill, 1949; McCubbin et al., 1980). There can be range in the significance of the life event. Some can be major (e.g., death of family member) some minor (e.g., poor grades), some positive (e.g., winning lottery), and some negative (e.g., illness). Any stressful family life event can affect the child's development either positively and negatively depending on the child's abilities to cope with and adapt to the stress (Compas, 1987; Johnson, 1982). One study found that one out of four youth experienced at least one significant stressful family life event, such as the death of a loved one or witnessing a traumatic event (Zimmer-Gembeck & Skinner, 2008). Furthermore, studies have shown that youth who experienced a stressful family life events had more externalizing and internalizing problems (Compas, 1987; Compas, Connor-Smith, Saltzman, Thomsen & Wadsworth, 2001; Ge et al., 2001; Graber et al., 2004; Jackson & Warren, 2000; Kim, Conger, Elder Jr, & Lorenz, 2003; Taylor, Weems, Costa, & Carrion, 2009;).

Although researchers have explored relationships between youth' stressful family life events and negative emotional or behavioral problems, correlations are modest at best (Compas, 1987). Therefore, the complex relationship among biological, psychological, and stressful family life events remains unclear.

A relationship has also been found between youth' stressful family life events and pubertal timing, especially in female youth. Studies have shown that female youth who are exposed to various stressful family life events tend to have early pubertal maturation. Absence of a father figure has received special attention in the empirical literature. One study found a significant interaction between father absence and mother's stress in predicting daughter's pubertal timing (Ellis & Garber, 2000). They found that female youth who lived with single mother tended to have early pubertal maturation when their mothers started to have a new male friend or a stepfather entered the family (Ellis & Garber, 2000). Similarly, another study found that more years of father absence was associated with earlier age of menarche (Moffitt, Caspi, Belsky, & Silva, 1992). No known studies explored this issue in male youth. Based on these findings, youth stressful family life events were considered potential confounding factors that might affect the association between pubertal timing, and youth externalizing and internalizing problems, specifically in female. There was insufficient information in these studies about whether the stress had been chronic or short term. In an attempt to examine the influence of chronic and short-term stress, this study included youth stressful life events as confounding variables if they occurred within the previous 12 months.

Mother's marital status. Many studies, conducted in Western cultures, found that children in divorced and remarried families are at increased risk for developing psychological, behavioral, social, and academic problems as compared to children in non-divorced families (Hetherington,

1991; 1993; 2003). Many studies reported that mothers and adolescents in divorced single-mother households experience more negativity and conflict than those in two-biological-parent households (Baer, 1999; Demo & Acock, 1996; Demo & Cox, 2000). Furthermore, a systematic review by Ellis (2004) concluded that there is evidence that females who experience the father's absence from an early age tend to have earlier pubertal timing than their same age peers. Based on these findings, mother's marital status was considered a potential confounding factor in this study because it could affect the association among pubertal timing, quality of youth-mother communication, and youth externalizing and internalizing problems.

Family's socioeconomic status. Research has consistently shown that youth living in families of low socioeconomic status have many parent-youth relationship problems. Although few studies have explored low socioeconomic status as a predictor of negative communication between youth and mother, many studies have found that the family's socioeconomic status is a predictor of youth health and mental health problems (Wickrama, Merten, & Wickrama, 2012; Zimmerman & Messner, 2013).

Mother's physical and mental Health. Many studies have strongly supported the finding that parents' physical and mental health can affects the quality of parent-adolescent communication, particularly when the mother has physical or mental health problems (Jacob & Johnson, 2001; Ohannessian, 2012). Barkmann, Romer, Watson, and Schulte-Markwort, (2007) found that a parent's serious physical illness is a risk factor for children's psychological adjustment. Female youth living with a severely sick mother showed more emotional problems and behavioral problems. Based on these findings, the mother's physical and mental health was considered a confounding factor that might affect the quality of communication and interactions between the mother and youth.

Conclusion

The quality of youth-mother communication can be considered a proxy for the relationship between youth and their mothers in the family; and a meditating factor between the youth pubertal timing and youth externalizing and internalizing problems. Base on previous studies, there is evidence to suggest that youth pubertal timing and quality of youth-mother communication are significant variables associated with youth externalizing and internalizing problems, but no study explored the quality of youth-mother communication as a mediating variable. Although findings show increases in youth externalizing and internalizing problems and changes in youth-mother communication in Asian countries, most studies to date have been conducted in Western cultures. The major aim of this study was to explore the relationships among these variables within the Thai culture. This study investigated whether pubertal timing was associated with externalizing and internalizing problems and determined whether the quality of youth-mother communication mediated the relationship between youth pubertal timing and externalizing/internalizing problems in a nonclinical sample in Thailand.

Two complementary conceptual models guided this study, the Mediated Effects Model (Petersen & Taylor, 1980) and the Circumplex Model of Marital and Family Systems (Barnes & Olson, 1985). The Mediated Effects Model (Petersen & Taylor, 1980) informed the hypotheses about youth pubertal timing, youth-mother communication, and youth externalizing and internalizing problems, whereas the Circumplex Model (Barnes & Olson, 1985) informed the hypotheses about youth-mother communication. The study included two factors that might influence youth externalizing and internalizing problems. Youth pubertal timing was used as an independent variable and quality of youth-mother communication was considered a mediating variable. Youth sex was considered a moderating variable. The study also included potential

confounding factors such as youth stressful life events, mother's marital status, mother's education, and mother's physical and mental health. Three innovative aspects of this study merit highlighting. (a) The design was based on two models to test a bio-psycho-social model and examine the mediating associations of youth-mother communication on the relationship between youth pubertal timing and mental health status. (b) This was the first study to explore the mediating associations of youth-mother communication within the Thai population. (c) This study collected and analyzed data from both member of the youth-mother dyad to gain an understanding of each perspective.

Chapter 3: Methods

This chapter describes the study design, including population and sample, recruitment and data collection procedures, measurement instruments, sample size calculation, and protection of human subjects.

Design

A cross-sectional and correlational design was used to examine the relationships among youth pubertal timing, mother-youth communication, and youth mental health (externalizing and internalizing problems). Based on the conceptual frameworks of the Mediated Effect Model and the Circumplex Model, the PI tested hypotheses regarding the following two aims:

Aim 1: Explore whether pubertal timing is significantly associated with externalizing and internalizing problems in Thai youth.

H1a: Among Thai female youth, early pubertal timing is associated with more externalizing and internalizing problems than on-time and late pubertal timing.

H1b: Among Thai male youth, early and late pubertal timing are associated with more externalizing and internalizing problems than on-time maturation.

Aim 2: Explore whether the quality of youth-mother communication mediate the relationship between youth pubertal timing and youth externalizing and internalizing problems in Thai youth

H2a: The quality of daughter-mother communication is a mediating factor between youth pubertal timing and youth externalizing and internalizing problems.

H2b: The quality of son-mother communication is a mediating factor between youth pubertal timing and youth externalizing and internalizing problems.

H2c: Problems in the quality of youth-mother communication are associated with more externalizing problems among male youth than female youth.

H2d. Problems in the quality of youth-mother communication are associated with more internalizing problems among female youth than male youth

Population and Sample

The target population in this study was Thai youth-mother dyads living in Southern part of Thailand. Convenience sampling was used to recruit participants from two high schools in one province in Southern part of Thailand. The sample size calculation was based on the general guideline that there should be no less than 50 participants for a correlation or regression with the number increasing with larger numbers of independent variables (IVs). Cohen (1988) suggested that a typical study in behavioral science requires a medium effect size (small = .20, medium = .50, and large = .80), with a desired statistical power level of $\geq$ .80, and an alpha =.05. The PI applied the guidelines recommended by Green (1991) for determining the regression sample sizes. He suggests N > 104 + m (where m is the number of IVs) for testing individual predictors. The PI conducted a path analysis with 7 parameters (early, on-time, and late pubertal timing, youth rated open, and problems youth-mother communication, mother rated open, and problems youth-mother communication), 2 moderators (female and male youth), and 5 covariates (mother's partner status, mother's education, mother's mental and physical health and youth-reported life event and changes in family). Based on Green's (1991) recommendation, a sample of 118 youth-mother dyads were needed to detect a medium effect size in this study. However, this study explored youth sex as a moderator in the relationship between pubertal timing and externalizing/internalizing problems as well as in the relationship between the quality of mother-youth communication and externalizing/internalizing problems. Also the number of youth in

each cell would be decreased after categorizing them into three level of pubertal timing (e.g., early, on-time, and late). Thus, to allow for attrition, the PI planned to enroll 300 dyads to comprise of 150 male youth-mother dyads and 150 female youth-mother dyads.

The inclusion criteria for Thai youth in the study were (a) being between 12-14 years of age, (b) residing with the biological mother at the time of data collection and during the six months just prior to data collection, and (c) being able to read and write in Thai. The exclusion criteria for youth were (a) less than 12 years or more than 14 years and (b) not being able to read or write in Thai (c) having mothers who did not participate.

The inclusion criteria for Thai mothers of youth in the study were (a) having a youth between 12-14 years of age, (b) residing with the biological youth at the time of data collection and during the six months just prior to data collection, and (c) being able to speak and write in Thai. The exclusion criteria for mothers were (a) having youth less than 12 years or more than 14 years, (b) not being able to read or write in Thai, and (c) having children who did not participate.

Participant Recruitment, Consent and Assent Procedure

The PI trained a research assistant, who is a PhD student from School of Nursing, Prince of Songkla University (PSU) in Thailand, to recruitment participants, obtain written informed consent, and collect data in Thailand. This research assistant completed not an online Collaborative Institutional Training Initiative (CITI) training regarding the protection of human subjects required by the institutional review board (IRB) at the University of Wisconsin (UW). She also completed coursework in research ethics during her doctoral education. To assure effective communication, the PI and the research assistant had weekly phone meetings throughout the time of data collection.

Table 3.1

Recruitment and Consent Procedures

Written approval for protocol obtained from Thai school principal
Written approval for protocol obtained from School of Nursing IRB of the Prince of Songkla University (PSU), Thailand
Written approval for protocol obtained from Educational and Social Behavioral IRB of the University of Wisconsin-Madison (UW)
PI informed school principal about IRB from PSU and UW approval
With the principal's approval, the PI contacted the appropriate teacher to help the PI identify students who met the inclusion criteria.
A time was scheduled for the research assistant to meet with students/youth identified by the teacher to explain the study and give them recruitment packets to give to their mothers.
The mothers were asked to review recruitment materials and completed the consent and questionnaires and returned them within 1 week by youth brought back to school.
The research assistant contacted the same teacher to schedule a time to meet with students whose mothers consented for their children to take part in the study.
The research assistant met with students, explained the study, obtained assent and collected data.

Recruit youth and their mother's procedure. Because data were collected in Thailand but analyzed in the US, two Institutional Review Boards (IRBs) reviewed and approved this study protocol (see Table 3.1 Recruitment and Consent Procedures). The PSU School of Nursing IRB

agreed to serve as the oversight board for the conducting this study in Thailand The Education and Social/Behavioral Science Institutional Review Board (ED/SBS IRB) of the University of Wisconsin-Madison (UW) served as the oversight board for data analysis in US. The PI also obtained approval from the principal of the two Thai high schools to allow data collection at each school.

Participants were recruited from two schools in one province in a rural city of southern Thailand. Teachers at each school identified 7th or 8th graders who matched the inclusion criteria. After the teacher identified potential participants, the research assistant collaborated with the teacher to determine the best time to meet with potential youth participants in the classroom to discuss the study. During this first meeting, the research assistant introduced the study, explained the overall purpose, described the data collection procedures, and asked them if they were interested in this study. Classroom presentations to groups of 40-50 students for the recruitment process took about 10-15 minutes. Those youth who indicated interest in participating were given an envelope containing the following three documents: (1) cover letter containing a brief summary of the study, an invitation for the youth's mother to participate in this study and a request for her permission for her child to participate, (2) consent form for mothers that indicated her willingness to participate and her permission for her child to participate, and (3) study instruments. More detailed information was included on the consent form (e.g., study purpose, study procedures, reason for asking the youth's mother to participate, research assistance and PI's contact information, risks and benefits of participation, approval from the PSU school of Nursing IRB, University of Wisconsin IRB and school principal, compensation to mother, protection of privacy and confidentiality, the voluntary nature of the study, and the right to withdraw or refuse to participate in this study without any consequences). Mothers who wanted

to participate in this study were asked to give their names and their youth's information (e.g., name, youth's school, classroom) so the research assistance could match each mother's data with her child. She also was asked for her address for future contact if she consented for herself and her child to be in the study.

Mothers indicated that they consented to participate in this study and to allow their children to participate in the study by checking "YES" on the consent form. Signatures were not required because Thai people are accustomed to only writing their signatures on official documents related to legal issues, such as government contracts or bank accounts. Any document that requires a signature can cause stress and therefore, they are likely to refuse to participate in this study if a signature was required. This is especially true for people with low to middle socioeconomic status. Additionally, the potential risks of participating in this study were classified as "minimal", therefore the PI obtained IRB permission to have potential participants check only the YES or NO as an indication of their consent or decline to take part in the study. Each mother received a copy of the consent form. All research materials (consent form, invitation letter and questionnaires) were written in Thai by the PI who is fluent in the Thai language.

Any mother who did not want to participate in this study was asked to write her name, and her child's information (e.g., name, youth's school, and classroom) so the research assistant could make sure no data were collected from her child during the data collection process which took place at school. After data collection, all documentation related to parents who refused to take part in this study was destroyed and did not become part of the study data. If a mother checked NO on the consent form she was not asked to continue reading the questionnaires used for data collection. Regardless of whether mothers chose to participate in the study, they were

asked to have their children return the forms to the research assistant who collected them at the school. The research assistant provided a sealed box in the classroom for students to deposit the study materials. However, the teacher was not involved in data collection and did not have access to the mother's data. The teacher made sure the content of the box was not disturbed before the research assistant collected it within one week.

Human Subjects Section

The study involved human participants. The IRBs at PSU and ED/SBS classified this study as minimal risk because the questionnaires in this study posed no more risk than that which could be experienced in the course of daily life.

This study included minors who were considered members of a vulnerable population. Therefore, the following measures were taken to protect them. Therefore, obtaining permission from their mothers to participate was required. Additionally, informed assent was obtained from each youth. They were informed that their decision about taking part in the study would not be shared with the school faculty. The research assistant, who obtained written assent and collected the data, was a nursing instructor. She was not a school employee and did not have any role of authority within the high school system.

Sources of material-data collection. Sources of data included mothers and youth who completed paper and pencil standardized questionnaires only one time.

Potential risks. This study involved asking participants to complete paper-based questionnaire which took about 50 minutes for youth (including the instructions) to complete and about 30 minutes for the mothers to complete. The potential risks related to this study may involve the following:

The questionnaires focus on issues related to communication between youth and their mothers. Some youth might feel uncomfortable about sharing this information with someone outside the family, which is unacceptable within the Thai cultural.

Asking questions related to secondary characteristics or pubertal growth development (e.g., menstruation, breast or pubic hair, etc.) may cause some youth participants to feel embarrassed.

Youth participants may be concerned that being in this study at school will interfere with their overall activities in school.

Participation in this study could potentially result in the breach of confidentiality for mothers or youth. The time required to complete the questionnaires may interfere with some mother's activities of daily life.

Protection against risk. To protect against the risk of youth feeling of guilty about sharing information related to communication between them and their mothers, youth were given instructions that they could skip any question they do not want to answer, ask any questions of the research assistant throughout the process, and stop the study at any time without penalty. Furthermore, the research assistant carefully assessed each youth's willingness to participate throughout the study. If the research assistant noticed discomfort in a youth, she gently confirmed the youth's right to participate or withdraw from this study without any adverse consequence.

To protect against the risk of feeling embarrassed about questions related to secondary characteristics or pubertal growth (e.g., menstruation, breast or pubic hair, etc.), the PI trained the research assistant to be sensitive about answering questions related to secondary sexual characteristics.

To address youth participants' concerns about interfering with their school activities, the research assistant worked with the teacher to schedule a time for data collection that did not disrupt school events or examinations.

After the data collection, all data were de-identified and labeled with an ID number. The research assistant stored hard copies of the identified information (names, addresses, and school) and de-identified data separately in a locked cabinet at her locked office at the School of Nursing, Prince of Songkla University-Pattani Campus. Only the de-identified questionnaires were taken to the computer center, Prince of Songkla University, for the data entry and transformation from raw questionnaire data to coded data (the transformation of data into a form understandable by the computer software) which was stored on a password, firewall protected data base. The ID number was used to link each mother's data set to her child youth's data set. The research assistant transferred the de-identified coded data from Thailand to the PI in the US using HIPAA approved encryption methods. The PI stored the data in a password protected data base within the UW School of Nursing where only researchers directly involved in the study had access to it. The original data (both raw and coded data in encrypted memory stick) with the PI assistant in Thailand will remain stored in a locked cabinet until the study is completed. The data will be stored securely for 7 years after the final publication resulting from the data set.

Additionally, the research assistant and all members of the research team completed HIPAA training to protect participants' privacy and maintain confidentiality of the data.
To address the time required to complete the questionnaires, the invitation letter and consent form contain information about the amount of time that the questionnaires would take. Mothers were encouraged to complete the forms at their convenience with a 1 week time period.

If a youth was judged by the research assistant to have behavior that may put him/her or others at risk of harm, the research assistant reported these concerns to the PI immediately or no longer than 24 hours. The PI and the research assistant reported concern to school principal for 19 youth.

Consent process. Sufficient information was included in the consent process so the youth mothers could make an informed decision about participating in the study without any coercion or undue influence. For example, the following information was included: the propose, procedures associated with this study, reason for asking the youth to participate, the PI's and research assistant's contact information, risks and benefits of participation, approval from the PSU, IRB and UW, IRB and youth's school principal, compensation, protection information for privacy and confidentiality, and the right to withdraw or refuse to participate in this study without any consequence. Finally, the youth's mothers could contact the research assistant by phone, email or mail at any time if they had questions. A written assent form was prepared for youth participants whose mothers indicated interest in participating and signed the consent forms. Youth refusal to participate was respected. Thus, although consent from the youth's parent may be given, youth were informed that they can withdraw from this study anytime without consequence. The research assistant discussed the purpose, procedure, confidentiality, risks and benefits of the study with the youth participants using language appropriate to their development.

Remuneration. Each participating mother received 100 bahts (about $4 US) for completing the study. This money was given to the youth in an envelope and asked the youth to give to their mother.

Potential benefits of research to subjects and others. There was no direct benefit to the study participants. The results from this study may increase researchers understanding of the

relationships between pubertal timing, quality of youth-mother communication, and youth externalizing/internalizing problems. This information can potentially help other researchers and clinicians design future studies and interventions aimed at improving youth-mother communication and minimizing youth externalization and internalization problems.

Data Collection

When the research assistant received the mothers' completed documents, she notified the PI. Then the PI collaborated with the teachers and asked them to schedule a meeting for the research assistant to recruit potential youth participants whose mothers had been given consent for them to participate in this study. After explaining the research to students, including the voluntary nature of their participation, and answering their questions the research assistant collected data from youth who assented to participate.

Figure 3.1
Recruitment Process in Two Schools

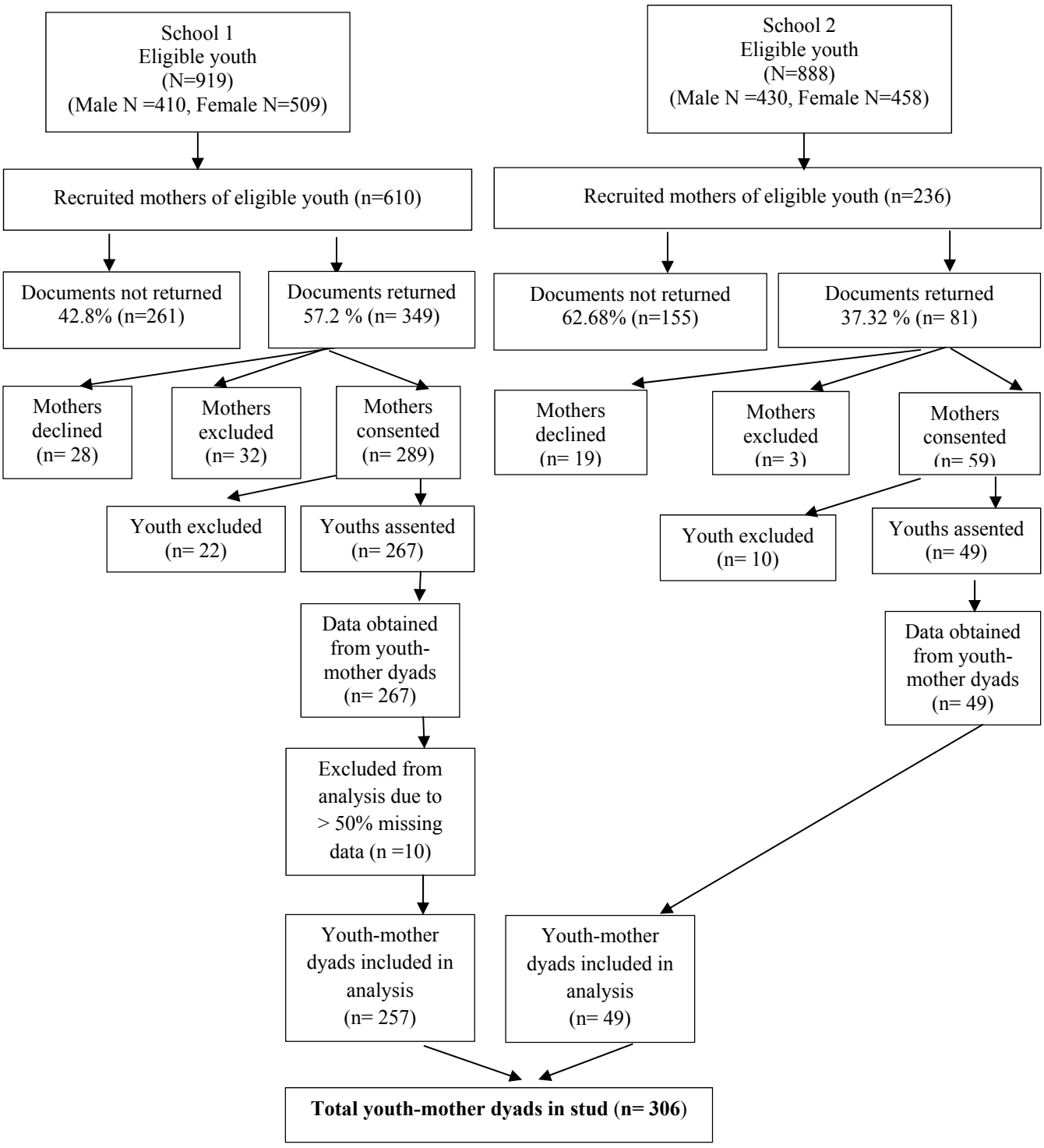


Figure 3.1 illustrates the recruitment pattern at each school. A total of 1807 students met the inclusion criteria from both schools (n=919 in school 1 and n=888 in school 2). Of the 289 mothers at school 1 who gave consent, 22 students did not present themselves on the data collection day. Some had scheduling conflicts and some were absented from school that day but no one declined to participate in this study. Ten dyads were excluded from the study because data from each questionnaire measuring major variables rated by mother participants were missing more than 50%. The final sample from school 1 was 257 dyads.

