Development and Psychometric Evaluation of the Prenatal Attachment Scale for Thai Pregnant Adolescents (PAS-Thai)

Maneeratsami Pattanasombutsook

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Nursing (International Program)

Prince of Songkla University

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I hereby certify that this work has not been accepted in substance for any degree, and is not being currently submitted in candidature for any degree.

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ชื่อวิทยานิพนธ์ การพัฒนาและทดสอบคุณภาพแบบประเมินความรักใคร่ผูกพันที่หญิงตั้งครรภ์วัยรุ่นไทยมีต่อทารกในครรภ์
ผู้เขียน นางมณีรัศมิ์ พัฒนสมบัติสุข
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บทคัดย่อ

การวิจัยนี้มีวัตถุประสงค์เพื่อพัฒนาและทดสอบคุณภาพแบบประเมินความรักใคร่ผูกพันที่หญิงตั้งครรภ์วัยรุ่นไทยมีต่อทารกในครรภ์ (PAS-Thai) โดยใช้แนวคิดทฤษฎีในการพัฒนาเครื่องมือวิจัยของเดอวิลลิส (DeVellis, 2017) โดยได้ดำเนินการ 2 ระยะ รวม 8 ขั้นตอน ระยะที่ 1 เป็นการพัฒนาแบบประเมิน ระยะที่ 2 เป็นการทดสอบคุณภาพของแบบประเมิน

ระยะที่ 1 การทบทวนวรรณกรรมที่เกี่ยวข้อง และการศึกษาข้อมูลเชิงคุณภาพโดยการสัมภาษณ์เชิงลึกรายบุคคลและการสัมภาษณ์เป็นรายกลุ่มจากหญิงตั้งครรภ์วัยรุ่นจำนวน 13 ราย ผลการศึกษาได้องค์ประกอบของแนวคิดความรักใคร่ผูกพันที่หญิงตั้งครรภ์วัยรุ่นไทยมีต่อทารกในครรภ์ จำนวน 3 ด้าน ข้อคำถามจำนวน 56 ข้อ คือ ด้านความคิด จำนวน 18 ข้อ ด้านอารมณ์ จำนวน 17 ข้อ และด้านพฤติกรรม จำนวน 21 ข้อ

ระยะที่ 2 ชุดข้อคำถามได้รับการตรวจสอบความตรงเชิงเนื้อหาจากผู้เชี่ยวชาญจำนวน 5 ท่าน ข้อคำถามที่มีความซ้ำซ้อนถูกตัดออกจำนวน 1 ข้อ เหลือข้อคำถามเพียง 55 ข้อ ค่าดัชนีความตรงเชิงเนื้อหาของข้อคำถามรายข้อ (.80-1.00) ข้อคำถามที่ผู้ทรงคุณวุฒิทุกท่านมีความเห็นตรงกันว่าข้อคำถามมีความเกี่ยวข้องกับสิ่งที่ต้องการวัด (.89) และทั้งฉบับ (.98) อยู่ในระดับที่น่าพอใจ เมื่อนำแบบประเมินไปทดสอบความเที่ยงกับหญิงตั้งครรภ์วัยรุ่น จำนวน 30 ราย ได้ค่าสัมประสิทธิ์แอลฟาของครอนบาคโดยรวม เท่ากับ .94 และรายด้าน ได้แก่ ด้านความคิดเท่ากับ .86 ด้านอารมณ์เท่ากับ .90 และด้านพฤติกรรมเท่ากับ .92

แบบประเมินถูกนำไปใช้กับกลุ่มตัวอย่าง จำนวน 575 ราย โดยเก็บข้อมูลจาก 5 ภาคของประเทศไทย ได้รับแบบประเมินฉบับสมบูรณ์นำมาวิเคราะห์ จำนวน 354 ราย วิเคราะห์ความตรงเชิงโครงสร้างโดยใช้สถิติวิเคราะห์องค์ประกอบเชิงสำรวจ สกัดองค์ประกอบแบบการหาองค์ประกอบมุขสำคัญ (Principal axis factoring: PAF) และหมุนแกนตั้งฉากแบบแวริแมกซ์ ผลการวิเคราะห์พบว่า แบบประเมินที่ได้ มีจำนวน 35 ข้อ ประกอบด้วย 3 องค์ประกอบ คือ 1) คิดปราถนาดีต่อลูก 2) เตรียมการเพื่อลูกที่จะเกิดมา และ 3) รู้สึกเชื่อมโยงถึงกันได้กับลูกในท้อง ค่าไอเกนของ

แต่ละองค์ประกอบเท่ากับ 6.82, 6.03, และ 3.32 ตามลำดับ ซึ่งสามารถอธิบายความแปรปรวนทั้งหมดได้ร้อยละ 46.19 แต่ละองค์ประกอบสามารถอธิบายความแปรปรวนได้ร้อยละ 19.48, 17.23, และ 9.48 ตามลำดับ ผลการทดสอบค่าความเที่ยงแบบวัดความสอดคล้องภายในอยู่ในระดับดี ได้ค่าสัมประสิทธิ์แอลฟาของครอนบาคโดยรวมเท่ากับ .94 และรายด้านได้แก่ ด้านคิดปราถนาดีต่อลูกเท่ากับ .91 ด้านการเตรียมการเพื่อลูกที่จะเกิดมาเท่ากับ .90 และด้านรู้สึกเชื่อมโยงถึงกันได้กับลูกในท้องเท่ากับ .89 ผลการทดสอบความตรงเชิงโครงสร้างโดยใช้กลุ่มต่าง พบความแตกต่างกันอย่างมีนัยสำคัญ (t = 9.05, p < .001) ระหว่างกลุ่มหญิงตั้งครรภ์วัยรุ่นที่ต้องการและพร้อมที่จะมีบุตรกับกลุ่มหญิงตั้งครรภ์วัยรุ่นที่ไม่ต้องการและไม่พร้อมที่จะมีบุตร

ดังนั้นแบบประเมินความรักใคร่ผูกพันที่หญิงตั้งครรภ์วัยรุ่นไทยมีต่อทารกในครรภ์ฉบับ 35 ข้อ จึงมีความความตรงและความเที่ยงเหมาะสมที่จะนำไปใช้ประเมินความรักใคร่ผูกพันทั้งในด้านความคิด ด้านพฤติกรรม และด้านอารมณ์ ที่หญิงตั้งครรภ์วัยรุ่นไทยมีต่อทารกในครรภ์

คำสำคัญ: ความรักใคร่ผูกพันที่มีต่อทารกในครรภ์, หญิงตั้งครรภ์วัยรุ่นไทย, การพัฒนาแบบประเมิน, การทดสอบคุณภาพแบบประเมิน

Thesis Title Development and Psychometric Evaluation of the Prenatal Attachment Scale for Thai Pregnant Adolescents (PAS-Thai)

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Major Program Nursing (International program)

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ABSTRACT

The purposes of this study were to develop the Prenatal Attachment Scale for Thai pregnant adolescents (PAS-Thai) and to examine the psychometric properties of the developed PAS-Thai. Based on DeVellis (2017)'s scale development guideline, the PAS-Thai was developed in two phases with eight steps. The first phase was the PAS-Thai development. The second phase was the psychometric evaluation of the PAS-Thai.

In the first phase, the PAS-Thai was developed based on extensive literature review and qualitative approaches using individual in-depth interview and focus group discussion with 13 Thai pregnant adolescents, generating three domains and 56 items: 1) cognitive attachment domain (18 items), 2) affective attachment domain (17 items), and 3) behavioral attachment domain (21 items).

In the second phase, the PAS-Thai was reviewed for content validity by five experts. One item was excluded because of redundancy. With 55 items, the content validity of the PAS-Thai was satisfactory both at item level and scale level (I-CVI = .80-1.00, S-CVI/UA = .89, S-CVI/Ave = .98.). The PAS-Thai was tested for reliability with 30 pregnant adolescents, yielding a Cronbach's alpha coefficient of .94

for the total scale, .86 for cognitive attachment domain, .90 for affective attachment domain, and .92 for behavioral attachment domain.

The questionnaires were distributed to 575 samples in five regions of Thailand, 354 cases were available without missing data for further analysis. Exploratory factor analysis (EFA) using PAF extraction with varimax orthogonal rotation method produced 35 items within three factors namely: having good wishes for the baby, preparing to care for the baby, and feeling of connectedness to the baby. The eigenvalues for the three factors were 6.82, 6.03, and 3.32, respectively. The percentage of total variance explained was 46.19, and the percentage of variance explained for each factor was 19.48, 17.23, and 9.48, respectively. The scale had a good internal consistency reliability with Cronbach's alpha coefficient of .94 for the total scale, .91 for "Having good wishes for the baby" domain, .90 for "Preparing to care for the baby" domain, and .89 for "Feeling of connectedness to the baby" domain. The contrasted group approach result revealed significantly different scores between the group of pregnant adolescents who wanted to and were ready to have a baby and the group of pregnant adolescents who did not want and were not ready to have a baby ($t = 9.05$, $p < .001$).

Thus, the 35-item PAS-Thai possessed acceptable validity and reliability for use in measuring cognitive, behavioral, and affective aspects of prenatal attachment of Thai pregnant adolescents.

Keywords: prenatal attachment, Thai pregnant adolescents, scale development, psychometric evaluation

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M.Pattanasombutsook

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CHAPTER 1

INTRODUCTION

Background and Significance of the Study

Adolescent pregnancy is recognized as a serious problem around the world. It is a significant social, economic, and health concern in Thailand. World health statistics for 2014 showed the global average number of pregnancies for every 1,000 girls in the 15-19 age group was 49 (WHO, 2018). The adolescent pregnancy rate in Thailand remains the highest rate in South-East Asia. More than 50 out of every 1,000 girls aged 15 to 19 give birth each year. Eighty percent of Thai adolescent mothers reported that their pregnancy was unplanned or unintended, and nearly one third seek the abortion (UNICEF, 2011; WHO, 2017). However, this statistic is considered below the actual rate because it does not include adolescent pregnancies that end with stillbirth, abortion, and abandonment after delivery (UNICEF, 2015). Adolescent pregnancy is a major problem in Thailand and that urgently needs to be solved.

Most Thai adolescent pregnancies are unplanned and the mothers are often either divorced or separated from the baby's father (Panyayong, 2010). For the adolescent mothers who do marry, the marriage is often unstable (Nirattharadorn, 2005; Sa-ngiamsak, 2016). Additionally, in Thai culture, adolescents who become pregnant before marriage can bring humiliation to their family and often experience societal stigmatization (Neamsakul, 2008; UNICEF, 2015). Pregnant adolescent women may be afraid of others' reactions, and fear the effects of the pregnancy on

their lives and relationships, and they may be not prepared physically, psychologically, or economically for becoming a mother. Most of them have negative feelings toward the pregnancy (Neamsakul, 2008; UNICEF, 2015) and tend to be less responsive, less sensitive, and more detached with regard to their unborn babies (Flaherty & Sadler, 2011; Sa-ngiamsak, 2016), and they may either conceal or terminate their pregnancies.

Due to the pregnancy being unplanned/unwanted and the immaturity of the growth and development of the adolescents, health problems regarding adolescent pregnancy include: high abortion rates (HITAP, 2013; WHO, 2017), late and inadequate prenatal care (Isaranurug, Mo-suwan, & Choprapawan, 2006; Pantumas, Kittipichai, Pitikultang, & Chamroonsawasdi, 2012; UNICEF, 2015), poor maternal and child health (Liabsuetrakul, 2012; Thaitae & Thato, 2011), more detachment, abuse, abandonment, neglect of the babies (Chaipornpattana, Danpradit, & Singhakam, 2009; Panyayong, 2010; Sa-ngiamsak, 2016), and even the killing of the babies (Chaturachinda, 2010).

One possible way to reduce the negative outcomes of adolescent pregnancy is to promote prenatal attachment. Prenatal attachment has been described as the first important relationship between a mother and her unborn child. It is clinically significant because it involves maternal love, which protects the fetus from harm (Brandon, Pitts, Denton, Stringer, & Evans, 2009; Walsh, Hepper, & Marshall, 2014). Prenatal attachment has been demonstrated to positively influence the pregnant women's adherence to healthier behaviors (Alhusen, Gross, Hayat, Woods, & Sharps, 2012; Lindgren, 2001; Ross, 2012), positive pregnancy outcomes, successful maternal-newborn adaptation, and the well-being of the child, both during

pregnancy and after birth (Alhusen, 2008; Cannella, 2005; Doan & Zimerman, 2008; Taffazoli, Asadi, Aminyazdi, & Shakeri, 2015; Yarcheski, Mahon, Yarcheski, Hanks, & Cannella, 2009). This relationship is also important to the mother in maintaining maternal health (Ossa, Bustos, & Fernandez, 2011; Ross, 2012), adaptating to pregnancy, and achieving maternal self-actualization (Alhusen, 2008; Pisoni et al., 2014; Siddiqui, Hägglöf, & Eisemann, 1999).

On the other hand, a low level of prenatal attachment is associated with negative health practices and inappropriate antenatal care during pregnancy, which may lead to high-risk a pregnancy (Bouchard, 2011; Pisoni et al., 2014). Ineffective prenatal attachment also leads to forms of fetal abuse, child neglect, and increases in the child's risk of psychological and behavioral problems (Alhusen, 2008; Brandon et al., 2009). This puts both pregnant adolescents and their babies at high risk of poor health and adverse outcomes.

It is crucial to assess prenatal attachment to identify pregnant women with attachment risks, then promote appropriate nursing care and interventions to reduce ineffective attachment. However, difficulties arise in measuring prenatal attachment. Numerous studies regarding prenatal attachment have been conducted by using existing prenatal attachment scales revealing many topics, factors, and conflicting results (Alhusen, 2008; Cannella, 2005; Yarcheski et al., 2009). Evidence of powerful relationships has not emerged from correlational studies examining psychosocial variables, and a substantive knowledge base for prenatal attachment has not yet been created (Cannella, 2005; Van den Bergh & Simons, 2009). Although rational explanations for these contrary findings are not clear, extensive review of

prenatal attachment studies indicate that these problems are related to the measurements of this concept and the differences between individuals.

The use of varying theoretical frameworks and by different disciplines may reflect a different underlying construct of prenatal attachment scales (Alhusen, 2008; Feldman, 2007; Van den Bergh & Simons, 2009; Walsh, 2010; Yarcheski et al., 2008). The existing versions of prenatal attachment scales are Maternal-fetal Attachment Scale (MFAS: Cranley, 1981a), Prenatal Attachment Inventory (PAI: Müller, 1989, 1993), and Maternal Antenatal Attachment Scale (MAAS: Condon, 1993). The theoretical basis of MFAS is the maternal identity theory (Cranley, 1981a), the PAI is based on attachment theory and pregnancy adaptation theory (Müller, 1989, 1993), while the model of adult attachment forms the basis of the MAAS (Condon, 1993). The theoretical basis of existing instruments is different. These scales may measure different constructs of prenatal attachment.

These scales appear to measure different aspects of prenatal attachment and with differing measurement purposes (Cannella, 2005; Feldman, 2007; Van den Bergh & Simons, 2009). MFAS relates to the state of pregnancy and maternal role (Cranley, 1981a; Van den Bergh & Simons, 2009), PAI stresses affectionate thoughts and feelings toward the fetus (Müller, 1989; 1993), and MAAS focuses on emotional attachment to provide a framework for improved understanding of aspects of psychosomatic obstetrics including reactions to fetal loss (Condon, 1993).

In addition, the psychometric properties of the existing scales should be considered. The MFAS has a good reliability for the total scale (α = .71 - .92), but its reliability of subscales was inadequate ("attributing" α = .63 - .84, "role-taking" α = .68 - .89, the other subscales $\alpha \leq .69$). MFAS's construct validity is not accepted

(Alhusen, 2008; Anand & Hima, 2012; Beck, 1999; Van den Bergh & Simons, 2009). As one dimensional scale, the PAI has acceptable validity and reliability (total scale α = .81 - .93). However, later factor analysis of the PAI by other authors (Della Vedova, Dabrassi, & Imbasciati, 2008; Siddiqui & Hägglöf, 2000) revealed a 5-factor solution, and that reliability of subscales are not desirable (α = .57 - .76). The validity of the MAAS is accepted, but the reliability is minimally accepted (total scale α = .69 - .82, subscales "quality" α = .69 - .73, "preoccupation" α = .73 - .77).

The time and circumstances when the scales were developed is another problem. The original scales were developed more than 20-30 years ago. During the passing decades the circumstances surrounding adolescent pregnancy and the state obstetrical knowledge and technology, such as, the availability and accuracy of ultrasound screening tests, and knowledge about fetal growth and development, through prenatal class, social media, and internet, have been continuously evolving. The option and ability to know about and see the fetus at an earlier point in a pregnancy likely influenced the development of prenatal attachment (Alhusen, 2008; Van den Bergh & Simons, 2009).

Other than the time and circumstances of the scales, all existing scales were developed based on Western countries for low-risk adult married Caucasian women who were rather well educated and employed (Condon, 1993; Cranley, 1981a; Müller, 1989; 1993), while several studies indicated that prenatal attachment in adolescent pregnancy differs from adult pregnancy (Bloom, 1995; Olivier 2016; Rowe, Wynter, Steele, Fisher, & Quinlivan, 2013). Other related factors such as adolescent development, low socio-economic status, single status, unwanted pregnancy, or experiences of abuse may also influence the level of prenatal

attachment (Bielawska-Batorowitcz & Siddiqui, 2008). The existing scales were developed for adult pregnant women and may not fit pregnant adolescents. By using the PAI, the unplanned pregnancy sample did not significantly affect PAI mean scores (Bielawska-Batorowicz & Siddiqui, 2008; Della Vedova et al., 2008). MAAS is also not validated for use in pregnant adolescents (Rowe et al., 2013). The MFAS has been troubled by producing inconclusive and often contradictory results (Brandon et al., 2009; Van den Bergh & Simons, 2009).

The prenatal attachment scale which is currently used in Thailand was translated and modified from Cranley's MFAS by Kootanavanichpong (1987). It has faced a considerable questioning related to its construct validity, reliability, and theoretical foundations. Importantly, some researchers (Kwarat, 2002; Pooripanyakun, 1996; Sawuanprom, 2006; Siriumpunkool, 2000) modified some of the items in the scale to fit their study purposes. Researchers have also varied the total number of items used the scale, with the number varying from 21 to 28 items according to the research purposes. The inconsistent use of the modified scale makes it difficult to compare or synthesize findings. Unsurprisingly, using this translated and modified scale in studies of prenatal attachment in Thailand (Kullawattana, 2000; Sriintravanit, 2005; Trirattanapikul, 1990) has produced inconsistent and contradictory results.

To date, little is known about prenatal attachment among pregnant adolescents (Feldman, 2012; Rowe et al., 2013), especially Thai pregnant adolescents. An extensive literature review was conducted and an existing specific scale measuring prenatal attachment for Thai pregnant adolescents was not found. Assessment prenatal attachment of Thai pregnant adolescents requires a scale that has coverage

and suitable domains within the Thai cultural context of where pregnant adolescents belong.

Development of a prenatal attachment scale is useful for assessment, planning, implementation, and evaluation of appropriate nursing care and interventions regarding prenatal attachment among Thai pregnant adolescents in order to assist and promote maternal and fetal well-being both during pregnancy and after birth, and to reduce adverse outcomes of adolescent pregnancy. Thus, it is needed to develop the Prenatal Attachment Scale for Thai Pregnant Adolescents (PAS-Thai).

Objectives of the Study

The purpose of this study was to develop the Prenatal Attachment Scale for Thai Pregnant Adolescents (PAS-Thai) to measure prenatal attachment among Thai pregnant adolescents. The research process was guided by the following objectives:

1. To develop the Prenatal Attachment Scale for Thai pregnant adolescents (PAS-Thai).

2. To examine the psychometric properties of the newly developed PAS-Thai.

Research Questions

1. What are the appropriate domains for the PAS-Thai?

2. What are the validity and reliability of the PAS-Thai in measuring prenatal attachment among Thai pregnant adolescents?

Conceptual Framework

The Prenatal Attachment Scale for Thai pregnant adolescents (PAS-Thai) was developed based on the maternal identity theory, a literature review regarding prenatal attachment, and individual in-depth interviews and focus group discussion conducted by the researcher. The details are as follows.

Maternal identity theory

The maternal identity theory was developed by Reva Rubin in 1967. Rubin (1984) described maternal identity as an internal sense of certainty and self-competency in maternal role and in knowledge of her baby. Achievement of maternal identity is a positive marker of the mother's process of building a relationship with her baby. Rubin (1984) proposed four developmental tasks in which the pregnant woman progresses toward maternal identity. Part of these developmental tasks of maternal identity involves prenatal attachment. The four developmental tasks include: 1) binding-in to the child, 2) safe passage, 3) acceptance by others, and 4) giving of oneself.

1. Binding-in to the child

The task "binding-in to the child" is an enduring affiliative attachment between mother and her fetus. The mother develops an attachment with her unborn child. Feeling love occurs after fetal movement and increases with progress of pregnancy. There is a mental picture of the unborn child and of what he/she will be after birth. The mother invests in making a healthy baby, and in providing a good

environment in utero for her baby. Possessive love stimulates maternal protectiveness to ensure safe passage for her child. The responsibility of protecting and caring for the child as an especially valuable gift and possession is given significance (Rubin, 1984, p. 65).

2. Safe passage

The task "safe passage" refers to the protective behaviors of the mother toward the fetus and herself (Rubin, 1984). When the pregnant woman accepts the unborn baby and her ties to the baby, she begins to be protective for her unborn child. This task involves the seeking of prenatal care, information and knowledge about childbearing and childrearing, and life style changes to ensure safe passage.

3. Acceptance by others

The task "acceptance by others" has been described as the maternal efforts at establishment of future acceptance of the unborn child by family and other adults. The family is made for intimate care, protection, and supportive nurturance that is necessary for the growing child. Rubin (1984) mentioned that what is most important in acceptance by each member of the family is the awareness of the other's acceptance of sacrifice in behalf of a child.

4. Giving of oneself

The task "giving of oneself" involves caring and self-deprivation of the mother for her baby. It includes the giving of the mother's time; of caring, attention, interest, or concern; and of companionship in stress and in pleasure (Rubin, 1984). Early in pregnancy there is resistance to this task as the demands are high and rewards less apparent. The increasing physical, psychological and social demands of

pregnancy require a purpose so they can be ensured. Giving of oneself is the hallmark of maternal behaviors.

In conclusion, prenatal attachment is considered an important part of the developmental tasks of maternal identity. The task "binding-in to the child" is the affection of the mother toward the unborn child. The task "safe passage" is the protective behaviors of the mother toward her unborn child. The task of "acceptance by others" has been described as the maternal efforts at establishment of future acceptance of the unborn child by family and other adults. This effort is made for the intimate care, protection, and supportive nurturance that is necessary for the infant and the growing child. The task "giving of oneself" involves the caring and self-deprivation of the mother in order to protect and nurture her unborn child. Although Rubin (1984) mentioned 'love for the unborn and growing child' in the first task "binding-in to the child", the other three tasks are also interwoven with prenatal attachment between the mother and her unborn child as shown in later studies or articles (Alhusen, 2008; Bloom, 1995; Brandon et al., 2009; Cranley, 1993; Della Vedova et al., 2008; Doan & Zimerman, 2003; Eichhorn, 2012; Müller & Ferketich, 1992; Ross, 2012; Shieh, Kravitz, & Wang, 2001; Walsh, 2010; Walsh et al., 2014). Thus, these four tasks will be used to provide the conceptual framework of prenatal attachment in this study.

Literature review regarding prenatal attachment

Extensive literature review of concept analysis articles and previous studies regarding prenatal attachment was used to formulate conceptual framework. The detailed was explained as follows.

1. Concept analysis of prenatal attachment

Based on examination of the concept analysis articles which analyzed the critical attributes of this concept (Brandon et al., 2009; Condon, 1993; Cranley, 1993; Dawson, 2002; Doan & Zimerman, 2003, 2008; Eddins, 2014; Müller, 1992; Shieh, et al., 2001; Young, 2013), three domains were summarized: 1) cognitive attachment, 2) affective attachment, and 3) altruistic attachment.

Cognitive attachment

Cognitive attachment is the desire to know (Condon, 1993; Cranley, 1993; Shieh et al., 2001), to understand or define the unborn child (Shieh et al., 2001). The pregnant woman has mental pictures of the unborn child (Doan & Zimerman, 2003, 2008; Shieh et al., 2001) and ascribes characteristics to her unborn child (Condon, 1993; Cranley, 1993; Müller, 1992; Shieh et al., 2001). Cognitive attachment includes the ability of the mother to conceptualize the unborn child as a person or to differentiate the unborn child from herself (Doan & Zimerman, 2003, 2008; Eddins, 2014; Shieh et al., 2001). Thus, the cognitive attachment includes the desire to know, to attribute characteristics, and to define the unborn child.

Affective attachment

Affective attachment is when the pregnant woman has affection for (Cranley, 1993; Doan & Zimerman, 2008; Müller, 1992), or bonding emotionally with the unborn child (Eddins, 2014). This includes the pleasure associated with thoughts of (Condon, 1993; Dawson, 2002; Shieh et al., 2001) and communication with the unborn child (Dawson, 2002; Doan & Zimerman, 2003, 2008; Shieh et al., 2001). Thus, the affective attachment includes the emotional bonding with the unborn

child including the pleasure associated with contact or interaction with the unborn baby.

Altruistic attachment

Altruistic attachment is the desire to protect the unborn child, satisfy its needs (Shieh et al., 2001), and the self-devotion behaviors to assure the safe delivery and the health of the baby (Young, 2013). This comprises appropriate life style changes to promote the growth of the unborn child, maintain good health practices, nourish the self (Doan & Zimerman, 2003), minimize abuse or neglect, and prepare for the baby's arrival (Shieh et al., 2001). Thus, the altruistic attachment includes the self-sacrificing behaviors for the benefit of the unborn child, and active preparation for the safe arrival of the baby.