Of the 59 mothers at school 2 who gave consent, 10 students did not present themselves on the data collection day. Some had scheduling conflicts and some were absented from school that day but no one declined to participate in this study. No any dyads were excluded from the study from school 2 because no more than 50% of their data were missing. The final sample from school 2 was 49 dyads. From recruitment in both schools, this study included a total of 306 youth-mother dyads. The mother response rate was 57.21 % for school 1 and 37.32 % for school 2. Although both male and female youth were recruited, mother of male youth had a higher rate no response than the mothers of female youth. Thus, the final sample size included 188 female youth-mother dyads and 118 male youth-mother dyads.

Measurement Instruments

Given that this study was conceptually based on youth-mother dyads in Thailand, separate Thai versions of questionnaires were administered to mothers and their children. All Thai version instruments administered to mothers were translated from English versions including: Child Behavioral Checklist (CBCL), Parent-Adolescent Communication Scale--Parent Form (MPACS), and World Health Organization Quality of Life Brief Scale (WHOQOL-BREF).

Another set of Thai version instruments administered to youth were translated from English versions including: Pubertal Development Scale (PDS), Youth Self Report Checklist (YSR), Parent-adolescent Communication Scale-- Adolescent Form (YPACS) and Adolescent-Family Inventory of Life Events and Changes (A-File). Finally, demographic characteristics were obtained from both mother and youth (in Thai). All the name of the instruments are presented in Table 3.2 along with Cronbach's alpha and Composite reliability from testing internal consistency.

Table 3.2

Instruments

Rated by	Variables	Measures Thai Versions	Reliability	
			Cronbach's Alpha	Composite Reliability
Mother	Youth Externalizing Problems	Child Behavioral Checklist (CBCL) (29 items)	0.88	NA
	Youth Internalizing Problems	Child Behavioral Checklist (CBCL) (30 items)	0.89	NA
Youth	Youth Externalizing Problems	Youth Self Report (YSR) (29 items)	0.91	NA
	Youth Internalizing Problems	Youth Self Report (YSR) (30 items)	0.91	NA
Youth	Pubertal Development for Male Youth	Pubertal Development Scale for male youth (5 items)	NA	0.82
	Pubertal Development for Female Youth	Pubertal Development Scale for female youth (4 items)	NA	0.92
Mother	Positive Communication	Parent Form of Parent-adolescent Communication scale (10 items)	0.81	NA
	Problems Communication	Parent Form of Parent-adolescent Communication scale (10 items)	0.72	NA
Youth	Positive Communication	Adolescent Form of Parent-adolescent Communication scale (10 items)	0.83	NA
	Problems Communication	Adolescent Form of Parent-adolescent Communication scale (10 items)	0.75	NA
Background Variables				
Mother	age, household income, level of education, current job, and religious affiliation	Demographic questionnaire For mother	NA	NA
Youth	age, sex, grade, family number living within family, living with father, and religious affiliation	Demographic questionnaire For youth	NA	NA
Mother	Physical health	World Health Organization Quality of Life-BREF (WHO QQOL-BRIEF) (7 items)	0.64	NA
Mother	Mental health	World Health Organization Quality of Life-BREF (WHO QQOL-BRIEF) (6 items)	0.79	NA
Youth	Adolescent-Inventory of Life Event and Changes	AFILE (50 items)	0.87	NA

1. Youth externalizing and internalizing problems. The Child Behavior Checklist (CBCL) and Youth Self Report (YSR) Thai versions (Sanmaneechai, Puthanakit, Louthrenoo, & Sirisanthana, 2005) were administered to mother and youth. These two instruments are based on the original English version (Achenbach & Rescorla, 2001). The CBCL, which is designed to assess the emotional and behavioral problems in children 6-18 years old as rated by caretakers, was completed by mothers. Youth completed the YSR designed to assess self-reports of emotional and behavioral problems in adolescents 11- 18 years old. Both assessments contain 112 items that use a 3-point Likert-type scale ranging from 0 to 2, where 0=not true, 1=somewhat or sometimes true, and 2=very true or often true within the previous 6 months. However, the analysis for this study included only the 29 items related to two externalizing syndrome scales (Rule-breaking Behavior, and Aggressive Behavior) and the 30 items related to three internalizing syndrome scales (Anxious/Depressed, Withdrawn/Depressed, and Somatic Complaints) (Achenbach & Rescorla, 2001).

In this study the CBCL-Thai version and YSR-Thai version had accepted internal reliability for the scales associated with CBCL-Externalizing ($\alpha = 0.88$) and Internalizing ($\alpha = 0.89$) YSR Externalizing ($\alpha = 0.91$) and Internalizing ($\alpha = 0.91$). Permission for using the CBCL-Thai version and YSR-Thai version were obtained from Louthrenoo (Sanmaneechai et al., 2005) who has a copy right for these instruments.

For this study, the mean score of 29 items for externalizing problems (Rule-breaking Behavior, and Aggressive Behavior) and the mean score of 30 items for internalizing problems (Anxious/Depressed, Withdrawn/Depressed, Somatic Complaints) were separately computed. Higher scores indicated higher levels of problems.

2. Pubertal timing. The Pubertal Development Scale (PDS)-Thai version was used to measure the youth pubertal timing. The PDS-Thai version based on Petersen, Crockett, Richards and Boxer (1988) was translated by the PI (see the cross-cultural equivalence section). Pubertal timing was measured by male and female youth using a 5-item self-report scale to rate their physical characteristics associated with pubertal maturation. There were separate forms for males and females. The 5 items for females included body hair (pubic hair) growth, breast growth, skin changes, growth spurt, and menarche; the 5 items for males included body hair growth, facial hair growth, skin changes, voice deepening, and growth spurt. Responses were rated on a Likert scale (1=no development, 2=barely started, 3=definitely underway, 4= development complete). Additionally, females rated the onset of menstruation as 1=no or 4=yes.

The categories of pubertal timing (early, on-time, and late) were computed following the technique proposed by Ge, Brody, Conger, Simons, and Murry (2002). To establish a standardized PDS score within each age group (e.g., 12, 13, and 14 years) and sex (males and females), an average score for male pubertal timing was calculated by summing the ratings of the 5 items and then dividing by five. However, an average score for female pubertal timing was calculated by summing the ratings of 4 items and dividing by four. The first item (question about growth spurt) was excluded because the confirmatory factor analysis of the female scale indicated that this item was not correlated with other items (see testing confirmatory factor analysis in Chapter 4). There was one other difference between the standardization of the male and female scores. Based on the results of a confirmatory factor analysis, the item asking about female menarche was computed as a binary with 0= no and 1 = yes, rather than 1=no and 4=yes as recommended by Ge et al, (2002).

After the mean score of each sex was computed, the categories of pubertal timing for each sex was divided into three groups (early-maturing, on-time-maturing and late-maturing groups) based on the statistical distribution of the PDS scores (Graber, Petersen, & Brooks-Gunn, 1996). Youth whose scores were one standard deviation above or below the sample mean were classified as early maturing or late maturing, respectively. Youth whose pubertal timing scores fell within one standard deviation of the mean were classified as on–time-maturing. (Please see Chapter 4 for detail).

The PDS has not been applied to research with Thai youth. Therefore, the original PDS was translated from the English version to Thai and backed translated following the method proposed by Brislin (1970) as reported in the cross-cultural equivalence section.

In this study the composite reliability was computed in Psychometrics Program version 1 (Brown, 2006) for the 5 items of the youth male PDS-Thai version and the 4 items of the youth female PDS-Thai version. The composite reliability for was 0.82 for male and 0.92 for female respectively.

3. Youth-mother communication. The Parent-adolescent Communication Scale (PACS) parent form (MPACS) and youth form (YPACS) Thai versions were used to measure the self-report assessments of the quality of youth-mother communication. Both MPACS and YPACS Barns and Olson (2003) were translated by the PI (see the cross-cultural equivalence section) because they have not been applied to research with Thai youth and their mothers.

In this study, the MPACS and YPACS were used to measure the mediating variable, quality of youth-mother communication. Both MPACS and YPACS were developed to assess "listening skills, speaking skills, self-disclosure, clarity, continuity tracking, and respect, and regard" (Olson & Gorall, 2003, p.520). In this study communication reflects the quality of the

parent-child relationship. Although observations might offer more accurate documentation of parent-child behavior interactions, subject reports provide information about the parent's and child's perception about their interactions and by proxy relationship which is most salient to this study. The MPACS was completed by mothers to rate the quality of communication between her and her youth child, whereas the YPACS was completed by the youth to rate the quality of communication between him/her and his/her mother. There are two versions: (1) Adolescent Form, and (2) Parent Form. Youth-mother communication can be measured in dual-parent families and single-parent (mother or father-headed) families. The original version of MPACS and YPACS has 20 items and composed of two sub-scales (Barns & Olson, 1985). Ten items measure the degree of openness in family communication and another 10 items measure the extent of problems in family communication. Participants use a Likert scale (ranging from 1=strongly disagree to 5=strongly agree) to rate each item. The scores for the problems subscale are reversed so that high scores represent a lack of perceived problems in communication. Thus, higher sum scores on all 20 items represent better communication than lower scores (Barns & Olson, 1985).

In this study, the scores for PACS were separated into positive and problem scale (10 items each) and separate composite scores were calculated with each scale (Allison & Schultz, 2004; Laursen, Coy, & Collins, 1998; Weichold, Büttig, & Silbereisen, 2008). Participants (i.e., youth and mother) were asked to rate how strongly they agreed or disagreed to each statement on a 5-point scale ranging from 1(strongly agree) to 5 (strongly disagree). Higher scores indicated higher levels of open and higher levels of problematic in youth-mother communication.

For this study, the Cronbach alpha reliability of positive and problems subscale of the

MPACS were 0.81 and 0.72 respectively. The Cronbach alpha reliability of positive and problems of YPACS were 0.83 and 0.75 respectively.

4. Youth stressful life events and changes. A-File (McCubbin, Patterson, Bauman, & Harris, 1981) was completed by youth to measure a potential confounding variable of life events and recent changes in the family. The A-File is a 50-item self-report instrument that measures life events and changes during the last 12 months. There are another 27 items that measure life events and changes that occurred prior to the previous 12 months but were not included in this study. The 50-item A-File consists of six domains: (1) Transitions includes 14 items (e.g., parent quit or lost a job, child or teenager transferred to a new school, family moved to a new home), (2) Sexuality includes 4 items (e.g., unmarried family member became pregnant, birth of brother or sister, teenager began having sexual intercourse) , (3) Losses includes 7 items (e.g., brother or sister died, parent died, death of a close friend or family member, (4) Responsibilities and Strains includes 19 items (e.g., family member was hospitalized, grandparent(s) became seriously ill, increase of parent's time away from family) , (5) Substance Abuse includes 4 items (e.g., family member uses illicit drugs, family member drinks too much alcohol), and (6) Legal Conflict includes 2 items (e.g., family member went to jail, juvenile detention). Each item required a rating of YES (scored as 1) or No (scored as 0). Higher sum scores indicate higher levels of stress than lower scores.

The 50 items of A-File asking about youth life event and changes occurred prior to 12 months were included as a covariate in the analysis.

The A-File measurements have been translated from the English to Thai (Pummanee & Trangchasombut, 2000). For this study, the Cronbach alpha reliability of 50-item was 0.87.

5. **Mothers' physical and mental Health.** The World Health Organization Quality of life (WHOQOL)-BRIEF Thai version was used to measure a potential confounding variable of the physical and mental health of mothers. The WHOQOL-BRIEF Thai version was developed by the Constitution of World Health Organization (WHO) (The WHOQOL Group, 1998) and translated by Mahatnirunkul and colleges (1998).This 26-item self-report consists of four domains: (1) Physical Health (e.g., to what extent do you feel that physical pain prevent you from doing what you need to do, do you have enough energy for everyday life); (2) Psychological (e.g., how well are you able to concentrate, how satisfied are you with yourself); (3) Social relationships (e.g., how satisfied are you with your personal relationships, how satisfied are you with the support you get from your friends); and (5) Environmental (e.g., how satisfied are you with your transport, how safe do you feel in your daily life).

Based on the aims of this study, only the two domains of Physical Health, containing 7 items, and Psychological health, containing 5 items, were included in the analysis. Participants used a Likert scale (ranging from 1=very dissatisfied to 5=very satisfied) to rate each item. Higher sum scores indicated higher levels of mother satisfied with their physical and mental health than lower scores. For this study, the Cronbach alpha reliability of the physical health (7 items) and mental health were 0.64 and 0.79 respectively.

6. Demographic information. Demographic information was collected from the youth and their mothers. The youth were asked to provide information about their age, sex, grade level, total of family number living within family within 6 months, living with father, and religious affiliation. The mothers were asked to provide information about their age, household income per month, highest level of mother's education, mother's current job, and religious affiliation.

Cross-cultural Equivalence of Parent-Adolescent Communication Inventory and Pubertal Developmental Scale (Thai version)

Parent-Adolescent Communication Inventory (PACS) both MPACS and YPACS, and Pubertal Developmental Scale (PDS) were not yet available in the Thai language. Therefore, the PACS and PDS were translated from English to Thai and back translated for this study. Two approaches were used to make PACS and PDS applicable to Thai youth and their mothers: (1) establishment of cross-cultural semantic and content equivalence, and (2) testing of the content validity, construct validity, and reliability of the PACS and PDS Thai versions.

To establish semantic and content equivalence between the original and translated versions of the PACS, the instrument was translated and back-translated using procedures proposed by Brislin (1970, 1986). Specifically, three bilingual (Thai and English) PhD students from University of Wisconsin Madison (two from the Nursing program and one from the Nutritional Science program) independently translated the English version of the PACS and PDS into a Thai version taking into account cultural relevance. Then, a consensus meeting was held during which the three translators compared their translations, discussed and reconciled discrepancies, and reached consensus about a final translated version. During the back translation process, another two bilingual (Thai and English) individuals who are faculty at the Liberal Arts schools in Thailand blindly back-translated the Thai versions of PACS and PDS into English. Then, they met to compare translations, reconcile discrepancies, and reach consensus about a final version. Finally, two monolingual native English speakers (Doctor of Psychology and PhD candidate of Nursing) compared the original and back-translated versions for semantic equivalence by equating the meaning of each item in the two versions. They also evaluated

content equivalence by comparing the focus of each item in the two versions (van de Vijver & Tanzer, 2004). They determined if discrepancies exist and if word differences in the two versions had the same meaning and were acceptable. If discrepancies were found, the whole process of translation and back-translation was repeated on the items that were judged to be discrepant. This process was repeated twice to resolve discrepancies between the original and back-translated versions.

To test the psychometric properties of the Thai version of PACS and PDS, content validity was assessed using the content validly index (CVI) score. One Professors of Adolescent Psychiatry and four Professors of Nursing (two professors are familiar with the concept of PACS and PDS, and the other two professors are specialists in testing measurement in research) served as an expert panel. Each was asked to rate the representativeness of each item relative to the dimension it is supposed to measure on a 4-point Likert scale (1= not at all representative, 4= very representative). They were also asked to evaluate the comprehensiveness of all the items as (1= comprehensive, 2=not comprehensive). Based procedures recommended by Lynn (1986), the CVI for each item (I-CVI) was calculated as the proportion of items given ratings of 3 or 4 divided by the total number of experts. The CVI for the whole instrument (S-CVI) was calculated as the proportion of items given ratings of 3 or 4 divided by the total number of Items. I-CVI and S-CVI of $\geq$ .80 are considered acceptable (Polit, Beck, & Owen, 2007). In this study, the I-CVI and S-CVI of the PACS and PDS were equal to 1. Although, the experts judged all the domains of both PACS and PDS to be applicable in youth and their mothers in Thai culture, some experts suggested minor modifications for some items to make them more applicable and modifications were done accordingly.

The ED/SBS IRB determined that the following pre-testing procedure did not require IRB oversight because the aim was to determine whether the content of the translated PACS and PDS is appropriated to for use with Thai youth and their mothers. No data were generated, analyzed or interpreted. A pre-testing method, recommended by the WHO (2014) was conducted with five Thai youth and their mothers. The PI and a trained researcher in Thailand carried out the pre-testing. The inclusion criteria for participating in the pre-testing process were: (i) being a youth in the age range of 12-14 years, (ii) both youth and his/her mother being able to understand the Thai language, and (iii) both youth and his/her mother being willing to complete the pre-testing procedures. The mothers and youth were informed about the process of pre-testing verbally and with written information. Participants with diverse socio-economic status were included in this procedure.

The mothers completed the PACI and the youth completed PDS and PACS independently. Then, a semi-structured interview was made to further assess applicability and understandability of the final translated versions of PACS and PDS. The PI interviewed mothers via telephone, whereas the trained researcher in Thailand interviewed youth in person. The youth and mother were asked to comment about whether the items of the translated versions of PACI and PDS are easy to read and understand. The information obtained from the five mother-youth regarding the PACS and PDS were only used to assure the content validity of these instruments, not as data in the study.

In summary, the PACS and PDS measurements were found to have strong applicability and understandability in the Thai culture. The PACS and PDS were applied to this study and then were tested for the construct validity with the confirmatory factor analysis (see Chapter 4).

Data Analysis

Based on this study was the first time the PACS and PDS measurements were applied in Thai population, confirmatory factor analysis was performed to check if observed items of the PACS (both youth and mother forms) and PDS represent well the latent variables they were supposed to measure. Then, the Chi-Square, degree of freedom (*df*), the Chi-Square divided by degree of freedom (*df*), Comparative Fit Index (CFI); Tucker Lewis Index (TLI); Root Mean Square Error of Approximation (RMSEA), and Weighted Root Mean Square (WRMR) were checked for model fit. Furthermore, PDS score for male and female youth were categorized into early, on-time, and late based on Ge et al, (2002) separately for male and female youth.

The outcome: YSR were computed based on 2 domains (externalizing problems and internalizing problems rated by youth).The outcome: CBCL were computed based on 2 domains (externalizing problems and internalizing problems rated by mother).

Descriptive statistics were used to explore the demographics and study variables. Means and standard deviations for continuous variables and frequency and percentages for categorical variables were computed.

Correlation analysis for all major variables was analyzed using SPSS 22.0 to report the relationship among all major variables and covariates.

Another step of statistical analysis was following the Aim 1: Explore whether pubertal timing is significantly associated with externalizing and internalizing problems in Thai youth.

H1a: Among Thai female youth, early pubertal timing is associated with more externalizing and internalizing problems than on-time and late pubertal timing.

H1b: Among Thai male youth, early and late pubertal timing are associated with more externalizing and internalizing problems than on-time maturation.

Using M-Plus 7.0 (Muthén & Muthén, 1998-2012), a multivariate regression analysis was performed by putting the categorized PDS, YSR externalizing and internalizing problems, CBCL externalizing and internalizing, and confounding variables simultaneously into the model, separately for male and female youth.

Bootstrap distributions were performed. Bootstrapping is a statistical approach created for decreasing the problem of small sample size in research study (e.g., Type II errors and less power to represent the population) (Sideridis & Simos, 2010). Also, the data analyzed with boostrap method was found to have better estimate of confidence intervals and standard error (Cheung & Lau, 2008; Lau & Cheung, 2012). By using a repeated re-sampling technique from the original sample with Bootstrap distributions 1000 replications, the estimated means and standard errors of Bootstrap distributions were computed. This method provides more precise estimates value compared to estimate computed from one sample (Hesterberg, et al. 2003). Furthermore, Bootstrap method has no assumption about the normality testing to help estimate the distribution of the statistics of interest (Sideridis & Simos, 2010).

Finally, the Unstandardized Estimation, Standard Error (SE), Unstandardized 95 % Confidence interval (95% CI), P-value and Standardized Estimates were checked for model fit.

Another step of statistical analysis was following the Aim 2: Explore whether the quality of youth-mother communication mediate the relationship between youth pubertal timing and youth externalizing and internalizing problems in Thai youth

H2a: The quality of daughter-mother communication is a mediating factor between youth pubertal timing and youth externalizing and internalizing problems.

H2b: The quality of son-mother communication is a mediating factor between youth pubertal timing and youth externalizing and internalizing problems.

H2c: Problems in the quality of youth-mother communication are associated with more externalizing problems among male youth than female youth.

H2d. Problems in the quality of youth-mother communication are associated with more internalizing problems among female youth than male youth

Using M-Plus 7.0 (Muthén & Muthén, 1998-2012), a path analysis mediational model was performed by putting the predictors (categorized PDS), mediator (MPACS and YPACS), outcomes (YSR and CBCL) and confounding variables simultaneously into the model separately for male and female youth. Then, bootstrap distributions were performed and Sobel test was run to test if the indirect effect was significant (Sobel, 1982).

Finally, the Unstandardized Estimation, Standard Error (SE), Unstandardized 95 % Confidence interval (95% CI), P-value and Standardized Estimates were checked for model fit.

For sub aim H2c and H2d, the sex interaction of the association between youth-mother communication and youth externalizing and internalizing problems were tested by M-Plus 7.0 (Muthén & Muthén, 1998-2012). To explore whether the association between quality of youth mother communication and youth externalizing and internalizing problems are the same for male and female youth, the interaction of mediation path analysis was performed to assess sex interaction of the association between youth-mother communication and youth externalizing and internalizing problems. Wald test chi-square was also performed. The Wald test is a statistical test that compares if estimates between different groups are significantly different (Harrell, 2001). In this study, the Wald test chi-square was performed to test 16 difference contrast between female and male youth for the associations between quality of youth-mother communication (positive and problematic from the perspective of youth and mother) and youth externalizing and internalizing problem (from the perspective of youth and mother). Finally,

the Chi-Square, degree of freedom, and p-values were checked for all 16 contrasts and a p-value < .05 indicated significant difference between male and female.