2. Previous studies of prenatal attachment

After an extensive review of the available literature of existing scales, empirical studies, and qualitative studies regarding prenatal attachment, eight domains of prenatal attachment were identified: 1) thinking about the unborn child, 2) thinking about taking care of the baby, 3) concern for fetal well-being, 4) affection toward the unborn child, 5) being connected to the unborn child, 6) communication and interaction with the unborn child, 7) giving of self to nurture and protect the unborn child, and 8) preparation for the baby's arrival.

1. Thinking about the unborn child

Thinking about the unborn child is when the pregnant woman starts having thoughts about the unborn child as soon as she find out she is pregnant, after feeling the fetal movement, hearing fetal heart sound, or seeing the fetal picture from

ultrasound (Delahoussaye, 1994). She desires to know or define the unborn child. The results of many studies revealed that the pregnant woman wondered how the unborn child will act or look like after birth (Bloom, 1992; Delahoussaye, 1994; Leva-Giroux, 2002; Müller & Ferketich, 1992, 1993; Rauenhorst, 2001). The pregnant woman assigned attributions including personality to her unborn child (Ahern & Ruland, 2003; Condon, 1993). Siddiqui and Hägglöf (2000) mentioned that the pregnant women who experienced greater attachment imagined more about her unborn child in general.

2. Thinking about taking care of the baby

The pregnant woman fantasized about mothering (Delahoussaye, 1994; Leva-Giroux, 2002), and her future with the baby (Müller & Ferketich, 1993; Rauenhorst, 2001). She imagined herself taking care of the baby most of the time (Cranley (1981b). The qualitative study of Delahoussaye (1994) revealed that the pregnant adolescent fantasized about being a mother and taking care of her baby. She imagined herself being a good mother. She envisioned her role as a key figure in creating a happy life for her baby, and planned to do everything possible to help her baby be happy and have a good life.

3. Being concerned for fetal well-being

The pregnant woman has great sense of protectiveness and responsibility for fetal well-being. Qualitative studies (Delahoussaye, 1994; Müller & Ferketich, 1992; Shieh & Kravitz, 2002) found that the pregnant women were concerned for the baby's health, baby's well-being, and about complications that may occur to the baby or as a results of the birth. They had ideas about doing what is necessary to welcome the baby into the world and to ensure safe passage for the baby (Leva-Giroux, 2002).

4. Affection toward the unborn child

The pregnant woman feels love toward her unborn child (Condon, 1993; Delahoussaye, 1994; Müller, 1989, 1993; Müller & Ferketich, 1992; Rowe et al., 2013; Siddiqui & Hägglöf, 2000; Siddiqui et al., 1999; Shieh & Kravitz, 2002). The love of the mother toward her unborn child is considered as the core experience of prenatal attachment (Condon, 1993; Walsh, 2010; Walsh et al., 2014). The results of a grounded theory approach to discover an adolescents' relationship with her unborn baby (Delahoussaye, 1994) revealed that the pregnant adolescent desires to have and keeps her baby, feels that the baby belonged to her, and is a part of her body. The love for the baby is expressed in terms of ownership.

5. Being connected to the unborn child

The pregnant women feel closeness to the unborn child (Alhusen et al., 2012b; Delahoussaye, 1994; Leva-Giroux, 2002). She has an emotional connection to the baby (Pollock & Percy, 1999). Ross (2012) revealed the connection between a mother and her baby during pregnancy. The participants in qualitative studies of Leva-Giroux (2002) and Rauenhorst (2001) also revealed feelings of connectedness toward the unborn child. Moreover, several qualitative studies (Delahoussaye, 1994; Leva-Giroux, 2002; Müller & Ferketich, 1992) found that pregnant woman felt pleasure when thinking about her unborn child.

6. Communication and interaction with the unborn child

Prenatal attachment studies revealed that almost all pregnant women described having communication and interaction with their unborn child (Condon, 1993; Cranley, 1981; Delahoussaye, 1994; Müller, 1992; Rauenhorst, 2001; Shieh et al., 2001). The qualitative study of Delahoussaye (1994) gave information that the

pregnant adolescents communicate with the unborn child in many ways such as talk to, tell the fetus about their love, sing songs to, read out loud, touch and rub the stomach, poke, and guess the fetal movement. Fetal movement is a major means of communication between the pregnant woman and her unborn child. The pregnant women interpret differences in fetal movement (Bloom, 1998), and enjoyment and satisfaction has been derived therefrom interaction (Condon, 1993). Siddiqui and Hägglöf (2000) mentioned that the pregnant women who experienced greater attachment showed more overall involvement during interaction.

7. Giving of self to nurture and protect the unborn child

The pregnant woman has a great sense of responsibility for the baby's well-being. Both empirical studies and qualitative studies revealed that pregnant women would be willing to respond to the needs of the fetus which transcend the needs of the self (Ahern & Ruland, 2003; Bloom, 1995, 1998; Condon, 1993; Cranley, 1981a, 1981b; Hsu & Chen, 2001; Pollock & Percy, 1999), and have self-sacrificing behaviors for fetal well-being (Bloom, 1995, 1998; Delahoussaye, 1994; Rauenhorst, 2001). The studies of Lindgren (2001), Ross (2012), and Young (2013) found that the level of the mother's tie to their unborn child is demonstrated by their self-devotion behaviors to assure safe delivery and the health of their babies.

The results of empirical studies and qualitative studies found that the pregnant women have appropriate life style changes and practice various health-promoting behaviors to promote the growth and well-being of the unborn child (Ahern & Ruland, 2003; Bloom, 1992; Cranley, 1993; Condon, 1993; Leva-Giroux, 2002; Rauenhorst, 2001; Shieh & Kravitz, 2002; Young, 2013), and to protect the unborn child (Leva-Gioux, 2002; Pollock & Percy, 1999; Walsh et al., 2014).

Pregnant women who have higher levels of prenatal attachment are assumed to be taking more care of themselves in an effort to improve both the baby's health and the outcomes of pregnancy (Alhusen et al., 2012b; Lindgren, 2001; Ross, 2012).

8. Preparation for the baby's arrival

Pregnant women have ideas and do what is necessary to welcome their baby into the world including planning for labor and delivery (Bloom, 1992; Leva-Giroux, 2002; Shieh & Kravitz, 2002). Qualitative studies (Delahoussaye, 1994; Rauenhorst, 2001) have revealed that pregnant women think about and increase their knowledge on how to take care of their babies in general. They obtain information and learn about the growth and development of the baby, labor and delivery. They engage in or pursue learning activities, and attend prenatal class to gain more understanding of the baby. Moreover, other studies (Bloom, 1998; Leva-Gioux, 2002; Pollock & Percy, 1999; Shieh et al., 2001) have found that pregnant women also prepare for the baby's birth, and prepare their home for the baby's arrival.

Qualitative approach (Individual in-depth interviews and focus group discussion)

A qualitative approach using individual in-depth interview and focus group discussion was employed by the researcher to understand Thai pregnant adolescents for whom the PAS-Thai was developed. Ten themes emerged based on data analysis as follows.

Theme 1: Accepting the baby

Participants felt that there is a life living in their body. Although most of the participants did not think about naming the baby, they called their baby "Look" which means "son" and "daughter", or "Nong" or "Dae" which means little baby. Some participants thought about naming the baby, and accepted the baby as their child by giving a name which related to herself or the baby's father.

Theme 2: Being curious and imagining the baby

Most of the participants reported that they were curious about the baby and at the 20 weeks' ultrasound, wanted to know the baby's gender if possible. When not possible, they reported that they had some sense that their baby was a girl. Most participants wanted to know the characteristics of the baby. They imagined what their baby would look like. Some wanted the baby to look like his/her father. Some wanted the baby to look like them, because he/she is their baby. Some wanted the baby to look like both his/her father and mother. They also wanted their baby look ‘lovely’ or look good.

Theme 3: Being concerned about the baby's health

Most of the participants were concerned about the baby’s health. They wanted their baby to be healthy and not disabled. They worried about having a small sized baby, low birth weight, premature birth, and the baby having a disability because the doctors, nurses and adults always warned them about this. This raised their concern and they thought about how to make their babies healthy.

Theme 4: Wanting to be a good mother

Most participants wanted to be a good mother and thought how they would raise the baby to be happy, to be a good person, and to have a good future. Some

participants described that they wanted to take good care of the baby. They wanted their baby to study in higher education and get a good job in the future. They did not want their babies to be like them. Moreover, most of participants described that they thought about how they would raise the baby. They planned where the baby should live after the birth, that they were going to breastfeed sometimes because of the benefits of breastfeeding but also because of their economic situation, and overall view on how to nurture the baby. They also thought about who would help them raise the newborn during the first few months and how they would take care of the baby themselves.

Theme 5: Feeling glad to have the baby

Some participants who married before pregnancy reported that when they knew they were pregnant, they felt happy to have the baby. They wanted to have a baby. One reported that she felt confused and then started to love the baby when he started to move. For the participants who got pregnant before marrying or for those who were unmarried, all felt stress and fear regarding their parents' reactions and the negative effects of pregnancy. At the time they found out about their pregnancy, they did not think about the baby. They thought about how they could solve the problem. After the pregnancy was accepted, then they felt more relaxed and began feeling happier to have baby.

Theme 6: Loving, attaching, and having a sense of ownership

All participants explained that they loved their baby. Some only knew that they loved their baby very much, but could not explain their thoughts and feelings in words. Three participants who married before pregnancy stated that they felt love for their baby as soon as they found out that they were pregnant. Others explained that

they felt love for their baby as soon as they felt the baby move or saw the baby's ultrasound image. They felt like they had a friend who lives with them. Most of them described feeling that the baby belongs to them. They felt love and attached, wanted to see and to hold the baby. They did not want to have an abortion, abandon, or have their baby's adopted. One participant gave her reason for not having an abortion stating that she felt the baby wants her mother as she always wanted her mother.

Theme 7: Feeling connected to the baby

Most of the participants felt connect to the baby. They felt that there was a connection between them as mothers and their baby. Some participants described that they felt the baby could hear and understand what happened outside the womb, and could understand his or her mother.

Theme 8: Communicating and interacting with the baby

Most of the participants reported that they always communicated with their baby by talking, singing/playing songs, and reading out loud. They liked playing with the baby and thought that the baby also liked to play with them. They felt happy and believed that the baby could understand and responded to them by moving or kicking in return. When their baby moved, they always responded to their baby by rubbing their tummy or talking to the baby.

Theme 9: Taking good care of self for the well-being of the baby

Most of the participants described that they took good care of themselves for sake of the baby's health by eating well, taking vitamins and iron supplements, and doing exercise. Even though some participants did not like to eat some kinds of food, take medicine, or do exercise, they did it for the benefit of their baby. Their reasons were that they wanted their baby to be strong and healthy. They also avoided

eating ‘junk’ food or doing harm to the baby. Some participants used to hang out at night and drink alcohol. They stopped these risky behaviors for the baby.

Theme 10: Preparing for the baby arrival

All participants prepared for the baby’s arrival. They sought out a ‘good’ ANC clinic, moved to stay with a relative closer to the hospital, prepared essential baby items, searched for knowledge about the baby from the internet and they asked their family and friends how to raise the baby. They also prepared themselves for giving birth by doing exercises because someone had told them that this would help them give birth easily. However, some participants did not prepare layettes because they could not afford to do this. Some reported that their parents were superstitious about preparing the baby's items before the birth because this would be not good for the newborn’s health.

In summary, prenatal attachment can be defined as the affectionate relationship between a pregnant adolescent and her unborn baby which is manifested in thoughts, feelings, and behaviors. Therefore, the three domains which yielded from examination of concept analysis articles regarding prenatal attachment (cognitive attachment, affective attachment, and altruistic attachment), the eight domains which yielded from existing scales, empirical studies, and qualitative studies regarding prenatal attachment (thinking about the unborn child, thinking about taking care of the baby, concern for fetal well-being, affection toward the unborn child, being connected to the unborn child, communication and interaction with the unborn child, giving of self to nurture and protect the unborn child, and preparation for the baby's arrival), and the 10 themes which emerged from qualitative approaches: 1) accepting the baby,

2) being curious and imagining the baby, 3) being concerned about the baby's health, 4) wanting to be a good mother, 5) feeling glad to have the baby, 6) loving, attaching, and having a sense of ownership, 7) feeling connected to the baby, 8) communicating and interacting with the baby, 9) taking good care of self for the well-being of the baby, and 10) preparing for the baby's arrival) are integrated into the pre-specified domains of the Prenatal Attachment Scale for Thai pregnant adolescents (PAS-Thai). Thus, the pre-specified domains of the PAS-Thai are composed of: 1) cognitive attachment, 2) affective attachment, and 3) behavioral attachment as explained below.

Cognitive attachment

Cognitive attachment is the thoughts and imaginations about the attribution of the baby and taking care of the baby. In addition, cognitive attachment includes the concern for fetal well-being. Pregnant adolescents think or imagine about the baby (Delahoussaye, 1994; Rowe et al., 2013). They recognize the baby as a person and assign attributions including personality to their unborn child. The given attributes of the baby are based on the characteristics that the pregnant adolescents think the baby will have. They think and imagine about taking care of the baby and their relationship with the baby after birth (Delahoussaye, 1994; Salisbury, Law, LaGasse, & Lester, 2003). The pregnant adolescents also have a great sense of protectiveness and responsibility for fetal well-being. Concern about the baby health is included. Thus, the cognitive attachment domain is composed of thinking about the attributes of unborn child, thinking about taking care of the baby, and concern for fetal well-being.

Affective attachment

Affective attachment is defined as the affection and the emotional connection toward the unborn child. The love for the baby the pregnant adolescent expresses in terms of ownership and accepting that the baby belongs to her and is a part of her body. The pregnant adolescents desire to have and keep the baby (Delahoussaye, 1994). The pregnant women have an emotional tie to the unborn child (Brandon et al., 2009; Eddins, 2014). The pleasure associated with thoughts of or interaction with the baby is included (Delahoussaye, 1994; Shieh et al., 2001). Thus, the affective attachment domain is composed of affection toward, and being connected with the unborn child.

Behavioral attachment

Behavioral attachment refers to the communication and interaction with the unborn child, the self-sacrificing behaviors for fetal well-being, protection, and preparation for the baby's arrival. The pregnant adolescents communicate and interact with the unborn baby in many ways (Bloom, 1995; Delahoussaye, 1994). They adjust reactions, respond to, and seek closeness with their unborn child (Doan & Zimerman, 2008). In addition, the pregnant women maintain good health practice to nurture and protect the unborn child. They prepare themselves for taking care of the baby, and do what is necessary for the baby's arrival (Doan & Zimerman, 2008; Eichhorn, 2012; Shieh et al., 2001). Thus, the behavioral attachment domain is composed of communication and interaction with the unborn child, giving of self to nurture and protect the unborn child, and preparation for the baby's arrival.

In summary, the pre-specified domains of the PAS-Thai were developed based on the maternal identity theory, literature review regarding concept analysis of prenatal attachment, literature of existing scales, empirical and the qualitative studies regarding prenatal attachment, and qualitative approach of prenatal attachment among Thai pregnant adolescents. In addition, the scale development guidelines of DeVellis (2017) will be employed to develop and evaluate psychometric properties of the PAS-Thai. The conceptual framework of the PAS-Thai is demonstrated in Figure 1 as follows:

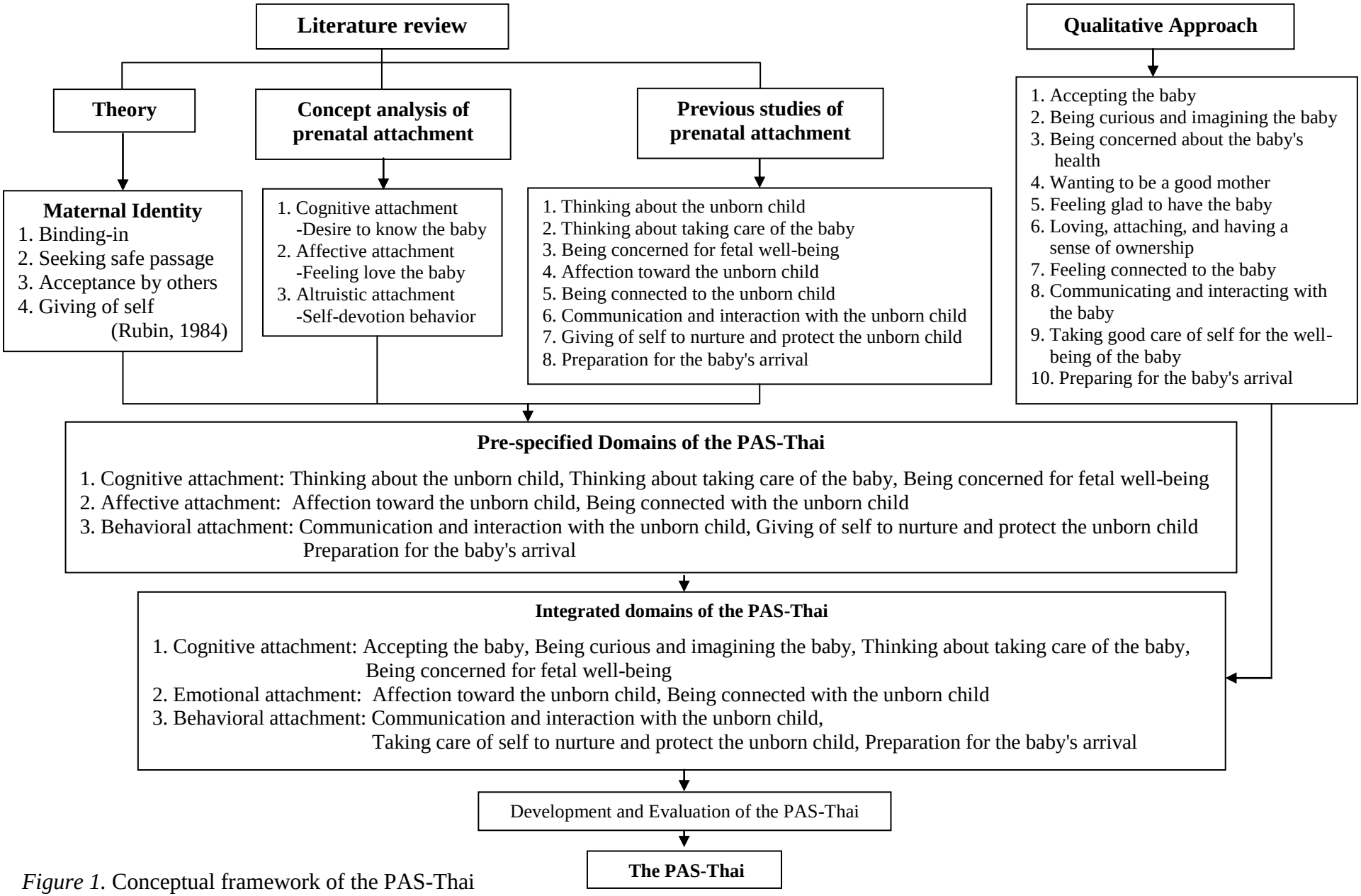


Figure 1. Conceptual framework of the PAS-Thai

Definitions of Terms

Prenatal attachment can be defined as the affectionate relationship and a sense of nurturance and protection of a pregnant adolescent toward her unborn child which is manifested in thoughts, feelings, and behaviors. This prenatal attachment was evaluated by the Prenatal Attachment Scale for Thai pregnant adolescents (PAS-Thai) which was developed based on literature review regarding maternal identity theory, concept of prenatal attachment, previous studies of prenatal attachment, and information on prenatal attachment among Thai pregnant adolescents from qualitative approach. The PAS-Thai consists of three domains: 1) cognitive attachment, 2) emotional attachment, and 3) behavioral attachment. The definition of each domain is presented as follows:

Cognitive attachment

Cognitive attachment is the thoughts and imagining of pregnant adolescents about the attributes of their unborn child, how to take care of the baby, and their concern for fetal health and well-being.

Emotional attachment

The emotional attachment of pregnant adolescents is the affection for, being connected to, and the pleasure associated with thoughts or communication with the unborn child.

Behavioral attachment

The behavioral attachment is the communication and interaction of pregnant adolescents with their unborn child, the self-sacrificing behaviors for fetal

health and well-being, nurturance and protection of the unborn child, and preparation for the baby's arrival.

Significance of the Study

Adolescent pregnancy is a major problem in Thailand that has profound effects not only on the well-being of adolescents, but also on their children, families, and society. One possible way to reduce the negative outcomes of adolescent pregnancy is to assess and promote prenatal attachment, because prenatal attachment is the most important relationship between the mother and her unborn child. Key aspects of prenatal attachment are love and protection from mother to her baby.

The PAS-Thai is expected to be a potential scale assessing the level of prenatal attachment among pregnant adolescents in the Thai context. Using the PAS-Thai which fits the Thai context can provide useful information for nursing practices regarding prenatal attachment. The appropriate nursing care regarding prenatal attachment is assumed to have benefits for reducing ineffective prenatal attachment and improving the level of prenatal attachment, and thereby contributing to improve the well-being of adolescent mothers and their babies both during pregnancy and after birth.

CHAPTER 2

LITERATURE REVIEW

Literature review is an important way to investigate theoretical literatures and the empirical evidences related to prenatal attachment among pregnant adolescents which will support this study. To develop Prenatal Attachment Scale for Thai Pregnant Adolescents (PAS-Thai), a literature review was carried out on the following topics:

1. Adolescent Pregnancy
   - 1.1 Definition of adolescence
   - 1.2 Adolescent development
   - 1.3 Outcomes of adolescent pregnancy
2. Concept of Prenatal Attachment
   - 2.1 Theory related to prenatal attachment
   - 2.2 Definitions of prenatal attachment
   - 2.3 Domains of prenatal attachment
     - 2.3.1 Concept analysis of prenatal attachment
     - 2.3.2 Previous studies of prenatal attachment
   - 2.4 Prenatal attachment in Thai cultural context
   - 2.5 Factors related to prenatal attachment among pregnant adolescents
   - 2.6 Measurement of prenatal attachment

Adolescent Pregnancy

This literature review provides concerns of pregnant adolescent development for understanding the study participants which the PAS-Thai would be developed for. Literature review in this section composes of definition of adolescence, adolescent development, and outcomes of adolescent pregnancy.

Definition of adolescence

Adolescence is a critical period of developmental transition which an individual develops the psychological and physiological changes from a child into an adult. The World Health Organization (WHO, 2018b) defined adolescence as "a particularly important phase in life; a critical time of rapid physical, mental, emotion, social, and spiritual development. The rates at which these changes occur, and the key events that mark them, vary considerably among individuals and among societies. There are differences in the place and quality of development among adolescents of the same age and sex, between the sexes, and among adolescents from different cultural, social, and economic backgrounds" (Shaffer & Kipp, 2014). Adolescents are not a homogeneous group, but they grow differently in biology, psychology, and emotion. Each adolescent responds to life's demand and circumstance in different way (Sherer & Radzik, 2016).

In terms of numbered years, adolescence is generally defined as the period between 13 and 19 years. The period of adolescence can be divided into three stages: 1) early adolescence (age 14 and under), 2) middle adolescence (15-17 years), and 3)

late adolescence (18-19 years) (Davidson, London, & Ladewig, 2012). Although the conventional age is divided into each stage, the maturity level may be not the same as chronological age. These stages overlap among different adolescents. In this study, the participants would be between 13 years and under 20 year of age.

Adolescent development

Chronological age of adolescent may be not the same as maturity level. They may be at different level of cognitive development and psychosocial development. Additionally, cognitive and psychosocial development stage may be effected prenatal attachment in pregnant adolescents. The developmental tasks of adolescence and pregnancy may develop differently in each adolescent. Thus, understanding the cognitive and psychosocial development of adolescent is crucial. The cognitive and psychosocial development of adolescents is presented as follows.

Cognitive development

Adolescents think in different ways than adults. Cognitive development affects all aspects of psychosocial development. Cognitive development proceeds from concrete to abstract thinking throughout all phases of adolescent development. During the concrete operation stage, children and young adolescents think only today's action, not future's consequences. They often do not realize the consequences of their actions (Broecker & Hillards, 2009; Daley, Sadler, & Reynold, 2013). In the formal operation stage, or abstract thinking stage, adolescents develop the ability of logical thinking together with abstract thinking, and understanding of complex

concepts and the consequences (Sherer & Radzik, 2016). Cognitive development of adolescence is categorized into early, middle, and late adolescent as follows:

The early adolescent (11 to 14 years) is very concrete thinker. They are dependent and have limited ability to see themselves in the future and the consequences of their behaviors (Davidson et al., 2012) which make the adolescents laboriously adapt to the changes of pregnancy and the responsibilities of parenthood (Daley et al., 2013). The middle adolescent (15 to 17 years) is beginning to move from concrete to abstract thinking, and not ready to anticipate the long-term effects of their behaviors. They may even believe that they are unbeatable and will not get adverse consequences from risk-taking behaviors (Sherer & Radzik, 2016). Late adolescence (18 to 19 years) is characterized by the ability to think abstractly and anticipate consequences. They are capable of abstract thinking. They are learning about problem-solving, conceptualization, and decision-making. These abilities help them to understand and accept the outcomes of their behaviors (Davidson et al., 2012). Moreover, a pregnant adolescent may truly believe that she is not pregnant or going to deliver a baby even though she knows the cause and effect relationship between sexual intercourse and pregnancy, observes her enlarging abdomen, get noticeable changes and is informed about the diagnosis of her pregnancy (Colucciello, 1998; Sherer & Radzik, 2016).

The adolescents who have accomplished the formal logical operations stage can use complex thinking about specific concerns and plan ahead of their future. They are capable to realize how their behaviors effect to the health of their unborn baby and outcomes of pregnancy. Thus, they are able to plan for baby care and maternal role (Broecker & Hillards, 2009; Daley et al., 2013). In contrast, the

adolescents who become pregnant before a stable identity is developed may be not able to plan for future, and often have difficulty seeing themselves as a mother (Murray & McKinney, 2010).

Importantly, the absence of, or immaturity in, formal operational thought may make it difficult for the pregnant adolescent to attach to her unborn baby, since the baby may not be perceived of as real baby or the inability to conceptualize herself attached to the unborn baby (Bloom, 1995). Early adolescents may be difficult or unable to develop prenatal attachment toward their unborn child because of egocentric reaction and concreate thinker (Broecker & Hillards, 2009; Daley et al., 2013).