Chapter 4: Results

In this chapter, the PI describes data preparation, analysis, and reports. All data were double-entered into an Excel file which was imported into SPSS. Data were screened for outliers and inaccuracies. When problem were found, data entries were checked against raw data and corrected. No outliers were found in the independent and dependent variables.

Missing Data Management

From the original 315 dyads, there were 9 dyads were excluded from the analysis because the data from each major variable were missing more than at least 50 %. For example the participants were excluded if they didn't complete more than or equal 10 items in the total 20 items of questionnaire. Thus, 306 dyadic youth-mother data were assessed for patterns of missing data. Patterns missing completely at random (MCAR) and missing at random (MAR) were assessed based on Little's Missing Completely at Random (MCAR) Test provided in the SPSS 21.0 Missing Values Analysis. Little (1998) states that a significant value of chi-square statistic indicates the data are not MCAR.

The Little's MCAR test were obtained for each variable in this study; pubertal developmental scale (PDS) both male and female ($\chi^2 = 7.862, df = 11, p = .726$) , youth rating of open communication (YPACS-open) ($\chi^2 = 65.910, df = 61, p = .311$), youth rating of problems communication (YPACS-problems) ($\chi^2 = 59,481, df=71, p=.833$), mother rating of open communication (MPACS-open) ($\chi^2 = 215.959, df=113, p<.001$), mother rating of problem communication (MPACS-problems) ($\chi^2 = 111.447, df=86, p=.034),$ youth rating of youth externalizing problems (YSR-Ext) ($\chi^2 = 791.079, df = 360, p< .001$), youth rating of youth internalizing problems (YSR-Int) ($\chi^2 = 453.304, df = 417, p=.107$), mother rating of youth

externalizing problems (CBCL-Ext) ($\chi^2 = 499.834, df = 308, p < .001$), mother rating of youth internalizing problems (CBCL-Int) ($\chi^2 = 543.526, df = 522, p = .249$).

Most variables indicated that the data were missing at random (MCAR).The following instruments, MPACS-positive, MPACS-problem, YSR-Ext, and CBCL-Ext, were not the MCAR. The missing values were imputed with an expectation maximization (EM) algorithm method. EM method is considered to be a high quality technique for imputing data when data are MCAR, MAR because it can reduce a bias from parameter estimate (Acock, 1997; Fox-Wasylyshyn & El-Masri, 2005).

Construct Validity of Instruments

This study was the first time the Pubertal Development Scale and Parent-Adolescent Communication Scale were used in the Thai population. Therefore, the PI conducted a confirmatory factor analysis to check if observed items of the youth-mother communication Scale (PACS) and Pubertal Development Scale (PDS) represent well the latent variables they were supposed to measure.

All five items of the PDS from the Thai male youth participants were correlated within the PDS factor. Furthermore, the statistical numbers showed goodness of fit; a non-significant chi-square ($p > 0.05$), chi-square and degree of freedom ratio less than 3.00 (Kline, 2011), CFI and TLI values above .90 (Hu & Bentler, 1999), RMSEA less than .05 (Kline, 2011), and WRMR less than 1.0 (Muthén & Muthen, 2008-2012). In other words, the PDS data obtained from Thai male youth showed a good fit (see Table 4.1). The PDS data from the Thai female youth participants, however, were found to have poor fit. One item asking about growth spurt in the Thai female youth showed a poor correlation with the other four items. Therefore that one item (female growth spurt item) was removed. After 1 item was removed, all four items of the

Thai female PDS were found to have correlated within the PDS factor. Furthermore, as shown in Table 4.1, the goodness of fit for the PDS was similar for female and male. In other words, the data obtained from Thai female PDS youth showed a good fit to the concept of original English version of PDS (see Table 4.1).

Regarding the PACS (Thai version), both Parent and Youth Forms (each 20 items) were also check if observed items of the youth-mother communication Scale (PACS) represent well the latent variables they were supposed to measure.

All 20 items of the PACS both parent and youth forms responded by Thai youth and mother participants were correlated within the PACS factor. Although the model was significant chi-square ($p< .001$), another statistical numbers showed reasonable model fit; chi-square and degree of freedom ratio less than 3.00 (Kline, 2011), CFI and TLI values above .90 (Hu & Bentler, 1999), and RMSEA less than .08 (Kline, 2011). In other words, the obtained data from PACS for Thai youth and mother showed a reasonable fit to the concept of original English version of PACS (see Table 4.2).

Based on the two CFA model, 5 items of PDS for Thai male youth instrument and 4 items of PDS for Thai female youth instrument including PACS instruments for both Thai youth and mother form were applied to the analyzes process.

Table 4.1

Fit Indices for Confirmatory Factor Analysis Model of the Pubertal Developmental Scale (PDS)

Measure	χ^2	df	χ^2/df	P-value	CFI	TLI	RMSEA	WRMR
PDS-Male	4.454	5	0.890	0.486	1.000	1.011	0.000	0.360
PDS-Female	0.053	2	0.026	0.974	1.000	1.046	0.000	0.045

Note: χ2= Chi square goodness of fit statistic; df= degree of freedom; CFI= Comparative Fit Index; TLI= Tucker Lewis Index; RMSEA= Root Mean Square Error of Approximation; WRMR= Weighted Root Mean Square Residual

Table 4.2

Fit Indices for Confirmatory Factor Analysis Model of the Parent-Adolescent Communication Scale (PACS)

Measure	χ^2	df	χ^2/df	P-value	CFI	TLI	RMSEA	WRMR
MPACS	520.637	169	3.080	0.000	0.905	0.893	0.082	1.386
YPACS	500.691	169	2.962	0.000	0.909	0.898	0.080	1.329

Note: χ2= Chi square goodness of fit statistic; df= degree of freedom; CFI= Comparative Fit Index; TLI= Tucker Lewis Index; RMSEA= Root Mean Square Error of Approximation; WRMR= Weighted Root Mean Square Residual

Categorization of Pubertal Timing

The pubertal timing was categorized as early, on-time, and late based on the work of Ge, Brody, Conger, Simons, and Murry (2002). Youth whose pubertal timing scores fell within one standard deviation of the mean were classified as on–time-maturing. Whereas youth whose scores were one standard deviation above or below the sample mean were classified as early maturing or late maturing, respectively. To illustrate the method used to categorize pubertal timing, graphic picture is presented in Figure 4.1 and 4.2.

As shown in Figure 4.1, an average score for female pubertal timing was calculated by summing the ratings of the 4 items and then dividing by four. The first item (question about growth spurt) was excluded as mentioned in the previous section. Therefore, the mean score of female PDS was 1.993 and the standard deviation was 0.474. Of the 188 female youth, those whose scores were between1.518-2.468 were classified as on-time (n=110) and those whose scores were more than 2.468 and less than 1.518 were classified as early maturing (n=37) or late maturing (n= 41), respectively.

As shown in Figure 4.2, an average score for male pubertal timing was calculated by summing the ratings of the 5 items and then dividing by five. Therefore, the mean score of male PDS was 2.161, and the standard deviation was 0.499 Of the 118 male youth, those whose scores were between 1.662-2.660 were categorized as on-time (n= 79) and those whose scores were more than 2.662 and less than 1.660 were classified as early maturing (n= 22) or late maturing (n= 17), respectively.

After categorizing pubertal timing for, number in each cell were higher than 20, except for late maturing male which had n=17.

Figure 4.1

Pubertal Timing for Female Youth Categorized by Mean and SD

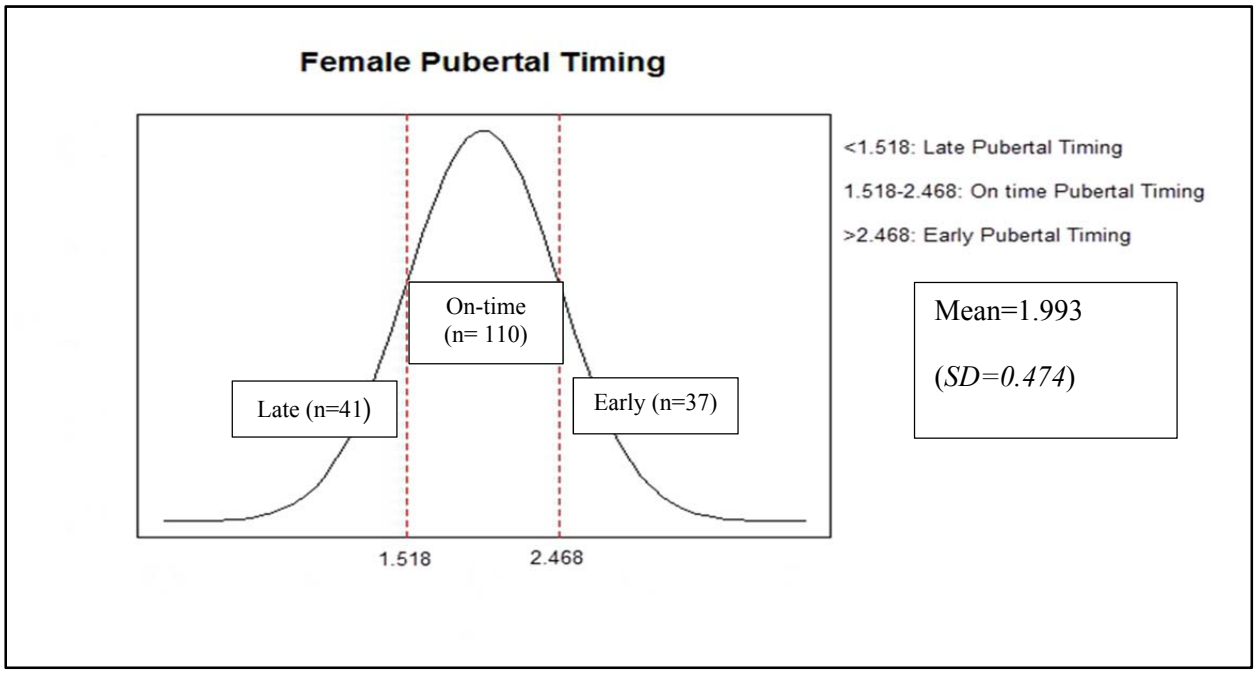
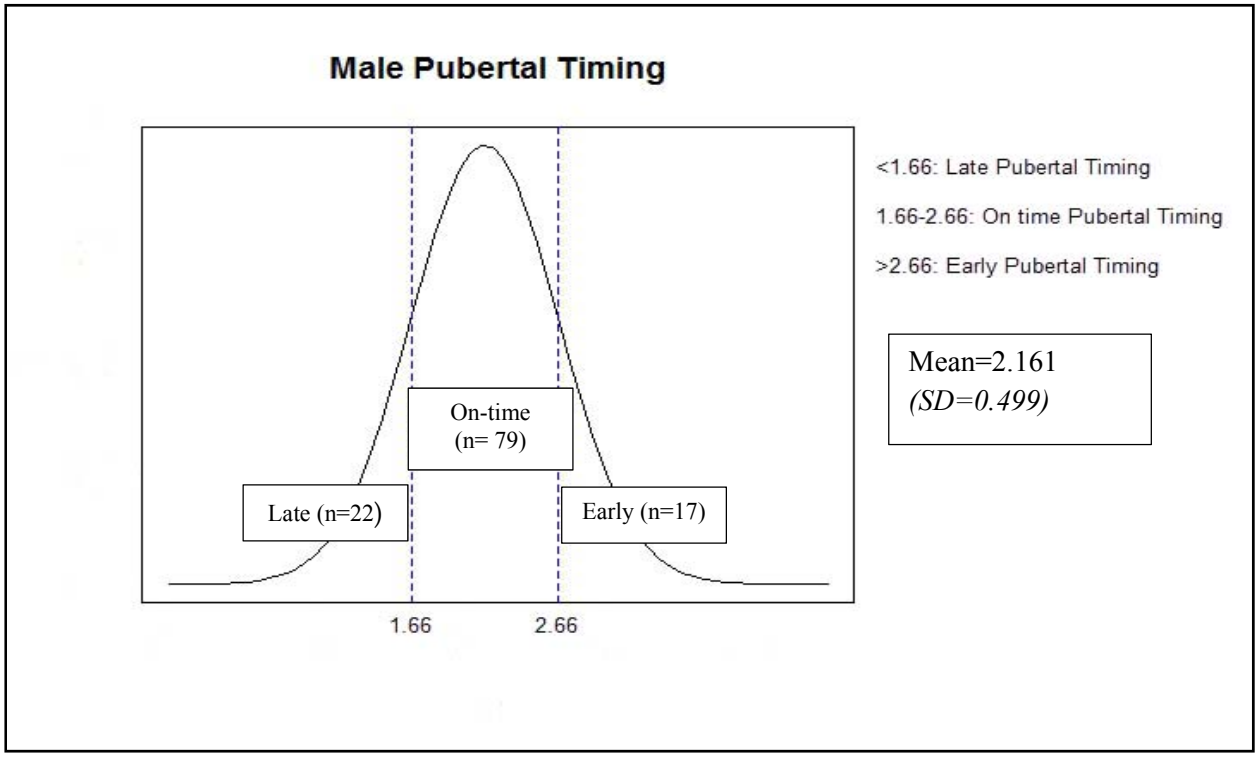


Figure 4.2

Pubertal Timing for Male Youth Categorized by Mean and SD



Demographic Data

As shown in Table 4.3 the youth sample was comprised of mostly females (n=188, 61.4%), with a mean age of 12.82 years and males (n=118, 38.6%) with a mean age of 12.73 years old. Female youths were either in grade seven (59.6%) or in grade eight (39.9%). Male youth were either in grade seven or (70.3%) grade eight (28.8%). Grade data were missing for one female and one male youth. The religious affiliations for female youth was Buddhism (60.1%) or Islam (38.8%); similarly for male youth Buddhism (68.6%), or Islam (31.4%). Religious affiliation was missing for two female youth.

The mean age of mothers was 42.32 years old. Most mothers were partnered including married (75.2%) or remarried (5.2%), no partner and parenting child alone(15.0%), not specified for three mothers (1.0%) and missing data for eleven mothers (3.6%). The religious affiliations for mother were similar to their children: Buddhism (61.8%) or Muslim (38.2%). Most mothers were well-educated having completed college (32%), followed by some high school (19.3%), secondary vocational or diploma school (13.7%). Family incomes were 10,000-20,000 Baht (29.7%) followed by less than 10,000 Baht (18.6%) and 30,001- 40,000 Baht (14.1%). Based on the currency exchange ($1.00 = 32.5 Baht) the range in dollars was $308-615 (29.7%) followed by less than $308 (18.6%), and 923-1,230 (14.1%).

Based on data found from National Statistical Office Thailand (2014) and the website of this city in Thailand (www.pattani.go.th), incomes and religious affiliation of mothers in this study was not representative of the population in this city when the study was conducted. Based on the National Statistical Office Thailand (2014), current information about average incomes for the whole 14 provinces in the southern part of Thailand in 2014 (we have no data for this city) was 27,504 Thai Bath per months. In additional based on information of religious

affiliations of population in this city from the website of this province in Thailand from year 2006 (www.pattani.go.th), Buddhism affiliations were 33.15% which less than Muslim affiliations which were 66.85 %. For educational level, we don't have current information about the education level from this province, thus we cannot claimed that the educational level in this study represented the population in this city.

Table 4.3
Participant Characteristics

Characteristic	Youth N=306		Mother N=306		Mother N=306
	Female n=188	Male n=118	Of female youth n=188	Of male youth n=118	
Age, year, mean (*SD*)	12.82(*0.71*)	12.73(*0.64*)	42.10(*5.83*)	42.66(*6.14*)	42.32(*5.95*)
12	68(36.2%)	45(38.1%)	-	-	-
13	86(45.7%)	60(50.8%)	-	-	-
14	34(18.1%)	13(11.0%)	-	-	-
Grade Levels (%)			-	-	-
Grade 7	112(59.6%)	83(70.3%)	-	-	-
Grade 8	75(39.9%)	34(28.8%)	-	-	-
Missing	1(0.5%)	1(0.8%)	-	-	-
Religious Affiliation (%)					
Buddhism	113(60.1%)	81(68.6%)	110(58.5%)	79(66.9%)	189(61.8%)
Islam	73(38.8%)	37(31.4%)	78(41.5%)	39(33.1%)	117(38.2%)
Missing	2(1.1%)	0	0	0	0
Highest education of mother					
Less than High school	-	-	35(18.6%)	22(18.6%)	57(18.6%)
Primary High school (grade 7-9)	-	-	26(13.8%)	6(5.1%)	32(10.5%)
Secondary High school (grade 10-12)	-	-	32(17.0%)	27(22.9%)	59(19.3%)
Diploma or secondary vocational	-	-	29(15.4%)	13(11.0%)	42(13.7%)
College	-	-	58(30.9%)	40(33.9%)	98(32.0%)
Master Degree	-	-	6(3.2%)	4(3.4%)	10(3.3%)
Other	-	-	2(1.1%)	3(2.5%)	5(1.6%)
Missing	-	-	0	3(2.5%)	3(1.0%)
Mother marital status (%)					
Married	-	-	136 (72.3%)	94 (79.7%)	230(75.2%)
Re-married	-	-	8 (4.3%)	8 (6.8%)	16(5.2%)
Single mother	-	-	34 (18.1%)	12 (10.2%)	46(15.0%)
Not specified	-	-	3 (1.6%)	0	3(1.0%)
Missing	-	-	7 (3.7%)	4 (3.4%)	11(3.6%)
Family income (Baht)					
<10,000	-	-	35(18.6%)	22(18.6%)	57(18.6%)
10,000-20,000	-	-	54(28.7%)	37(31.4%)	91(29.7%)
20,001-30.000	-	-	26(13.8%)	16(13.6%)	42(13.7%)
30,001-40,000	-	-	25(13.3%)	18(15.3%)	43(14.1%)
40,001-50,000	-	-	18(9.6%)	7(5.9%)	25(8.2%)
50,001-60,000	-	-	8(4.3%)	8(6.8%)	16(5.2%)
60,001-70,000	-	-	8(4.3%)	5(4.2%)	13(4.2%)
>70,000	-	-	7(3.7%)	4(3.4%)	11(3.6%)
Missing	-	-	7(3.7%)	1(0.8%)	8(2.6%)

Correlation among Variables

Based on the literature, analyses of correlation for all independent and dependent variables were conducted. Correlations among all variables are reported in Table 4.4. Pearson Product-moment correlation (*r*) statistics were computed to explore the relationship (*p< .05, p< .01, and p< .001*)) among major variables including covariates.

The results showed that the five major variables (pubertal timing, youth rating of open communication with mother [YPACS-open], youth rating of problem communication with mother [YPACS-prob], mother rating of open communication with youth [MPACS-open], and mother rating of problem communication with youth [MPACS-prob]) were significantly associated with each other and with the four youth mental health outcomes (youth self-rating of externalizing problems (YSR-Ext), youth self-rating of internalizing problems (YSR-Int), mother rating of youth externalizing problems (CBCL-Ext), and mother rating of youth internalizing problems (CBCL-Int). Some of the correlations were positive and other were negative and values ranged between small (*Pearson's r= .02*) to high correlations (*Pearson's r= .70).* These findings suggested that all independent variables had significant relationships with each of the outcome variables (both positive and negative).

The results showed pubertal timing (PDS) had a significant negative relationship with one variable: YSR-Ext (*r = -.118, p< .05*).

YPACS-open had a significant negative relationship with three variables: YPACS-prob, YSR-Ext, and YSR-Int (*r from -.279 to -.332, p< .001*); and positive relationship with MPACS-open (*r = .297, p< .001*).

YPACS-prob had significant negative relationship with one variables: MPACS -open (*r = -.141, p< .05*), and positive relationship with five variables; MPACS-prob, YSR-Ext, YSR-Int, CBCL-Ext and CBCL-Int (*r from .136 to .335, p< .001 to <.05).*

MPACS-open had significant negative relationship with three variables: MPACS prob, CBCL-Ext, and CBCL-Int (*r from -.140 to -.297, p< .001 to .05*).

MPACS-prob had significant positive relationship with two variables: CBCL-Ext, and CBCL-Int (*r from .198 to .241, p< .001*).

YSR-Ext had significant positive relationship with three variables: YSR-Int, CBCL-Ext, and CBCL-Int (*r from .238 to .792, p< .001*).

YSR-Int had significant positive with two variables: CBCL-Ext, and CBCL-Int (*r from .352 to .347, p< .001*).

CBCL-Ext hads significant positive relationship with one variables: CBCL-Int (*r=.70, p< .001*).

All covariates had significant negative and positive relationships with major variables (pubertal timing, YPACS-open, YPACS-prob, MPACS-open, and MPACS-prob) in this study, except for mother mental health and mother marital status. However, these two covariates still were analyzed with other variables based on the literature.

Table 4.4

Bivariate Correlation among variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Pubertal timing	1.000													
2.YPACS-open	.012	1.000												
3.YPACS-prob	.002	-.332***	1.000											
4. MPACS-open	-.025	.297***	-.141*	1.000										
5. MPACS-prob	.060	-.109	.241***	-.240***	1.000									
6. YSR-Ext	-.118*	-.279***	.335**	-.026	.019	1.000								
7. YSR-Int	-.096	-.301***	.343***	-.065	.039	.792***	1.000							
8. CBCL-Ext	.007	-.104	.182**	-.140*	.198**	.413***	.347***	1.000						
9. CBCL-Int	.011	-.102	.136*	-.183**	.223***	.238***	.352***	.700***	1.000					
10. Youth Stressful Life Event	-.113*	-.187**	.144*	-.032	.034	.131*	.207***	.072	.104	1.000				
11. Mother Education	-.062	.053	.093	.090	-.122*	-.035	-.056	-.152**	-.231***	.008	1.000			
12. Mother Physical Health	-.033	.105	-.060	.181**	-.297***	-.095	-.112	-.270***	-.323***	-.057	.250***	1.000		
13. Mother Mental Health	-.085	.217	-.150	.297	-.237	-.057	-.165	-.204	-.321	-.163	.131	.633	1.000	
14. Marital Status	-.066	-.064	-.013	.004	-.025	.039	.036	-.050	-.002	.158	.080	.008	-.090	1.000

Note ***p< .001, **p< .01 *p< .05

YPACS-open= Youth Rating Open Communication with Mother, YPACS-prob= Youth Rating Problem Communication with Mother, MPACS-open= Mother Rating Open Communication withYouthr, MPACS-prob= Mother Rating Problem Communication with Youth, YSR-Ext= Youth Rating Youth Externalizing problems, YSR:Int= Youth Rating Youth Internalizing problems, CBCL Ext =Mother Rating Youth Externalizing problems, CBCL Int= Mother Rating Youth Internalzing problems.

Results Related to Research Aims

Aim 1 research question. Is the pubertal timing (early, on-time, and late) associated with externalizing and internalizing problems among Thai youth, and does this relationship vary across sexs**?**

To answer the research question, two hypotheses were tested:

H1a: Among Thai female youth, early pubertal timing is associated with more externalizing and internalizing problems than on-time and late pubertal timing.

H1b: Among Thai male youth, early and late pubertal timing are associated with more externalizing and internalizing problems than on-time maturation.

Table 4.5 illustrates results for aim 1. Figure 4.3 illustrates the operational model; whereas, Figure 4.4 (female model) and Figure 4.5 (male model) illustrate the significant relationships between youth pubertal timing and youth mental health problems for female and male youth. As shown in Table 4.5 and Figure 4.4 the female model, there were significant negative associations between youth ratings of late pubertal timing and youth self-ratings of externalizing and internalizing problems ($p< .001; p= .014$). In other words, females with late pubertal onset reported fewer mental health problems than females with on-time puberty. There were no significant findings based on mothers' reports. Given that those with early pubertal onset showed no differences in mental health problem, one can infer (based on youth reports) that the females with late onset had fewer mental health symptoms than both other groups. Therefore, hypothesis H1a, was partially supported by youth reports because the later the pubertal timing, the fewer the symptoms.

As shown in Table 4.5 and Figure 4.5 (male model), there were no significant associations between pubertal timing (reported by youth only) and youth mental health (reported by the youth and mothers). Therefore, hypothesis H1b was not supported.

Covariates

As shown in Figure 4.4, youth-reported stressful life events were positively associated with youth ratings of externalizing and internalizing problems ($p = .002$; $p = .011$). In other words, perceptions of higher levels of stressful life events were associated with more mental health problems than lower levels of stressful events. Mothers' educational levels were negatively associated with youth internalizing problems as reported by mothers ($p = .026$). In other words, the higher the mothers' education, the fewer the youth internalizing problems observed by mothers. Mothers' physical health was negatively associated with youth externalizing problems (both based on mothers' reports). In other words, the more mothers were satisfied with their physical health, the fewer the youth externalizing problems observed by mothers ($p = .044$).

As shown in Figure 4.5, youth-reported stressful life events were positively associated with youth ratings of internalizing problems ($p = .043$). In other words, perceptions of higher levels of stressful life events were associated with more internalizing problems.

Outcome Correlations

As shown in Figure 4.4, there was a positive correlation between youth-reported externalizing and internalizing problems ($p < .001$). Female youth who experienced high levels of externalizing problem tended to also experienced high levels of internalizing problems. There was a positive correlation between youth-reported and mother-reported youth internalizing problems ($p = .007$). Mothers tended to have similar perceptions as their daughters regarding the

daughters' internalizing problems. There was a positive correlation between mother-reported externalizing and internalizing problems ($p = .011$). When mothers observed high levels of externalizing problems in their daughters, they tended to also observe high levels of internalizing problems in their daughters.

As shown in Figure 4.5, there was a positive correlation between youth-reported externalizing and internalizing problems ($p < .001$). Male youth were similar to female youth in that those who experienced high levels of externalizing problem tended to also experienced high levels of internalizing problems. There was a positive correlation between youth-reported and mother–reported youth externalizing and internalizing problems ($p = .012$, $p = .044$). Mothers tended to have similar perceptions as their sons regarding the sons' externalizing and internalizing problems. Additionally, there was a positive correlation between youth-reported internalizing problems and mother-reported youth externalizing problems ($p = .008$). Thus, mothers tended to observe high levels of externalizing problems in youth who experienced high levels of internalizing problems. There was a positive correlation between mother-reported externalizing and internalizing problems ($p < .001$). When mothers observed high levels of externalizing problems in their sons, they tended to also observe high levels of internalizing problems in their sons.

Table 4.5

Effect Paths for Female and Male Youth Aim 1

	Female					Male				
Path Coefficient	**Unstandardized Estimates**	**SE**	**Unstandardized 95 % CI**	**p**	**Standardized Estimates**	**Unstandardized Estimates**	**SE**	**Unstandardized 95 % CI**	**p**	**Standardized Estimates**
Early PT → Y Ext	0.009	0.036	(-0.065, 0.076)	0.806	0.015	-0.096	0.074	(-0.236, 0.056)	0.197	-0.096
Early PT → Y Int	0.025	0.048	(-0.070, 0.117)	0.608	0.035	-0.093	0.082	(-0.261, 0.064)	0.256	-0.093
Early PT → M Ext	-0.042	0.027	(-0.098, 0.006)	0.112	-0.091	0.052	0.070	(-0.076, 0.198)	0.463	0.052
Early PT → M Int	0.003	0.045	(-0.079, 0.093)	0.952	0.004	0.031	0.060	(-0.076, 0.163)	0.600	0.031
Late PT → Y Ext	**-0.127**	**0.033**	**(-0.199, -0.066)**	**0.000**	**-0.226**	-0.082	0.071	(-0.210, 0.068)	0.249	-0.082
Late PT → Y Int	**-0.111**	**0.045**	**(-0.205, -0.027)**	**0.014**	**-0.164**	-0.069	0.073	(-0.202, 0.092)	0.344	-0.069
Late PT → M Ext	0.011	0.031	(-0.053, 0.062)	0.721	0.025	-0.052	0.043	(-0.142, 0.035)	0.224	-0.052
Late PT → M Int	0.012	0.042	(-0.076, 0.091)	0.780	0.019	-0.008	0.040	(-0.087, 0.076)	0.845	-0.008
Confounders										
Y Stress → Y Ext	**0.014**	**0.004**	**(0.005, 0.022)**	**0.002**	**0.200**	0.009	0.011	(-0.013, 0.031)	0.422	0.009
Y Stress → Y Int	**0.017**	**0.007**	**(0.005, 0.030)**	**0.011**	**0.198**	**0.023**	**0.011**	**(0.002, 0.047)**	**0.043**	**0.023**
Y Stress → M Ext	0.007	0.004	(-0.001, 0.014)	0.068	0.124	0.006	0.008	(-0.008, 0.021)	0.431	0.006
Y Stress → M Int	0.006	0.005	(-0.003, 0.016)	0.221	0.087	0.005	0.007	(-0.010, 0.019)	0.519	0.005
M Edu → Y Ext	-0.011	0.012	(-0.037, 0.008)	0.368	-0.075	0.015	0.016	(-0.018, 0.046)	0.357	0.015
M Edu → Y Int	-0.006	0.014	(-0.034, 0.021)	0.667	-0.034	0.002	0.017	(-0.030, 0.035)	0.894	0.002
M Edu → M Ext	-0.012	0.011	(-0.036, 0.005)	0.253	-0.108	-0.013	0.011	(-0.035, 0.012)	0.238	-0.013
M Edu → M Int	**-0.027**	**0.012**	**(-0.050, -0.002)**	**0.026**	**-0.180**	-0.021	0.013	(-0.046, 0.004)	0.111	-0.021
M Health → Y Ext	-0.004	0.007	(-0.018, 0.008)	0.525	-0.064	-0.015	0.012	(-0.040, 0.007)	0.195	-0.015
M Health → Y Int	0.002	0.007	(-0.013, 0.014)	0.797	0.023	-0.009	0.013	(-0.036, 0.014)	0.473	-0.009
M Health → M Ext	**-0.011**	**0.005**	**(-0.024, -0.002)**	**0.044**	**-0.205**	-0.011	0.007	(-0.026, 0.002)	0.123	-0.011
M Health → M Int	-0.010	0.006	(-0.024, 0.002)	0.125	-0.141	-0.012	0.008	(-0.028, 0.004)	0.137	-0.012
M Mental → Y Ext	0.001	0.007	(-0.011, 0.015)	0.842	0.020	0.003	0.014	(-0.023, 0.029)	0.823	0.003
M Mental → Y Int	-0.016	0.009	(-0.033, 0.000)	0.060	-0.191	-0.006	0.015	(-0.035, 0.024)	0.714	-0.006
M Mental → M Ext	0.001	0.006	(-0.009, 0.014)	0.931	0.009	-0.008	0.009	(-0.025, 0.009)	0.331	-0.008
M Mental → M Int	-0.012	0.008	(-0.027, 0.003)	0.104	-0.166	-0.016	0.009	(-0.033, 0.002)	0.091	-0.016
Marital S → Y Ext	0.048	0.041	(-0.035, 0.130)	0.247	0.075	-0.005	0.103	(-0.183, 0.225)	0.959	-0.005
Marital S → Y Int	-0.001	0.054	(-0.098, 0.104)	0.989	-0.001	0.020	0.110	(-0.185, 0.244)	0.854	0.020
Marital S → M Ext	-0.006	0.028	(-0.061, 0.048)	0.826	-0.012	-0.080	0.068	(-0.210, 0.056)	0.239	-0.080
Marital S → M Int	-0.022	0.041	(-0.096, 0.062)	0.590	-0.032	0.012	0.057	(-0.108, 0.117)	0.833	0.012

Note:

Early PT = early pubertal timing; Late PT = late pubertal timing

Y Stress = youth stressful life events, M Edu = mother education; M Health = mother physical health ; M Mental = mother mental health: Marital S = mother marital status

Y Ext= youth rating youth externalizing problems, Y Int= youth rating youth internalizing problems, M Ext= mother rating youth externalizing problems

M Int= mother rating youth internalizing problems

SE= Standard Error

CI= Confidence interval

P< .05 are in bold

Table 4.5 continued

Effect Paths for Female and Male Youth Aim 1

	Female					Male				
Correlation	**Unstandardized Estimates**	**SE**	**Unstandardized 95 % CI**	**p**	**Standardized Estimates**	**Unstandardized Estimates**	**SE**	**Unstandardized 95 % CI**	**p**	**Standardized Estimates**
Y Ext ⟷ Y Int	**0.041**	**0.012**	**(0.025, 0.073)**	**0.000**	**0.716**	**0.092**	**0.024**	**(0.056, 0.156)**	**0.000**	**0.092**
Y Ext ⟷ M Ext	0.023	0.014	(0.007, 0.062)	0.096	0.613	**0.012**	**0.005**	**(0.003, 0.021)**	**0.012**	**0.012**
Y Ext ⟷ M Int	0.021	0.011	(0.007, 0.053)	0.051	0.431	0.001	0.005	(-0.009, 0.012)	0.857	0.001
Y Int ⟷ M Ext	0.020	0.012	(0.006, 0.052)	0.079	0.442	**0.013**	**0.005**	**(0.004, 0.023)**	**0.008**	**0.013**
Y Int ⟷ M Int	**0.027**	**0.010**	**(0.012, 0.053)**	**0.007**	**0.445**	**0.012**	**0.006**	**(0.002, 0.025)**	**0.044**	**0.012**
M Ext ⟷ M Int	**0.028**	**0.011**	**(0.013, 0.059)**	**0.011**	**0.704**	**0.026**	**0.006**	**(0.016, 0.042)**	**0.000**	**0.026**

Note:

Y Ext= youth rating youth externalizing problems

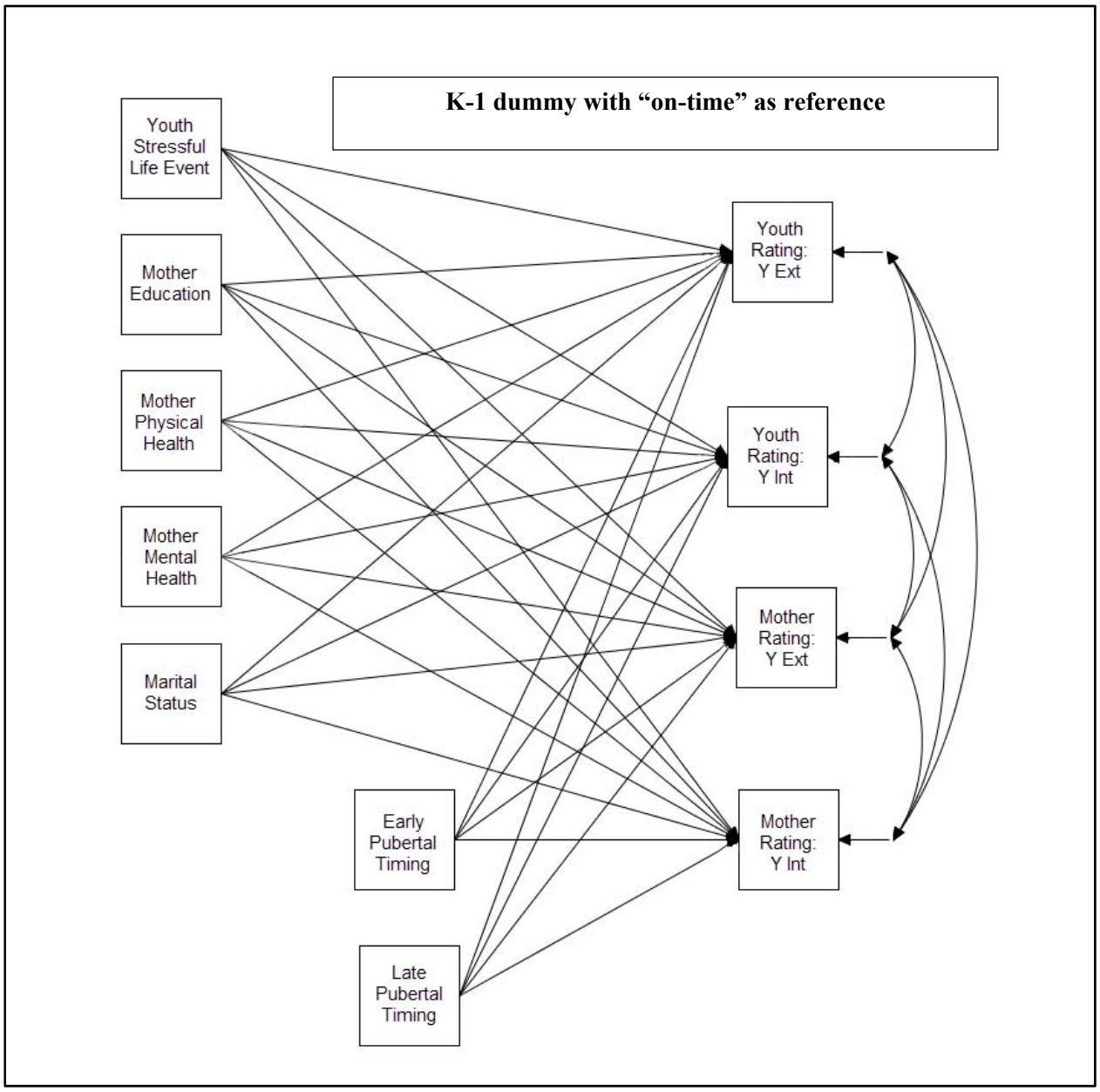
Y Int= youth rating youth internalizing problems

SE= Standard Error

CI= Confidence interval

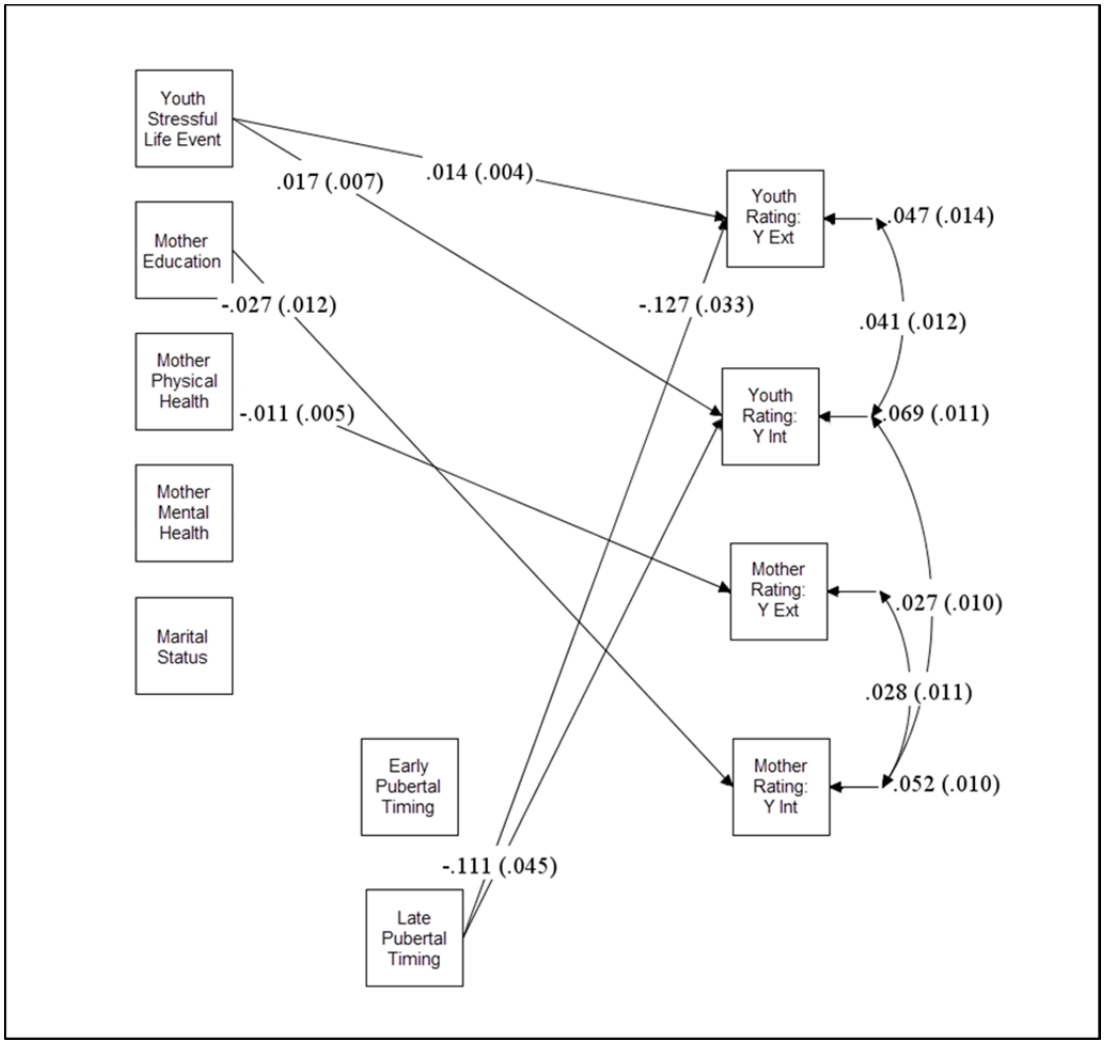
P< .05 are in bold.

Figure 4.3
Operational Model for Aim 1



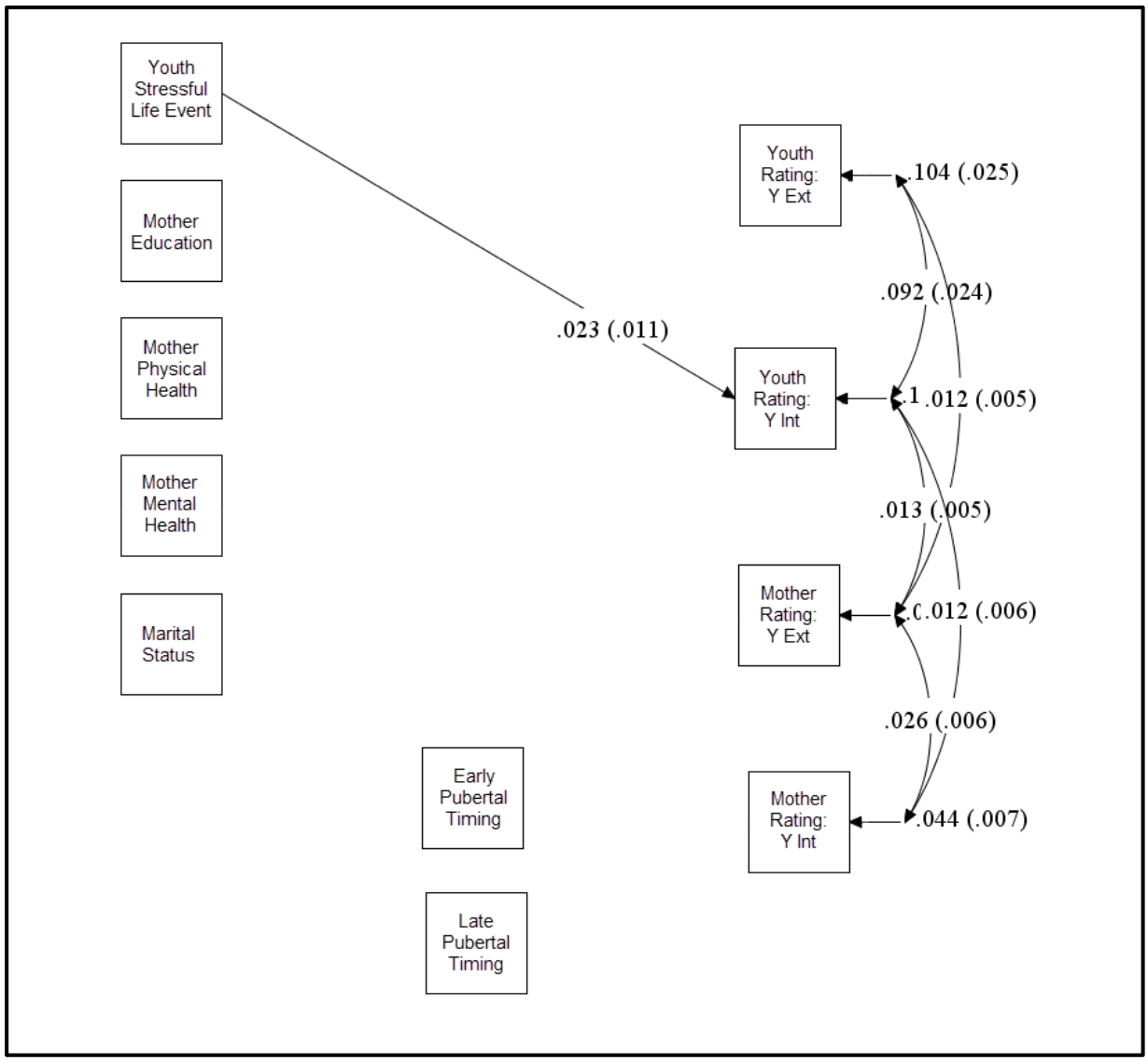
Note: Y Ext= Youth externalizing problems, Y Int= Youth internalizing problems

Figure 4.4
Significant Relationships between Youth Pubertal Timing and Youth Mental Health Problems for Female Youth Model.