Psychosocial development

Identity formation is the major developmental task of adolescence. Adolescents are generally egocentrism (Colucciello, 1998; Davidson et al., 2012). Even though the pregnant adolescents know that their risk-taking behaviors effect to their unborn baby, they might not feel that this is important (Davidson et al., 2012). The psychosocial development of adolescence is categorized as follows:

The early adolescent has intense feeling about body image, loss of body control, and many physical changes taking place. Early adolescence is characterized by hormonal influence on the emotions. They are very egocentric, self-interest, fantasy, and weakly developed sense of self (Sherer & Radzik, 2016). Early pregnant adolescents feel too much confuse for identity formation. Concern with body image and worry about being different may make them hide their pregnancy. Moreover, they need incentives to adhere to recommendations for healthy prenatal behaviors, and still rely on parents and other adults and need much support regarding maternal roles (Broecker & Hillards, 2009; Daley et al., 2013).

Middle adolescence is the most frustrating period of adolescent. They struggle for identity, while most of them usually still rely on parents or the other adults (Feldman, 2012). Middle adolescence focuses on personal identity and sense of self. In this stage, their bodies reach maturity. They become more introspective, narcissistic, and impatient. Decisions about sexual activity are often passionate and made with less regard to prior prevention or negative consequences. Middle pregnant adolescent usually react negatively to body image changes associated with pregnancy (Sherer & Radzik, 2016). Due to the sexuality development, some of the adolescents may desire to get pregnant to intensify relationship with her partner or confirm feminine identity (Broecker & Hillards, 2009; Daley et al., 2013).

Late adolescence has a feminine identity formation, and capable to accommodate to pregnancy and maternal roles like older mothers. Late pregnant adolescents feel more comfortable with body maturity and maternal changes. They develop self-motivation to do for a healthy pregnancy and can take primarily responsibility for maternal role (Broecker & Hillards, 2009; Daley et al., 2013).

If the pregnancy is unplanned, the identity formation and self-dependence can be disturbed as this young mother struggles to integrate the tasks of pregnancy, the attachment to the unborn baby, and the preparation for the baby's arrival. This process leads to conflicts and stress (Ricci, Kyle, & Carman, 2013).

In summary, accomplishment of developmental tasks of adolescence becomes more complicated when adolescents get pregnancy. Not only do the adolescents encounter the adolescent developmental tasks, but also the developmental tasks of pregnancy. Thus, understanding adolescent development is important for developing an appropriate scale measuring prenatal attachment in this age group. In

addition, outcomes of adolescent pregnancies have been considered adverse physiologically, psychologically, and sociologically as described below.

Outcomes of adolescent pregnancy

The pregnancy in adolescence involves developmental threats. The pregnant adolescents struggle to adapt to the demands of adolescence, the pregnancy, and the relationship with the fetus and maternal role (Bloom, 1995). Pregnant adolescents are more likely than adult pregnant to face emotional disappointment and anxiety. Early adolescent has high levels of concealment and denial of pregnancy (Davidson et al., 2012). In addition, they may be ambivalent to continue their pregnancy or raise the baby. They may protect their emotion by not becoming too attached to their baby (Rowe et al., 2013). The pregnant adolescents are often found to be egocentric, having less life-experience, knowledge and understanding regarding their maternal responsibility. Adolescent pregnancy, desire or unintended, is recognized as a high risk pregnancy as follows:

Physiological risks

Adolescent pregnancy is recognized to be at physiologically high risk because the developmental tasks of pregnancy are superimposed on those of adolescence. Several Thai studies showed that most of the adolescent mothers initially became aware of their pregnancy at a later point in the gestational periods, started to seek prenatal care services later than when they should have, and received inadequate prenatal care (Isaranurug et al., 2006; Pantumas et al., 2012; Techainth & Siriwattanapa, 2013). They may lack of knowledge about signs and symptoms of

pregnancy such as breasts enlargement or absence of menstruation. They may think that physical changes in their bodies are occurring because of the development of adolescence (Neamsakul, 2008).

The pregnant adolescents may not express concerns or taken good care of themselves for the sakes of the unborn child. Isaranurug et al. (2006) and Panthumas et al. (2012) studied self-care behaviors among Thai primigravida teenagers. The results revealed that pregnant adolescent always not seek timely antenatal care because of concealment or denial of pregnancy. The study of Panthumas et al. (2012) also revealed that self-care behaviors of the pregnant adolescents were inappropriate.

Moreover, they may not adhere to the recommendations given by health care providers (Davidson et al., 2012; Thato, Rachukul, & Sopajaree, 2007). These problems effect to the health of both pregnant adolescents and their unborn babies.

Physiological risks for pregnant adolescents include poor maternal weight gain, preterm birth, low birth weight infant, pregnancy induced hypertension, iron deficiency anemia, sexuality transmitted infections, and cephalopelvic disproportion (Davidson et al., 2012; Liabsuetrakul, 2012; Pillitteri, 2014; Thaitae & Thato, 2011). For the children of adolescent mothers, many studies show that these children face significant challenges with risks of fetal distress, born at low birth weight, birth asphyxia, neonatal death, and increased mortality and morbidity (Cox, 2008; Flaherty & Sadler, 2011; Liabsuetrakul, 2012; Thaitae & Thato, 2011).

Psychological risks

Adolescent pregnancy is considered to be at high risk psychologically because adolescent development characteristics such as egocentrism, formation of identity, formation of sexual identity, and making effort for independence all

complicate the process of being a mother (Davidson et al., 2012; Pungbangkadee, Parisanyakul, Kantaruksa, Sripichyakarn, & Kools, 2008). Qualitative study of Pungbangkadee et al. (2008) revealed that Thai pregnant adolescents may not mind to keep themselves and their fetus healthy because they want to respond their desire. Moreover, most of Thai adolescent pregnancies are unplanned and occur outside marriage (UNICEF, 2015; WHO, 2017). Pregnant adolescents are often being single mums because partnerships at this age are unstable. Moreover, there is often a strong culture and family pressure on adolescent pregnancy (Kirchengast, 2009; Noknoi, 2013). The unacceptable pregnancy makes pregnant adolescents confront many problems. They may be afraid of others' reaction, and fear the effects of pregnancy on their lives and relationships. Being socially disgraced can make pregnant adolescents experienced of anxiety, depression, and lower self-esteem (McFarland et al., 2011; Siegel & Brandon, 2014).

The study of Figueiredo, Bifulco, Pacheco, Costa, and Magarinho (2006) and Rowe et al. (2013) revealed that pregnant adolescents are more likely than adult pregnant to face emotional distress, depression, and anxiety which negatively associated with prenatal attachment. Most of Thai pregnant adolescents reported negative feelings to the pregnancy such as shocked, afraid, guilty, angry, confused, ashamed, stressed, depressed, worried, embarrassed, and humiliated (Neamsakul, 2008; UNICEF, 2015). These feelings lead pregnant adolescents to conceal, deny, or terminate their pregnancy. Pregnant adolescent may think that the baby is an enemy who brings about discomfort during pregnancy (Davidson et al., 2012; Sherer & Radzik, 2016). The negative feelings can interfere the attachment relationship with the fetus (Kaewjanta, 2012; Lindgren, 2001; Siegel & Brandon, 2014), leading to

negative outcomes of pregnancy. Not surprisingly that most of them once used to seek for criminal abortion, more detached, and be a harsh parent to their babies.

Sociological risks

Adolescent pregnancy has profound effects not only on the well-being of adolescents, but also on their children, families, and society. Pregnant adolescents have less access to educational and vocational opportunities. Many of them withdraw from school and fail to achieve their education (Feldman, 2012; UNICEF, 2015). Low educational achievement reduces the employability or quality of jobs available for them. They have lower incomes and worsened living situation (Kirchengast, 2009). The studies of Isaranurug et al. (2006), Pantumas et al. (2012), and Sa-giamsak (2016) also revealed that Thai pregnant adolescents often have unstable jobs and work for low wages, while pregnancy increases the need for financial and emotional support (Murray & Mckinney, 2010). This difficulty forces them to become more dependent causing conflicts (Feldman, 2012) and leads to an economic burden to their families and the society (Panyayong, 2010; WHO, 2017).

Adolescents are not developmentally or economically prepared to be parents that make children of adolescent parents are at a disadvantage in many ways (Davidson et al., 2012). In some cases, adolescents may intentionally try to become pregnant without appreciating their responsibilities (Orshan, 2008). Adolescent mothers seem to be more prone to neglect to their babies. Some left their babies to their parents to take care for (Chaipornpattana et al., 2009). Most of children of adolescent parents are experienced mental health, developmental, and behavioral problems (Cox, 2008; Flaherty & Sadler, 2011; Liabsuetrakul, 2012; Thaitae & Thato,

2011). They are frequently poor, abused, and/or neglected which is contributing to the vicious cycle again (Panyayong, 2010).

In conclusion, the adolescent who continues her pregnancy is recognized as a high risk pregnancy, including physiological, psychological, and sociological risks. Life event stress and difficult experiences during pregnancy may be an important determinant of poor outcomes for adolescent mother and her baby. These problems are potential threats to the successful accomplishment of developmental tasks of pregnancy and prenatal attachment.

Concept of Prenatal Attachment

Concept of prenatal attachment in this study was discussed in the following topics: 1) theory related to prenatal attachment, 2) definition of prenatal attachment, 3) domains of prenatal attachment, 4) prenatal attachment in Thai cultural context, 5) factors related to prenatal attachment among pregnant adolescents, and 6) measurement of prenatal attachment.

Theory related to prenatal attachment

The following reviews of theory related to prenatal attachment focus on maternal identity theory. Although prenatal attachment concept was originated from attachment theory, prenatal attachment is not aligned with attachment theory (Eichhorn, 2012; Walsh et al., 2014). Attachment theory mentions that the attachment

system involves seeking comfort and protection, whereas prenatal attachment involves providing caring and protection.

Maternal identity theory is one of the most frequently used theory supporting the understanding of prenatal attachment (Alhusen, 2008; Brandon et al., 2009; Cranley, 1981a, 1993; Doan, Cox, & Zimerman, 2003; Shieh et al., 2001; Walsh, 2010). The constructions of maternal identity process indicate the adoption of maternal behaviors (Özkan & Polat, 2011). The detail of the theory is presented as follows:

Maternal identity theory was developed by Reva Rubin, a nurse scholar and midwife, in 1967. Rubin laid the foundation to the construct of prenatal attachment. Rubin summarized that the bonding between mother and newborn after birth was developed during pregnancy (Rubin, 1984). The quality research work provided her ideas of the development of maternal identity. Firstly, Rubin's tasks were based on intensive, longitudinal interviews with nine pregnant women of diverse backgrounds over the course of pregnancy and the first postpartal month. The longitudinal sample was supplemented with a cross-sectional sample of 32 women interviewed once at various periods during pregnancy and eight women who were interviewed in the first postpartal month. Rubin later developed her works from naturalistic clinical observations of 6,000 childbearing women in university teaching hospitals in Chicago and Pittsburgh. In addition, 100 women served as longitudinal subjects, they were traced from the earliest confirmation of their pregnancy through to early childbearing experiences.

Rubin refined her theoretical work in 1984. Content analysis of responses and feedback from women were used to obtain the themes of developmental tasks of

pregnancy. Each developmental task involves three systems: the mother-child system, the self-system, and the larger family system. A central component is that of a changing identity. The incorporation is by the way of imaginations self as a mother. Maternal identity will be achieved when the woman felt an internal self-actualization in maternal role and the knowledge of her baby (Rubin, 1984).

Rubin (1984) proposed four developmental tasks which occurred continuously and orderly at the discovery of pregnancy and continuing throughout the first year after birth to achieve maternal identity. She viewed the developmental tasks of pregnancy as separate aspects and sequential building blocks of maternal identity development. Four developmental tasks of maternal identity include: 1) safe passage, 2) acceptance by others, 3) binding-in to the child, and 4) giving of oneself. The detail of each task is presented as follows:

1. Safe passage

The first task "safe passage" refers to the protective behaviors of the mother toward fetus and herself. This task occurs after binding-in begins. At the end of the second trimester, the mother starts to protect her unborn baby (Rubin, 1984).

Rubin (1984) mentioned that this task involves the sought of prenatal care, information and knowledge about childbearing and childrearing, life style changes to ensure safe passage. In order to have a healthy baby and protect him from harm, the pregnant woman seeks good prenatal care. She also needs the competent doctor to ensure safe pregnancy and delivery both for herself and the baby. The ensurance of safe passage is done by loading of knowledge of what to expect and of how to cope with the manifest phenomena. During pregnancy the literature and the personal experiences of other women is selected. The mother alters her lifestyle to ensure safe

passage and protects her baby from the hazards in an ordinary environment. Empirical indicators were seen in behaviors.

In addition, Rubin (1984) mentioned to pregnant adolescents that "the very young teenager is constricted in searching for models, makes fewer observations, and rarely participates in conversations with women older than herself. This constriction seem to be a factor of the stage of cognitive development with its limited concept of future time" (p. 55).

2. Acceptance by others

The second task has been described the attempts of the mother to establish the acceptance of the baby by family members and others. The family is made for the intimate care, protection, and supportive nurturance that is necessary for the baby and the growing child. What is the most important in acceptance by each member of the family is the awareness of the other's acceptance of sacrifice in behalf of a child (Rubin, 1984). This task occurred late in pregnancy when safe passage was assured.

This task is not an easy one for the pregnant adolescent. Family reaction to the pregnancy of adolescents usually negative: shock, anger, guilt, and sadness (Neamsakul, 2008). The fears about family reaction and rejection to the pregnancy make the pregnant adolescent possibility to reject the baby. Bloom (1998) also mentioned that the rejection of pregnancy by the pregnant woman herself and important person may have adversely affected on prenatal attachment. If the task "acceptance by self and others" was not achieved, the developmental task "binding-in or attachment" and the development of maternal identity would be difficult to achieve.

3. Binding-in to the child

The third task "binding-in to the child" is an enduring affiliative attachment between mother and fetus (Rubin, 1984). The mother transforms the theoretical pregnancy into a real person growing within her and develops a bond with the growing infant. Romantic love promotes idealization of the child. There are fantasies of the ideal figure and form of the child and of what he will be when he grows up. Through fantasy, the fetus became a known person.

Feelings of being tied by affection or love occur after fetal movement and increase with progress of pregnancy. Maternal love for the unborn child becomes stronger in the second trimester. Rubin (1984) mentioned that "by the end of the second trimester, the pregnant woman becomes so aware of the child within her and attaches so much value to him that she possesses something very dear, very important to her, something that gives her considerable pleasure and pride" (p. 54). The attachment is in stability during the third and fourth trimester, and then advancement again after baby birth.

The mother does for having a good baby, and to provide a home for the baby both in utero and in her house. Possessive love stimulates maternal protectiveness to ensure safe passage for the child. The responsibility for protecting and caring for the child as "my child", an especially valuable gift and possession, is given significance (Rubin, 1984, p. 65). This possessive love increases the maternal protectiveness for the child.

Binding-in to the child and a maternal identity formation are reciprocal components in the same process (Rubin, 1984). Binding-in involves both recognition and awareness of the fetus as a real living child, and development of a loving

protective relationship with the unborn. If the first task "binding-in" was not achieved, the other developmental tasks of maternal identity would be difficult to achieve. Importantly, without binding-in, motivation to become a mother is low (Rubin, 1984). Importantly, Rubin (1984) explained that the single woman who has a complicate problem in social acceptance to have a baby and to be a mother. She tends particularly to avoid binding-in to the child.

4. Giving of oneself

The final task "giving of oneself" involves caring, self-deprivation of giver for a receiver, and adaptation of the woman's body and her social and psychological self. Rubin (1984) mentioned that "this task is the most intricate and complex task of childbearing and childbirth" (p. 66). Early in pregnancy there was resistance to this task as the demands were high and rewards less apparent. The increasing physical, psychological and social demands of pregnancy required a purpose so they could be ensured. It is this consideration of self-sacrifice behaviors: the giving of one's time; of caring attention, interest, or concern; and of companionship in stress and in pleasure (Rubin, 1984). Importantly, this task is not easy for the pregnant adolescents. Even though some adolescents know that their health-related behaviors have a strong influence on their babies, they might not feel that this is important. They may still conceal the pregnancy by wearing a tightened cloth or do activities as usual that may effect their health and the fetal well-being (Davidson et al., 2012).

In conclusion, the maternal identity formation process is correlated with prenatal attachment. The developmental task of each pregnant woman may work differently. The task "binding-in to the child" is considered represent affective

attachment. The task "safe passage" is considered as protective behaviors of the mother toward her unborn child. The task of "acceptance by others" has been demonstrated the attempts of a mother to establish the acceptance of the unborn child by family members and others. This effort is made for supportive nurturance the baby. The task "giving of oneself" involves caring and self-deprivation of the mother for her baby. This task is considered represent to behavioral attachment. Thus, these four tasks were used to provide the conceptual framework of prenatal attachment in this study.

Definition of prenatal attachment

Prenatal attachment is an abstract concept, which is conceptualized as the affectionate relationship between a mother and her unborn child (Cranley, 1981a; Della Vedova et al., 2008; Doan & Zimerman, 2003; Eichhorn, 2012; Feldman, 2007; Müller, 1989, 1993; Zachariah, 1994). This concept has been used in various fields such as in nursing, psychology, and sociology. Importantly, various theoretical definitions have been used generally and varying.

Recently, the terms "attachment" and "bonding" are being used interchangeably in the literatures. Klaus and Kennell (1982) defined the term "bonding as the emotional tie from parent to infant, whereas attachment is the tie from infant to parent". Cranley (1981) firstly gave definition of maternal-fetal attachment or prenatal attachment. She originally defined maternal-fetal attachment as "the extent to which women engage in behaviors that represent an affiliation and

interaction with their unborn child" (p. 282). Cranley's definition of maternal-fetal attachment was critiqued that it exclusively focused on maternal behaviors.

Other scholars who focused prenatal attachment on feelings toward the baby later defined this term, for example, Condon and Corkindale (1997) gave definition of prenatal attachment as "the emotional tie or bond which normally develops between the pregnant woman and her unborn child" (p. 359). Doan et al. (2003, p. 167) described prenatal attachment to the affectionate bond that expectant mothers develop toward their unborn children. Feldman (2007, p. 211) stated that prenatal attachment is "the affectional tie that the pregnant woman feels towards her fetus". Bouchard (2011) defined prenatal attachment as "the feeling of love for one's unborn child" (p. 197). Walsh (2010, p. 449) also mentioned that prenatal attachment is a strong emotional tie.

Moreover, other researchers viewed prenatal attachment as an affectionate relationship, for example, Müller (1989) defined prenatal attachment as "the unique, affectionate relationship that develops between a woman and her fetus" (p. 11). Della Vedova et al. (2008, p. 86) and Anand and Hima (2012, p. 630) described prenatal attachment as "the affective investment that parents (mothers) develop toward the unborn baby during the gestational period".

Currently, both quantitative and qualitative studies have revealed that prenatal attachment involves not only affectionate relationship (Cranley, 1981; Della Vedova et al., 2008; Doan & Zimerman, 2003; Feldman, 2007; Müller, 1989; Zachariah, 1994) but also the maternal responsibility to provide security and well-being of the fetus (Brandon et al., 2009; Leva-Giroux, 2002; Lewis, 2008; Pollock & Percy, 1999; Rauenhorst, 2001; Rowe et al., 2013; Shieh et al., 2001; Walsh, 2010;

Walsh et al., 2014). Some researchers combined characteristics of protection into the definitions, for example, Zachariah (1994) defined prenatal attachment as "the intimate and enduring relationship that provides the individual with a sense of security, comfort, support, and closeness" (p. 37). Alhusen et al. (2012b) mentioned prenatal attachment as "the development of an emotional tie between the mother and unborn child as well as an innate desire to protect the unborn baby" (p. 114).

However, there is no universal agreement on definition of the term prenatal attachment (Brandon et al., 2009; Walsh, 2010; Walsh et al., 2014). Researchers have attempted to combine thoughts, feelings, and behaviors in the definition as demonstrated in the followings: 1) "The relationship with the fetus is manifested in behaviors, attitudes, thoughts, and feelings that demonstrate care and commitment to the fetus" (Van den Bergh & Simons, 2009, p. 116); 2) "The parent's emotions, perceptions, and behaviors that are related to the fetus" (Pisoni et al., 2014, p. 45), and 3) "The affiliated relationship between a parent and fetus, which is potentially present before pregnancy, is related to cognitive and emotional abilities to conceptualize another human being, and develops within an ecological system" (Doan & Zimerman, 2003, p. 110).

Many studies have been conducted to investigate prenatal attachment, and found that the core aspect of prenatal attachment is not only love but also protection (Delahoussaye, 1994; Ross, 2012; Walsh et al., 2014). Therefore, the conclusion of prenatal attachment meaning from many studies can be defined in this study as the affectionate relationship and a sense of nurturance and protection of a pregnant adolescent toward her unborn child which is manifested in thoughts, feelings, and behaviors.

Domains of prenatal attachment

Concept of prenatal attachment has been documented as multidimensional nature of the construct (Doan & Zimerman, 2008; Eichhorn, 2012; Müller & Ferketich, 1992; Siddiqui et al., 1999) and has been explored in nursing, psychology, and other disciplines for decades. The used of different theoretical basis by different disciplines may reflect the different constructs of this concept. The guidance of Walker and Avant (2005) was used to identify domains of prenatal attachment among pregnant adolescents. Extensive reviewing literature of articles which analyzed concept of prenatal attachment and previous studies regarding prenatal attachment were approached.

Concept analysis of prenatal attachment

Base on analyzing of the literature review regarding concept analysis of prenatal attachment which analyzed the critical attributes of this concept (Bloom, 1995; Brandon et al., 2009; Condon, 1993; Cranley, 1993; Dawson, 2002; Doan & Zimerman, 2003, 2008; Eichhorn, 2012; Eddins, 2014; Müller, 1992; Rowe et al., 2013; Salisbury et al., 2003; Shieh et al., 2001; Van den Bergh & Simons, 2009; Walsh, 2010; Young, 2013), three critical domains of prenatal attachment were identified as cognitive attachment, affective attachment, and altruistic attachment. Therefore, these domains were integrated into the domains of the PAS-Thai.

1) Cognitive attachment

Cognitive attachment is the desire to know (Condon, 1993; Cranley, 1993; Eichhorn, 2012; Shieh et al., 2001), to understand, or to define the fetus (Shieh et al.,

2001). Pregnant women conceptualize the unborn baby as an individual or differentiate the unborn baby from themselves (Doan & Zimerman, 2003, 2008; Eddins, 2014; Eichhorn, 2012; Shieh et al., 2001). Pregnant women have mental picture of the baby (Doan & Zimerman, 2003, 2008; Salisbury et al., 2003; Shieh et al., 2001; Van den Bergh & Simons, 2009), and ascribe characteristics to the baby (Condon, 1993; Cranley, 1993; Eichhorn, 2012; Müller, 1992; Salisbury et al., 2003; Shieh et al., 2001).

Shieh et al. (2001) mentioned that successful cognitive attachment occurs when the representation of the child, which initially viewed as an integral part of the pregnant women, becomes more autonomous and real after detection the fetus. Salisbury et al. (2003) included the imagined scenarios between mother and child into cognitive attachment. Thus, cognitive attachment includes the desire to know, to attribute characteristics, and to imagine about the fetus.

2) Affective attachment

Affective attachment has been described as the pregnant women have affection for (Cranley, 1993; Doan & Zimerman, 2008; Eichhorn, 2012; Müller, 1992; Walsh, 2010), bonding to (Bloom, 1995), or bonding emotionally with the fetus (Eddins, 2014). The pleasure or enjoyment associated with thoughts of the baby (Condon, 1993; Dawson, 2002; Eichhorn, 2012; Shieh et al., 2001), and indirect contact or interaction with the fetus (Dawson, 2002; Doan & Zimerman, 2003, 2008; Eichhorn, 2012; Shieh et al., 2001) is included. Positive attachment involves emotional accessibility (Eichhorn, 2012; Shieh et al., 2001; Van den Bergh & Simons, 2009), and sensitivity in the relation with the fetus (Brandon et al., 2009; Doan &

Zimerman, 2008). Thus, affective attachment includes affectionate bonding and the pleasure associated with thought of or interaction with the unborn child.

3) Altruistic attachment

Altruistic attachment is the ambition to protect the unborn child or gratify its needs (Eichhorn, 2012; Shieh et al., 2001). Pregnant women have feelings of responsibility for fetal well-being (Brandon et al., 2009). Appropriate life styles or health practices change to promote the growth of the fetus and minimize abuse or neglect, maintain good health practices, nourish the self (Doan & Zimerman, 2003), including prepare for the baby's arrival (Eichhorn, 2012; Shieh et al., 2001). Doan and Zimerman (2008) explained this kind of attachment as "self-care practice". The study of Bloom (1995) indicated that this attachment reflects a pregnant woman's self-sacrificing behaviors for the sake of fetal well-being. Young (2013) also stated that maternal tie to their unborn baby is shown by their self-sacrificing behaviors to provide the safe delivery and make a healthy baby. Shieh et al. (2001) summarized that altruistic attachment equates with the developmental tasks of "give of self" and "safe passage" as described by Rubin (1984). Thus, altruistic attachment includes self-sacrificing behaviors for the sake of fetal well-being and active preparation for safe arrival of the baby.

Previous studies of prenatal attachment

In order to determine the domains of prenatal attachment among pregnant adolescents, extensive reviewing literature of the existing scales, qualitative studies and empirical studies regarding prenatal attachment were approached.

1) Existing scales

Reviewing literature related to the existing scales found three frequently mentioned scales reflected prenatal attachment. Three instruments of varying quality and mixed theoretical underpinnings, directed measurement of prenatal attachment (Condon, 1993; Cranley, 1981a; Müller, 1989, 1993) were located.

Cranley (1981a) developed the Maternal-Fetal Attachment Scale (MFAS) to assess maternal-fetal attachment based on maternal identity theory and literature review. The scale stresses on attachment behavior and maternal role. It organized into five subscales: 1) differentiation of self from the fetus, 2) interaction with the fetus, 3) attributing characteristics and intentions to the fetus, 4) giving of self, and 5) role taking.

Condon (1993) developed the Maternal Antenatal Attachment Scale (MAAS) to assess prenatal attachment for managing psychosomatic problem during pregnancy. It composes of two dimensions, "quality of affective experiences" and "intensity of preoccupation with the fetus". The central aspect is love. It focuses on knowing and being with the fetus, protection, gratifying needs, and avoiding loss.

Müller (1989, 1993) developed the Prenatal Attachment Inventory (PAI), a one-dimension scale, measured affectionate relationship which excluded behaviors.

Subsequently, the structures of the MFAS (Cranley, 1981a) and the PAI (Müller, 1989, 1993) were investigated in six studies (Della Vedova et al., 2008; Hsu & Chen, 2001; Müller & Ferketich, 1993; Siddiqui & Hägglöf, 2000; Siddiqui et al., 1999; Wang, 2012). Based on a literature review in this study, the study investigating the structure of the MAAS was not found.

2) Empirical studies

Reviewing literature of empirical studies which focused on the relationship a pregnant woman developed with her unborn baby revealed additional information supported the domains of prenatal attachment as presented follows:

Cranley (1981b) examined the level of parents' engagement in attachment behaviors toward their fetus during gestation. The interviewed using the construct of the MFAS was conducted with 30 women at the last 6 weeks of gestation and 3 days after giving birth. The results of the analysis indicated that the women exhibited attachment to the unborn baby during pregnancy. Pregnant women demonstrated a significant level of attachment to their fetus in all five areas of maternal-fetal attachment: 1) role taking, 2) differentiation of self from the fetus, 3) giving of self, 4) interaction with the fetus, and 5) attributing characteristics to the fetus. The behaviors in the giving-of-self category were the most frequently practiced. Seventy-nine percent responded that they imagined themselves taking care of the baby most of the time.

Bloom (1992) studied the attachment behavior development in 79 low-income pregnant adolescents. Participants were recruited in the study during the first trimester. Data collection was re-collected in the second and the third trimester (n = 64 and 54, respectively), and after delivery (n = 47). The Cranley's MFAS was administered in each trimester. Bloom concluded two dimensions of prenatal attachment as below.

- *The internal dimension*: The thought center around questions about what is actually happening within her body. Behaviors represent an interactive participation, with mother responding to the unborn child, the unborn child to mother.

- *The external dimension*: The thoughts and activities include fantasizing about the baby and how it will act or look after birth, and making decisions about naming the baby. As the pregnancy progress, the pregnant women exhibited seeking closeness behaviors with the unborn child. These attachment behaviors include: talking about the unborn child to the baby's father, family, and the others; responses to the baby's movement; giving a nickname to the unborn child, interpretation of the baby's movements; searching knowledge about fetal growth and development; and arrangement the home for the baby's coming. The mothers also have altering activities or eating practices for the benefit of the baby.

Bloom (1995) studied the development of attachment in pregnant adolescents. Seventy-nine pregnant adolescents were recruited in the first trimester. Data were collected three times: at the second trimester, third trimester, and after delivery. Maternal-fetal attachment was measured at all three prenatal data-collection points with the Cranley's MFAS. Multivariate analysis revealed that prenatal attachment in pregnant adolescents start during pregnancy and increase after quickening and as gestation progressed. Analysis of scores on maternal-fetal attachment revealed moderate attachment in pregnant adolescents (M = 3.63, SD = .48). The role-taking subscale had the highest mean (M = 4.31, SD = .43), whereas the lowest mean score was on the interaction-with-the-fetus subscale (M = 2.94, SD = .79). The differentiation-of-self-from-fetus subscale had a mean score of 3.94 (SD = .48), the giving-of-self subscale had a mean score of 3.32 (SD = .71), and the attribution-of-characteristics-to-the-fetus subscale had a mean score of 3.94 (SD = .71).

Bloom (1998) examined the development of maternal attachment in pregnant adolescents. Seventy-nine pregnant adolescents were recruited. Data were assessed four times: gestational age less than 20 weeks; gestational age during 20 to 29 weeks and 30 to 40 weeks; and during one week after giving birth. Maternal-fetal attachment was assessed using the MFAS. The findings revealed that adolescents frequently identified baby's personality and expected the baby's attributes. The attachment behaviors consisted of curiosity about or guessing the baby's characteristics and behaviors. The least common behaviors composed of communicating with the unborn child, calling to the unborn baby using a nickname, and rubbing uterus or poking the baby to stimulate fetal movement. In addition, attachment behaviors of the mother were influenced by a close and affectionate relationship with her spouse.

Pollock and Percy (1999) examined prenatal attachment style and potentially abusing of the fetus. Forty pregnant women completed a self-report measure maternal antenatal emotional attachment. The mothers who had negative preoccupied attachment pattern were reported the stimulation to harm the fetus, less of attachment to the unborn child, a minimal effort to prepare for the birth.

Lindgren (2001) proposed a conceptual model investigated the influence of depression on prenatal attachment and health practices. Two hundred and fifty-two adult pregnant women were recruited from five antenatal care clinics. The inclusion criterion was 20-40 weeks gestation. Mailed self-reported instruments were used to collect data. The effects of depression and maternal-fetal attachment on health practice were examined using Hierarchical regression. The findings revealed that pregnant women who are more attached to their fetus are more invested in taking

good care of themselves for the benefit of healthy babies, and comply with health practices to improve fetal outcomes.

Ahern and Ruland (2003) conducted pilot study in a sample of 40 subjects included pregnant women both Hispanic-American and African-American ethnic background. The Cranley's MFAS was administered to participants in two antenatal care sites in two Mid-Atlantic States. The mean scores were highest in 'attributing characteristics to fetus' and 'giving of self' subscales for both groups, revealed that pregnant women were more likely to interested in attributes of the unborn baby and would be willing to improve health behaviors for the health of the unborn baby. The lowest mean score was in 'differentiation of self from fetus' subscale.

Alhusen et al. (2012b) conducted the longitudinal descriptive study to investigate the relationship among prenatal attachment, health practice during pregnancy, and neonatal outcomes. One hundred and seventy-four pregnant women were convenient sampling from three urban antenatal care clinics in the Mid-Atlantic region. The MFAS was administered to the participants, 16 years old or older, and 24 to 28 weeks' gestation. The findings revealed the mother developed an emotional bond and a protective desire toward her unborn baby. The pregnant women who had high levels of maternal-fetal attachment tended to take good care of themselves for heathy pregnancy and fetal outcomes.

Rowe et al. (2013) conducted a prospective cohort study about maternal-fetal emotional attachment development in pregnant adolescents. One hundred and ninety-four pregnant adolescents were recruited in this study. Maternal-fetal attachment was assessed three times during gestation: during their first hospital visit, and during 20 and 30 weeks gestation, respectively. The MAAS was used to measure

maternal-fetal attachment. Adolescents had significant lower mean global scores than adults in the first trimester, but the scores were not different in the second and third trimester. Adolescents demonstrated significantly lower scores in 'intensity' subscale in the first trimester, and higher scores in 'quality' subscale than older women in the second and third trimester.

Walsh et al. (2014) proposed and evaluated a maternal-fetal relationship model. Two hundred and fifty-eight pregnant women with gestational age 13 weeks, 23 weeks, and 33 weeks were measured attachment and thoughts to their unborn child online. Maternal-fetal relationships were tested using a structural equation model. Data analysis revealed that the reflection of maternal-fetal relationships is the caregiving system.

3) Qualitative studies

Reviewing literature of qualitative studies which focused on the attachment which pregnant woman developed with her unborn child provided information supported the domains of prenatal attachment as presented follows:

Müller and Ferketich (1992) conducted a content analysis to examine the construct validity of maternal-fetal attachment as presented by the Cranley's MFAS subscales. The categories generated from the content analysis support a multidimensional construct of prenatal attachment. The content analysis categories composed of recognizing the baby as a person, imagine self as parent, general anticipation and curiosity, concerns and fears, negative statements, and affective statements.

Delahoussaye (1994) conducted a grounded theory approach to the discovery of adolescents' relationship with her unborn child. Data obtained from 20

low-income pregnant adolescents between the ages of 15 and 17. They were interviewed during 7 and 32 weeks gestation. The themes emerged from the study compose of thinking, accepting, and caring. The theme "thinking" includes knowing baby's presence and labeling the baby. The theme "accepting" composes of wanting the baby and learning about childbearing. The theme "caring" composes of fantasizing being a mother, communicating with baby, and relating to significant others.

Rauenhorst (2001) conducted a qualitative investigation of the attachment a woman experiences to her unborn child during the final trimester of pregnancy. Twelve culturally diverse women were selected using semi-structure interviews to examine what factors had influenced on their maternal-fetal attachment. Data analysis identified major themes regarding prenatal attachment. The theme "feelings, thoughts, or images of the baby" composes of emotions/feelings about the baby, spiritual experiences, images/impressions of the baby, projecting into the future, and dreams of the baby. The theme "interaction with and experience of the baby" composes of experience of the baby moving, talking to the baby, and two-way interactions with the baby. The theme "information about the baby or education about babies in general" composes of education through books, prenatal and birth preparation classes, hearing the baby's heartbeat, ultrasounds, knowing the baby's sex and naming the baby.

Leva-Giroux (2002) conducted a phenomenological approach to explore how pregnant women living the experience of prenatal attachment toward their unborn babies. Participants in this study were 10 primigravidas. Unstructured interviews were employed two times: during 14-16 weeks and 26-28 weeks of

gestation. Data analysis revealed emerged themes as follows: awareness of a life-changing event, experiencing a mixture of feelings, feeling supported, being protective this new life, imagine the life within, being connected to this growing life, experiencing the reality of the life within, creating a dream or fantasy, and anticipating the birth.

Shieh and Kravitz (2002) explored constructs of prenatal attachment in pregnant women. To extract themes of prenatal attachment, content analysis method was conducted with 40 pregnant women who used illicit drugs after the menstruation. The emerged themes were composed of cognitive attachment, affective attachment, and altruistic attachment.

Ross (2012) explored maternal-fetal attachment and compliance with prenatal advices. Qualitative approach using nine semi-structured interviews and a focus group were conducted with women who were pregnant or who had recently given birth. The results found that maternal attachment had important affected on maternal healthy behaviors. Analysis of focus group and interview transcripts revealed the connection with the baby during pregnancy, creating the bond, and maternal-fetal attachment and health behaviors.

Olivier (2016) conducted a qualitative multiple case study with three pregnant adolescents in the third trimester of pregnancy. The findings revealed that the development of prenatal attachment of pregnant adolescents differs from adult pregnant women, especially in the first and second trimester.

In conclusion, after extensively reviewing available literature of the existing scales and its factor analysis, qualitative studies and empirical studies

regarding prenatal attachment; the eight finding domains of prenatal attachment were composed of: 1) thinking about the unborn child, 2) thinking about taking care of the baby, 3) being concerned for fetal well-being, 4) affection toward the unborn child, 5) being connected to the unborn child, 6) communication and interaction with the unborn child, 7) giving of self to nurture and protect the unborn child, and 8) preparation for the baby's arrival. These finding domains were integrated into the pre-specified domain of the PAS-Thai.

1. Thinking about the unborn child

Pregnant women are preoccupied with thoughts (Bloom, 1992; Condon, 1993; Rowe et al., 2013) and dream about their baby (Della Vedova et al., 2008; Hsu & Chen, 2001; Leva-Gioux, 2002; Müller, 1989, 1993; Rauenhorst, 2001; Siddiqui & Hägglöf, 2000; Siddiqui et al., 1999). Qualitative studies revealed that pregnant women wonder what the baby might be like (Müller & Ferketich, 1992; Rauenhorst, 2001) and curious about the baby gender, looks, personality, and health (Delahoussaye, 1994).

Both empirical studies (Ahern & Ruland, 2003; Bloom, 1995, 1998; Cranley, 1981a, 1981b) and qualitative studies (Müller & Ferketich, 1992; Rauenhorst, 2001; Ross, 2012; Shieh & Kravitz, 2002) found that pregnant women attribute characteristics and intention to the fetus. Ahern and Ruland (2003) explored maternal-fetal attachment behaviors. Participants were Hispanic-American and African-American pregnant women. The results indicated that mean scores were highest in the subscale of attributing characteristics to the unborn baby, indicating the pregnant women were more interested in the characteristics of the unborn child. Bloom (1998) examined the development of maternal attachment in pregnant

adolescents. The findings revealed that pregnant adolescent was frequently intended to attribute characteristics of the unborn child. Pregnant adolescents also gave information in qualitative study of Delahoussaye (1994) that they think the baby would have good attitude and positive characteristics. In terms of baby's personality, some pregnant women felt that baby would be like herself, her husband, or her parents (Delahoussaye, 1994; Leva-Giroux, 2002; Rauenhorst, 2001). Some pregnant women gave information that they conceptualized the fetal characteristics based on fetal movement (Leva-Gioux, 2002; Rauenhorst, 2001; Shieh & Kravitz, 2002) and had a lot of thought in selecting the perfect name for her baby (Delahoussaye, 1994; Leva-Gioux, 2002).

Participants in qualitative studies of Delahoussaye (1994) and Rauenhorst (2001) gave information that they identify and call the baby by name. Qualitative study of Shieh and Kravitz (2002) revealed that the participants named the baby related to themselves or family members. However, qualitative study of Leva-Giroux (2002) found that pregnant woman who felt dissatisfaction about being pregnant expressed difficulty in picturing the life inside her.

2. Thinking about taking care of the baby

Pregnant women think about being a mother (Delahoussaye, 1994; Leva-Giroux, 2002; Müller & Ferketich, 1992). They think about the next stage of their relationship with the baby (Delahoussaye, 1994; Doan & Zimerman, 2003; Rauenhorst, 2001). Qualitative studies (Delahoussaye, 1994; Leva-Giroux, 2002) revealed that pregnant women want to take care of and spend time with the baby. They imagine scenarios between mother and child and fantasize about mothering, taking care of the baby, holding the baby, feeding the baby, dressing the baby up, or

going somewhere with the baby. The study of Delahoussaye (1994) found that pregnant adolescent want to be a good mother for her baby. They envisioned their roles as a key figure in creating a happy life for the baby.

3. Being concerned for fetal well-being

Pregnant women expressed concern about the baby's health (Delahoussaye, 1994; Müller & Ferketich, 1992; Shieh & Kravitz, 2002), the baby's well-being (Ross, 2012), and complications that may occur to the baby (Müller & Ferketich, 1992). Being protective the unborn child is an intrinsic desire (Leva-Gioux, 200). Qualitative study of Leva-Giroux (2002) revealed that pregnant women thought that their bodies were seen as a source of life for the developing baby. Pregnant women have a great sense of protectiveness and responsibility for fetal well-being (Leva-Giroux, 2002; Rauenhorst, 2001). Most of pregnant adolescents worry and fear mainly related to the health or a birth defect of the developing baby (Delahoussaye, 1994).

4. Affection toward the unborn child

Pregnant women have affection toward the baby (Condon, 1993; Delahoussaye, 1994; Müller, 1989, 1993; Müller & Ferketich, 1992; Rowe et al., 2013; Siddiqui et al., 1999; Siddiqui & Hägglöf, 2000; Shieh & Kravitz, 2002). They create a bond with the baby (Ross, 2012). The pregnant adolescents in qualitative studies of Delahoussaye (1994) revealed that the love for the baby was expressed in terms of ownership and accepting that the baby belonged to her and was a part of her body. They desire to have and keep the baby. They wanted the baby regardless of whether or not husband or family accepts her baby. Pregnant adolescent also wanted her baby to be accepted by her husband, her family, and her friends. Qualitative

studies (Delahoussaye, 1994; Leva-Giroux, 2002; Rauenhorst, 2001) found that the pregnant women have feeling of happiness and excitement to have baby.

5. Being connected with the unborn child

Pregnant women have feelings of closeness or emotional connection toward the fetus (Alhusen, 2012b; Delahoussaye, 1994; Leva-Giroux, 2002; Rauenhorst, 2001). Ross (2012) explored maternal-fetal attachment and compliance with prenatal advices. The study found that most participants expressed a felt connection with the baby. Qualitative study of Leva-Giroux (2002) also generated the theme "being connected to the growing life". The participants feel both emotional and physical connectedness to the fetus.

Moreover, pregnant women have feeling pleasure when think about or interact with the unborn child. Qualitative studies (Delahoussaye, 1994; Leva-Giroux, 2002; Müller & Ferketich, 1992) found that pregnant women feel pleasure when think about the baby. Qualitative study of Shieh and Kravitz (2002) revealed that pregnant women express pleasure to watch fetal movement, and feel the tickling sensation when baby move.

6. Communication and interaction with the unborn child

Pregnant women spend more time to communicate with their baby (Van Bussel, Spitz, & Demyttenaere, 2010). Ji and Han (2010) mentioned that maternal-fetal interaction is expressed as a mother's affiliation behaviors toward her unborn baby. Siddiqui and Hägglöf (2000) also mentioned that pregnant women who had more affection showed more overall involvement during interaction. The studies about prenatal attachment found that pregnant women communicate with their unborn child in many ways such as talk to (Ahern & Ruland, 2003; Bloom, 1998; Condon,

1993; Delahoussaye, 1994; Doan & Zimerman, 2003, 2008; Leva-Giroux, 2002; Rauenhorst, 2001), call the unborn child by name (Bloom, 1992, 1998), tell the unborn child about their love (Delahoussaye, 1994), sing songs to the unborn child (Delahoussaye, 1994; Rauenhorst, 2001), listen to the radio or play CD (Delahoussaye, 1994; Rauenhorst, 2001), read out loud (Delahoussaye, 1994; Rauenhorst, 2001), touch and rub the stomach (Condon, 1993; Delahoussaye, 1994; Doan & Zimerman , 2003, 2008; Leva-Giroux, 2002), poke, and guess the fetal movement (Delahoussaye, 1994; Leva-Giroux, 2002; Rauenhorst, 2001). Pregnant women react to fetal movement such as touching their tummies, poking the unborn child to elicit a response (Bloom, 1992, 1998; Delahoussaye, 1994; Doan & Zimerman, 2008; Leva-Giroux, 2002). The participants in qualitative studies (Delahoussaye, 1994; Rauenhorst, 2001) reported that they felt that the unborn child intentionally interacted with them by responding to their verbal or physical cues.

7. Giving of self to nurture and protect the unborn child

Giving of self, involves the realization of what the pregnant woman will need to give up as a result of having a child, what she will gain, and a realization of the commitment that will be required in having and raising the child (Kaiser, 2002). This task takes place through changing in life styles, providing the essentials for growth, and protecting the fetus from harm. Pregnant women give of self and alter activities for the benefit of the unborn child (Bloom, 1992, 1998). Lindgren (2001) and Ross (2012) found that the self-sacrificing behaviors to ensure the safe delivery and healthy baby demonstrated the level of the mother's tie to their unborn child. Pregnant women who had higher levels of prenatal attachment tended to take good care of themselves to promote their unborn child's health and outcomes of pregnancy.

Ahern and Ruland (2003) found that the mean scores were highest in the subscale of 'giving of self', indicating the pregnant women would improve their healthy behaviors for the benefit of the unborn child. Many studies related to prenatal attachment also revealed that the pregnant women have appropriate life style changes and practice various self-health promoting behaviors to promote the growth and well-being of the unborn child (Ahern & Ruland, 2003; Bloom, 1992; Cranley, 1993; Condon, 1993; Leva-Giroux, 2002; Rauenhorst, 2001; Shieh & Kravitz, 2002).

Qualitative study of Leva-Giroux (2002) revealed that pregnant women maintained in a healthy manner and protected the unborn child from harm. Pregnant women connected the healthiness of maternal body to the healthiness of the developing baby. Pollock and Percy (1999) also found that the mothers with negative preoccupied attachment pattern were reported a minimal effort to protect and serve the unborn child.

Bloom (1995) examined the attachment behaviors in pregnant adolescents. The findings showed low scores on the giving-of-self subscale for 12 to 14 year-olds age, it makes sense that the younger adolescent would find this task most difficult to sacrifice personal desires or behaviors for the benefit of the fetus. Middle adolescent are capable to take responsibility for the unborn baby. Late adolescents are capable to focus on her unborn baby and understand the results of their actions on fetal health. They have competence of parenting roles (Davidson et al., 2012; Drake, 1996; Sherer & Radzik, 2016).

8. Preparation for the baby's arrival

Pregnant women do what is necessary to welcome the baby into the world and to ensure safe passage (Delahoussaye, 1994; Leva-Giroux, 2002; Ross, 2012).

The studies (Bloom, 1992; Delahoussaye, 1994) found that some attempts were made to become more educated about the growing baby, labor and delivery by reading books, watching film or VDO. Participants in qualitative studies gave information that they observed experiences of people around them (Delahoussaye, 1994), and participated in prenatal care (Rauenhorst, 2001). The participants in qualitative studies of Leva-Giroux (2002) also reported that they have ideas to do what is necessary to welcome the baby into the world and to ensure safe passage for the baby.

Pregnant women have thoughts and ideas about the baby's need such as clothing (Leva-Giroux, 2002; Ross, 2012), equipment, the baby's room (Bloom, 1998; Leva-Giroux, 2002), and prepare things for baby's arrival (Bloom, 1992, 1998; Delahoussaye, 1994; Leva-Giroux, 2002). They plan and prepare to ensure the safe delivery (Delahoussaye, 1994; Leva-Giroux, 2002). However, independent actions in terms of pursuing more knowledge about pregnancy and the growing baby are very limited for the adolescents. Gaining knowledge about childbearing can cause fear for some pregnant adolescents (Delahoussaye, 1994).

In summary, after extensively reviewing the available literature of maternal identity theory, concept analysis of prenatal attachment, and previous studies regarding prenatal attachment, the finding domains of prenatal attachment were integrated into three main domains including: 1) cognitive attachment domain, 2) affective attachment domain, and 3) behavioral attachment domain. Cognitive domain composes of: 1) thinking about the unborn child, 2) thinking about taking care of the baby, and 3) being concerned for fetal well-being. Affective domain composes of: 1) affection toward the unborn child, and 2) being connected to the unborn child.

Behavioral domain composes of: 1) communication and interaction with the unborn child, 2) giving of self to nurture and protect the unborn child, and 3) preparation for the baby's arrival. These pre-specified domains were integrated into the integrated domains of the PAS-Thai.

Prenatal attachment in Thai cultural context

Thailand is located in Southeast Asia. Although western culture has influenced on Thai society because of globalization, Thai attitudes, social norms, and context are different from Western countries. Buddhism is practiced more than 90% of Thais. Religions affect the thoughts, the beliefs, and the way of living of Thai people. Cultural backgrounds and certain beliefs also place restrictions on pregnant women behavior and activities (Krans & Chang, 2011, as cited in Pillitteri, 2014).

Teaching of Buddhism has cultivated into Thai Buddhist mind since they were young. Buddhism respects and admires a mother as the most important person as "Brahma or Pra-Prom" of her child. Buddhism respects the mother as "Pra-Prom" because the mother gives life to and well nurtures her child all of her life. Mother always has "Four principles virtuous existence or Four sublime states of mind (Prom-Vi-Harn See)" toward her child: 1) being loving-kindness (Met-Ta), 2) being compassion (Ka-Ru-Na), 3) being sympathetic joy (Mu-Ti-Ta), and 4) being equanimity (Au-Beg-Kha) (Buddhadasa Bhikkhu, 2007; College of Religious Study, 2014; Pramahavuthichai Vajiramedhi, 2014).

Three sublime states of mind which mother used during pregnancy and related to prenatal attachment are loving-kindness, compassion, and sympathetic joy.

A mother has these sublime states of mind to her child since he/she is in the mother's body until her child death. Loving-kindness of the mother toward her child composes of giving of life, love, nurturance, concern, taking care, and protection. Compassion of the mother toward her child means that the mothers always being self-sacrifice, helping, supporting, and devoting themselves for the benefit of their children. To be sympathetic joy of the mother, it means that the mother feels pleasure when her child is healthy, strong, and has no disable or anomaly (Buddhadasa Bhikkhu, 2007; Pramahavuthichai Vajiramedhi, 2014).

Women in Thai culture are assumed the role of being good mother. The preparation for the title of mother takes place informally much earlier as young girls (Ratanarungsee, 1987). Cultural values the characteristics of a mother as the life giver, the mother-nurturer image, and the protector (College of Religious Study, 2014; Lhodkum, 2014; Phochathikorn, 2014). Mother who gives life should preserve, be responsible for the child life, protect her child from all suffering, devote herself and do for the benefit of her child (Ratanarungsee, 1987).

Importantly, a Thai girl is expected to be inexperienced in sexual matters and to preserve her virginity until marriage. If the pregnancy occurred during adolescence and/or outside marriage, the pregnant adolescent could bring humiliation to her family and became socially stigmatized (Neamsakul, 2008; UNICEF, 2015). The pregnant adolescents themselves perceived that they were devalued. In order to gain acceptance from family and society, many of pregnant adolescents had traditional wedding ceremony. To prevent having to confront stigma and dishonored, and to conceal their pregnancy, the adolescents avoid peers' contact and engagement in normal teen activities or try to seek for criminal abortion (Muangpin, Tiansawad,

Kantaruksa, Yimyam, & Vonderheid, 2010). Thus, the unacceptable of adolescent pregnancy in Thai culture also have profound effects on maternal behaviors and prenatal attachment.

In addition, the induced abortion is considered a serious Buddhist sin call "bap". Killing the unborn baby is severe sinful and has evil consequences. Many Thai women remain fearful the consequences of this sin, so they selected to continue their unintended or unwanted pregnancy (Sriyasak, 2016). For the adolescents who decided to continue their pregnancies, to conceal their pregnancy, may not display appropriate maternal behaviors and attachment relationship toward their fetus.

In conclusion, Thai woman is expected the role of being a good mother as an ideal to give life and devotes herself to nurture and protect the baby, while the unacceptable pregnancy of adolescent has negative effected on prenatal attachment. Thus, these Thai cultural contexts may be influenced over the scale domains, and were considered in the process of scale development.