Note:
Y Ext= Youth externalizing problems, Y Int= Youth internalizing problems
Unstandardized estimate (standard error)

Figure 4.5
The Significant Relationship between Youth Pubertal Timing and Youth Mental Health Problems for Male Youth Model.



Note:
Y Ext= Youth externalizing problems, Y Int= Youth internalizing problems
Unstandardized estimate (standard error)

Aim 2 research question. Does the quality of communication between Thai youth and their mother mediate the relationship between pubertal timing and externalizing and internalizing problems?

To answer the research question, two hypotheses assessed whether the quality of youth-mother communication mediate the relationship between youth pubertal timing and youth externalizing and internalizing problems in Thai youth.

H2a: The quality of daughter-mother communication is a mediating factor between youth pubertal timing and youth externalizing and internalizing problems.

H2b: The quality of son-mother communication is a mediating factor between youth pubertal timing and youth externalizing and internalizing problems.

Table 4.6 illustrates results for these first two hypotheses and Figure 4.6 illustrates the operational model. Figure 4.7 and Figure 4.8 illustrate significant relationships between youth pubertal timing, youth mother communication, and youth mental health problems for female and male youth models respectively.

As shown in Table 4.6, the indirect effect paths results showed the quality of youth-mother communication (both open and problems) was not a significant mediator in the relationship between youth pubertal timing and youth mental health. Therefore, hypotheses H2a and H2b were not supported.

As shown in Figure 4.7 (Female Youth Model) and Figure 4.8 (Male Youth Model), there were no significant associations between early pubertal timing and youth ratings of problem communication with their mother. Also, there were no significant associations between early pubertal timing and mother ratings of problem communication with their daughters or sons. Therefore, hypotheses H2a and H2b were not supported.

As shown in Figure 4.7 (Female Youth Model), there were significant negative associations between youth ratings of late pubertal timing and youth ratings of externalizing and internalizing problems ($p< .001; p= .038$). Even after adding communication to the model, there was still a significant negative association between late female pubertal timing and youth self-report of mental health. These findings are similar to those for Aim 1; the direction of the relationship remained the same.

Additionally, there were significant negative associations between youth ratings of open communication with their mothers and youth ratings of externalizing and internalizing problems ($p=.009; p= .001$). In other words, the more open the female youth perceived their mothers' communication, the fewer the mental health problems they (youth) reported. Furthermore, there were significant positive associations between youth ratings of problem communication with their mothers and youth ratings of externalizing and internalizing problems ($p= .007; p= .005$). In other words, the more problematic female youth perceived their communication with their mothers to be, the more mental health problems they (youth) experienced.

Finally, based on the mothers' reported, there was a significant negative association between mothers' rating of open communication with their daughter and mothers' ratings of youth externalizing problems ($p= .049$). In other word, the more open the mothers perceived their communication with their daughters to be, the fewer externalizing problems they (mothers) observed.

As shown in Figure 4.8 (Male Youth Model), there were no significant associations between pubertal timing and youth externalizing and internalizing problems, both youth and mother reported. In other words, although the quality of youth-mother communication was added

as a mediator, the relationship between male pubertal timing and male youth mental health was the same as in the model for Aim 1.

Additionally, similar to the female model, the male model showed significant positive associations between youth ratings of problem communication with their mothers and youth ratings of youth mental health ($p = .001$, $p < .001$). In other word, the more problematic the youth perceived their communication with their mothers to be, the more mental health problems they (youth) reported.

Unlike the female youth model, there was a significant positive association between male youth ratings of problem communication with their mothers and mother ratings of youth externalizing problems ($p = .051$). In other word, the more problematic male youth perceived their communication with their mothers to be, the more the externalizing problems in the youth were observed by their mother.

Another significant finding was a positive association between mothers' ratings of problem communication with their sons and mother-reported youth externalizing problems ($p = .014$). In other word, the more problematic mothers perceived their communication with their sons, the more externalizing problems, they (mother) observed in their sons.

Covariates

In the female model, youth-reported stressful life events were positively associated with youth ratings of externalizing problems ($p = .059$). In other words, perceptions of higher levels of stressful life events were associated with more externalizing problems than lower levels of stressful events. Mothers' educational levels were negatively associated with youth internalizing problems as reported by mothers ($p = .026$). In other words, the higher the mothers' education, the fewer the youth internalizing problems observed by mothers.

In the male model, mothers' educational levels were negatively associated with youth internalizing problems as reported by youth ($p = .028$). In other words, the higher the mothers' education, the fewer the youth reported internalizing problems.

Outcome Correlations

Based on the outcome correlation in the Aim 2, there were the same significant associations between each parameter as in Aim 1.

Table 4.6
Effect Paths for Male and Female Youth based on Aim 2

	Female					Male				
Path Coefficient	**Unstandardized Estimates**	**SE**	**Unstandardized 95 % CI**	**p**	**Standardized Estimates**	**Unstandardized Estimates**	**SE**	**Unstandardized 95 % CI**	**p**	**Standardized Estimates**
Early PT→Y Ext	0.021	0.036	(-0.049, 0.091)	0.549	0.037	-0.072	0.072	(-0.224, 0.060)	0.316	-0.074
Early PT→Y Int	0.040	0.046	(-0.050, 0.131)	0.387	0.059	-0.074	0.078	(-0.245, 0.064)	0.347	-0.074
Early PT→M Ext	-0.040	0.027	(-0.098, 0.006)	0.139	-0.087	0.061	0.071	(-0.070, 0.206)	0.395	0.106
Early PT→M Int	0.006	0.046	(-0.077, 0.095)	0.903	0.009	0.029	0.052	(-0.066, 0.137)	0.571	0.046
Late PT →Y Ext	**-0.113**	**0.030**	**(-0.176, -0.061)**	**0.000**	**-0.205**	-0.054	0.073	(-0.193, 0.093)	0.458	-0.062
Late PT→ Y Int	**-0.094**	**0.046**	**(-0.192, -0.011)**	**0.038**	**-0.143**	-0.053	0.073	(-0.199, 0.079)	0.465	-0.059
Late PT→ M Ext	0.012	0.029	(-0.046, 0.068)	0.682	0.027	-0.059	0.043	(-0.148, 0.024)	0.172	-0.114
Late PT→ M Int	0.012	0.041	(-0.073, 0.093)	0.766	0.021	-0.023	0.043	(-0.115, 0.061)	0.591	-0.040
Y Com-open →Y Ext	**-0.008**	**0.003**	**(-0.014, -0.002)**	**0.009**	**-0.224**	-0.012	0.008	(-0.028, 0.002)	0.108	-0.178
Y Com-open →Y Int	**-0.012**	**0.003**	**(-0.018, -0.004)**	**0.001**	**-0.267**	-0.007	0.008	(-0.022, 0.009)	0.384	-0.096
Y Com-open → M Ext	0.000	0.002	(-0.004, 0.004)	0.927	0.007	-0.001	0.004	(-0.009, 0.006)	0.842	-0.018
Y Com-open→ M Int	-0.002	0.003	(-0.007, 0.004)	0.605	-0.040	0.005	0.005	(-0.006, 0.016)	0.346	0.109
Y Com-prob →Y Ext	**0.008**	**0.003**	**(0.003, 0.014)**	**0.007**	**0.240**	**0.021**	**0.006**	**(0.009, 0.034)**	**0.001**	**0.377**
Y Com-prob→ YInt	**0.009**	**0.003**	**(0.003, 0.015)**	**0.005**	**0.217**	**0.023**	**0.007**	**(0.011, 0.037)**	**0.000**	**0.401**
Y Com-prob→ M Ext	0.003	0.002	(-0.001, 0.006)	0.141	0.097	**0.006**	**0.003**	**(0.000, 0.011)**	**0.051**	**0.166**
Y Com-prob →M Int	0.002	0.002	(-0.003, 0.007)	0.451	0.052	0.005	0.004	(-0.001, 0.012)	0.156	0.139
M Com-open →Y Ext	0.004	0.003	(-0.003, 0.010)	0.249	0.079	0.003	0.007	(-0.011, 0.020)	0.703	0.043
M Com-open →Y Int	0.003	0.004	(-0.005, 0.012)	0.431	0.063	0.002	0.008	(-0.013, 0.018)	0.818	0.026
M Com-open → M Ext	**-0.005**	**0.002**	**(-0.009, 0.000)**	**0.049**	**-0.128**	0.003	0.004	(-0.004, 0.012)	0.421	0.077
M Com-open→ M Int	-0.003	0.004	(-0.010, 0.004)	0.413	-0.059	-0.004	0.005	(-0.012, 0.006)	0.426	-0.085
M Com-prob→ Y Ext	-0.001	0.004	(-0.010, 0.006)	0.733	-0.035	-0.008	0.007	(-0.022, 0.004)	0.219	-0.150
M Com-prob→ YInt	-0.002	0.004	(-0.010, 0.005)	0.539	-0.053	-0.008	0.007	(-0.022, 0.006)	0.246	-0.142
M Com-prob→M Ext	0.000	0.004	(-0.009, 0.006)	0.930	-0.011	**0.007**	**0.003**	**(0.001, 0.012)**	**0.014**	**0.210**
M Com-prob→ M Int	0.001	0.004	(-0.006, 0.009)	0.727	0.032	0.007	0.004	(0.000, 0.014)	0.070	0.180

Note:
Early PT = early pubertal timing; Late PT = late pubertal timing
Y Com-open= youth rating quality of youth-mother open communication, Y Com-prob= youth rating quality of youth-mother problem communication
M Com-open= mother rating quality of youth-mother open communication, M Com-prob= mother rating quality of youth-mother problem communication
Y Ext= youth rating youth externalizing problems, Y Int= youth rating youth internalizing problems
M Ext= mother rating youth externalizing problems, M Int= mother rating youth internalizing problems
SE= Standard Error
CI= Confidence interval
P< .05 are in bold.

Table 4.6 continued
Effect Paths for Male and Female Youth based on Aim 2

	Female					Male				
Indirect Effect Paths	**Unstandardized Estimates**	**SE**	**Unstandardized 95 % CI**	**p**	**Standardized Estimates**	**Unstandardized Estimates**	**SE**	**Unstandardized 95 % CI**	**p**	**Standardized Estimates**
Early PT → Y Com-open → Y Ext	-0.007	0.010	(-0.029, 0.011)	0.510	-0.011	-0.012	0.022	(-0.084, 0.016)	0.585	-0.013
Early PT Y Com-open → Y Int	-0.009	0.014	(-0.041, 0.015)	0.503	-0.014	-0.007	0.017	(-0.066, 0.010)	0.687	-0.007
Early PT Y Com-open → M Ext	0.000	0.003	(-0.006, 0.007)	0.959	0.000	-0.001	0.006	(-0.024, 0.007)	0.902	-0.001
Early PT → Y Com-open → M Int	-0.001	0.005	(-0.020, 0.003)	0.789	-0.002	0.005	0.011	(-0.006, 0.048)	0.661	0.008
Early PT → Y Com-prob → Y Ext	-0.006	0.011	(-0.031, 0.014)	0.593	-0.010	-0.010	0.039	(-0.089, 0.063)	0.800	-0.010
Early PT Y Com-prob → Y Int	-0.006	0.012	(-0.033, 0.015)	0.596	-0.009	-0.011	0.042	(-0.091, 0.069)	0.797	-0.011
Early PT Y Com-prob → M Ext	-0.002	0.004	(-0.016, 0.003)	0.641	-0.004	-0.003	0.011	(-0.025, 0.020)	0.820	-0.004
Early PT → Y Com-prob → M Int	-0.001	0.004	(-0.018, 0.003)	0.749	-0.002	-0.002	0.011	(-0.034, 0.013)	0.825	-0.004
Early PT → M Com-open → Y Ext	0.001	0.005	(-0.004, 0.018)	0.771	0.003	-0.003	0.014	(-0.054, 0.014)	0.827	-0.003
Early PT M Com-open → Y Int	-0.001	0.006	(-0.005, 0.021)	0.814	0.002	-0.002	0.014	(-0.046, 0.018)	0.895	-0.002
Early PT M Com-open → M Ext	-0.002	0.006	(-0.019, 0.007)	0.742	-0.004	-0.003	0.008	(-0.031, 0.005)	0.695	-0.006
Early PT → M Com-open → M Int	-0.001	0.005	(-0.021, 0.004)	0.827	-0.002	0.004	0.009	(-0.006, 0.035)	0.664	0.006
Early PT → M Com-prob → Y Ext	0.000	0.005	(-0.008, 0.016)	0.959	0.000	0.007	0.016	(-0.011, 0.064)	0.646	0.008
Early PT M Com-prob → Y Int	0.000	0.006	(-0.010, 0.016)	0.934	0.001	0.007	0.016	(-0.011, 0.062)	0.652	0.007
Early PT M Com-prob → M Ext	0.000	0.005	(-0.009, 0.012)	0.989	0.000	-0.006	0.011	(-0.030, 0.013)	0.575	-0.011

Note:
Early PT = early pubertal timing; Late PT = late pubertal timing
Y Com-open= youth rating quality of youth-mother open communication,Y Com-prob= youth rating quality of youth-mother problem communication
M Com-open= mother rating quality of youth-mother open communication, M Com-prob= mother rating quality of youth-mother problem communication
Y Ext= youth rating youth externalizing problems; Y Int= youth rating youth internalizing problems, M Ext= mother rating youth externalizing problems;
M Int= mother rating youth internalizing problems
SE= Standard Error
CI= Confidence interval ; P< .05 are in bold.

Table 4.6 continued. *Effect Paths for Male and Female Youth based on Aim 2*

	Female					Male				
Indirect Effect Paths	**Unstandardized Estimates**	**SE**	**Unstandardized 95 % CI**	**p**	**Standardized Estimates**	**Unstandardized Estimates**	**SE**	**Unstandardized 95 % CI**	**p**	**Standardized Estimates**
Early PT → M Com-prob → M Int	0.000	0.005	(-0.013, 0.009)	0.958	0.000	-0.006	0.011	(-0.036, 0.012)	0.609	-0.009
Late PT → Y Com-open → Y Ext	-0.005	0.010	(-0.033, 0.013)	0.634	-0.009	-0.022	0.022	(-0.084, 0.002)	0.313	-0.025
Late PT Y Com-open → Y Int	-0.007	0.014	(-0.042, 0.018)	0.627	-0.011	-0.012	0.019	(-0.070, 0.010)	0.516	-0.014
Late PT Y Com-open → M Ext	0.000	0.003	(-0.006, 0.006)	0.967	0.000	-0.001	0.007	(-0.019, 0.011)	0.856	-0.003
Late PT → Y Com-open → M Int	-0.001	0.004	(-0.021, 0.004)	0.827	-0.002	0.009	0.013	(-0.006, 0.050)	0.485	0.015
Late PT → Y Com-prob → Y Ext	-0.008	0.012	(-0.037, 0.011)	0.515	-0.014	0.004	0.030	(-0.058, 0.064)	0.901	0.004
Late PT Y Com-prob → Y Int	-0.008	0.013	(-0.043, 0.013)	0.508	-0.013	0.004	0.033	(-0.065, 0.065)	0.900	0.005
Late PT Y Com-prob → M Ext	-0.003	0.005	(-0.018, 0.003)	0.585	-0.006	0.001	0.009	(-0.014, 0.022)	0.913	0.002
Late PT → Y Com-prob → M Int	-0.002	0.005	(-0.021, 0.003)	0.706	-0.003	0.001	0.008	(-0.013, 0.022)	0.913	0.002
Late PT → M Com-open → Y Ext	-0.002	0.005	(-0.021, 0.003)	0.606	-0.004	0.000	0.008	(-0.016, 0.020)	0.996	0.000
Late PT M Com-open → Y Int	-0.002	0.006	(-0.025, 0.004)	0.693	-0.003	0.000	0.009	(-0.018, 0.019)	0.998	0.000
Late PT M Com-open → M Ext	0.003	0.005	(-0.004, 0.018)	0.536	0.007	0.000	0.005	(-0.011, 0.012)	0.993	0.000
Late PT → M Com-open → M Int	0.002	0.005	(-0.003, 0.017)	0.682	0.003	0.000	0.006	(-0.016, 0.012)	0.993	0.000
Late PT → M Com-prob → Y Ext	-0.001	0.006	(-0.022, 0.007)	0.824	-0.003	-0.001	0.015	(-0.037, 0.028)	0.958	-0.001
Late PT M Com-prob → Y Int	-0.003	0.007	(-0.026, 0.006)	0.719	-0.004	-0.001	0.015	(-0.041, 0.026)	0.960	-0.001
Late PT M Com-prob → M Ext	0.000	0.006	(-0.020, 0.009)	0.955	-0.001	0.001	0.011	(-0.023, 0.021)	0.952	0.001
Late PT → M Com-prob → M Int	0.001	0.006	(-0.007, 0.020)	0.817	0.002	0.001	0.011	(-0.024, 0.025)	0.956	0.001

Note:
Early PT = early pubertal timing; Late PT = late pubertal timing, Y Com-open= youth rating quality of youth-mother open communication,Y Com-prob= youth rating quality of youth-mother problem communication, M Com-open= mother rating quality of youth-mother open communication, M Com-prob= mother rating quality of youth-mother problem communication, Y Ext= youth rating youth externalizing problems; Y Int= youth rating youth internalizing problems, M Ext= mother rating youth externalizing problems; M Int= mother rating youth internalizing problems, SE= Standard Error, CI= Confidence interval; P< .05 are in bold.