Factors related to prenatal attachment among pregnant adolescents

In reviewing previous studies, there are many variables which influence prenatal attachment among pregnant adolescents. These variables are gestational age, planning of pregnancy, parity, knowledge about fetal behaviors and interaction to the fetus, emotional state, marital status and marital relationship, relationship with her own mother, and social support. The details are as follows:

1. Gestational age

Prenatal attachment is progressive in nature (Doan & Zimerman, 2008). Although the findings revealed that prenatal attachment increases throughout the gestational period and after quickening (Bloom, 1995; Cannella, 2005; Doan & Zimerman, 2008; Yarcheski et al., 2009), it cannot be assumed that women's emotional attachment towards the fetus will remain stable or unidirectional throughout pregnancy. The qualitative study of Ross (2012) found that the levels of fetal attachment felt by the women were variable. It could be resisted until later during the pregnancy, or delayed until after birth.

Doan and Zimerman (2003) and Ustunsoz, Guvenc, Akyuz, and Oflaz (2010) explained that fetal movement effects prenatal attachment. The explanation is that as the gestational age increases, the fetus becomes larger, and perception of fetal movements is more often (Lewis, 2008). The more aware of the fetus the pregnant women became positively contributed to the level of attachment (Ross, 2012). As the gestation progress, the quality and quantity of prenatal attachment increase (Van Bussel, et al., 2010).

An empirical analysis interactional model of maternal-fetal attachment (Lewis, 2008) also revealed that gestational age is one of the best predictors of prenatal attachment. The extensive review literature supported high correlation between gestational age and prenatal attachment of pregnant women (Cannella, 2005; Lewis, 2008; Walsh et al., 2014; Weis & Lederman, 2010; Yarcheski et al., 2009), and of pregnant adolescents (Alhusen, 2008; Bloom, 1995; Feldman, 2007; Munoz & Stevens, 2007; Rowe et al., 2013; Wayland & Tate, 1993).

Wayland and Tate (1993) examined maternal-fetal attachment in African-American, Mexican-American, and Caucasian pregnant adolescents. The MFAS was administered to 61 samples. Scores on prenatal attachment scale significantly correlated with gestation. Bloom (1995) studied the attachment behaviors development using the MFAS in 79 low-income pregnant adolescents, 12 to 19 years of age. Multivariate analysis revealed that prenatal attachment in adolescents start during pregnancy and increase over gestation period, particularly after quickening. Feldman (2007) studied the predicted variables of prenatal attachment in pregnant adolescents. One hundred and twenty-nine subjects with the ages between 13 and 19 years old were recruited. The PAI had been administered to the sample. Regression analysis revealed that gestational age is powerfully predicted prenatal attachment in pregnant adolescents.

Munoz and Stevens (2007) studied prenatal attachment in a sample of 60 pregnant Mexican American adolescents, 14 to 18 years old. The MFAS was used to collect data. Multiple regression analysis showed an association between length of gestation and prenatal attachment ($\beta = .47$, $p = .01$).

From different methodologies findings, maternal-fetal attachment of pregnant adolescents increased as gestation progressed. Therefore, the consistent findings support that prenatal attachment among pregnant adolescents has positive correlation with gestational age, and increases after quickening and fetal movement.

2. Planning of pregnancy

Planning of pregnancy is a crucial factor to the development of prenatal attachment. Mother is attached to the fetus when expecting a baby (Kullawattana, 2000; Rowe et al., 2013; Ustunsoz et al., 2010). In contrast, unplanned pregnancy,

discontent and unwanted pregnancy demonstrated the highest risk for lower prenatal attachment (Feldman, 2007, 2012; Ossa et al., 2012). Pregnant adolescents may have lower attachment in early pregnancy because they may ambivalent to remain the pregnancy or become a mother (Rowe et al., 2013). Koniak-Griffin (1989) used the MFAS with a culturally diverse sample. Ninety unmarried pregnant adolescents enrolled in the study. The results revealed that the significant predictor of prenatal attachment was planning of pregnancy. Although most of the pregnancies were unplanned, scores on the MFAS indicated a positive affection toward their unborn baby. Bloom (1992) studied attachment behaviors development in pregnant adolescents. Seventy-nine low-income pregnant adolescents with 13 to 19 years of age were recruited. The MFAS was used in each trimester. The findings revealed that adolescents who desired to become pregnant scored higher on the total maternal-fetal attachment, were able to differentiate self from fetus, report more role taking behaviors and interact with the fetus, and changed some behaviors for the benefit of the unborn child. Feldman (2007) later studied the significant variables predicting prenatal attachment in 129 pregnant adolescents in public schools. The PAI has been administered to the sample. Regression analysis revealed that pregnancy planning is powerfully predicted prenatal attachment in an adolescent population.

Thus, the findings support that prenatal attachment among pregnant adolescents has positive correlation with planning of pregnancy.

3. Parity

The multigravid mothers had significantly lower prenatal attachment scores than the primigravid mothers (Ustunsoz et al., 2010). The study of Condon and Corkindale (1997) supports this finding. However, the study of Lindgren (2001) and

Zachariah (1994) did not find such relationship. The reason for the differences of prenatal attachment level between primigravid and multigravid mothers may be related to the giving attention to their other child which may reduce attention to the unborn baby.

4. Knowledge about fetal behaviors and interaction to the fetus

Prenatal education course which improve knowledge about fetal behaviors and promote interactions between pregnant adolescent and her fetus showed significantly higher scores of prenatal attachment (Koniak-Griffin & Verzemnieks, 1991; Pooripanyakun, 1996; Yakasem & Chaiyasung, 2012).

Koniak-Griffin and Verzemnieks (1991) evaluated affective and behavioral attachment influenced by a nursing intervention program. The sample comprised 20 primiparous black and Hispanic pregnant adolescents. The MFAS was used in this study. Interestingly, the adolescents who received intervention significantly demonstrated prenatal attachment but there were no differences in actual maternal behaviors. The researchers raised questions about theoretical assumptions related to the connection of affective and behavioral domain of mothering.

Pooripanyakun (1996) examined the effect of antenatal counselling on Thai pregnant adolescents. The MFAS was used with 40 subjects. The antenatal counselling was significantly interacted on maternal-fetal attachment at 36 weeks of gestation. Yakasem and Chaiyasung (2012) examined the effect of maternal-fetal attachment program on prenatal attachment in 60 Thai pregnant adolescents. The MFAS was used in this study. The findings revealed that the experimental group significantly had better mean scores of prenatal attachment than the control group. Therefore, prenatal education course which increase knowledge about fetal behaviors

and interaction to the fetus can increase the level of prenatal attachment in pregnant adolescents.

5. Emotional state

Pregnant adolescents are likely to have anxiety, depression, and emotional distress (Rowe et al., 2013), while it was shown that life events stress and anxiety experience during pregnancy might decrease prenatal attachment (Shin & Kim, 2011). Many studies revealed that high levels of depressive symptoms and a feeling of worthlessness (Alhusen, 2008; Alhusen, Gross, Hayat, Rose, & Sharps, 2012; Lindgren, 2001; Ossa et al., 2012), higher levels of stress (Cranley, 1981; Feldman, 2007), and anxiety (Alhusen, 2008; Van Bussel et al., 2010; Pisoni et al., 2014; Ossa et al., 2012; Rowe et al., 2013) can interrupt the maternal relationship with the fetus. A recent meta-analysis of Yarcheski et al. (2009) investigated predictors of prenatal attachment. Depression was reported as a predictor of prenatal attachment with low effect size (r = .17-.19). Therefore, the consistent findings support that anxiety, stress, and depression might decrease prenatal attachment among pregnant adolescents.

6. Marital status and marital relationship

The importance of perceived relationships with important persons during pregnancy to prenatal attachment in adolescents has been reported. The spouse is an important supportive source to increase maternal attachment to the unborn baby. The pregnant women who experienced a positive relationship with the baby's father expressed higher attachment level to their fetus (Bouchard, 2011; Ossa et al., 2012; Siddiqui et al., 1999; Yarcheski et al., 2009). However, the findings are not consistent.

Bloom (1992) studied the attachment behaviors development in pregnant adolescents. The samples were 79 low-income pregnant adolescents. The MFAS was used in each trimester. The findings revealed that close relationship with the baby's father had positive relationship with subscales of 'role taking', 'differentiation of self from the fetus', and 'giving of self'.

Wayland and Tate (1993) examined the correlations between maternal-fetal attachment and the perceived relationships with the father of the baby. The MFAS was used to a sample of 61 pregnant adolescents. Prenatal attachment scores significantly associated with marital status, perceived of close relationship with the baby's father, and frequently contact with the baby's father.

Pooripanyakun (1996) compared prenatal attachment in adolescent mothers in different marital status. The Modified MFAS of Kootanavanichpong (1987) was administered to the sample of 60 primigravidarum adolescent mothers. The study found that good marital relationship had higher maternal-fetal bonding than the poor groups at 36 weeks of pregnancy at the .05 level. Bloom (1998) examined the perceived relationship with the baby's father and maternal attachment in pregnant adolescents. The MFAS was administered to 79 subjects. A closeness and satisfaction relationship with the baby's father significantly influenced on maternal attachment behaviors.

Conversely, the work of Silvera (2013) about prenatal attachment in 40 pregnant adolescents who were ethnically diverse and had low income, the PAI was used in this study. The results revealed that the adolescent's relationship to the baby's father was not a significant predictor of prenatal attachment. The finding is coherent with Zachariah's (1994) which using the MFAS in 115 adult sample. The prenatal

attachment scores were not correlated with husband-wife attachment scores. Therefore, marital status and marital relationship had a conflicting correlation with prenatal attachment studies in pregnant adolescents.

7. Relationship with her own mother

The pregnant women who had experiences of positive relationship with important persons in their lives demonstrated higher attachment level to their fetus (Zachariah, 1994). However, the findings are not consistent. Wayland and Tate (1993) investigated the correlations between maternal-fetal attachment and the perceived relationships with pregnant adolescents' mother. The MFAS was administered to a sample of 61 pregnant adolescents. Scores on prenatal attachment scale significantly associated with the perceived close relationship with pregnant adolescent's mother. In contrast, Silvera (2013) investigated prenatal attachment in pregnant adolescents using the PAI. The result revealed that the attachment of pregnant adolescent to her own mother was not a significant predictor of prenatal attachment. This finding is consistent with Müller's (1993) and Zachariah's (1994) that prenatal attachment scores were not correlated to mother-daughter attachment scores. Thus, the previous studies revealed that the relationship with the mother is not consistent correlated with prenatal attachment in pregnant adolescents.

8. Social support

Social support was investigated as an antecedent variable of prenatal attachment (Alhusen, 2008; Ossa et al., 2012). A social support insufficiency would be interrupted prenatal attachment development (Pisoni et al., 2014). A meta-analysis of Yarcheski and colleagues (2009) investigated predictors of prenatal attachment.

Results demonstrated that social support was the most powerful psychosocial predictor of prenatal attachment with the moderate effect size (r = .29).

James (1997) conducted a correlational study of variables affecting adolescent pregnancy in a sample of 72 pregnant adolescents. The MFAS was administered to the subjects. The results showed that perceived social support explained 19.6% of the variance in prenatal attachment scores. The result was consistent to the study of Feldman (2007) in 129 pregnant adolescents which found that a significant predictor of prenatal attachment was support expectation.

Conversely, Koniak-Griffin (1989) examined the correlations between self-esteem, social support, and maternal-fetal attachment in adolescents. The MFAS was used in this study. Although non-significant correlation was found between maternal-fetal attachment scores and social support measurement, total functional support and total size of network were found to be the powerful predictors of prenatal attachment. Koniak-Griffin, Lominska, and Brecht (1993) later conducted a comparison of social support among 161 pregnant adolescents. The MFAS was used in this study. Social support and prenatal attachment was found to be not significantly correlated.

Therefore, the findings reveal that the correlations between prenatal attachment and social support are not consistent in pregnant adolescents.

In summary, reviewing literature revealed that gestational age, planning of pregnancy, knowledge about fetal behaviors and interaction to the fetus, and emotional state are correlated to prenatal attachment among pregnant adolescents, while marital status and marital relationship, relationship with her own mother, and

social support had a conflicting correlations. It does appear that many variables influence prenatal attachment in pregnant adolescents, but the findings are not consistent. Different findings may be related to the different methodology, different measurements, and different samples used in previous studies.

Measurement of prenatal attachment

Prenatal attachment is an abstract concept. Difficulty arises in measuring prenatal attachment as each available instrument for prenatal attachment seems to measure different aspect with a different underlying conceptualization of a similar construct, or a totally different construct (Walsh, 2010; Yarcheski et al., 2008). They have been used since the 1980s with the different aspects of prenatal attachment. The existing scales measuring prenatal attachment compose of: 1) the Maternal Fetal Attachment Scale (MFAS), 2) the translated Maternal Fetal Attachment Scale (MFAS: Thai version), 3) the Prenatal Attachment Inventory (PAI), 4) the Maternal Antenatal Attachment Scale (MAAS), 5) the Modified Maternal Fetal Attachment Scale (MMFAS: Mandarin Chinese version), and 6) the Pregnancy Involvement List (PIL). The details are as follows.

The Maternal Fetal Attachment Scale (MFAS)

The Maternal Fetal Attachment Scale (MFAS) was the first scale developed by Cranley (1981a) to measure maternal-fetal attachment in pregnant women based on literature review regarding maternal identity and clinical experiences. Content for subscales was obtained by consulting with experts within

antenatal care clinicians and a group of Lamaze teachers. At the beginning, the scale was consisted of 37 items within six subscales: 1) differentiation of self from the fetus, 2) interaction with the fetus, 3) attributing characteristics and intentions to the fetus, 4) giving of self, 5) role taking, and 6) nesting. Content validity was obtained by a group of experts (Cranley, 1981a). Seventy-one pregnant women during gestational age between 35 and 40 weeks gestation, mean age of the women was 27 years with a range of 20 to 33 years, were recruited in this study. Item analysis was performed resulting in the deletion of 13 items, including an entire "nesting" subscale (α = .12). The MFAS comprises 24 items measuring five dimensions of maternal-fetal attachment. The items are scored on a 5-point Likert-scale (0 = *definitely no* to 5 = *definitely yes*).

For the original scale, a coefficient of reliability was reported as .85 for the total scale and ranged from .52 to .73 for subscales (Cranley, 1981a). Reliability data are widely available across different studies. For the total scale, Cronbach's alpha ranged between .71 and .92. For subscales, Cronbach's alpha ranged between .40 and .89. Cronbach's alphas range from .63 to .84 for "attributing" subscale, from .68 to .89 for "role-taking" subscale, and below .69 for all other subscales (Alhusen, 2008; Anand & Hima, 2012; Beck, 1999; Van den Bergh & Simons, 2009). According to DeVellis (2017), Cronbach's alpha below .65 is undesirable, indicating subscale's reliability was unsatisfactory.

Many researchers have examined relationship between prenatal attachment and related variables by using the MFAS. Scores on the MFAS are contradictory with both prevailing theory and common sense (Condon, 1993). Correlational and comparative studies have not been created a strong body of scientific (Cannella,

2005). Many of these studies have demonstrated inconsistent and conflicting results generating questions to the validity of the MFAS (Brandon et al., 2009; Condon, 1993; Doan et al., 2003; Feldman, 2007; Müller, 1992; Van den Bergh & Simons, 2009; Zachariah, 1994). Bloom (1992) used the MFAS in her study and noted that "Are there other behaviors, not reported with the maternal-fetal attachment that would be more valid indicators of the dimensions being studied?" (p. 97).

Construct validity of the MFAS is problematic. At the beginning, Cranley (1981a) did not conduct exploratory or confirmatory factor analyses because the sample size was not sufficient. The MFAS has been factor analyzed later by other authors. The study of Müller and Ferketich (1993) yielded two factors (N = 371) and three factors (N = 310), and Van den Bergh (1989, as cited in Van den Bergh & Simons, 2009) identified three factors (N = 256). Validity of the MFAS subscales was also investigated by the secondary analysis of structured interviews by Müller and FerKetich (1992), indicating that only three subscales of the MFAS's coincided with the generated categories, while two subscales "giving of self" and "interaction with the fetus" did not coincide at all. The results of these studies do not support construct validity of the MFAS subscales and indicate that the use of the MFAS subscales is problematic. However, several studies have based their data analysis and conclusion on individual subscale of the MFAS (Bloom, 1995; Müller, 1992; Yarcheski et al., 2009).

Convergent validity of the MFAS is supported by a correlation (r = .72) with the Prenatal Attachment Inventory (PAI) (Anand & Hima, 2012; Facello, 2008; Van den Bergh & Simons, 2009). However, Damato (2004) compared the MFAS with the PAI in a sample of women who were expecting twins. She found the

differences of attachment for each twin in using the PAI, but not found in using the MFAS.

The original dimensions of the MFAS are not based on factor analysis, they were theoretically derived (Cranley, 1981a). The other authors (Müller & Ferketich, 1993; Van den Bergh & Simons, 2009) conducted factor analysis later, but the results of their studies did not support validity of the MFAS subscales.

In conclusion, the MFAS has been used widely, but the problems exist in the MFAS's conflict findings, construct validity, and inadequate reliability of subscales. Construct validity of the MFAS is problematic, as the results of secondary analysis of structured interviews (Müller & Ferketich, 1993) and factor analysis (Müller & Ferketich, 1992; Van den Bergh & Simons, 2009) did not support construct validity of the MFAS. The inconsistent using of the scale length varies from 20 to 24 items also makes difficulty to compare the findings. Some studies utilized the 20-item version (Narita & Maehara, 1993), the 23-item version (Lindgren, 2001; Shin & Kim, 2011; Zachariah, 1994) while others used the 24-item version (Anand & Hima, 2012; Bloom, 1998; Lewis, 2008; McFarland et al., 2011; Nichols, Roux, & Harris, 2007; Öhman & Waldenström, 2010). Although the reliability of the total scale is acceptable (α = .71-.92), reliability of subscales was inadequate (α = .40-.89). Thus, construct validity and reliability of the MFAS are not adequate for the standard psychometric properties. Moreover, the MFAS was developed on a sample of pregnant women ranging of 20 to 33 years (Cranley, 1981). Beck (1999) reviewed literature about the MFAS, and reported that the studies using the MFAS in adolescents showed no differences. Thus, the MFAS may be not validated for pregnant adolescents.

The translated Maternal Fetal Attachment Scale (MFAS: Thai version)

The scale measuring prenatal attachment in Thailand is the translated MFAS. Kootanavanichpong (1987) forward translated the Cranley's MFAS into Thai. The translated scale was content validated by seven experts. It consists of 24 items and composes of five subscales: 1) differentiation of self from the fetus, 2) interaction with the fetus, 3) attributing characteristics and intensions to the fetus, 4) giving of self, and 5) role-taking. The items are scored on a 5-point Likert-scale (0 = *never* to 5 = *every time*). The Cronbach's alpha of internal consistency using with pregnant women was .97. This translated scale has not reported the translation process and other validity testing.

There were tested for content validity by a panel of experts, and for reliability by using Cronbach's alpha in other Thai studies (Chanachote, 2007; Kaewboonruang, 2001; Kala, 2001; Keawsiriwan, 2003; Kootanavanichpong, 1987; Kullawattana, 2000; Kusol, 1993; Kwarat, 2002; Mamak, 2007; Poopatayakorn, 1995; Pooripanyakun, 1996; Sawuanprom, 2006; Siriumpankool, 2000; Somanusorn, 1993; Songtrirat, 1997; Sriintravanit, 2005; Triratanapikul, 1990; Yakasem, 2005; Yakasem & Chaiyasung, 2012). The other psychometric properties evaluation was not reported.

Several researchers used this 24-item scales and further modified for their measurement purposes for example; Kwarat (2002) studied the effectiveness of prenatal attachment promotion on paternal- and maternal-fetal attachment by using 28 items of the MFAS; Sawuanprom (2006) studied the relationships between family factors, anxiety, and maternal-fetal attachment in thalassemia carrier pregnant women

using 21 items of the MFAS; Siriumpunkool (2000) studied the effect of maternal-fetal bonding program on pregnant adolescents using 22 items of the MFAS.

In conclusion, reliability of the translated MFAS is acceptable, but validity is problematic since the original scale is validity problematic. Moreover, the inconsistent using of modified items and different scale length make it difficult to compare findings of prenatal attachment studies in Thailand.

The Prenatal Attachment Inventory (PAI)

Müller (1989) created the Prenatal Attachment Inventory (PAI**)** to measure emotional attachment between a mother and the unborn child. The PAI was deductively developed from attachment theory and pregnancy adaptation theory. The PAI originally comprised 48 items. Content validity was assessed by 11 experts. Construct validity and reliability of the PAI was assessed in a sample of 336 low-risk pregnant women. Eighty-five percent of the subjects were married. Subjects' age was between 18 and 44 years (M = 30 years) with gestational age ranged from 14 to 41 weeks. Factor analysis produced five factors with eigenvalues greater than one, examination of item content suggests that the first factor, consisting of 11 items, represents attachment. The PAI was a one-dimensional construct and explained 50% of the variance (Müller, 1989). Concurrent validity was established with the MFAS (r = .72, p < .01) in other study (Müller, 1993).

The final PAI is a one-dimensional scale, and comprises 21 items based on a 4-point Likert scale, ranging from "*almost always*" to "*almost never*". The higher scores indicate the greater maternal emotional attachment. The internal consistency reliability using an alpha coefficient was .81 when evaluated by the developer

(Müller, 1993). Cronbach's alpha ranged between .81 and .93 in other studies (Della Vedova et al., 2008; Feldman, 2007; Saastad, Israel, Ahlborg, Gunnes, & Frøen, 2011; Siddiqui et al., 1999; Van den Bergh & Simons, 2009).

The PAI has been later factor analyzed by other authors. An explorative factor analysis of Siddiqui and Hägglöf (2000) revealed a 5-factor solution of the PAI that accounted for 53.9% of variance. The Cronbach's alphas for dimensions were between .57 and .76. The alpha coefficient for the total scale was .86. All dimensions were positively correlated with the total scale (r = .24-.57). Moreover, the study of Della Vedova et al. (2008) also revealed five factors from PAF extraction of the PAI scores. The solution accounted for 41.23% of the total variance. All factors were positively correlated to each other (r = .24-.57) and with the total score (r = .62-.86). However, Müller (1989) herself intended to propose the PAI as a one-dimensional construct scale. Gua and Lee (2003) later reported a one-dimensional construct of the PAI in their study. Thus, it means that internal structure of the PAI has contradictory results.

In summary, as a one dimension scale, the strength of the PAI is that validity and reliability are accepted. The weakness is that Müller herself intended to provide only a global score which emphasis affiliation and exclude behavioral measures (Müller, 1989), while prenatal attachment was studied and reported as a multidimensional concept which manifests in thoughts, feelings, and behaviors (Doan & Zimerman, 2003; Shieh et al., 2001; Van den Bergh & Simons, 2009). In addition, the PAI was not developed for pregnant adolescents. Eighty-five percent of the developed subjects of the PAI were married. Subjects' age was between 18 and 44

years (*M* = 30 years). Thus, the construct of the PAI may not be capable to measure multidimensional prenatal attachment, and is not validated for pregnant adolescents.

The Maternal Antenatal Attachment Scale (MAAS)

Condon (1993) the psychologist, developed a tool, the Maternal Antenatal Attachment Scale (MAAS) because he believed that existing instruments were not capable to discriminate the attitude toward the unborn child from the attitude toward the maternal role. A Condon's hierarchical model of adult attachment was used as a basis for development of the MAAS (Condon, 1993). The core experience of maternal attachment of this model is the maternal love toward her unborn child. He developed this scale to gain more understanding and to assist in managing psychological problems during pregnancy and postpartum period, normal and pathological reactions to fetal loss, killing the newborn, or relinquishment for adoption.

Based on the five dispositions of adult attachment (to know, to interact with, to avoid separation, to protect, and to gratify needs), the MAAS was developed using unstructured interviews with 15 expectant couples. Attachment experiences and behaviors were identified, producing a 36-item pool. A pilot study was conducted with 54 expectant couples to test the instrument. Item analysis was not conducted, but many items were rewritten or deleted to avoid the unclear term "the pregnancy". This resulted in a final 27-item questionnaire. A later study with 112 pregnant women refined and tested the MAAS, producing a 19-item. The subjects' mean age was 26 and mean of weeks of gestation was 32. The scale was formatted using a structure of 5-point Likert-scale (1 = *represents the absence of* and 5 = *represents very strong*

feeling toward the fetus). Most questions are based on experiences for the past two weeks. Factor analysis yielded two factors, explained 39% of total variance. Factor one represents the quality of affective attachment. Factor two represents the intensity of preoccupation with the unborn child. For convergent validity, the MAAS scale had positive correlations with facilitator scales (Condon, 1993; Van Bussel et al., 2010).

Reliability was assessed using internal consistency. Cronbach's alpha of the total scale ranged from .69 to .82. For "quality" subscale, Cronbach's alpha ranged between .69 and .73. For "preoccupation" subscale, Cronbach's alpha ranged between .73 and .77. The preoccupation subscale and quality subscale were correlated (r = .54-.57) (Condon, 1993; Van den Bergh & Simons, 2009). According to DeVellis (2017), the reliability between .65 and .70 is minimally acceptable.

In conclusion, strength of the MAAS is that validity is accepted and reliability is minimally accepted. However, most studies using the MAAS could not report prenatal attachment scores across the course of pregnancy (Van Bussel et al., 2010). In addition, the MAAS was developed based on the expectant couples. The developed samples mean age was 26 and mean of weeks of gestation was 32. The purpose of the MAAS is to improve understanding and managing of aspects of psychosomatic obstetrics (Condon, 1993), not for the pregnant adolescents (Rowe et al., 2013). Thus, the MAAS may be not validated for using in pregnant adolescents.

The Modified Maternal Fetal Attachment Scale (MMFAS: Mandarin Chinese version)

The Maternal Fetal Attachment Scale was modified and forward translated in Mandarin by Hsu and Chen (2001). The MMFAS was translated into Mandarin

Chinese version from the original English version, but the authors did not complete the back-translation (Wang, 2012). The items of the MFAS were merged with the items of the PAI into one scale resulting in 41 items. The scale was formatted using a 5-point Likert scale (1 = *never* to 5 = *always*). The content validity was provided by six experts. Factor analysis revealed four factors: 1) interacting with the fetus, 2) giving of herself, 3) identify with the fetus, and 4) fantasizing. The internal reliability on subscales ranges from .74 to .84. The internal consistency reliability of the total scale was reported at .92. The test-retest reliability at two week intervals was .82.

The other authors, Huang, Wang, and Chen (2004), conducted a principal component factor analysis using varimax rotation confirmed four factors which accounted for 49.86% of variance. The internal consistency reliability of the total scale was reported at .94. The test-retest reliability was .92. The internal reliability on subscales was between .83 and .87. Wang (2012) later performed factor analysis generated two factors. Two components were extracted using PCA with oblimin rotation. The total variance explained was 37.99%. Therefore, 39 items were retained. Cronbach's alpha coefficient of the total scale was .95: alpha coefficients were between .88 and .93 for subscales.

In conclusion, the MMFAS has shown acceptable reliability and validity, but the application is available only in Taiwan because of the limitation of the language.

The Pregnancy Involvement List (PIL)

Kleinveld, Timmermans, Van den Berg, Van Eijk, and Ten Kate (2007) created the Pregnancy Involvement List (PIL). This scale was developed for the

purpose of measuring prenatal attachment very early in pregnancy, before feeling of fetal movement. Ten items of the scale were taken from the existing questionnaire using a 5-point Likert scale format (1 = *absolutely not applicable* to 5 = *very applicable*). Factor analysis produced one factor; Cronbach's alphas range from .79 to .81. The item-total correlations ranged from .30 to .70. Concurrent validity was established with the PAI (r = .62, p < .001). However, this scale is less frequently used. There is no available data using this scale.

In summary, a critical evaluation of these existing scales revealed that each scale appears to measure different aspects of prenatal attachment, with a different underlying structure and different purposes. Moreover, the psychometric properties of each scale should be considered. The MFAS, the PAI, and the MAAS have its own strengths and weakness. The validity of the MFAS is problematic. The validity of the PAI and the MAAS are acceptable. However, the validity evaluation is specific for a group or purpose, it may be valid in one situation but not in another (Burns & Grove, 2007). All existing prenatal attachment scales were developed for adult married Caucasian women, while prenatal attachment may be a different experience for women who belong to specific group influences by such characteristics as adolescents. As prenatal attachment studies in pregnant adolescents show no different or inconsistent results. The inconsistent findings may indicate that results are not generalizable across group. Thus, the existing scales may be not validated for Thai pregnant adolescents. Therefore, it is needed to develop the PAS-Thai to measure prenatal attachment among Thai pregnant adolescents.

Conclusion

Prenatal attachment has been demonstrated positively influence on pregnant women's adherence to healthier behavior, positive pregnancy outcomes, the successful of maternal-newborn adaptation, and the well-being of the child, both during pregnancy and after birth. One possible way to reduce negative outcomes of adolescent pregnancy is to assess and promote prenatal attachment.

However, findings of previous prenatal attachment studies are inconsistent and conflicting. These problems may relate to the measurements of this concept and the differences of the samples. Each instrument stresses on different aspect of prenatal attachment with different theoretical based and different purposes. In addition, the existing scales were developed for adult married Caucasian women, they may be not validated for pregnant adolescents and do not fit with Thai pregnant adolescents. It is crucial to develop the PAS-Thai which fit to Thai pregnant adolescents. The developed scale will be used to assess prenatal attachment, evaluate nursing care/intervention related to prenatal attachment.

Theoretical foundations of the PAS-Thai development and psychometric evaluation were based on maternal identity theory, literature review regarding prenatal attachment, and DeVellis's guideline of scale development. The process of the PAS-Thai establishment started with a literature review of maternal identity theory, prenatal attachment concept and related topics to the construct of the PAS-Thai. The pre-specified domains of this scale comprised: 1) cognitive attachment, 2) affective attachment, and 3) behavioral attachment. Qualitative approach using individual in-depth interview and focus group discussion was employed to gain data

from Thai pregnant adolescents. Information obtained from literature review and qualitative study was used to refine the integrated domains and generate an item pool. The PAS-Thai will be used to measure prenatal attachment among Thai pregnant adolescents by norm referenced. The PAS-Thai psychometric properties were evaluated in terms of validity and reliability. Content validity was evaluated by having the initial item pool reviewed by a panel of expert. Construct validity was determined by using EFA and contrasted group approach. Reliability was determined by internal consistency using Cronbach's alpha.

CHAPTER 3

METHODOLOGY

The research process of this study was guided by the following objectives: 1) to develop the Prenatal Attachment Scale for Thai pregnant adolescents (PAS-Thai), and 2) to examine the psychometric properties of the developed PAS-Thai. This chapter is presented in two sections which are focused on: 1) scale development, and 2) psychometric properties evaluation.

Scale Development and Psychometric Properties Evaluation

Prenatal attachment is expressed in pregnant adolescents' thoughts, feelings, and behaviors, but the pregnant adolescents may be have the different levels of prenatal attachment (Doan & Zimerman, 2008). In development and evaluation of the PAS-Thai, which can make fine distinctions between respondents with differing levels of prenatal attachment, a norm-reference measurement framework was used to guide the process.

The eight steps of scale development set forth by DeVellis (2017) were used as a guideline to create and evaluate the PAS-Thai. This study consisted of two phases. The first phase was the development of the PAS-Thai. The second phase was the psychometric evaluation of the PAS-Thai. The details and steps of each phase are presented as follows.

Phase I Development of the Prenatal Attachment Scale for Thai Pregnant Adolescents (PAS-Thai)

The aim of the first phase was to create the PAS-Thai. This phase consisted of three main steps: 1) determine the scale content, 2) generate an item pool, and 3) determine the scale format. The details of each step were explained as follows:

Step 1 Determine the scale content

The purposes of this step were: 1) to explore the concept of prenatal attachment and 2) to specify domains of prenatal attachment among Thai pregnant adolescents. To develop and validate a scale, DeVellis (2017) suggested that literature reviews and qualitative interviews are useful for domain identification and item generation. Thus, this step consisted of two parts: 1) an extensive literature review, and 2) individual in-depth interviews and focus group discussion.

1) Extensive literature review

The process of creating the PAS-Thai began with literature review of the substantive theories and literature related to prenatal attachment, the boundaries of the phenomenon, and how the empirical and theoretical evidence pertain to the concept of prenatal attachment among pregnant adolescents. The extensive literature review of concept analysis articles and previous studies regarding prenatal attachment was used to formulate the conceptual framework guiding scale development, and to determine the constructs to be measured and the interview guidelines.

Various databases were used for the literature search, including PUBMED, CINAHL, ScienceDirect, ProQuest, SpringerLink, Google Scholar, Clinical Key and Thailis. Relevant studies were identified by using specific key words in different combinations. Search terms used were prenatal attachment, maternal-fetal attachment, prenatal bonding, maternal-fetal bonding, prenatal tie, maternal-fetal tie, maternal-fetal relationship, pregnant adolescents, and adolescent pregnant women. The year of searching was not limited. Information obtained from the literature review was used to determine the construct and content of prenatal attachment. Domains and subdomains were used as a guide to design the semi-structured questions used in qualitative approaches, and to generate items for the developed PAS-Thai.

2) Individual in-depth interview and focus group discussion

The existing prenatal attachment scales were developed for adult, married, and caucasian pregnant women. Previous studies revealed that they were not validated for use in pregnant adolescents (Bielawska-Batorowicz & Siddiqui, 2008; Della Vedova, et al., 2008; Rowe et al., 2013). Little is known about prenatal attachment among pregnant adolescents. Importantly, no previous studies have been conducted to investigate prenatal attachment among Thai pregnant adolescents. Conducting qualitative approaches to understand the population for whom the scale is intended to measure is critical for developing good items (DeVelliis, 2017). Thus, after the literature review, qualitative approaches using individual in-depth interviews and focus group discussion were employed. Information obtained from the qualitative approaches were used to refine the pre-specified domains from the literature review,

to elaborate on any specific content and domains of prenatal attachment among Thai pregnant adolescents, and to assist in creating appropriate items for Thai pregnant adolescents. The participants, settings, instruments, data collection, and data analysis in this part were described as follows:

Participants and setting: The participants were purposely selected and recruited from the antenatal care (ANC) clinic at Health Promotion Hospital Center 12 in Southern Thailand. The inclusion criteria were: 1) pregnant Thai adolescent 13 to 19 years of age, 2) gestational age 20 weeks or greater, 3) attending a routine care at ANC clinic, 4) no complications or high risk during pregnancy, 5) able to understand and speak Thai, and 6) willing to take part in this study. In qualitative approach, sample size should be based on informational needs or data saturation (Polit & Beck, 2017). Based on this guiding principle in sampling, 13 pregnant adolescents were recruited in this step.

Instrument: The instruments used in this step were the demographic data and interview guideline form. The demographic data form consisted of the participants' characteristics such as age, religion, education level, marital status, and planning of pregnancy. The interview guideline form consisted of open-ended questions which were generated from the pre-specified domains of prenatal attachment obtained from an extensive literature review. Examples of interview questions were:

- How do you feel about your unborn baby?
- When did you start feeling love for your baby?
- What are your thoughts about the unborn baby?
- What else can you tell me about your thoughts about the baby?

- What are your behaviors during pregnancy related to taking care of your unborn baby?
- How and why are you doing that?
- When you communicate (talk to/play with/stroke the abdomen) with your baby, how do you feel? and what do you think about the baby?

Data collection: After receiving approval from the Institutional Review Board (IRB) of the Faculty of Nursing, Prince of Songkla University and Health Promotion Hospital Center 12 (Appendix A), data collection was performed between September, 2016 and January, 2017 as follows:

Pregnant adolescents who met the inclusion criteria were chose by collaborating with the nurses at the ANC clinic in the hospital setting, and were invited to take part voluntarily in the study. All participants were informed about the objectives, requirements, confidentiality, anonymity, and their rights. They could leave the study at any time without any repercussions.

Firstly, the researcher built rapport with participants before individual in-depth interviews were conducted, then a focus group approach was appropriate to obtain information in this study because pregnancy at this age was a sensitive issue for this group of participants. The participants were interviewed in a private place after they agreed to participate in the study and signed a consent form. They were asked to allow tape recordings of the interviews. The duration of individual in-depth interviews varied from 30 to 60 minutes and ended when target data was acquired or the participants wanted to stop the interview. According to Liamputtong (2013), focus group discussion works well with 4-10 participants. After thirteen individual in-depth interviews, four selected participants who are able and willing to share

information on their prenatal attachment experiences (Liamputtong, 2013) were then invited to participate in a focus group discussion. However, one invited participant did not come on the appointment date. The focus group interview was performed with the researcher acting as the moderator, and a research assistant was the note taker. The duration of the focus group was approximately 80 to 90 minutes and ended when target data was acquired.

Data analysis: The data from individual in-depth interviews and focus group discussion were analyzed using content analysis methods (Liamputtong, 2013). The data were analyzed by reading several times to ensure that all relevant experiences were identified, then coding, and categorized themes were determined. In order to confirm the results of analysis, the contents and emerged themes were discussed in relation to the data with experts in qualitative research. After that, each theme was synthesized as one of the pre-specified domains of prenatal attachment among Thai pregnant adolescents. To maintain the requirements of qualitative methodological approaches, credibility was considered (Polit & Beck, 2014).

The results of data analysis were integrated into the pre-specified domains of the PAS-Thai. Therefore, pre-specified domains extracted from literature reviews and findings from qualitative approaches were consolidated into the integrated domains of the PAS-Thai.

Step 2 Generate an item pool

The purpose of this step was to generate an item pool for the PAS-Thai. According to DeVellis (2017), the procedures of generating the item pool from the integrated domains of the PAS-Thai were composed of: 1) developing conceptual

definitions of each domain, 2) formulating the operational definitions of each domain, 3) identifying observable indicators of each domain, and 4) generating the items.

Based on DeVellis (2017)'s suggestions, on positive wordings of the items, only one idea being described in each statement, redundancy of the items, and good and bad characteristics of items were considered. In addition, as fetal movement is a significant event that effects prenatal attachment level in pregnant women (Cannella, 2005; Yarcheski et al., 2009), items related to fetal movement were generated to differentiate scores between the pregnant adolescents who have, and have no experiences of fetal movement.

Step 3 Determine the scale format

The objective of this step was to determine the scale format of the PAS-Thai. The desired items were expected to make fine discriminations between respondents (Waltz, Strickland, & lenz, 2017) with differing levels of thoughts, feelings, and behaviors contributing to prenatal attachment among pregnant adolescents. The scale was formatted using a structure of 5-point Likert scale. This scale format was chosen because: 1) the response options provide the opportunity for gradation (DeVellis, 2017), 2) the summation feature of the scale format makes it possible to see fine discriminations among respondents with different viewpoints (Polit & Beck, 2017), 3) the clear meaning of the words used to describe frequency, and its appropriateness for the pregnant adolescents, 4) its quantitative scores are concreate and appropriate to facilitate several techniques of psychometric evaluation of the scale (Munro, 2005), 5) the 5-point scale measurement has been demonstrated to create variance that is necessary for the examination of the item-scale correlations

and create adequate coefficient alpha reliability estimation (Hinkin et al., 1997), and 6) it has become common to assume that Likert scales are intervals which meet requirements to perform factor analysis (Hair, Black, Babin, & Anderson, 2010).

Phase II Psychometric Properties Evaluation

The aim of the second phase of this study was to evaluate the psychometric properties of the PAS-Thai, including the validity and reliability of the instrument. This phase consisted of five main steps: 1) have the initial item pool reviewed by experts, 2) pre-test, 3) administer the scale to the development sample, 4) evaluate the scale, and 5) optimize the scale length. The details of each step were explained as follows:

Step 1 Have the initial item pool reviewed by experts

The aim of this step was to assess the content validity of the first draft of PAS-Thai. Content validity is the first type of validity that should be established and is a prerequisite for all type of validity (DeVellis, 2017). The items' content was examined and evaluated to see whether the criteria statements within each domain accurately and adequately measured the construct by a panel of experts.

A panel of experts in content and practice areas related to prenatal attachment and pregnant adolescents consisted of: one physician, one public health supervisor, and one nurse instructor who was an expert in the area of adolescent pregnancy and two nurses in the area of antenatal care and prenatal attachment for pregnant adolescents (Appendix B). A letter from Faculty of Nursing, Prince of

Songkla University, was attached with the draft instrument, a conceptual framework, and definitions of terms related to prenatal attachment among Thai pregnant adolescents used in this study and included in the formation provided to the experts. The experts were invited to evaluate and give their opinions on each item and the overall PAS-Thai for clarity of wording, adequacy of items covered the construct, relevance of the items to the construct, and appropriateness for the pregnant adolescents (DeVellis, 2017).

To evaluate the relevance and to compute the scale's content validity index, the experts were invited to rate each item on the first draft of the PAS-Thai that ranged from 1 to 4 on a rating form (1 = *not relevant*, 2 = *somewhat relevant*, 3 = *quite relevant*, 4 = *highly relevant*). If there was agreement about the lack of relevance, the experts were asked to suggest revised wordings for items with a rating of "*not relevant*" or "*somewhat relevant*", as well as items with unclear or inappropriate wording. To enhance the content validity of the individual items and the scale overall, the items rated at level 3 or 4 were retained (Polit & Beck, 2017). The items rated at level 1 or 2 would be deleted or rewritten regarding the experts' suggestion and discussion with thesis advisors.

Based on feedback of the experts, the wording of questions on demographic data was improved for clarity. Then, the scores from each expert were computed for CVI at both item level (I-CVI) and at scale level (S-CVI/Ave and S-CVI/UA). The recommended criteria for an I-CVI is .80 or higher; S-CVI/Ave is .90 or higher (Polit & Beck, 2017); and S-CVI/UA is .80 or higher (Polit et al., 2006).

The I-CVI was calculated as the percentage of experts giving a rating of either 3 or 4, respectively. The S-CVI/Ave was calculated as the average of the I-CVIs for all items on the scale. The S-CVI/UA (universal agreement) is the proportion of items on an instrument that achieved a rating of 3 or 4 by all the experts. The S-CVI/UA was computed by calculating the percentage of items on the scale for which all judges agree on content validity (Polit & Beck, 2017).

Step 2 Pre-test

The performance of each item on the preliminary scale needs to be evaluated empirically (Polit & beck, 2017). Thus, the purpose of this step was to reveal potential problems related to the content, and to ensure the understandability and appropriateness, administration procedures, scoring, and reliability of the instrument before using it with the development sample.

Participants and setting: According to Polit and Beck (2017), a minimum of 30 subjects are an appropriate number for pretest. Thus, the sample for pre-testing of the PAS-Thai was 30 Thai pregnant adolescents. The inclusion criteria in this step were: 1) pregnant Thai adolescent 13 to 19 years of age, 2) gestational age 20 weeks or greater, 3) attending a routine care at the ANC clinic, 4) no complications or high risk during pregnancy, and 5) able to understand and speak Thai. A purposive sampling method was employed to recruit participants who met the inclusion criteria from the ANC clinic at Health Promotion Hospital Center 12. This hospital was selected because it offered diverse samples both urban and rural areas from provinces in the Deep South of Thailand that enhanced the sample's representativeness.

Instrument: The second draft of the PAS-Thai including demographic information sheets were used in this step.

Data collection: After receiving approval from the IRB of Faculty of Nursing, Prince of Songkla University and the hospital setting (Appendix A), the pre-testing was performed. The participants were invited to respond to a self-report questionnaire individually after they agreed to voluntarily participate in the study and signed a consent form. In addition, they were asked about the understandability and clarity of the items, and to make suggestions for improving them. In order to ensure that the participants could freely express their experiences and not project favorable images, each of them were asked to complete a self-report questionnaire individually in a private place. Participants' right protection, anonymity, and confidentiality were emphasized and maintained in all data collection processes (Polit & Beck, 2014).

Data analysis: In this step, item analysis and internal consistency were used for preliminary evaluation of the items and scale.

1) Item analysis

Item analysis was performed to assess the relationship of the items and whether they adequately established the instrument (Polit & Beck, 2017). Firstly, positive scores of the alpha correlation of item analysis are desirable. For the items on the same subscale, an average inter-item correlation between .30 and .70 is desirable (Polit & Beck, 2017; Waltz et al., 2010). Moreover, Tabachnick and Fidell (2007) suggested that if the items highly correlated (.90 or more), they should be dropped from the analysis due to redundancy. Lastly, the alpha level should not

decrease if the item is deleted. Thus, the criteria for item selection in this step were an alpha level greater than .30 and less than .90.

2) Internal consistency

The internal consistency reliability was performed to assess the degree to which all subparts of the PAS-Thai are measuring the same characteristics (DeVellis, 2017). To evaluate the homogeneity of the items within the scale, the internal consistency reliability was evaluated by calculating Cronbach's coefficient alpha for the entire PAS-Thai and its dimensions. DeVellis (2017) recommended ranges for research instruments as follows: below .60, objectionable; .60 to .65, unsatisfactory; .65 to .70, minimally satisfactory; .70 to .80, acceptable; .80 to .90, admirable; and greater than .90, the researcher should consider shortening the scale. Based on these criteria, the desirable Cronbach's coefficient alpha for the entire PAS-Thai and its dimensions was determined to be at least .70.

Step 3 Administer the scale to the development sample

In order to evaluate the psychometric properties of the PAS-Thai including the validity and reliability of the scale, administration of the third draft of PAS-Thai to a development sample was performed.

Participants and setting: Using the same inclusion criteria as in pre-testing step, the participants were purposively selected. The estimated sample size was based on statistical assumptions of factor analysis requirements. As a general rule of thumb, at least 300 cases are sufficient to perform factor analyses, and it is good to have 500 cases (Tabachnick & Fidell, 2007). In terms of a ratio of items to respondents, a ratio

of 5 to 10 subjects per item is suggested (Munro, 2005; Polit & Beck, 2017). In this study, 55 items of the PAS-Thai were established and a ratio of 10 subjects per item was used to estimate the sample size. Thus, the sample size required in this study was 550 subjects.

The administration of an initial pool of items to an appropriately large and representative sample is important (DeVellis, 2017). To achieve the large sample size requirement and to enhance the representativeness of the population in this study, data were collected using stratified sampling technique from five regions of Thailand. By using data demonstrated the adolescent pregnancy prevalence from Health Data Center (HDC) Dashboard of Ministry of Public Health, Thailand, one province which had high adolescent birth rate from each region was selected. They were Khonkean (Northeastern), Chiangrai (North), Chonburi (East), Songkhla (South), and Patumthani (Central). Then, the provincial hospital of each province was selected. The ANC clinic of each setting was contacted initially to ask for information about pregnant adolescents attending antenatal care. The sample size of each hospital setting was calculated by using the number of pregnant adolescent per year from ANC clinic data of each setting as shown in Table 1.

Table 1

Sample size estimation of each hospital setting

Region	Provincial hospital	Number of pregnant adolescent per year of each setting	Sample size calculation (550/2320 = 0.237)	Sample size estimation
Northeastern	Khonkean	860	203.88	204
North	Chiangrai	400	94.83	95
East	Chonburi	390	92.46	92
South	Songkhla	380	90.09	90
Central	Patumthani	290	68.75	69
	Total	2320	550.00	550

Instrument: The third draft of the PAS-Thai including demographic sheet was used in this step.

Data collection: With approval from the IRB of Faculty of Nursing, Prince of Songkla University (Appendix A), steps in data collection were initiated as follows:

1. The researcher contacted the head nurse of ANC clinic of each hospital setting to obtain permission for data collection. Once the informal permission was granted, the research assistant in each setting, who had graduated from a bachelor or master degree in nursing and voluntarily took part in data collection process, was contacted primarily for collecting data.

2. A formal letter from Faculty of Nursing, Prince of Songkla University and submission requirements were sent to the IRB of each hospital setting to ask permission for data collection.

3. Once approval has been granted by the IRB of each setting (Appendix A), the researcher informed the research assistants about the purposes of the study, the contents of the questionnaire, the data collection process, the subjects' right protection, and the research assistant's responsibilities. Then, the questionnaires were distributed to, and collected by, the research assistants.

4. The subjects who met inclusion criteria were asked to complete a self-report questionnaire individually after they agreed to participate voluntarily in the study.

5. After the data were collected completely and investigated for completeness, the data collectors or research assistants mailed questionnaires to the researcher.

Data analysis:

Before conducting the statistical analysis, completeness of the returned questionnaires was checked before coding and entering data.

The returned questionnaires were checked for completeness. From a rough inspection, the questionnaires with more than 10 percent of data missing were excluded (Tabachnick & Fidell, 2007). After data entry, the missing data were checked again using frequency inspection of each item. Although missing data under 10 percent for an individual case can generally be omitted or imputed (Hair et al., 2010), deletion of cases with missing data was preferred in this study

Data examining and cleaning was performed to ensure that the numbers and code entered of each case and variable in a dataset were accurate.

Step 4 Evaluate the scale

After the third draft of the PAS-Thai was administered to the development sample, validity and reliability were assessed to evaluate psychometric properties of the scale (DeVellis, 2017). The participants and setting, instrument, and data analysis were explained in each analysis as follows:

1) Factor analysis

Factor analysis is one of the most critical procedures to ascertain the viability of the instrument (Hinkin et al., 1997). Exploratory factor analysis (EFA) is used primarily to analyze the structure of the correlations among a large number of items by determining sets of items that are highly correlated, and recognized as factors (Hair et al., 2010). DeVellis (2017) mentioned that factor analysis for instrumentation serves several purposes: 1) to determine how many latent variables underline a set of items, 2) to condense information, 3) to define the meaning of the factors, and 4) to detect the performance of items. Thus, EFA was used to reduce a set of items and identify the internal dimensions of the developed PAS-Thai.

Data analysis: Testing assumptions for factor analysis was primarily conducted as follows.

1.1) Type of data: EFA requires an interval or ratio level of measurement (Munro, 2005). The PAS-Thai was formatted using the structure of a 5-point Likert scale. It has become common to assume that Likert scales are intervals which meet requirements to perform factor analysis (Foster, Barkus, & Yavorsky, 2006).

1.2) Sample size: To have a robust result of an exploratory factor analysis (EFA), the preferable sample size ranges from a ratio of at least 5 subjects per item

(Hair et al, 2010) to 10 subjects per item (Polit & Beck, 2017). Additionally, Tabachnick and Fidell (2007) recommended having not less than 300 cases for factor analysis. In this study, 55 items of PAS-Thai were established and a ratio of 10 subjects per item was used to estimate the sample size. Thus, an estimated 550 subjects were used in this analysis.

1.3) Normality: To conduct factor analysis, data should be normally distributed (Munro, 2005). Multivariate normality is assumed when all items and all linear combinations of items are normally distributed. Multivariate normality testing is delicate. It is assumed that the assumption of multivariate normality is met if all individual items are normally distributed. Thus, a test of normality among single items using significance skewness and kurtosis values of less than ± 3.29 was performed (Tabachnick & Fidell, 2007).

1.4) Outliers: Outliers can have an obvious influence on any type of empirical analysis (Hair et al., 2010). Univariate outliers were detected using box plots. Multivariate outliers were detected through Mahalanobis distance measurement with the criteria of $p < .001$. Probability was estimated for a case being an outlier using $\chi 2$ value, $df = 55$ with $p < .001$ (Hair et al., 2010; Tabachnick & Fidell, 2007) was used to detect multivariate outliers in this study. When outliers were found, the reasons for the presence of an outlier were investigated before deletion.

1.5) Linearity: Factor analysis is based on correlations between variables. Thus, it is crucial to examine the linear correlations amongst the variables. Linearity among pairs of items was assessed through the visual investigation of scatterplots (Tabachnick & Fidell, 2007).

1.6) Multicollinearity: Multicollinearity is problems when items are highly linearly correlated in a correlation matrix (.90 and above). With multicollinearity, the variables are redundant and they are not needed in the same analysis. Multicollinearity was evaluated using a correlation matrix. The value of $r < .90$ is acceptable (Tabachnick & Fidell, 2007). If multicollinearity was found, the redundant items would be excluded.

1.7) Factorability: Before conducting EFA, factorability indices were assessed to assure that the data underlying the analysis meet all requirements for factor analysis (Hair et al., 2010).