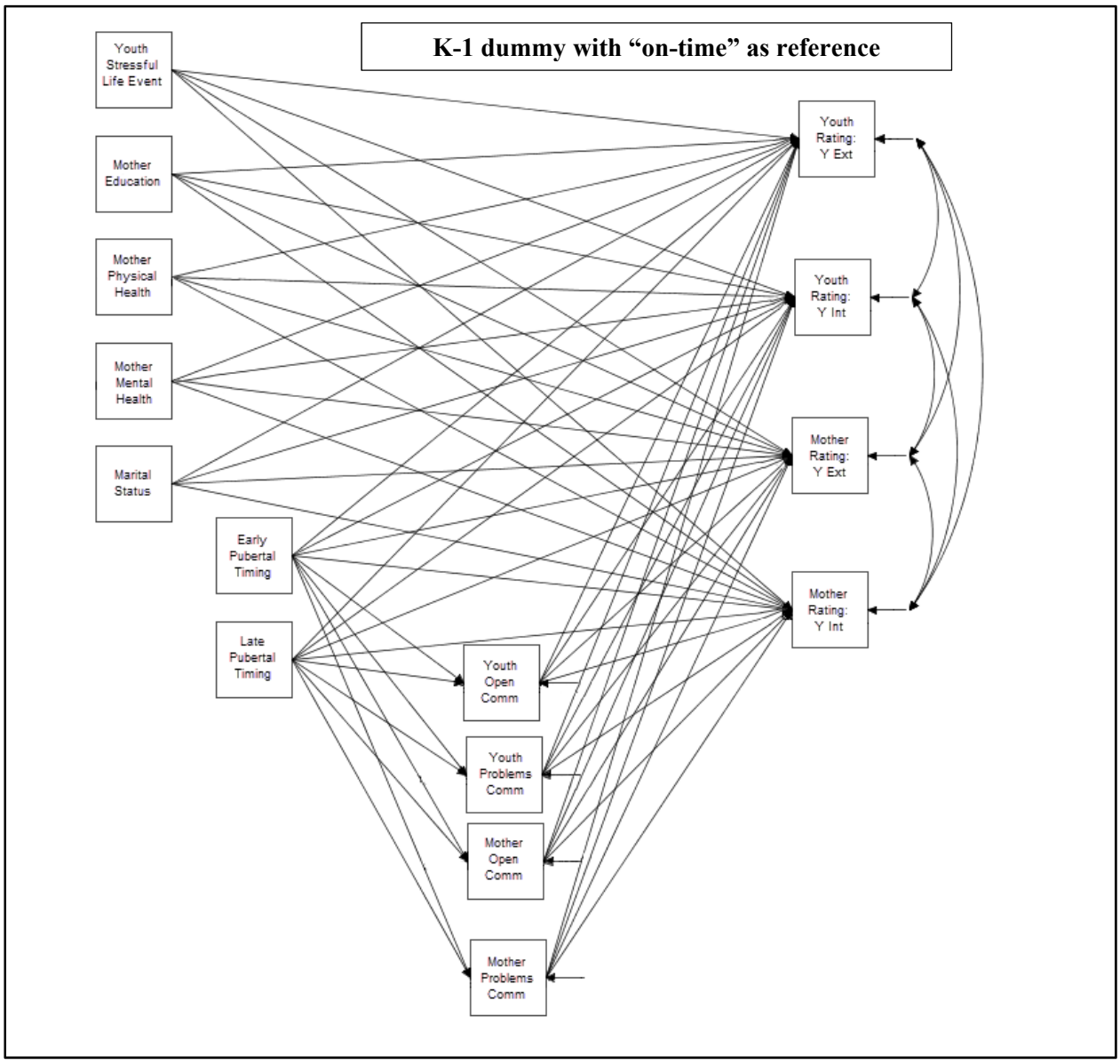
Table 4.6 continued

Effect Paths for Male and Female Youth based on Aim 2

	Female					Male				
Covariates	**Unstandardized Estimates**	**SE**	**Unstandardized 95 % CI**	**p**	**Standardized Estimates**	**Unstandardized Estimates**	**SE**	**Unstandardized 95 % CI**	**p**	**Standardized Estimates**
Y Stress → Y Ext	**0.008**	**0.004**	**(-0.001, 0.017)**	**0.059**	**0.124**	0.005	0.011	(-0.015, 0.026)	0.639	0.035
Y Stress → Y Int	0.010	0.007	(-0.003, 0.024)	0.148	0.118	0.019	0.012	(-0.002, 0.043)	0.104	0.126
Y Stress → M Ext	0.006	0.004	(-0.002, 0.013)	0.109	0.109	0.003	0.008	(-0.012, 0.020)	0.689	0.038
Y Stress → M Int	0.005	0.005	(-0.005, 0.016)	0.357	0.069	0.003	0.008	(-0.013, 0.016)	0.715	0.029
M Edu → Y Ext	-0.012	0.011	(-0.037, 0.008)	0.298	-0.086	-0.017	0.016	(-0.053, 0.011)	0.284	-0.085
M Edu → Y Int	-0.007	0.013	(-0.035, 0.017)	0.583	-0.043	**-0.035**	**0.016**	**(-0.071, -0.008)**	**0.028**	**-0.170**
M Edu → M Ext	-0.012	0.011	(-0.036, 0.006)	0.242	-0.111	-0.015	0.011	(-0.035, 0.007)	0.196	-0.122
M Edu → M Int	**-0.028**	**0.012**	**(-0.050, -0.002)**	**0.026**	**-0.184**	-0.021	0.014	(-0.051, 0.007)	0.143	-0.159
M Health → Y Ext	-0.006	0.007	(-0.022, 0.005)	0.346	-0.099	-0.019	0.012	(-0.045, 0.003)	0.117	-0.192
M Health → Y Int	-0.002	0.007	(-0.015, 0.011)	0.829	-0.020	-0.013	0.013	(-0.039, 0.011)	0.317	-0.129
M Health → M Ext	-0.011	0.006	(-0.027, -0.002)	0.088	-0.207	-0.008	0.008	(-0.023, 0.007)	0.293	-0.144
M Health → M Int	-0.010	0.007	(-0.025, 0.003)	0.163	-0.141	-0.011	0.009	(-0.028, 0.006)	0.220	-0.165
M Mental → Y Ext	0.006	0.006	(-0.005, 0.017)	0.353	0.081	0.012	0.014	(-0.015, 0.039)	0.386	0.117
M Mental → Y Int	-0.010	0.008	(-0.026, 0.005)	0.216	-0.124	0.004	0.015	(-0.025, 0.033)	0.772	0.042
M Mental → M Ext	0.003	0.006	(-0.007, 0.015)	0.599	0.055	-0.006	0.009	(-0.025, 0.009)	0.479	-0.104
M Mental → M Int	-0.010	0.008	(-0.023, 0.006)	0.206	-0.131	-0.011	0.010	(-0.030, 0.009)	0.273	-0.161
Marital S → Y Ext	0.037	0.039	(-0.036, 0.119)	0.343	0.059	0.078	0.085	(-0.071, 0.269)	0.359	0.067
Marital S → Y Int	-0.013	0.050	(-0.109, 0.090)	0.795	-0.017	0.116	0.091	(-0.048, 0.305)	0.203	0.096
Marital S → M Ext	-0.003	0.028	(-0.057, 0.049)	0.906	-0.007	-0.053	0.072	(-0.191, 0.098)	0.456	-0.077
Marital S → M Int	-0.020	0.041	(-0.095, 0.068)	0.633	-0.029	0.036	0.066	(-0.086, 0.179)	0.590	0.046
Correlation										
Y Ext ↔ Y Int	**0.033**	**0.011**	**(0.018, 0.061)**	**0.002**	**0.670**	**0.075**	**0.016**	**(0.050, 0.109)**	**0.000**	**0.845**
Y Ext ↔ M Ext	0.022	0.013	(0.005, 0.059)	0.100	0.637	**0.008**	**0.004**	**(0.001, 0.018)**	**0.048**	**0.158**
Y Ext ↔ M Int	0.020	0.011	(0.005, 0.048)	0.061	0.436	-0.001	0.004	(-0.010, 0.008)	0.874	-0.012
Y Int ↔ M Ext	0.019	0.011	(0.004, 0.049)	0.086	0.451	**0.009**	**0.004**	**(0.001, 0.019)**	**0.048**	**0.163**
Y Int ↔ M Int	**0.025**	**0.010**	**(0.011, 0.049)**	**0.009**	**0.452**	**0.009**	**0.004**	**(0.001, 0.018)**	**0.040**	**0.151**
M Ext ↔ M Int	**0.027**	**0.011**	**(0.012, 0.056)**	**0.014**	**0.701**	**0.023**	**0.006**	**(0.014, 0.041)**	**0.000**	**0.643**

Note:
Early PT = early pubertal timing; Late PT = late pubertal timing, Y Com-open= youth rating quality of youth-mother open communication,Y Com-prob= youth rating quality of youth-mother problem communication, M Com-open= mother rating quality of youth-mother open communication, M Com-prob= mother rating quality of youth-mother problem communication, Y Ext= youth rating youth externalizing problems; Y Int= youth rating youth internalizing problems, M Ext= mother rating youth externalizing problems; M Int= mother rating youth internalizing problems, SE= Standard Error, CI= Confidence interval
P< .05 are in bold.

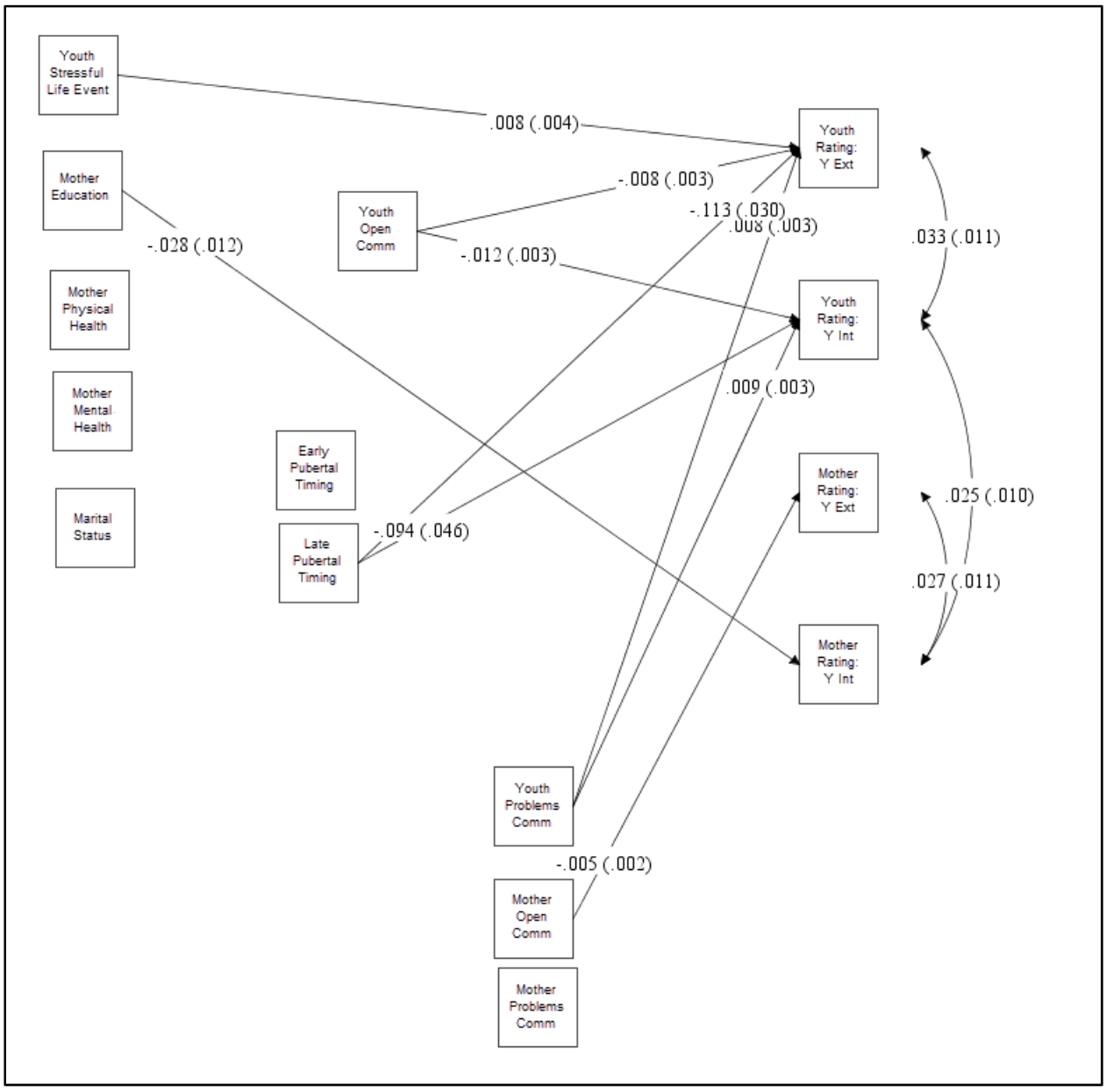
Figure 4.6
Operational Model for Aim 2



Note: Y Ext= Youth externalizing problems, Y Int= Youth internalizing problems, Comm= communication

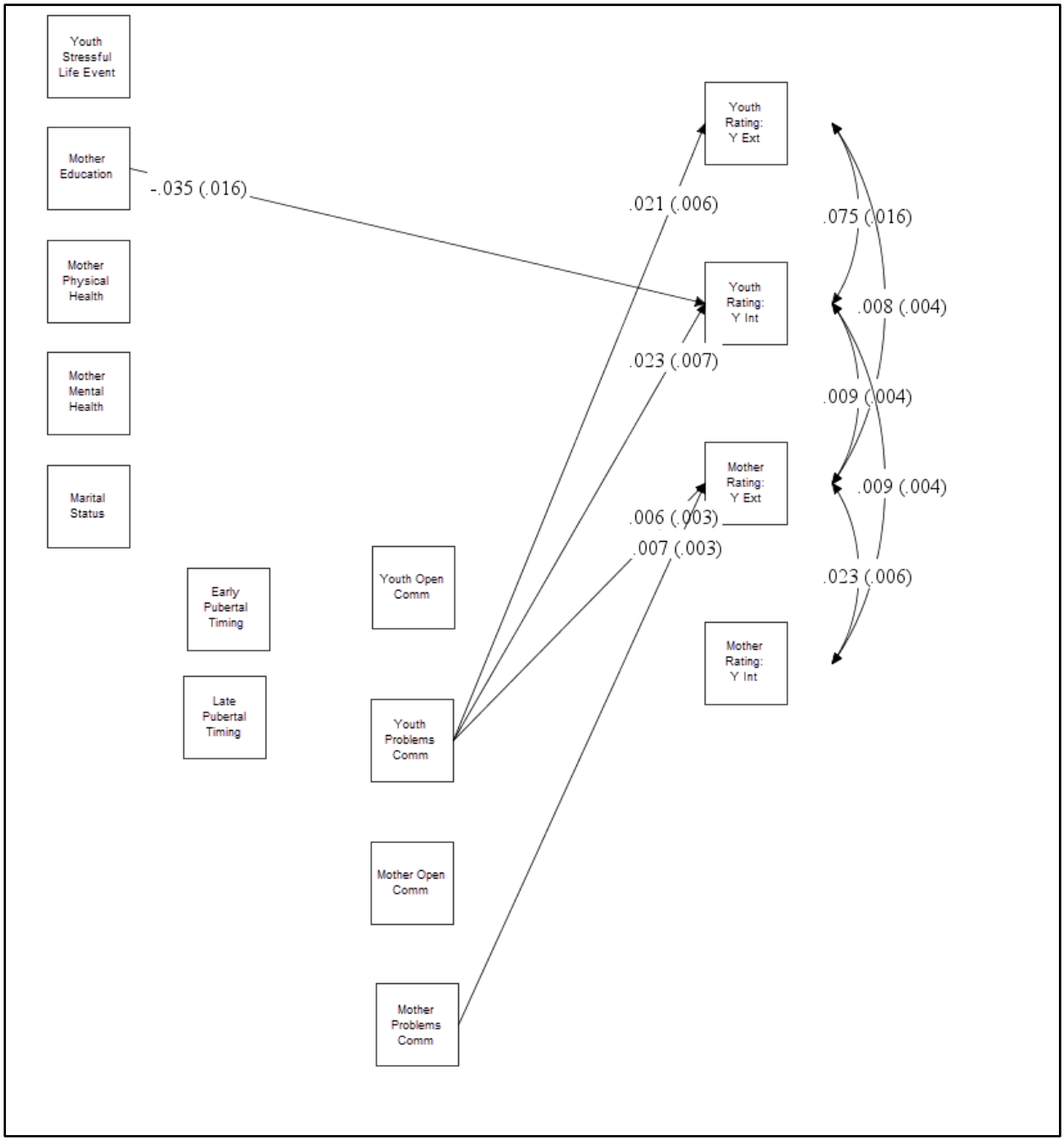
Unstandardized estimate (standard error)

Figure 4.7
The Significant Relationship between Youth Pubertal Timing, Youth-mother Communication and Youth Mental Health Problems for Female Youth Modell.



Note: Y Ext= Youth externalizing problems, Y Int= Youth internalizing problems, Comm= communication
Unstandardized estimate (standard error)

Figure 4.8
The Significant Relationship between Youth Pubertal Timing, Youth-mother Communication and Youth Mental Health Problems for Male Youth Model.



Note: Y Ext= Youth externalizing problems, Y Int= Youth internalizing problems, Comm= communication
Unstandardized estimate (standard error)

Additionally aim 2 asked. Does the quality of youth-mother communication and externalizing and internalizing problems differ between adolescent boys and girls?

To answer the question 3, the following last two hypotheses were tested:

H2c: Problems in the quality of youth-mother communication are associated with more externalizing problems among male youth than female youth.

H2d. Problems in the quality of youth-mother communication are associated with more internalizing problems among female youth than male youth

As shown in table 4.7, an interaction test was performed to examine the relationship of the interaction of sex and quality of youth mother communication (from youth and mother rating) and youth externalizing and internalizing problems (from youth and mother rating). The finding in Table 4.7 showed two significant relationships. Based on the outcome of youth rating their externalizing and internalizing problems, the relation between youth rating problem communication with mother and youth rating youth externalizing $\chi 2(1, N = 306) = 5.270, p= .002$ and internalizing problems were significant $\chi^2(1, N = 306) = 5.772$ to $3.986, p= .01$. As same as in the stacked model which tested the relationship within each youth sex, the findings showed two significant relationships. To clarify the pattern of the relationship within each youth sex, two graphic pictures were produced by Microsoft Excel 2007. The slope of each female and male line was illustrated the trend and direction based on their beta coefficient value (standardize).

As shown in Figure 4.9, the slope showed that when both female and male reported high score of problem communication with mother, male tended to have higher rating scores for their externalizing problem ($\beta^*= .377, p= .001$) than female ($\beta^*= .240, p= .004$). In other word,

problems in quality of youth-mother communication were associated with more youth externalizing problems among males than females. Therefore, hypothesis H2c was supported.

As shown in Figure 4.10, the slope showed that when both female and male reported high score of problem communication with mother, male tended to have higher rating scores for their internalizing problem ($\beta^* = .401, p = .001$) than female ($\beta^* = .217, p = .005$). In other word, problems in quality of youth-mother communication were associated with more youth internalizing problems among males than females. Therefore, hypothesis H2d was not supported.

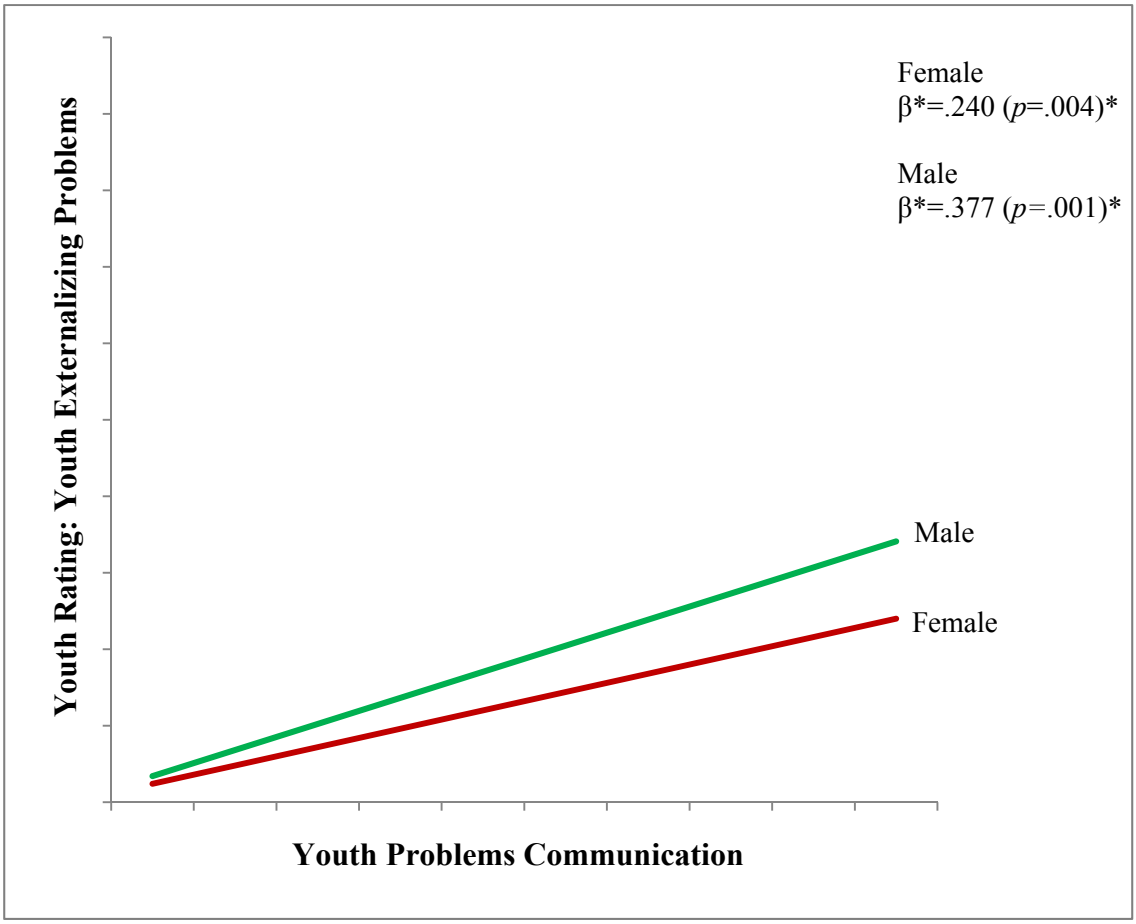
Table 4.7

The Sex Interaction of the Association between Quality of Youth-Mother Communication to Youth Externalizing and Internalizing Problems

Youth Rated Externalizing and Internalizing Problems				Mother Rated Externalizing and Internalizing Problems			
Path Coefficient	**Chi-square (Wald Test)**	**Degree of freedom**	**p-value**	**Path Coefficient**	**Chi-square (Wald Test)**	**Degree of freedom**	**p-value**
Y Com-open → Y Ext	0.431	1	0.51	Y Com-open → M Ext	0.048	1	0.82
Y Com-open → Y Int	0.460	1	0.49	Y Com-open → M Int	1.668	1	0.19
Y Com-prob → Y Ext	**5.270**	**1**	**0.02**	Y Com-prob → M Ext	0.566	1	0.45
Y Com-prob → Y Int	**5.772**	**1**	**0.01**	Y Com-prob → M Int	0.541	1	0.46
M Com-open → Y Ext	0.016	1	0.89	M Com-open → M Ext	2.871	1	0.09
M Com-open → Y Int	0.055	1	0.81	M Com-open → M Int	0.024	1	0.87
M Com-prob → Y Ext	1.481	1	0.22	M Com-prob → M Ext	3.466	1	0.06
M Com-prob → Y Int	0.856	1	0.35	M Com-prob → M Int	1.309	1	0.25

Note:
Y Com-open= youth rating quality of youth-mother open communication
Y Com-prob= youth rating quality of youth-mother problem communication
M Com-open= mother rating quality of youth-mother open communication
M Com-prob= mother rating quality of youth-mother problem communication
Y Ext= youth rating youth externalizing problems
Y Int= youth rating youth internalizing problems
M Ext= mother rating youth externalizing problems
M Int= mother rating

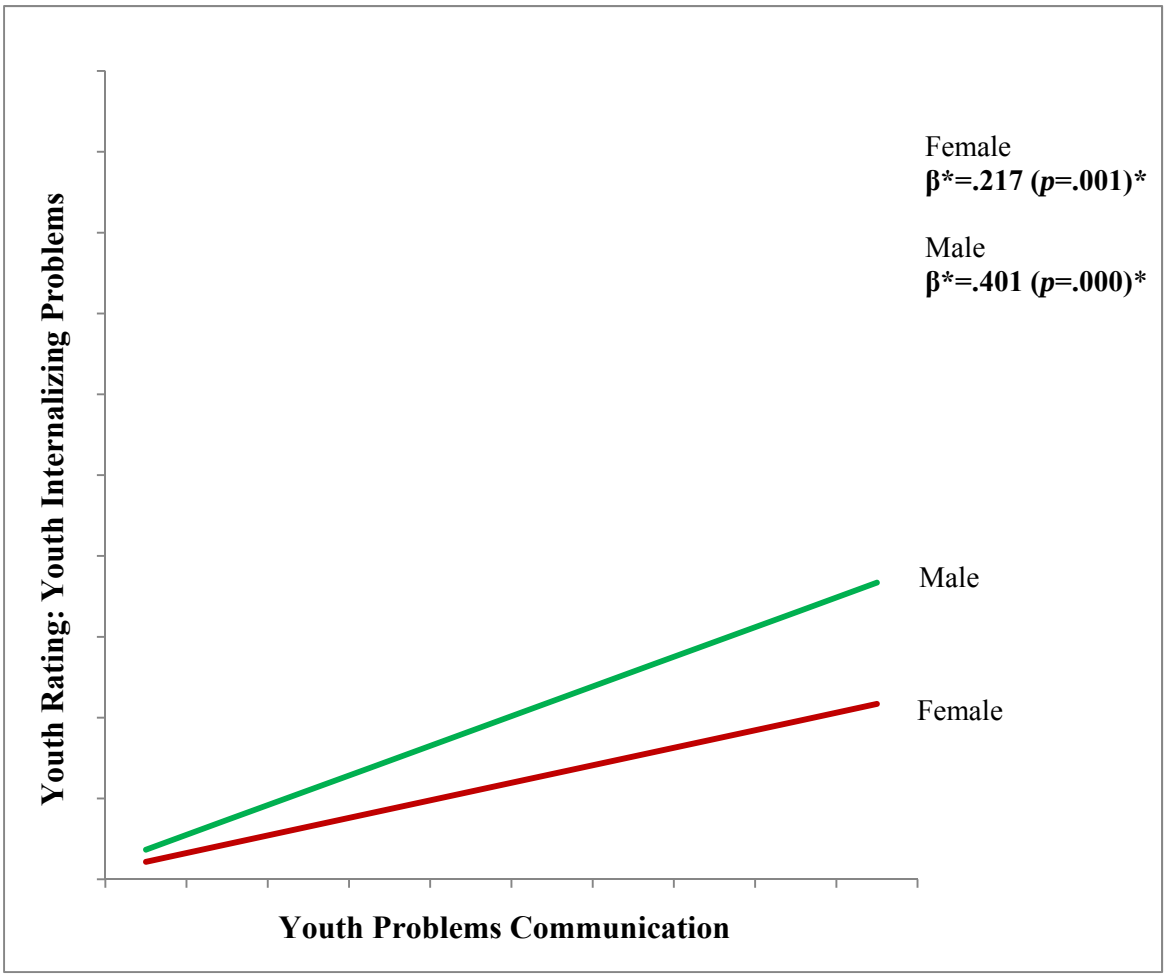
Figure 4.9
The Sex Interaction of the Association between Youth Problems Communication and Youth Rating: Youth Externalizing Problems.