1.7.1) Alpha correlation: According to DeVellis (2017), determining the nature of latent variables underlying an item set is critical. Item analysis was performed to investigate the pattern of responses to each item of the scale and whether it is appropriate to conduct factor analysis (Polit & Beck, 2017). The alpha correlation of each item was examined. Positive scores for the correlation coefficient (r) in the item analysis are desirable. The interpretation of the factorability indices for EFA includes the correlation coefficient (r) in which all pairs of items range from .30 to .70 (Hair et al., 2010; Polit & Beck, 2017; Waltz et al., 2010). In this study, the criteria for item selection are item correlations between .30 and .70.

1.7.2) Bartlett's test of Sphericity: Bartlett's test of Sphericity is a method of examining the entire correlation matrix. A statistically significant Bartlett's test of Sphericity ($p < .05$) demonstrates the correlations among items are adequate to perform factor analysis (Hair et al., 2010). A statistically significant Bartlett's test of Sphericity ($p < .05$) before proceeding with the factor analysis was used in this study.

1.7.3) The Kaiser-Meyer-Olkin measure (KMO): KMO presents the comparison between the zero-order correlations and the partial correlations. The larger values point out a greater difference between zero-order correlations and the partial correlations. A represented value of .90 or greater is wonderful, .80 or greater is praiseworthy, .70 or greater is adequate, .60 or greater is passable, .50 or greater is pathetic, and below .50 is undesirable (Munro, 2005). In this study, the value of KMO measurement of sampling adequacy of the PAS-Thai was determined at least .60.

1.7.4) Measure of Sampling Adequacy (MSA): MSA is examining the degree of intercorrelation among the items both the entire correlation matrix and each individual item. A represented value of .80 or greater is praiseworthy, .70 or greater is adequate, .60 or greater is generous, .50 or greater is pathetic, and below .50 is undesirable (Hair et al., 2010). Assessment of MSA through anti-image correlation matrix was performed, and the items with MSA lower than .50 should be excluded (Hair et. al. 2010). In this study, the MSA value of each item above .50 was determined before proceeding with factor analysis.

Thus, the factorability indices for EFA including the alpha correlation of each item, Bartlett's test of Sphericity, the test of KMO, and MSA (Hair et al., 2010; Munro, 2005; Tabachnick & Fidell, 2007) were examined before conducting EFA.

After the appropriateness of performing a factor analysis was examined, factor extraction using Principal axis factoring (PAF) method was performed. The goal of PAF is to maximize the variance accounted for from the data set with each successive factor. The common variance is analyzed with unique and error variance eliminated (Tabachnick & Fidell, 2007), so its results are much more reliable (Nguru

& Waititu, 2015). Importantly, if the assumption of multivariate normality is violated, PAF method is suitable to extract factor (Costello & Osborne, 2005; Treiblmaier & Filzmoser, 2010).

The criteria for the number of extracted factors consisted of (Hair et al., 2010; Munro, 2005; Tabachnick & Fidell, 2007): 1) an Eigenvalue represents the amount of information captured by a factor greater than one or that account for at least 5% of variance, 2) a scree test result which is based on a plot of the Eigenvalues correlated with succeeding factors, 3) the value of factor loading for each item that is .30 or greater, 4) the items in each component that show theoretical sense and parsimonious accounting for the factors. Additionally, Hair et al. (2010) recommended of at least 5 items per factor.

Then, an orthogonal rotation using varimax rotation method was used to rotate the components. The orthogonal rotation method is usually beneficial for instrument development, in which the researcher aims to create subscales which are rationally independent from one another (Munro, 2005). This rotation method assumes that the factors in the analysis are uncorrelated. This method maximizes a variable's loading on one factor and minimizes its loading on all others which makes interpretation clearer (Hair et al., 2010).

The most widely used method of orthogonal rotation is varimax rotation. This method aims to maximize the variance of the loadings within factors, across items. The varimax method strives to condense the number of high loading items on a factor, which facilitates interpretation of the factors (Hair et al., 2010; Tabachnick & Fidell, 2007). Thus, an orthogonal rotation using varimax rotational method was used in this study.

The results of factor analysis can not only be used to identify the dimensionality of the construct, but also to make decisions about item retention and deletion (Polit & Beck, 2017). The difference of at least .20 between an item's loading on any other factors was considered to retain or delete items in the analysis (Hair et al., 2010).

Then, several runs of the analysis were executed to explore the most appropriate factor solution. Therefore, the results from this step would be used to further evaluate the psychometric properties of reliability and validity.

2) Internal consistency assessment

To ensure the psychometric properties of reliability, the final draft of the PAS-Thai was reassessed for its reliability. The internal consistency reliability using Cronbach's alpha coefficient was assessed to examine the homogeneity of the items (DeVellis, 2017).

To evaluate the homogeneity of the items within the scale, the internal consistency reliability was determined using Cronbach's coefficient alpha for the entire PAS-Thai and its dimensions. Similar to the pre-testing step, suggested ranges for research tools are as follows: below .60, objectionable; between .60 and .65, unsatisfactory; between .65 and .70, minimally unsatisfactory; between .70 and .80, desirable; between .80 and .90, excellent; and greater than .90, the researcher should consider shortening the scale (DeVellis, 2017). Based on these criteria, the minimal acceptable level of Cronbach's coefficient alpha for the PAS-Thai was .70.

3) Construct validation

To evaluate construct validity of the developed PAS-Thai, the contrasted group approach was performed. The contrasted group approach is typically conducted with two groups of subjects known to be excessively high and excessively low in the characteristics assessed by the tool. If the tool is sensitive to individual differences in that characteristic, the produced scale scores can discriminate members of one group from one another (DeVellis, 2017). The mean scores of the two contrasted groups should differ significantly and should be in the predicted direction (Waltz et al., 2010).

Consistent evidence supported that planning pregnancy and intention to keep the baby (Feldman, 2007, 2012; Koniak-Griffin, 1989; Ossa et al., 2012; Rowe et al., 2013; Ustunsoz et al., 2010; Yarcheski et al., 2009) are consistently positively correlated with prenatal attachment. Thus, the two groups who are extremely different in regard to their characteristics of prenatal attachment, a group of pregnant adolescents who desire and are ready to have a baby and a group of pregnant adolescents who do not want or are not ready to have a baby, were expected to have different responses to the PAS-Thai.

Participants and setting: Two groups of pregnant adolescents expected to have different characteristics of prenatal attachment were purposively selected from the ANC clinic of each setting. The first group comprised 31 Thai pregnant adolescents who desired and were ready to have a baby with the same inclusion criteria as the priori steps. The contrasted group consisted of 31 pregnant adolescents who did not want or were not ready to have a baby. The inclusion criteria were: 1) Thai pregnant adolescent 13 to 19 years of age, 2) gestational age 20 weeks or greater,

and 3) attending routine care at the ANC clinic, 4) no complications during pregnancy, 5) willing to participate in this study, and 6) do not want to or not ready to have a baby. Some pregnant adolescents may be in the Youth Plus Program [The Youth Plus Program is a special program for pregnant adolescents who do not want to have baby or have any problems regarding their pregnancy, and want to conceal their pregnancy. The pregnant adolescents who joined this program were closely supported in attending the ANC clinic, labour room, and pueperium ward. There is the red symbol "+" on the right side of their OPD cards]

Instrument: The draft PAS-Thai including demographic sheets was used in this step.

Data collection: After receiving approval from the IRB of the Faculty of Nursing, Prince of Songkla University (Appendix A), and each hospital setting, the contrasted group approach was conducted as follows:

The group of pregnant adolescents who wanted to have a baby was contacted normally as in the priori steps. The group of the pregnant adolescents who did not want or were not ready to have a baby was contacted as follows:

1) Contact the head nurse of the ANC clinic of each hospital setting for data collection approval.

2) Coordinate with the research assistants to carefully select the pregnant adolescents who met the inclusion criteria.

3) With careful consideration, the research assistant privately contacted the selected pregnant adolescents who met the inclusion criteria at the ANC clinic, invited them to participate in this study, and comprehensively informed them about the study information. The confidentiality, anonymity, and participants' right were emphasized.

4) After the pregnant adolescents agreed to participate voluntarily in this study and had signed the consent form, they were asked to fill out the self-report questionnaire individually in a private place.

5) If the participants had some emotional risks such as discomfort over talking about the fetus, being sad for something, in this case, the data collection process would stop. The research assistant or the nurses who were well-trained to give counselling to the pregnant adolescents would take care of the participants until they felt better or their problem was solved. In addition, the participants had the right to leave the study at any time, and the withdrawal would not make any difference to their care or treatment. However, there was no emotional risk reported in this study.

Data analysis: Independent t-test was used to test the mean differences of the prenatal attachment scores between the two contrasted groups. It was expected that the mean scores of the group of pregnant adolescents who desired and were ready to have a baby would significantly differ from the group of pregnant adolescents who did not want or were not ready to have a baby. Significantly different scores between these two groups would confirm that the developed PAS-Thai has construct validity.

Step 5 Optimize the scale length

In this step, the optimal length of the PAS-Thai's final version would be established based on the acceptable reliability and validity scores of individual items, subscales, and the total scale. In making final decisions, content validity, factor analysis results, and the reliability of the scale were considered as follows.

Content validity: Sometimes Cronbach's coefficient alphas are overestimated by items that have similar wordings (Polit & Beck, 2017). The I-CVI and content of items in the PAS-Thai was re-evaluated.

Factor analysis results: The results of factor analysis were carefully re-considered to identify the items which clearly serve the construct. The items which clearly loaded on a single factor and the cutoff point of factor loadings greater than .40 were used in judging important items (Hinkin et al., 1997).

Reliability of the scale: The scale's alpha was re-considered to optimize the acceptable reliability. If the Cronbach's coefficient alpha of subscale is lower than .80, Polit and Beck (2017) suggested adding more items to increase alphas.

The development and psychometric evaluation of the PAS-Thai are shown in Figure 1.

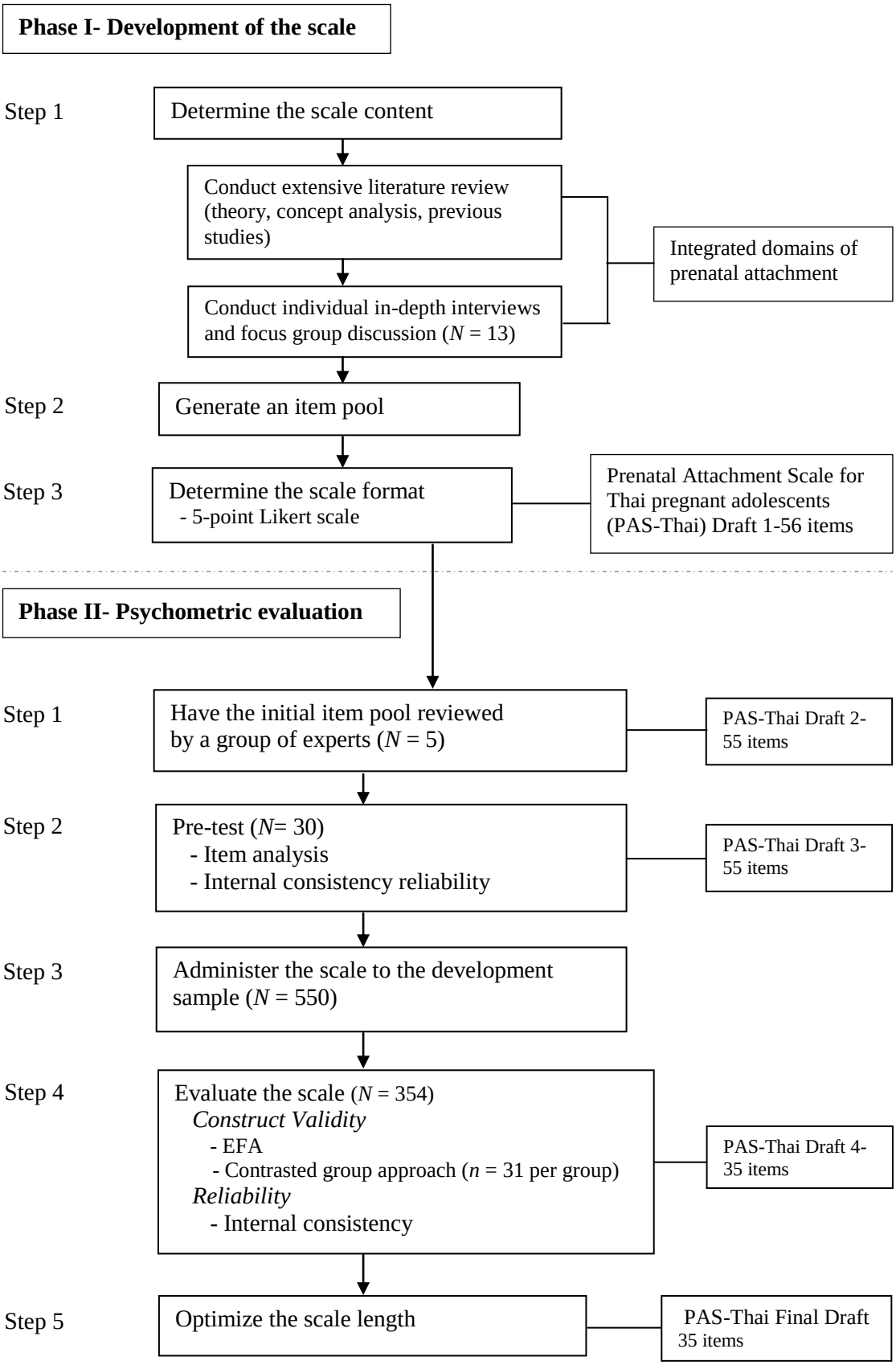


Figure 1. Flowchart of the development and psychometric evaluation of the PAS-Thai

Protection of Human Rights' Subjects

Protecting the human rights of the subjects in this study is a strong concern since the subjects are adolescents and pregnancy at this age is a very sensitive issue in Thai society. This study was conducted after approval from the Institutional Review Board (IRB) of the Faculty of Nursing, Prince of Songkla University, and approval of the study by the Institutional Review Boards of the participating hospitals (Appendix A).

The written informed consent consisted of: 1) the name, address, and phone number of the researcher, 2) the purposes of the study, 3) the benefits of using the results of this study in nursing, 4) assurance of the subject's anonymity and confidentiality, 5) voluntary participation in the study, and 6) the right to leave the study at any time and the withdrawal would not make any differences on their care or treatment.

The participants were informed clearly about the objectives, requirements, confidentiality, anonymity, and their rights before voluntarily participating in the study. In addition, some hospital settings determined that the participants' parents had to sign the consent form to allow the participants to take part in this study. After signing the consent form, the participants were asked to interview or fill out the self-report questionnaire individually in a private place.

There was no physical risk during participation in this study. However, if the participants had some psychological risks such as stress over talking or thinking about their baby, being sad for life circumstances, in this case, the data collection would stop. The research assistants or the nurses who were well-trained to give

counselling to the pregnant adolescents would take care of them until they feel better. If the participants decided to leave the study, the data collection would end without repercussions. However, there was no psychological risk reported in this study.

Confidentiality would be maintained in all data collection processes. Each subject received a package of a self-report questionnaire set, including a statement regarding their rights. No identification was used except for an anonymous code number. Code numbers were included on each questionnaire in order to follow up on the questionnaire if necessary. All information in this study was kept confidential and anonymous. The data would be only accessible by the researcher, thesis advisors, and research committee of PSU, Thailand. The results of the study would be presented in a summary. The participants' identity would remain anonymous in reports and publications of the study.

CHAPTER 4

RESULTS AND DISCUSSION

The purpose of this study was to develop and evaluate psychometric properties of the Prenatal Attachment Scale for Thai pregnant adolescents (PAS-Thai). This chapter presents the results and discussion as follows.

Results

The results are presented in two sections: 1) the development of the PAS-Thai, and 2) psychometric properties evaluation of the PAS-Thai. The details are as follows:

1. Development of the Prenatal Attachment Scale for Thai Pregnant Adolescents (PAS-Thai)

1.1 Scale content determination

To determine the construct to be measured, the process of the PAS-Thai development began with an extensive literature review. The results of the extensive literature review related to the theory of maternal identity, concept analysis of prenatal attachment, and previous studies regarding prenatal attachment were as follows:

- The four developmental tasks of maternal identity theory consisted of: 1) binding-in, 2) seeking safe passage, 3) acceptance by others, and 4) giving of self.

- The result of literature review regarding concept analysis of prenatal attachment consisted of: 1) cognitive attachment, 2) affective attachment, and 3) altruistic attachment.

- The result of literature review regarding previous studies of prenatal attachment consisted of: 1) thinking about the unborn child, 2) thinking about taking care of the baby, 3) being concerned for fetal well-being, 4) affection toward the unborn child, 5) being connected to the unborn child, 6) communication and interaction with the unborn child, 7) giving of self to nurture and protect the unborn child, and 8) preparation for the baby's arrival.

The result of this extensive literature review could be divided into three pre-specified domains with eight subdomains as shown in Figure 1. These pre-specified domains and subdomains were used as a guide to design the semi-structured questions employed in qualitative approaches (individual in-depth interview and focus group discussion), and to generate items for the developed instrument.

After determining the pre-specified domains of the PAS-Thai, qualitative approaches using individual in-depth interviews and focus group discussion were employed to gain more data from the sample which the scale intended to measure. The thirteen Thai pregnant adolescents attending the ANC clinic at Health Promotion Hospital Center 12 were recruited with inclusion criteria.

Demographic characteristics of the participants: The ages of the participants ranged from 13 to 19 years, with a mean of 17.62 years (*SD* = 1.61). The gestational ages ranged from 24 to 38 weeks, with a mean of 32.23 (*SD* = 4.44). More than half (53.85%) were Buddhist. Most of them (53.85%) left school before pregnancy. Most of them (61.54%) were not married before pregnancy and did not plan pregnancy (76.93%). The details were shown in Appendix C.

Thirteen individual in-depth interviews and one focus group discussion (*n* = 3) were conducted to collect data between September 2016 and January 2017.

Analysis of the data led to the construction of 10 themes. The results of data analysis were composed of: 1) feeling glad to have the baby, 2) loving, attaching, and having a sense of ownership, 3) feeling connected to the baby, 4) accepting the baby, 5) being curious and imagining the baby, 6) being concerned about the baby's health, 7) wanting to be a good mother, 8) communicating and interacting with the baby, 9) taking good care of self for the well-being of the baby, and 10) preparing for the baby's arrival. The 10 emerged themes were integrated into the domains of the PAS-Thai. The results of the literature review and qualitative approaches are presented in Table 2.

Table 2

Pre-specified and integrated domains of the PAS-Thai

Pre-specified domains		Integrated domain
Extensive literature review	Qualitative approach	
The cognitive attachment domain *(11 sub-domains)*		
- thinking about the unborn child - thinking about taking care of the baby - being concerned for fetal well-being	- being curious and imagining the baby - wanting to be a good mother - being concerned about the baby's health - accepting the baby	- being curious, thinking about the baby - recognizing the baby - thinking about taking care of the baby and wanting to be a good mother - being concerned about the baby's health and fetal well-being

Table 2 (continued)

Pre-specified domains		Integrated domain
Extensive literature review	Qualitative approach	
The affective attachment domain *(8 sub-domains)*		
- affection toward the unborn child - being connected to the unborn child	- loving, attaching, and having a sense of ownership - feeling connected to the baby - feeling glad to have the baby	- feeling glad to have the baby - loving, attaching, and having a sense of ownership - being connected to the unborn child
The behavioral domain *(9 sub-domains)*		
- communication and interaction with the unborn child	- communicating and interacting with the baby	- communication and interaction with the unborn child
- giving of self to nurture and protect the unborn child	- taking good care of self for the well-being of the baby	- taking good care of self to nurture and protect the unborn child
- preparation for the baby's arrival	- preparing for the baby's arrival	- preparing for the baby's arrival

1.2 Item generation and scale format determination

Item generation

After content analysis from literature review and qualitative approaches, a pool of 72 items which reflected the contents of the integrated domains of prenatal attachment among Thai pregnant adolescents was generated as follows: cognitive attachment domain 25 items, affective attachment domain 20 items, and behavioral attachment domain 27 items.

Based on DeVellis (2017)'s recommendations, all items were generated in positive wordings, and only one idea was described by each statement. The intensity of the statement, redundancy of items, and characteristics of good and bad items were determined.

After discussion with the study advisor, 14 items were excluded and five items were rewritten. In addition, the two items which statements were specific to one event or one culture, ultrasound results, and doing as religion believes, were deleted. Therefore, the first draft of the PAS-Thai comprised a total of 56 items within three domains (cognitive attachment domain 18 items, affective attachment domain 17 items, and behavioral attachment domain 21 items).

Scale format determination

The 56-item PAS-Thai was formatted using a structure of 5-point Likert scale to support further analysis. The Likert scale for reflecting the degree of prenatal attachment of Thai pregnant adolescents was labeled for each item as 1 = *least*, 2 = *less*, 3 = *moderate*, 4 = *very much*, and 5 = *most*. A high score indicates more prenatal attachment. Results from this phase were used to create the first draft of the PAS-Thai.

2. Psychometric properties evaluation

2.1 Having the initial item pool reviewed by experts

Content adequacy assessment using an expert panel was implemented. Based on feedback of the five experts, the wording of questions on demographic data were improved for clarity as follows: 1) the question about age of subjects, "month" was added in the item statement, 2) the question about marital status, "not married and

live as couple" was added in the item statement, 3) the question about income was changed from filling the amount of income per month to "have no income", "have income and enough", and "have income, but not enough", 4) the question about planning of pregnancy, "in case of not planned pregnancy, what family planning method is used?" and "please give reason if you do not want to have this baby" were added in the item statement.

For the items' content, minor wording changes were made to improve clarity in nine items (c1, c2, c10, a26, a31, b46, b49, b50, b53). For example, item c1 was changed from "I want to know the gender of my baby" to "I want to know if my baby will be a boy or a girl", and item 46 was changed from "I eat five food groups" to "I eat five food groups such as rice, noodle, bread, meat, milk, egg, vegetables, fruits etc.". One item (c8) was excluded based on the experts' opinion and discussion with thesis advisors because it was redundant with item c15. Thus, the wording of the PAS-Thai was improved and the instrument was reduced to 55 items in this step. The results are shown in Appendix D.

Three types of CVI were used to evaluate the scale content validity: 1) content validity index for items (I-CVI), 2) content validity index for scales (S-CVI) both average (S-CVI/Ave) and universal agreement (S-CVI/UA).

After the review by five experts, 49 items were rated at level 3 or 4 by all five experts. These 49 items had I-CVI = 1.00. Seven items were rated at level 3 or 4 by four experts, these seven items had I-CVI = .80. Thus, I-CVIs of the PAS-Thai were .80-1.00 which is acceptable.

To calculate S-CVI/Ave, the I-CVI for each item on the scale was computed, and then the average I-CVI across items was calculated. Averaging across the 56 items, the calculation of I-CVIs yielded a value of .97.

To calculate the S-CVI/UA, all experts agreed universally that 49 out of the 56 items were content valid and rated at level 3 or 4. Therefore the S-CVI/UA was .87.

Through this process, the I-CVI of all items ranged from .80 to 1.00, the S-CVI/Ave and S-CVI/UA of the 56-item PAS-Thai was .97 and .87, respectively (Appendix E). After the redundant item (c8) was deleted, the S-CVI/Ave and S-CVI/UA of the 55-item PAS-Thai was recalculated and changed to .98 and .89, respectively. The results indicated that the content validity of the 56-item and 55-item PAS-Thai both at item level and scale level was very good.

2.2 Pre-testing

The second draft of the PAS-Thai including demographic information sheets were pre-tested with 30 Thai pregnant adolescents.

Demographic characteristics of the participants: The ages of the participants ranged from 13 to 19 years, with a mean of 17.57 years (*SD* = 1.36). The gestational ages ranged from 20 to 39 weeks, with a mean of 30.50 (*SD* = 5.19). Most of them (80.00%) were Buddhist and live with their husband. More than half (53.30%) had left school before pregnancy. Most of them (80.00%) were married and lived with their husband before pregnancy and did not use any family planning method (46.70%). Half of them (50%) planned pregnancy. Most of them (90%)

wanted to have this baby and all of them (100%) were ready to take care of the baby. The details are shown in Appendix F.

Results in the pre-testing step revealed that the pregnant adolescents encountered no problems using the instrument. In addition, item analysis and internal consistency were used for preliminary evaluation of the scale and items as follows.

1) Item analysis

Item analysis was performed to investigate the pattern of responses of the items within the scale. Initial items' performance analysis revealed that out of 55 items, four items had corrected item-total correlations lower than .30 (c2 - .18, c16 - .11, c17 - .29, b36 - .26). After these four items were deleted, Cronbach's alpha coefficient of PAS-Thai was slightly increased from .941 to .944.

Four lower item-total correlations considered the item content and its redundancy, and found that the statement of item c2 "I wonder what my baby will look like" was one of the desires to know about the baby, and c16 "I will raise the baby myself" were one of the important intentions of the pregnant adolescents to take care of their baby. These two contents were found in previous studies (Delahoussaye, 1994; Leva-Giroux, 2002; Olivier, 2016) and the qualitative approaches of this study.

The statement of item c17 "I plan to breastfeed myself" and b36 "I like playing with my baby such as gently pressing on my tummy or putting my fingers around the tummy to make my baby move" were developed based on qualitative data analysis from the participants of this study.

Importantly, they were not redundant with the other items. Based on literature review, item redundancy, and careful consideration, the statements of item

c2, c16, c17, and b36 are important to maintain the content of its domain and the entire scale. After discussion with thesis advisor, lower-than-desired items were not excluded. The remaining 55 items of the PAS-Thai in this step were used to administer to the development sample. The results of item analysis are shown in Table 3.