Note

β*= Unstandardized Estimate

Figure 4.10
The Sex Interaction of the Association between Youth Problems Communication and Youth Rating: Youth Internalizing Problems.



Note

β*= Unstandardized Estimate

Chapter 5: Discussion

The main purpose of this study was to answer the question about whether the quality of Thai youth-mother communication (open versus problematic) can be a mediating process between youth pubertal timing, particularly off timing (early or late) and youth mental health. This study filled an important gap in research by documenting the relationship among these variables from two perspectives (e.g., Thai youth and their mothers). It also included separate analyses for male and female youth to determine whether the sex differences found in the research done in Western cultures would be found in Thai youth.

Pubertal Timing and Youth Mental Health

The first major finding was that Thai female youth with early pubertal timing did not report more externalizing and internalizing problems than those with late or on time pubertal timing. However, female youth with late pubertal timing reported fewer externalizing and internalizing problems. Therefore, this finding suggests that late pubertal onset can be a protective factor for Thai female youth relative to their mental health. This finding was consistent with the findings from other research that showed late pubertal onset was associated with fewer socio-emotional problems and better academic performance (Dubas, Graber, & Petersen, 1991; Mendle & Ferrero, 2012; Mendle, Turkheimer, & Emery, 2007; Stattin & Magnusson, 1990). By contrast, pubertal timing in Thai males did not play a significant role related to youth mental health problems. This finding is contrary to other studies that found late pubertal timing in males to be associated with psychosocial problems (Crocket & Petersen, 1987; Simmons & Blyth, 1987) and studies that found males with early pubertal timing had more problems with externalizing and internalizing problems than on time or late onset (Huddleston & Ge, 2003; Mendle & Ferrero, 2012). However, most of those studies were conducted in

Western countries. The two studies conducted in Asian countries had mixed findings relative to pubertal timing and youth psychosocial development. No studies could be found that compared Asian and Western youth. These earlier studies found that early pubertal onset (Hsu, Dorn, & Sereika, 2010; Lam et al., 2002) and on-time onset (Lam et al., 2002) in females were associated with externalizing problems. Females with early onset were also found to have more internalizing problems than females with on-time or late onset (Hsu, Dorn, & Sereika, 2010). These findings are similar to the findings in this study in which fewer internalizing and externalizing problems were reported by females with late onset. In one Asian study (Lam et al., 2002), males with early pubertal onset were found to have more externalizing problems than those with on-time or late onset which is different from the finding of this study which showed no relationships.

One explanation for the findings in the current study of Thai males and females (ages 12-14) is that pubertal changes in body shape are less visible among Thai youth as compared to the youth in Western countries. Additionally, in Thailand there is a rule requiring all students to wear uniforms in school. These uniforms are modest-looking and de-emphasize body shape. Thus, secondary sex characteristics are not as noticeable in these uniforms as they are in clothing worn by youth in Western cultures. Wearing school uniforms might be a factor contributing the findings of this study because youth are less likely to compare their own growth and development with peers when body changes are less visible. However, further study is needed to be explored these cultural differences.

Another explanation for the differences in the finding of this study as compared to studies conducted in Western cultures is the differences between collectivism found in the Thai culture as compared to individualism common in Western cultures that can affect the quality of parent-

child communication. The quality of communication tended to be more important than pubertal timing. When that communication was favorable, it served as a protective factor relative to Thai youth mental health. Perhaps, Thai parents react to their pubescent children in ways that are different from Western parents and serve to protective the youth form stresses associated with the developmental transition to adolescence. This cultural difference can also explain why the MEM model may not be appropriate for the Thai culture.

Quality of Youth-Mother Communication

The second major finding was that the quality of youth communication was not a mediating factor between pubertal timing and mental health problems in Thai youth. Given that this was the first study to test this mediational model, there were no other studies against which to compare the finding. One explanation for this finding might be the cultural context described in the previous paragraph. Another explanation could be the small sample size in this study. After categorizing data by pubertal timing (early, on-time and late) and youth sex, the resulting cell sizes were even smaller. Therefore, additional research is needed with larger sample sizes.

Although the quality of communication was not found to be a mediating factor, it was found to have a direct effect on youth mental health among males and females. In fact, the quality of communication proved to be more important than pubertal timing in its relationship to youth mental health as reported by youth and their mothers. The findings of relationships between the quality of youth-mother communication and youth mental health were similar previous studies (Davidson & Cardemil, 2009; Frampton, Jenkins, & Dunn, 2010; Hartos & Power, 2000; Houck, Rodrigue, & Lobato, 2007; Shek, 2005; Vuchinich, Ozretich, Pratt, & Kneedler, 2002; Xiao, Li, & Stanton, 2011). Another interesting finding was that mothers tended to report better communication and fewer problems than youth. This finding suggests, Thai

youth could be experiencing more serious mental health problem than their mothers recognize. Parents need to pay attention to the psychosocial need of their children during pubescence, a critical time in child development. Thus, future mental health research with Thai families should focus on ways to improve the communication between youth and their mothers.

Sex Differences

The third major finding came from the stacked model. Male youth who experienced poor communication with their mothers tended to report more externalizing and internalizing problems than female youth who experienced poor communication with their mothers. Another sex difference was found in the type of communication associated with youth metal health. When mothers perceived their communication with their daughters to be open, they (mothers) tended to observe fewer externalizing problems in their daughters. Whereas, when mothers perceived their communication with their sons to be problematic, they (mothers) tended to observe externalizing problems in their son. The findings from the current study depart from other research in that females in this study were less likely to report internalizing problems than previously reported. There were no significant paths between mothers' reports about communication and mother observations of youth internalizing problems in their daughters or sons. Findings suggest that mothers were more aware of their children's acting out behavior, which is visible, than they were aware of their children's' internal symptoms, such as sadness or anxiety, that require the youth to verbally describe. If communication between mother and child is poor, it is unlikely that the child would share such information, and therefore, the mother remains unware of such symptoms. Previous research that examined relationships between youth-parent communication and youth mental health generally mixed the data from male and female youth in their analyses. Therefore, the findings from this study build on previous work by

documenting sex differences associated with the quality of parent-youth communication within a sample of Thai families. Additionally, the finding of more externalizing and internalizing problems in males than females is consistent with previous research Tohkani (2011). Tohkani (2011) attributed the higher mental health problems to the violent political unrest within the region. Therefore, it is possible that the higher rates of self-reported mental health problems in males than females in the current study are related to political unrest.

Theoretical Foundation

This investigation was based by two theories. The Mediated Effects Model (MEM; Petersen & Taylor, 1980) informed the hypotheses about youth pubertal timing, youth-mother communication, and youth externalizing and internalizing problems, whereas the Circumplex Model (Barnes & Olson, 1985) informed the hypotheses about youth-mother communication. The MEM proposes that adolescents who are in off-time in their maturation, either early or late, compared to on-time maturation are in a *deviance* position and may experience some negative social effects (Petersen & Taylor, 1980). Based on the findings from this study, pubertal timing was not associated with Thai youth mental health problems. Only late pubertal timing in female youth showed a significant association with youth ratings of their mental health. Female youth classified as late pubertal timing reported fewer mental health problems than those with early or on-time development. Therefore, the relationship between the off-timing maturation and youth mental health in this study did not support MEM.

Furthermore, when the results showed no association between pubertal timing and youth mental health, the quality of youth-mother communication was not a mediating factor between youth pubertal timing and mental health as proposed by the MEM. In other words, MEM does not provide a suitable conceptual explanation for the findings in this study.

The Circumplex model was used to explain hypothesis about youth-mother communication. Although the quality of youth-mother communication was not found to be a mediating factors, other analyses showed that the quality of youth-mother communication had a direct effect on youth mental health. Mothers and youth (male and female) reports showed that more effective communication was associated with fewer mental health problems among youth. These findings supported the proposition that family communication plays an important role in relationships between youth and their mothers within the family which can ultimately affect youth psychological development. In other words, open youth-mother communication can serve as a protective family factor in the child's development. Although the Circumplex model was developed within Western cultures and limited in its use Asian cultures (Bhushan & Shirali, 1992), Korean (Cha, Kim, & Erlen, 2007; Shin, Choi, Kim, & Kim, 2010), and Japan (Nagamatsu, Saito, & Sato, 2008), the findings in this study support application to research with Thai families, particularly related to communication,

Strengths

This study was the first to combine the two theoretical models (MEM and Circumplex Model). Although findings did not support the MEM, this study was theoretically based and findings supported the Circumplex Model. Thus, this study suggests the Circumplex Model may be a useful framework for family research in Thailand.

Additionally, this study used dyadic data to gain the perspective of both youth and their mothers. Major variables (mediator and outcomes) collected from both youth and their mothers were included in the path analysis to provide a clearly understanding about the concordance and discordance between youth and their mothers' perspectives.

The study included standardized instruments with strong psychometric properties. This was also the first study Thai versions of the YPACS, MPACS, and PDS were used. The PI established the cross-cultural equivalence for these two instruments.

Finally, the PI, who is Thai, made every effort to assure the cultural sensitivity as well as scientific integrity of the study.

Limitations

The convenience sampling used to recruit participants could have led to sample biased. Given inclusion criteria that required mothers to be able to read and write in Thai, might have limited the enrollment of more educated families. In fact, the mothers in the sample were highly educated. The data that had to be excluded because the forms were incomplete mainly came from less educated mothers who might have been unable to read the material. Data were obtained from only two schools in one province which may limit the generalizability of these findings. The cross-sectional approach limits the ability to draw causal inferences about the findings. The self-report measurements of pubertal timing might be biased by youth attempts to give socially desirable responses.

The design that involved classifying youth pubertal timing into three categories and analyzing data by youth sex resulted in having small numbers in some cells and limited the statistical power. Furthermore, there is still a gap in the literature regarding the application of this conceptual model and use of the PDS in Asian cultures. Although the process of growth development in adolescence is not different physiologically, there are some differences among racial and ethnic groups. For example, there are differences between Asian and American females in the age of first menarche, and differences between Western and Eastern cultures in

youth' perceptions of their body image. These differences call for caution about drawing generalizations from this study to other cultures.

Another limitation was the limited use of the PDS (Petersen & Taylor, 1980) in the Thai culture. Only one publication that applied the PDS to an Asian sample (Chan et al., 2010) was found. Theoretical frameworks and culturally appropriate instruments are needed to advance family research in Asian countries.

Limited resources prevented the inclusion of fathers in this study. Future family research, particularly related to family communication and relationship, should include fathers as well as mother.

Implications for Research and Practice

Although this study did not find the quality of youth-mother communication to be a mediating factor between youth pubertal timing and youth mental health, it identified communication as an important factor associated with youth mental health. This finding is extremely useful. The timing of puberty is a physiologic process that may largely be controlled by genetic factors, while communication is a social process that can be the focus of psychosocial intervention. These finding calls for future research designed to improve communication between Thai mothers and their pubescent children to prevent or reduce mental health problems. Additional research is also needed to identify causal factors for sex differences in youth mental health problems. Given the limited literacy of many Thai parents, future studies of Thai families should include data collection procedures that will allow parents with limited literacy to participate. For example, parents might be given the option of reading the instrument themselves or having someone read it to them. Another option would be for the data collection to be done completely by interview. Future studies might also include a larger sample and families from

different regions of the country which would allow for greater generalizability of the findings. Although the Circumplex model was supported by the findings from this study, the MEM was not. Most conceptual frameworks used in nursing research were developed within Western cultures and therefore might be culture-bound. More research is needed to explore Thai parenting during pubescence to gain an understating of protective factors associated with youth mental health during the transition to adolescence. The role of Thai fathers in communicating and parenting their pubescent children needs to be examined with particular emphasis on relationships to youth mental health.

This study is only cross-sectional by design. Therefore, future study with better design such as longitudinal design and better control of confounders are needed to confirm our findings. If future study with better design finds similar results like my study, intervention studies should be considered to improve quality of youth-mother communication to reduce mental health problems among Thai youth.

Only mothers were included in this study. However, youth relationships with their fathers may also contribute to youth mental health. Future studies need to include father to gain an understanding of their contributions to youth psychosocial development. New improved ways of categorizing pubertal timing are needed to eliminate the problem of small cell size. Mothers who cannot read were excluded from this study, therefore, intervening method should be used in the future to collect data from mother with low education level to improve generalizability of the findings.

Future studies should also explore the association of pubertal timing and quality of youth-parent communication on other common problems associated with early adolescence, such as teen pregnancy, substance abuse and delinquency.

Conclusion

This study is the first to test the influence of pubertal timing, quality of youth-mother communication, and youth mental health in the Thai population. Two conceptual frameworks, MEM and Circumplex Model, guided the hypothesized relationship among these variables. Findings revealed that pubertal timing in Thai males is not a predictive factor associated with youth mental health, whereas late pubertal timing in females may be a protective factor related to mental health. The quality of youth-mother communication proved to be an important predictive factor for youth mental health. Males were more likely than females to have both externalizing and internalizing problems when youth-mother communication was poor. This study suggests a critical need for theoretical frameworks that are contextualized for Asian cultures, research that includes fathers, and intervention research that focuses on improving the quality of mother-child communication.

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Appendicies

Appendix 1. Script 1 – First meeting with youth at two schools

UNIVERSITY OF WISCONSIN-MADISON AND PRINCE OF SONGKLA UNIVERSITY

Script 1 – First meeting with youth at two schools

Title of the Study: Thai Youth-Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health

Principal Investigator: Audrey Tluczek, PhD, RN (phone: 1-608-263-6111)

Co-Principal Investigator (PhD Candidate): Treenut Pummanee, PhD Candidate, MS, RN (phone: 1-608-957-9477), email: pummanee@wisc.edu

Collaborating Researcher (In Thailand): Jitlada Piriyasart, PhD student, MS, RN (Phone: 081-9904916), email: jitlada.ying@gmail.com

Mailing Address: Jitlada Piriyasart, PhD student, MS, RN
School of Nursing, Prince of Songkla University, Pattani Campus, Building # 4
Jareurn Pradit Road, Rusamelae Muang Pattani, Thailand 94000

INTRODUCTION

Hello. My name is Jitlada Piriyasart. I am a collaborating researcher from the study "Thai Youth-Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health" which is exploring the quality of youth-mother communication in the Southern part of Thailand. The primary investigator (PI) is Professor Audrey Tluczek and her Co-PI is PhD student, Treenut Pummane who was born and raised in this province. We are conducting research on behalf of the School of Nursing, at the University of Wisconsin-Madison in the USA and School of Nursing, at the Prince of Songkla University, Thailand.

WHY I (RESEARCH ASSISTANT) WANT TO MEET YOU

Based on our study which is exploring the quality of youth-mother communication and another variable that relates to youth mental health, we would like to collect data from around 200 dyads that include both adolescents between 12 and 14 years old and their mothers. Thus, you and your mother are our target group so we would like to invite you to participate in this study.

You and your mother are invited to participate in this research study to help us explore the quality of Thai youth-mother communication and the process of youth pubertal timing which relates to youth mental health in the southern part of Thailand.

WHAT YOU CAN DO

Although we need to collect data for this study from youth, it is very most important that I ask permission from each youth's mother to give me the right to collect data from her son or daughter in school. Thus, you can help me by taking one package which contains the following three documents: (1) a cover letter to invite your mother to participate in this study and to ask for her permission to allow you to participate, (2) a consent form for your mother to complete that indicates that she is willing to participate and to give permission for you to participate, and (3) a description of the study instruments.
Once your mother receives this package, she can read all of the information and instructions to guide her through the process of this study. Because we want your mother to send this package back to us via mail, you do not need to bring this package back to us.

HOW YOU CAN HELP

Because I want to make sure that all of the information I give in each package is understandable for your mother at home, we would like to have your name, surname, and your mother's telephone number or/and your address so we can contact her to guide her through the process while doing this study or answer any questions. So, could you please write this information on the paper (show the paper to students)? I promise to only use this information to contact your mother about this study. If you have any questions, please don't hesitate to ask me. Thank you very much.

WHEN I WILL RETURN

I will come back again within two weeks after your mother returns all of the information to me by mail which should include permission from her to collect data from you (her son or daughter) at school.

I will make an appointment with your teacher and she will tell you the exact date that I will return.

FURTHER QUESTIONS
Do you have any questions about all of these details? Please let me know.

Although you may not have questions right now, you can call me anytime at 081-9904916 with further questions or write me at Jitlada Piriyasart, School of Nursing, Prince of Songkla University, Pattani Campus, Buliding# 4 Jareurn Pradit Road, Rusamelae Muang Pattani, Thailand 94000. I am also giving you my name card so you can contact me anytime

Thank you very much.

Have a good day!

Good bye

Appendix 2. Script 2 – Second Meeting with Youth at Two Schools

UNIVERSITY OF WISCONSIN-MADISON

Script 2 – Second meeting with youth at two schools

Title of the Study: Thai Youth-Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health

Principal Investigator: Audrey Tluczek, PhD, RN (phone: 1-608-263-6111)

Co-Principal Investigator (PhD student): Treenut Pummanee, PhD Candidate, MS, RN (phone: 1-608-957-9477), email: pummanee@wisc.edu

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INTRODUCTION

Hello. Do you remember me? My name is Jitlada Piriyasart. I am a research assistant from the study "Thai Youth-Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health" which is exploring the quality of youth-mother communication in the southern part of Thailand. The primary investigator (PI) is Professor Audrey Tluczek and her Co-PI is PhD student, Treenut Pummane who was born and raised in this province. We are conducting research on behalf of the School of Nursing, at the University of Wisconsin-Madison in the USA.

PURPOSE OF THIS SECOND MEETING

This is my second time to meet you. As I told you the last time, once I received permission from your mother to allow me to collect data from you at school, I would return to invite you to participate in this study.

Although your mother has already given me permission to collect data from you, we still need to ask for your permission individually, so please let me know whether or not you want to participate in this study.

HOW YOU CAN RECEIVE MORE INFORMATION ABOUT THIS STUDY

Please see the assent form that I gave you to study. This assent form gives important information about this study and finally asks your permission to participate in this study. I will give you about 7 minutes to read the form and to ask any questions about this form. If you need more time, let me know.

(Give them 7 minutes to read the assent form and ask if they need more time.)

ASKING FOR PARTICPATION

Now that you have read all of the information on the assent form, if you want to participate in this study, please check the "YES" box and we will start doing the five questionnaires as soon as we can.

If you do not want to participate in this study, please check the "NO" box and leave all the papers on the table and you can leave the room without any penalty or questions from me or from your teacher.

It has been a pleasure meeting you today.

THE PROCESS OF COLLECTING DATA

Right now, we can start to do the questionnaires. Let me explain the questionnaires.

There are five questionnaires that you will need to fill in. It will take around 40-50 minutes to complete all of the questionnaires. I will give you time to do these questionnaires by yourself. Please don't disturb your friends while they do their questionnaires. Please don't share your information with others. If you have any question, please raise your hand and I will come over to you. Once you finish your questionnaires, please put all of the papers in your envelope and leave the envelope on your table. I will pick up each of your envelopes.

Go ahead and fill in the questionnaires.

(Give time to complete the questionnaires. After 30-40 minutes, ask if they need more time.)

AT THE END

Everybody is done with the questionnaires, right? (Wait for responses.) Thank you very much for your participation in this study.

If you have any questions after you leave about the information in the assent form of this study or any question, please feel free to contact me. Thank you very much again and have a good day!

Appendix 3. Recruitment Letter for Youth's Mother

UNIVERSITY OF WISCONSIN-MADISON

Recruitment letter for youth's mother

Title of the Study: Thai Youth-Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health

Co- Principal Investigator (PhD student): Treenut Pummanee, PhD Candidate, MS, RN (phone: 1-608-957-9477), email: pummanee@wisc.edu

Research Assistant (In Thailand): Jitlada Piriyasart, PhD student, MS, RN (Phone: 081-9904916), email: jitlada.ying@gmail.com

Mailing Address: Jitlada Piriyasart, PhD student, MS, RN
School of Nursing, Prince of Songkla University, Pattani Campus, Buliding# 4
Jareurn Pradit Road, Rusamelae Muang Pattani, Thailand 94000

Treenut Pummanee, PhD Candidate, MS, RN
phone: 1-608-957-9477),
email: pummanee@wisc.edu

Dear Mother of an adolescent:

My name is Treenut Pummanee, a PhD student from the School of Nursing, at the University of Wisconsin-Madison in the USA. I am conducting a study titled "Thai Youth-Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health" which aims to explore how youth pubertal timing or the quality of youth-mother communication affects youth mental health. For this study we need to collect data from both youth ages 12-14 years old and their mothers. Thus, I am sending this letter to you because your child is between 12-14 years old, and I would like to invite you and your child to participate in this study.

Enclosed with this letter are the consent form and all of the questionnaires. Please read all of the details about this study on the consent form and follow the instructions. Because this study needs your permission to allow your child to participate, if you decide that you and your child would like to participate in this study, please check the "YES" box for yourself and check the "YES" box for your child on the consent form, and then complete all four attached questionnaires.

If you decide you would not like to participate in this study, you can check the "NO" box for you and also check the "NO" box for your child, and there is no need to do any questionnaires.

However, whether or not you decide to participate in this study, please send all of the information back to my research assistant using the envelope enclosed in the packet. Her address is already on the envelope. We would appreciate it if you could return the envelope and information no later than 2 weeks after you receive this letter.

If you have any questions about this study, please feel free to contact my research assistant at her telephone number 081-990-4916. Again, thank you very much for your participation.

Sincerely,

Treenut Pummanee
PhD Candidate, MS, RN (phone: 1-608-957-9477), email: pummanee@wisc.edu

Appendix 4. Subject CONSENT to Participate in Research and Consent form for the Mother to Give Permission for the Child to Participate in Research

UNIVERSITY OF WISCONSIN-MADISON

Subject CONSENT to Participate in Research
and
Consent form for the mother to give permission for the child to participate in research

Title of the Study: Thai Youth-Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health

Principal Investigator: Audrey Tluczek, PhD, RN (phone: 1-608-263-6111)
Co-Principal Investigator (PhD student): Treenut Pummanee, PhD Candidate, MS, RN (phone: 1-608-957-9477), email: pummanee@wisc.edu
Research Assistant (In Thailand): Jitlada Piriyasart, PhD student, MS, RN (Phone: 081-9904916), email: jitlada.ying@gmail.com

Mailing Address: Jitlada Piriyasart, PhD student, MS, RN
School of Nursing, Prince of Songkla University, Pattani Campus, Building #4
Jareurn Pradit Road, Rusamelae Muang Pattani, Thailand 94000

INVITATION

You are invited to participate in this research study to help us explore the quality of Thai youth-mother communication and the process of youth pubertal timing which relates to youth mental health in the southern part of Thailand. You are invited to take part because your child is an adolescent youth. Approximately 200 youth-mother dyads will participate in this study.

Your participation in this research study is voluntary. If you decide not to participate, your child's school benefit, your child, or your family will not be affected in any way.

A. WHAT IS THE PURPOSE OF THIS STUDY?

The purpose of this research is to help us understand how youth pubertal timing or the quality of youth-mother communication affects youth mental health. Furthermore, we want to test whether the quality of Thai youth-mother communication can be a mediator between pubertal timing and youth mental health.

B. WHAT WILL MY PARTICIPATION INVOLVE?

If you decide to participate in this research, please read the four questionnaires. The details in the questionnaires are about your child's behavioral health, the style of communication with your child, your quality of life, and information about your background, such as age, education, and marital status.

These questionnaires will take about 30 minutes to complete. You can read the instructions in each questionnaire, and they need to be completed with a pen or pencil. If you have any questions about the questionnaire, please feel free to contact the research assistant in this study by telephone, email, or mail at the address listed above.

You will be asked to complete the four study questionnaires within two weeks and mail them along with the consent form to the research assistant. A self-addressed, stamped envelope is attached.

The questionnaires will be kept for seven years after the end of this study before they are destroyed.

We will also collect the following information about you and your child for this research study:

1. From you about you: age, marital status, number of family members living in your home in the 12 months prior to completing the data collection. In addition, you will be asked about your family size, household income per month, highest education, your current job, and religious affiliation. You will also be asked for your name and current address so we can send you money as a gift for participation. All of this information will be kept completely confidential.

2. From you about your child:
Your child's name, school name, grade level, age, gender, and religious affiliation. The questionnaire will also ask for your opinion about your child's behavioral health, and if you give permission for us to collect data from your child at school.

C. WHAT WILL MY YOUTH CHILD PARTICIPATION INVOLVE?

If you allow your child to participate in this study, you can give permission with this consent form. However, the final decision about whether or not to be part of this study will be determined by your child before collecting the data at his/her school.

If your child agrees to participate in this study, he/she will read the five questionnaires. For example, the questionnaires are about his/her growth and development, behavioral health, style of communication with his/her mother, stressful life events, and background information such as age, sex, date of birth, grade level, and religious affiliation. This information will be kept completely confidential.

These questionnaires will take 40-50 minutes to complete. The research assistant will be available to help your child complete all the questionnaires at school. He/she can read the instructions for each questionnaire, and they need to be completed with a pen or pencil.

If you have any questions about your child completing the questionnaires at school, please feel free to contact the research assistant for this study by telephone, email, or mail at her address listed above.

D. ARE THERE ANY BENEFITS TO ME AND MY CHILD?

There are no expected direct benefits to you and your child from participating in this study. We hope the information learned from this study will benefit Thai youth and mothers through the important gathered information to help improve relationships between mothers and youth who live in the southern part of Thailand. We hope the information will also guide us to decrease youth mental health problems in the southern part of Thailand.

E. WILL I OR MY YOUTH CHILD BE PAID FOR MY PARTICIPATION?

You will receive $4 for participating in this study. After we receive your completed questionnaires by mail, we will send the money immediately to the address you give on the questionnaire. However, your child will not be paid for participation.

F. ARE THERE ANY SIDE EFFECTS OR RISKS TO ME AND MY YOUTH CHILD?

The main risk of taking part in this study is that your and your child's information could become known to someone who is not involved in performing or monitoring this study, but the chances that this will happen are very small. We are taking every effort to keep your information private and confidential.

This study takes about 30 minutes to complete the questionnaires. Some of the questions seem personal, such as questions about your feelings when you communicate with your child. If you feel uncomfortable with any of the questions, you can skip that question. If you have any questions about a particular question, please feel free to contact the research assistant by telephone, email, or mailing at the address listed above.

This study will take about 40-50 minutes of your child's time to complete the questionnaires at school. Some of the questions seem personal, such as questions about his/her growth and development and feelings when he/she communicates with his/her mother. However, the research assistant will observe and help him/her to do this process. If the research assistant detects that your child is uncomfortable with any of the questions, he/she has right to skip that question and ask the research assistant any questions.

G. HOW WILL MY CHILD'S PRIVACY BE PROTECTED AND WHO WILL USE MY INFORMATION?

We will take considerable effort to keep your and your child's information confidential. Your and your child's personal identifying information will be coded and only researchers involved in this study will have access to the information. Your and your child's answers will only be reported as part of the entire group of people who took part in this study. Information obtained through this study, including your and your child's results may be presented at professional meetings and published so that it may be useful to others. However, you and your child will not be identified in any written or oral presentations of the results from this study.

The information collected from you and your child during this study will be used by the researchers and research staff of the UW-Madison. It may also be shared with others at the UW-Madison.

If your youth is judged by the research assistant to have behaviors that may put him/her or others at risk of harm, the research assistant will report these concerns to the Co-PI immediately or no longer than 24 hours. The Co PI and the research assistant will make a decision about whether to report the concern to school principal and youth's mother.

Others at UW-Madison and its affiliates who may need to use your and your child's information in the course of this research:

• UW-Madison regulatory and research oversight boards and offices

H. IS MY PERMISSION VOLUNTARY AND MAY I CHANGE MY MIND?

Your permission is voluntary. No signatures will be required for this study. If you want to participate in this study, you will be asked to check "YES" to indicate that you consent to take part in the study. If you don't want to participate in this study, you will be asked to check "NO" to indicate that you don't want to participate in this study. If you check "NO," however, you cannot take part in this research study and your child cannot take part in this study too

In additional, if you want your child to participate in this study, you will be asked to check "YES" to indicate that you give permission for your child to take part in the study. If you don't want your child to participate in this study, you will be ask to check "NO" to indicate that you don't want him/her to participate in this study.

IF YOU DECIDE NOT TO PARTICIPATE IN THIS STUDY OR IF YOU STOP WHILE THE STUDY IS UNDERWAY, YOUR CHILD'S SCHOOL BENEFIT AND ITS AFFILIATES OR YOU AND YOUR YOUTH CHILD WILL NOT BE AFFECTED IN ANY WAY.

I. HOW LONG WILL MY PERMISSION TO USE MY INFORMATION LAST?

By checking "YES" in this form, you are giving permission for your information to be used by and shared with the individuals, companies, or institutions described in this form. Unless you withdraw your permission in writing to stop the use of your information, there is no specified end date for its use for this research study. You may withdraw your permission at any time by writing to the person whose name is listed below:

Treenut Pummanee
School of Nursing, University of Wisconsin-Madison
K6/117 CSC, 600 Highland Ave. Madison WI 53792, USA

Jitlada Piriyasart, PhD student, MS, RN
School of Nursing, Prince of Songkla University, Pattani Campus, Buliding# 4
Jareurn Prasdit Road, Rusamelae Muang Pattani, Thailand 94000

Beginning on the date you withdraw your permission, no new information about you will be used. Any information that was shared before you withdraw your permission will continue to be used. If you withdraw your permission, you can no longer actively take part in this research study.

J. WHO SHOULD I CONTACT IF I HAVE QUESTIONS?

Please take as much time as you need to decide whether or not you wish to participate. If you have any questions about this study at any time, contact the research assistant in Thailand **Jitlada Piriyasart, PhD student, RN at 081-9904916**

If you are not satisfied with the response of the research team, have more questions, or want to talk with the Co-Principle Investigator (PhD student) in the USA, contact Treenut Pummanee at 1-608-695-9477 or email address at pummanee@wisc.edu.

AGREEMENT TO PARTICIPATE IN THIS STUDY
AND
CONSENT FORM FOR THE MOTHER TO GIVE PERMISSION FOR THE CHILD TO PARTICIPATE IN RESEARCH

I have read this consent and authorization form describing the research study procedures, risks, and benefits, what personal information will be used, and how my personal information will be used. I have had a chance to ask questions about the research study, including the use of my personal information, and I have received answers to my questions. I agree to participate in this research study, and permit the researcher to use my personal health information and my child's personal information as described above.

Name of Mother:_____
(Please print)

( ) YES _____
Check mark "YES" if you want to participate **Date**

( ) NO _____
Check mark "NO" if you don't want to participate **Date**

Name of Mother's child:_____
(Please print)

( ) YES _____
Check mark "YES" if you want your child to participate **Date**

( ) NO _____
Check mark "NO" if you don't want your child to participate **Date**

I give permission to contact me with my address for any future contact.
( ) YES ( ) NO

Parents' Telephone Number:_____

Best Time to call:_____

Mailing address:_____

_____

Appendix 5. Subject ASSENT to Participate in Research

UNIVERSITY OF WISCONSIN-MADISON

Subject ASSENT to Participate in Research

Title of the Study: Thai Youth-Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health

Principal Investigator: Audrey Tluczek, PhD, RN (phone: 1-608-263-6111)
Co-Principal Investigator (PhD student): Treenut Pummanee, PhD Candidate, MS, RN (phone: 1-608-957-9477), email: pummanee@wisc.edu
Research Assistant (In Thailand): Jitlada Piriyasart, PhD student, MS, RN (Phone: 081-9904916), email: jitlada.ying@gmail.com

Mailing Address: Jitlada Piriyasart, PhD student, MS, RN
School of Nursing, Prince of Songkla University, Pattani Campus, Buliding# 4
Jareurn Pradit Road, Rusamelae Muang Pattani, Thailand 94000

INVITATION

You are invited to participate in this research study to help us explore the quality of Thai youth-mother communication and the process of youth pubertal timing which relates to youth mental health in the southern part of Thailand.

You are being asked to join the study because you are an adolescent who can give us direct information about how youth growth and development relates to the quality of youth-mother communication and youth mental health.

Your participation in this research study is voluntary. If you decide not to participate, your school benefit, you or your family will not be affected in any way.

A. WHAT IS THE PURPOSE OF THIS STUDY?

We want to tell you about a research study we are doing. A research study is a way to learn more about something. We would like to find out more about how youth growth and development or quality of youth-mother communication affects youth mental health.

B. WHAT WILL MY PARTICIPATION INVOLVE?

If you agree to join this study, you will be asked to do five questionnaires. These questionnaires will take 40-50 minutes to complete. The research assistant will help you complete all of the questionnaires during the class. You can read the instructions in each questionnaire and they need to be completed with a pen or pencil.

If you have any questions while completing the questionnaires, please feel free to ask the research assistant.

C. ARE THERE ANY BENEFITS TO ME ?

We do not know if being in this study will benefit you directly. We hope the information learned from this study will guide us with important information to improve relationships between other mothers and youth who live in the southern part of Thailand. We hope the information also can guide us to decrease youth mental health problems in the southern part of Thailand.

D. ARE THERE ANY SIDE EFFECTS OR RISKS TO ME ?

This study will take about 40-50 minutes to complete the questionnaires. Some of the questions seem personal, such as questions about your growth and development and feelings when you communicate with your mother. If you feel uncomfortable with any of questions, you have the right to skip that question and/or stop doing the questionnaire anytime without penalty.

If your questionnaire is judged by the research assistant to have behaviors that may put you or others at risk of harm, the research assistant will report these concerns to the Co-PI immediately or no longer than 24 hours. The Co PI and the research assistant will make a decision about whether to report the concern to school principal and your mother.

You do not have to join this study. It is up to you. You can say okay now and change your mind later. All you have to do is tell us you want to stop. No one will be mad at you if you don't want to be in the study or if you join the study and change your mind later and stop.

Before you say **yes or no** to being in this study, we will answer any questions you have. If you join the study, you can ask questions at any time. Just tell the research assistant that you have a question.
If you have any further questions about this study, please feel free to contact the **Co- Principal Investigator (PhD student):** Treenut Pummanee, PhD Candidate, MS, RN (phone: 1-608-957-9477), email: pummanee@wisc.edu

( ) Yes, I will be in this research study. ( ) No, I don't want to do this.

_____	_____	
Child's name (Print)	Date	
_____	_____	_____
Person obtaining Assent	Signature	Date

Appendix 6. Letter Asking Permission to Use the Thai Versions of the Child Behavioral Check List and Youth Self-Report

May 27, 2014
Dr. Orawan Louthrenoo
Department of Pediatrics, Faculty of Medicine
Chiang Mai University
Chiang Mai, 50200, Thailand

Dear Dr. Louthrenoo,

I am a doctoral candidate from the School of Nursing at the University of Wisconsin-Madison. My dissertation entitled, Thai Youth Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health, is being supervised by my dissertation committee chair Dr. Audrey Tluczek, Associate Professor at the School of Nursing, University of Wisconsin-Madison.

I would like your permission to use the Thai version of the Child Behavior Check List and the Youth Self-reportThai version copy right by year 2001 forms based on the original English version copy right by year 2001 by ProfessorThomas Achenbach from Achenbach System of Empirically Based Assessment (ASEBA)in my dissertation study.

I would like to use and print thissurvey under the following conditions:

☐ I will use this survey only for my research study and will not sell or use it with any compensated or curriculum development activities.

☐ I will include the copyright statement on all copies of the instrument.

☐ I will send my research study and one copy ofreports, articles, and the like that make use of these survey data promptly to your attention.

If these are acceptable terms and conditions, please indicate so by signing one copy of this letter and returning it to me by email.

Sincerely,
Treenut Pummanee.

TreenutPummanee
Doctoral Candidate, School of Nursing,
University of Wisconsin-Madison
K 6/117 CSC, 600 Highland Ave.
Madison WI 53792
Email: pummanee@wisc.edu

.....

Expected date of study completion:12/30/14
grant permission requested on the terms stated in this letter.
Credit line to be used:
1: Child Behavior Checklist 6-18 (CBCL 6-18) Thai Version(copy right year 2001)
2: Youth Self Report 11-18 (YSR 11-18) Thai Version (copy right year 2001)
Agreed to and accepted (Please sign)

Orawan Louthrenoo
(Orawan Louthrenoo, MD)

Date: May 28th, 2014

Appendix 7. Letter Asking Permission to Use the Parent-Adolescent Communication Scale

May 27, 2014
Dr. David H. Olson
Life Innovations/PREPARE-ENRICH
2660 Arthur Street
Roseville, MN 55113

Dear Dr. Olson,

I am a doctoral candidate from the School of Nursing at University of Wisconsin-Madison. My dissertation entitled, Thai Youth Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health, is being supervised by my dissertation committee chair, Dr. Audrey Tluczek, Associate Professor at the School of Nursing, University of Wisconsin-Madison.

I would like your permission to use the Parent-Adolescent Communication Scale (2003) in my dissertation study.I would like to use and print this survey under the following conditions:

☐ I will use this survey only for my research study and will not sell or use it with any compensated or curriculum development activities.

☐ I will include the copyright statement on all copies of the instrument.

☐ I will send my research study and one copy of translated in Thai version, reports, articles, and the like that make use of these survey data promptly to your attention.

If these are acceptable terms and conditions, please indicate so by signing one copy of this letter and returning it to me by email.

Sincerely,
Treenut Pummanee.

Treenut Pummanee
Doctoral Candidate, School of Nursing,
University of Wisconsin-Madison
K 6/117 CSC, 600 Highland Ave.
Madison WI 53792
Email: pummanee@wisc.edu

.....

Expected date of study completion: 12/30/14
grant permission requested on the terms stated in this letter.
Credit line to be used:
1: Parent-Adolescent Communication Scale; Adolescent and Mother Form 2003
2: Parent-Adolescent Communication Scale; Parent Form 2003
Agreed to and accepted (Please sign and date)

David H. Olson, Ph.D.
Date: May 27, 2014

Appendix 8. Letter Asking Permission to Use the Pubertal Development Scale

CENTER FOR
HUMAN GROWTH
& DEVELOPMENT
UNIVERSITY OF MICHIGAN

300 N. INGALLS, 10TH LEVEL
ANN ARBOR, MI 48109-0406
TEL: (734) 764-2443
FAX: (734) 936-9288
http://www.chgd.umich.edu

January 16, 2015

Dear Treenut:

This letter is in response to your recent request regarding use of the Pubertal Development Scale (PDS).

You have my permission to use the instrument. Please note that we expect that the source of the measure will be acknowledged, and that you will send us information about the results.

Enclosed is a copy of the PDS scale, information on the self-report measure, and indicators for coding responses, as well as an article on pubertal categories. Finally, use of the measure assumes that you will use the scales and items as we defined them. We especially note that we designed the scale to be used in the context of an interview. Some reports suggest that young adolescent boys are prone to exaggerate their state of development when the scale is administered as a questionnaire.

Please contact me if you have questions. Best wishes with your research.

Sincerely,

Anne C Petersen

Anne C. Petersen, Ph.D.
Research Professor, CHGD, University of Michigan
Founder & President, Global Philanthropy Alliance

Enclosure

Appendix 9. Letter Asking Permission to Thai Version of the World Health organization Quality of Life-BRIEF-THAI

May 28, 2014

Dr. Suwat Mahadnirunkul
Director of Srithanya Hospital
47 Mu 4, Mueang Nonthaburi District,
Nonthaburi 11000, Thailand

Dear Dr. Mahadnirunkul,

I am a doctoral candidate from the School of Nursing at the University of Wisconsin-Madison. My dissertation entitled, Thai Youth Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health, is being supervised by my dissertation committee chair Dr. Audrey Tluczek, Associate Professor at the School of Nursing, University of Wisconsin-Madison.

I would like your permission to use the Thai version of the WHOQOL-BREF-THAI in my dissertation study.

I would like to use and print this survey under the following conditions:

☐ I will use this survey only for my research study and will not sell or use it with any compensated or curriculum development activities.

☐ I will include the copyright statement on all copies of the instrument.

☐ I will send my research study and one copy of reports, articles, and the like that make use of these survey data promptly to your attention.

If these are acceptable terms and conditions, please indicate so by signing one copy of this letter and returning it to me by email.

Sincerely,

Treenut Pummanee.

Treenut Pummanee
Doctoral Candidate, School of Nursing,
University of Wisconsin-Madison
K 6/117 CSC, 600 Highland Ave.
Madison WI 53792
Email: pummanee@wisc.edu

.....

Expected date of study completion: 12/30/14
grant permission requested on the terms stated in this letter.
Credit line to be used:
1: WHOQOL-BREF-THAI Thai Version

Agreed to and accepted (Please sign) Suwat Mah

Date: _____

Appendix 10. Approval Letter for a Research Assistant to Help in Data Collection

FACULTY OF NURSING

PRINCE OF SONGKLA UNIVERSITY

P.O. BOX 9, KHOR HONG, HATYAI
SONGKHLA, THAILAND, 90112
FAX NO. 66-74-286421
TEL. NO. 66-74-286456,
66-74-286459

Date 11 June 2014

Dear Education and Social/Behavioral Science Institutional Review Board of University of Wisconsin-Madison,

On behalf of the Institutional Review Boards (IRB) of Faculty of Nursing, Prince of Songkla University (PSU-IRB), we had reviewed the dissertation: Thai Youth-Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health which our PhD student; Ms. Jitlada Piriyasart is taking part of this study. We also reviewed our student role activities in this study; recruitment of mothers and students, giving consent and assent, collecting data with questionnaires, managing raw data and transferring coding DE-identified data to the Co-Principle Investigator (Co-PI) from Thailand to USA. We would like to confirm to Education and Social/Behavioral Science Institutional Review Board of University of Wisconsin-Madison that the PSU-IRB does require oversight permission for Ms Jitlada's role to be part of this dissertation and PSU-IRB will provide this oversight for Ms Jitlada's role. We realize and approve that this study is collaboration between School of Nursing, Prince of Songkla University and University of Wisconsin-Madison (UW) and that data will be shared with UW.

Please don't hesitate to contact me if you have any question.

Sincerely,

Tasanee Nasae

Assistant Professor Dr. Tasanee Nasae
Chair of Institutional Review Boards (IRB) of Faculty of Nursing,
Prince of Songkla University

Appendix 11. Letter of IRB Approval at the University of Wisconsin Madison

THE UNIVERSITY of WISCONSIN MADISON

Education and Social/Behavioral Science IRB

7/28/2014

Submission ID number:	2014-0785
Title:	Thai Youth-Mother Communication: A Mediator between Youth Pubertal Timing and Mental Health
Principal Investigator:	AUDREY TLUCZEK
Point-of-contact:	TREENUT PUMMANEE
IRB Staff Reviewer:	LILLIAN LARSON

A designated ED/SBS IRB member conducted an expedited review of the above-referenced initial application. The study was approved by the IRB member for the period of 12 months with the expiration date of 7/27/2015. The study qualified for expedited review pursuant to 45 CFR 46.110 and, if applicable, 21 CFR 56.110 and 38 CFR 16.110 in that the study presents no more than minimal risk and involves:

Category 7: Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, or quality assurance methodologies

To access the materials approved by the IRB, including any stamped consent forms, recruitment materials and the approved protocol, if applicable, please log in to your ARROW account and view the documents tab in the submission's workspace.

If you requested a HIPAA waiver of authorization, altered authorization and/or partial authorization, please log in to your ARROW account and view the history tab in the submission's workspace for approval details.

Prior to starting research activities, please review the Investigator Responsibilities guidance (http://go.wisc.edu/m0lovn) which includes a description of IRB requirements for submitting continuing review progress reports, changes of protocol and reportable events.

Please contact the appropriate IRB office with general questions: Health Sciences IRBs

at 608-263-2362 or Education and Social/Behavioral Science IRB at 608-263-2320. For questions related to this submission, contact the assigned staff reviewer.