Table 3

Correlation coefficients of items of the 55-item PAS-Thai (N = 30)

Domain	Number of items	Item - item	Item - subscale	Item - total scale	Subscale-total
1. Cognitive attachment	17	.07 - .78	.13 - .73	.11 - .68	.75
2. Affective attachment	17	.14 - .78	.32 - .79	.42 - .76	.92
3. Behavioral attachment	21	.03 - .55	.18 - .69	.26 - .69	.88
Total scale	55	.01 - .78	.13 - .79	.11 - .71	.94

2) Internal consistency

To evaluate the homogeneity of the items within the scale, the internal consistency reliability was assessed by using Cronbach's coefficient alpha for the entire PAS-Thai and its dimensions. The results revealed that Cronbach's alpha coefficient for the overall PAS-Thai was .94. Cronbach's alpha coefficient of the cognitive attachment domain, affective attachment domain, and behavioral attachment domain were .86, .92, and .90, respectively (Table 4), indicating desirable results for use in the next step.

Table 4

Cronbach's alpha coefficient of the 55-item PAS-Thai (N = 30)

Domain	Number of item	Cronbach's alpha
1. Cognitive attachment	17	.86
2. Affective attachment	17	.92
3. Behavioral attachment	21	.90
Total scale	55	.94

2.3 Administer the items to the development sample

In this study, 55 items of the PAS-Thai were established, and a ratio of 10 subjects per item was used to estimate the sample size. 575 questionnaires were distributed to the hospital settings, 480 questionnaires (83.48%) were returned. Completeness of questionnaires was checked before coding and entering data. It was found that 16 questionnaires (3.33%) had missing data greater than 10 percent and 18 questionnaires (3.75%) had missing data less than 10 percent. Moreover, it was found that 10 subjects (2.08%) responded in abnormal manner, such as, answered in the level "*often*" on all items in page 1, "*always*" in page 2, and then "*often*" in page 3 or answered "*sometimes*" on all items in the questionnaire. The cases with missing values and abnormal responses were excluded. Afterward, the researcher requested the research assistants to collect more data to replace the questionnaires which had missing data and abnormal responses. With additional questionnaires, initially data from 460 cases were available with no missing values and abnormal responses.

1) Preliminary data analysis

Data checking and cleaning were preliminary performed to ensure that the numbers and codes entered were accurate before conducting the next statistical analysis.

2) Testing assumptions for EFA

Before conducting EFA, the critical assumptions of factor analysis were examined.

- *Type of data*: EFA requires an interval level of measurement. The PAS-Thai has a 5-point Likert scale format which is assumed to be an interval level of measurement. This assumption was met.

- *Sample size*: More than 300 subjects serve a good sample size for factor analysis. After preliminary data analysis, data were available from 460 cases with no missing data. In addition, a ratio of at least 5 subjects per item was considered. With the ratio of 8 subjects per item (460 cases: 55 items), the subjects-per-item ratio of this step was also accepted.

- *Outliers*: Since outliers have more influence on the factor solutions, outliers were detected and deleted. Univariate outliers were detected using box plots and 46 cases (10%) with univariate outliers were detected and excluded from the analysis. It was found that the outliers were cases of the pregnant adolescents who did not want, not sure, or were not ready to have baby. In addition, outliers were found in the very young pregnant adolescent group (age < 15 years). Most of them tended to respond the measure in the choices of "*least*", "*less*", or "*moderate*". This made them differ from the majority of cases in the analysis.

In addition, Mahalanobis Distance analysis with the criteria of critical $\chi 2$ = 93.168, df = 55, p < .001 was performed to identify multivariate outliers. Multivariate outliers were rechecked and deleted until there were no remaining outliers. 60 cases (13%) were identified through Mahalanobis distance as multivariate outliers with p < .001. With careful investigation, it was found that the multivariate outliers were the group of pregnant adolescents who extremely responded to the measure (average score 4.60-4.98 from 5.00), and the group of young pregnant adolescents (age < 15 years). All outliers were eliminated, leaving 354 non-outlying cases for the analysis.

As a general rule of thumb, it is sufficient to have at least 300 cases for factor analysis. After deleting the outlying cases, the sample size in this study exceeded the minimal size requirement for EFA (N = 354). With the 55 items, the subjects-per-item ratio was acceptable (6.44:1).

- *Normality*: After outlier deletion, distributions of the 55 items were investigated using skewness and kurtosis significances. Many of the items were negatively skewed. The significance of skewness varied from -0.51 to -18.22. The significance of kurtosis varied from -0.20 to 14.02 (Appendix G). Thus, non-normality was found.

- *Linearity*: After outlier deletion, linearity of all 55 items was examined through visual inspection of the scatterplots. The scatterplots showed straight-linear relationships. Thus, the linearity assumption was met.

- *Multicollinearity*: Testing multicollinearity using correlation matrix was performed. The correlation matrix revealed desirable correlations among 55 items (r = .04-.61), there was no correlation greater than .90. Multicollinearity was not found. This assumption was met.

- *Factorability*: Before conducting EFA, factorability indices were assessed to ensure that the data underlying the analysis were appropriate for factor analysis. The results were as follows.

The Kaiser-Meyer-Olkin measure (KMO): The KMO was performed to examine the sampling adequacy and the appropriateness to conduct factor analysis. The result revealed the KMO value of .94, indicating sampling adequacy for factor analysis.

Bartlett's test of Sphericity: Bartlett's test of Sphericity was performed and was resulted significant (p = .000) with the Chi-Square value 11947.133, df = 1485, indicating the adequate correlations exist among the items and appropriateness to perform factor analysis.

The measure of sampling adequacy (*MSA)*: The MSA for individual item was examined through the anti-image box. The inspection revealed values ranging from .82 to .97, indicating excellent inter-correlation among the items and appropriateness to perform factor analysis.

Demographic data of the development sample

After preliminary data analysis and assumptions for EFA testing, 354 cases were appropriate for conducting factor analysis. The ages of the participants ranged from 13 to 19 years, with a mean of 17.54 years (SD = 1.39). The gestational ages ranged from 18 to 40, with a mean of 30.31 (SD = 5.07). Most of them (86.70%) were Buddhist. More than half (57.30%) were married and lived with their husband before pregnancy, and did not use any family planning method (43.50%). Although more than half (63.30%) did not plan their pregnancy, most of them (90.40%) wanted to have this baby. The details were presented in Table 5.

Table 5

Frequency, percentage, mean (M), standard deviation (SD), minimum-maximum of demographic data of the development sample (N =354)

Items	Frequency	Percentage
Age (years)		
< 15	9	2.50
15-17	142	40.10
18-19	203	57.40
M = 17.54 , SD = 1.39, Md = 19, Min =13, Max = 19		
Skewness value -5.36, Kurtosis value -1.41		
Religion		
Buddhism	307	86.70
Christianity	24	6.80
Islam	22	6.20
Ghost	1	0.30
Marital status		
Married and live with husband	203	57.30
Not married and live as couple	113	31.90
Single	24	6.80
Divorce	8	2.30
Married but separated	6	1.70
Gestational age (weeks)		
< 21	13	3.60
21-24	35	9.90
25-28	92	26.00
29-32	99	28.00
33-36	62	17.50
37-40	53	15.00
M = 30.31, SD = 5.07, Md = 28, Min =18 , Max = 40		
Skewness value -1.85, Kurtosis value -3.00		

Table 5 (continued)

Items	Frequency	Percentage
Educational level		
Grade 1-6	22	6.20
Junior high school	126	35.60
Senior high school/Vocational certificate	131	37.00
High vocational certificate	19	5.40
Bachelor	9	2.50
Non-formal education	6	1.70
No schooling	41	11.60
Occupation		
Unemployed	185	52.30
Student	92	26.00
Street vendor	38	10.70
Worker	37	10.40
Farmer	2	0.60
Income		
Have no income	187	52.80
Have income and enough	143	40.40
Have income but not enough	24	6.80
Living with/at		
Live with parents	142	40.10
Live with husband	129	36.40
Live with husband's parents	69	19.50
Live alone	8	2.30
Live with cousin	5	1.40
Live at Regional juvenile vocational training center	1	0.30

Table 5 (continued)

Items	Frequency	Percentage
The person who will raise the baby after birth		
The pregnant woman and her husband	127	35.90
The pregnant woman and parents	72	20.30
The pregnant woman's parents	43	12.20
The pregnant woman and the husband's parents	31	8.90
The husband's parents	17	4.80
The pregnant woman only	27	7.70
Both family of the pregnant woman and her husband	36	10.20
Family planning method		
Non-contraceptive method	154	43.50
Oral pill	74	20.90
Coitus interruptus	34	9.60
Emergency contraceptive pill	30	8.50
Condom	28	7.90
Billings ovulation method	11	3.10
Transdermal patch	4	1.10
more than 1 method	19	5.40
Planned pregnancy		
Did not plan	224	63.30
Plan	130	36.70
Readiness to take care of the baby		
Ready	334	94.30
Not ready	20	5.70
Wanted to have the baby		
Wanted	320	90.40
Not wanted	34	9.60

Table 5 (continued)

Items	Frequency	Percentage
Planning of feeding method		
Breast feeding	264	74.60
Breast and bottle feeding	73	20.60
Bottle feeding	17	4.80

2.4 Item and scale evaluation

In order to ensure the psychometric properties of the developed scale, the items and scale were assessed as follows.

1) Item analysis

Initial items' performance analysis using the item-total correlation of each item and the internal consistency were analyzed before conducting factor analysis.

1.1 Item-total correlation:

Evaluation revealed that two items had low item-total scale correlations (a29 = .20, b47 = .28), these two items were then excluded from the analysis. 53 items were retained and re-evaluated. Results revealed item-total correlations ranging from .32 to .73. Thus, 53 items were available for further analysis.

1.2 Internal consistency:

The internal consistency of the 53-item PAS-Thai was evaluated using Cronbach's alpha coefficient. The results revealed alpha coefficients were .96 for the total scale, .89 for cognitive attachment domain, .91 for behavioral attachment domain, and .94 for affective attachment domain.

2) Evaluation of construct validity

To evaluate the construct validity of the PAS-Thai, exploratory factor analysis (EFA) and contrasted group approach were performed.

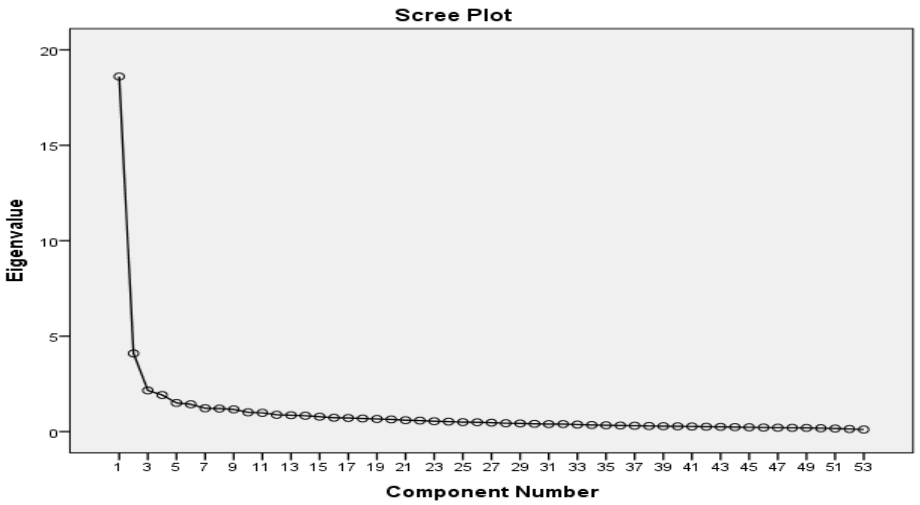
2.1) Exploratory factor analysis

Exploratory factor analysis (EFA) was conducted to reduce a set of items for the purposes of scale development. The 53-item PAS-Thai was used for analysis in this step. Assumption requirements were re-examined before performing EFA. The KMO value was .94, and the MSA ranged from .87 to .97, indicating sampling adequacy for factor analysis. Bartlett's test of Sphericity was significant (p = .000) with the Chi-Square value 11668.93, df = 1378, indicating a high correlation which was appropriate to perform factor analysis.

- *Factor extraction and rotation*

Factor extraction was initially conducted using Principal axis factoring (PAF) extraction. With the cutoff point of an eigenvalue greater than one and factor loading greater than .30, the results produced five factors which had an eigenvalue greater than one and accounted for 49.39% of variance. In addition, scree plot inspection indicated that there were probably 3-5 factors that should be extracted (Figure 2). Then, forcing 3-5 factors extraction was sequentially performed.

Figure 2. The scree plot of the 53-item PAS-Thai



The criteria for the number of factors to be retained consisted of (Hair et al., 2010; Munro, 2005; Tabachnick & Fidell, 2007): 1) Eigenvalues greater than one or that accounted for at least 5% of variance, 2) scree test results, 3) factor loading values for each item .30 or greater, 4) items in each component that show theoretical sense and parsimonious accounting for the factors, and 5) there were at least 5 items per factor.

In order to explore the most appropriate factor solution, PAF extraction using varimax rotation method was used to extract and rotate factors. Forcing 3-5 factors extraction with the cutoff point of factor loading greater than .30 was performed.

Forcing extraction of five factors with the cutoff point of factor loading greater than .30 was performed. The results revealed the explained variance of the five factors ranging from 4.99% to 16.82%, and the total variance explained of 48.60%. However, the extraction produced unclear results with 19 cross-loadings

which made difficult interpretation. In addition, when the cross-loading items were deleted, the fifth factor had less than 5 items within factor.

Then, forcing extraction four factors with the cutoff point of factor loading greater than .30 was performed. The results revealed the explained variance of the four factors ranging from 8.17% to 18.54%, and the total variance explained of 46.49%. However, the extraction produced unclear results with 20 cross-loadings which made difficult interpretation. In addition, when the cross-loading items were deleted, the second and the third factors had less than 5 items per factor.

Then, forcing extraction of three factors with the cutoff point of factor loading greater than .30 was performed. The results revealed the explained variance of the three factors ranging from 10.80% to 19.14%, and the total variance explained of 43.86%. However, the extraction produced unclear results with 15 cross-loadings which made difficult interpretation.

Comparing the forcing analyses, the 3-factor extraction was scrutinized as the most appropriate factor solution. To gain the parsimonious and theoretical interpretation of the construct, the cutoff point of factor loading was increased from .30 to .40.

Forcing three factors extraction of the 53-item with the cutoff point of factor loading greater than .40 was performed. The results revealed the explained variance of the three factors ranging from 10.80% to 19.14%, and the total variance explained of 43.86%. However, the extraction produced unclear results with 7 cross-loadings which made difficult interpretation. Then, seven items (a19, a20, a21, a25, a27, a28, b35) were excluded because of notable cross-loading. Although the seven items (c4, c5, a18, a22, a23, a24, b49) had cross-loading greater than .20, they were

excluded to ensure the construct was parsimonious. Moreover, four items (c6, b42, b43, b44) did not load on any factor. Thus, item loading was reduced from 53 to 35 items.

Finally, the final 3-factor construct of the 35-item PAS-Thai was established (Appendix H). The results revealed a KMO value of .927, and Bartlett's test of Sphericity was significant (p = .000) with the Chi-Square value 7141.46, df = 595, indicating the appropriateness of the data for factor analysis. Three factors accounted for 46.19% of variance with eigenvalues ranged from 3.32 to 6.82. The results are shown in Table 6.

Table 6

The factorability and the criteria for the number of factors to be retained in the 35-item PAS-Thai (N = 354)

Method/Criteria	35-item PAS-Thai	Normal value
- Sample adequacy	354	≥ 300 cases (Tabachnick & Fidell, 2007)
	subjects: item 10.11: 1	5-10 subjects per item (Polit & Beck, 2017)
- Extraction method	PAF	
- Rotation method	Varimax	
- KMO	.927	≥ .60 (Tabachnick & Fidell, 2007)
- Bartlett's test of Sphericity	.000 ($\chi 2$ = 7141.46, *df* = 595)	sig < .05 (Hair et al., 2010)
- MSA	.86 - .95	> .50 (Hair et al., 2010)
- Scree plot (factors)	3	A sharp drop of scree plot (Hair et al., 2010)
- Factor loadings	.42 - .79	≥ .30 (Hair et al., 2010)
- Number of items per factor	Factor 1: 14 items Factor 2: 15 items Factor 3: 6 items	≥ 5 items per factor (Hair et al., 2010)
- Eigenvalue	Factor 1: 6.82 Factor 2: 6.03 Factor 3: 3.32	> 1 (Hair et al., 2010)
- Percentage of variance explained for factors	Factor 1: 19.48 Factor 2: 17.23 Factor 3: 9.48	≥ 5% (Hair et al., 2010)
- Percentage of total variance explained	46.19	≥ 40% (Scherer et al., 1988) ≥ 60% (Hair et al., 2010)

The results of factor analysis yielded three factors with 35 items accounting for 46.19% of total variance. Based on factor loadings and item statements, the three factors were named as follows: having good wishes for the baby, preparing to care for the baby, and feeling of connectedness to the baby.

Factor 1 "Having good wishes for the baby" comprised 14 items with factor loadings ranging from .46-.79. This factor explained 19.48% of variance of the PAS-Thai. The items in this factor described the maternal thoughts about good wishes for, curiosity about, and planning to take care of the baby (Table 7).

Table 7

Factor loadings, communalities, eigenvalues, and percentage of variance of factor 1 of the 35-item PAS-Thai (N = 354)

Item	Item statements	Factor loadings	h^2
Factor 1: Having good wishes for the baby (14 items)			
1	I want my baby to have a good future	.79	.63
2	I want to see my baby	.74	.59
3	I want to raise my baby as best as I can	.72	.60
4	I want my baby to be a good person	.72	.56
5	I want to hold my baby	.68	.59
6	I want to know if my baby will be healthy or not?	.66	.50
7	I want my baby to be healthy	.65	.43
8	I think that I will make my baby be happy	.60	.54
9	I think that the baby needs its mother the same as me	.60	.45
10	I plan to breastfeed my baby	.53	.38
11	I want to know if my baby will be a boy or a girl	.51	.32
12	I want to know if the baby looks like me or his father	.49	.32
13	I will not have my baby adopted	.48	.28
14	I will raise the baby myself	.46	.34
	Eigenvalue	6.82	
	Percentage of variance	19.48	

Factor 2 "Preparing to care for the baby" comprised 15 items with factor loadings ranging from .47 - .65. This factor explained 17.23% of variance of the PAS-Thai. The items in this factor described the preparation for the baby's coming, the communication with the baby, and the self-nourishment for the benefit of the baby (Table 8).

Table 8

Factor loadings, communalities, eigenvalues, and percentage of variance of factor 2 of the 35-item PAS-Thai (N = 354)

Item	Item statements	Factor loadings	h^2
Factor 2: Preparing to care for the baby (15 items)			
1	I prepare the room or house for the baby.	.65	.42
2	I prepare baby's items, such as my baby's bed, blanket, clothes, etc.	.62	.41
3	I learn about how to take care of my self during pregnancy and how to take care of the baby by using the internet, books, and television programs, etc.	.62	.52
4	I talk to my baby.	.61	.52
5	I read books out loud to my baby.	.61	.43
6	I call my baby by his or her name or nickname.	.60	.47
7	I sing songs or turn on music for my baby.	.59	.43
8	I ask about how to raise the baby from experienced people, such as my parents, cousins, or friends, etc.	.59	.51
9	I ask about how to take care of myself and prepare for the birth by talking to doctors or nurses	.59	.39

Table 8 (continued)

Item	Item statements	Factor loadings	h^2
10	I tell my baby that I love him or her	.56	.48
11	I like playing with my baby, such as gently pressing on my tummy or putting my fingers around the tummy to make my baby move	.55	.45
12	I am seeking a good ANC clinic for my baby	.50	.31
13	I attend prenatal and birth preparation class (Parent's school) for my baby	.49	.28
14	I eat five food groups such as rice, noodle, bread, meat, milk, egg, vegetables, fruits, etc.	.48	.28
15	I take iron supplements, calcium, and vitamins as the doctor's suggest	.47	.31
	Eigenvalue	6.03	
	Percentage of variance	17.23	

Factor 3 "Feeling of connectedness to the baby" comprised 6 items with factor loadings ranging from .52 to .71. This factor explained 9.48% of variance of the PAS-Thai. The items in this factor described the emotional connectedness with and the desire to have a baby (Table 9).

Table 9

Factor loadings, communalities, eigenvalues, and percentage of variance of factor 3 of the 35-item PAS-Thai (N = 354)

Item	Item statements	Factor loadings	h^2
Factor 3: Feeling of connectedness to the baby (6 items)			
1	I feel that my baby and I have a connection	.71	.68
2	I feel that the baby can understand my feelings and emotions	.68	.61
3	The baby knows that I love him or her	.67	.61
4	I feel close to my baby	.61	.66
5	I want to have this baby	.54	.47
6	I feel pleasure to have this baby	.52	.39
	Eigenvalue	3.32	
	Percentage of variance	9.48	

2.2) The contrasted group approach

The contrasted group approach was conducted to test the PAS-Thai's construct validity. The contrasted groups comprised 31 pregnant adolescents who did not want to have a baby and 31 pregnant adolescents who wanted to have a baby. Independent t-test was used to evaluate the mean difference of the prenatal attachment scores between these two groups. The normality test and Levene's test for equality of variances of the independent variable were tested and met assumptions before the t-test was performed (Appendix I).

The results revealed that the pregnant adolescents who wanted to have a baby had significantly higher scores on the PAS-Thai than the pregnant adolescents who did not want or were not ready to have a baby as shown in Table 10. The result indicated the construct validity of the PAS-Thai.

Table 10

Mean, standard deviation, and t-value of the contrasted group on the PAS-Thai scores (N =62)

Group of pregnant adolescents	*n*	Mean	*SD*	*t*
1. Want to have a baby	31	4.51	.21	9.05*
2. Not want to have a baby	31	3.85	.35	

* $p < .001$

3) Reliability

To ensure the psychometric properties of reliability, the 53-item version and 35-item version of the PAS-Thai were re-evaluated for internal consistency using Cronbach's alpha coefficient. The analysis of the 53-item PAS-Thai both in the step of pre-testing and field test revealed the acceptable internal consistency of total scale and all dimensions. In addition, the analysis of 35-item PAS-Thai revealed the internal consistency of total scale was .94, and ranged from .89 to .91 for its dimensions. The results provided evidences for reliability of the three versions of PAS-Thai as shown in Table 11.

Table 11

Comparisons of the internal consistency among the three versions of PAS-Thai

Domain of PAS-Thai	Pre-testing (*N* = 30) 55-item	Field test (*N* = 354) 53-item	Post-test (*N* = 354) 35-item
- Cognitive attachment (Having good wishes for the baby)	.86	.89	.91
- Behavioral attachment (Preparing to care for the baby)	.92	.91	.90
- Emotional attachment (Feeling of connectedness to the baby)	.90	.94	.89
Total scale	.94	.96	.94

Discussion

The PAS-Thai was established in two phases based on eight steps of scale development set forth by DeVellis (2017). The discussion will be presented in two sections based on research questions: 1) the construct of the PAS-Thai, and 2) the psychometric properties of the PAS-Thai.

1. The construct of the PAS-Thai

The results of factor analysis yielded three satisfactory factors with 35 items which accounted for 46.19% of total variance. Although the total variance explained was less than 50%, the variance explained for each factor ranged from 9.48 to 19.48% which is acceptable. The reason of unexpected low variance was explained later in section 2.1.2 construct validity. Based on factor loadings and item statements, the three factors were named as follows: Factor 1 having good wishes for the baby,

Factor 2 preparing to care for the baby, and Factor 3 feeling of connectedness to the baby.

The 3-factor solution of the PAS-Thai is consistent with the idea that prenatal attachment is a multidimensional construct (Doan & Zimerman, 2003; Eichhorn, 2012; Müller & Ferketich, 1992: Siddiqui et al. 1999). Importantly, the three factor solution is consistent with the analyses of the concept analysis articles regarding prenatal attachment which analyzed the critical attributes of this concept. The three critical domains of prenatal attachment were identified as cognitive attachment, affective attachment, and altruistic attachment (Brandon et al., 2009; Cranley, 1993; Doan & Zimerman, 2003, 2008; Eddins, 2014; Müller, 1992; Salisbury et al., 2003; Shieh et al., 2001; Walsh, 2010; Young, 2013).

Factor 1 Having good wishes for the baby

The first factor had 14 items with factor loadings ranging from .46-.79, indicating good correlation between the item and its factor (Munro, 2005). The eigenvalue of this extracted factor was 6.82 and explained 19.48% of variance of the scale, which is the highest eigenvalue and percentage of variance of the scale, representing its significance. The internal consistency using Cronbach's alpha coefficient of this factor was .91, and the item-subscale correlations were ranged from .50-.72. The results indicated that the items within each factor measure the same trait (Polit & Beck, 2017). The items in this factor described the maternal thoughts about good wishes and concern for, curiosity about, and planning to take care of the baby

- *Good wishes and concern for*: The first important aspect was the maternal thoughts about her good wishes and concern for her unborn baby both in her

womb and in the future as shown in the item statements, such as, "I want my baby having a good future", "I want my baby to be a good person", "I want my baby to be healthy". These items' statements are in line with the results of qualitative approaches in the step of scale content determination as the participants in this study mentioned that they wanted their baby to study in higher education and get a good job in the future. They did not want their babies to be like them.

In addition, the items' statements "I think that I will make my baby happy", "I want to raise my baby as best as I can", "I will raise the baby myself" are also consistent with the results of qualitative studies of Delahoussaye (1994) and Leva-Giroux (2002) in that the pregnant adolescents wanted to take good care of the baby, and envisioned their roles as a key figure in creating a happy life for their baby.

- *Curiosity about*: This aspect was demonstrated in the items' statements "I want to know if my baby will be a boy or a girl", I wonder what my baby will look like", "I wonder who will my baby look like, me or his father?", "I want to know will my baby be healthy or not". The items in this aspect described maternal curiosity about the baby's characteristics and health, and is consistent with the attributes "the desire to know" in cognitive attachment (Condon, 1993; Cranley, 1993; Eichhorn, 2012; Shieh et al., 2001).

These two aspects are consistent with the three subdomains "Desire to know about the baby", "Thinking about taking care of the baby", and "Concern for fetal well-being" of the pre-specified domains of the PAS-Thai.

However, it is interesting that majority of the previous studies related to prenatal attachment using both qualitative and quantitative approaches conducted in adult pregnant women all described that the pregnant women had mental pictures of

the baby (Cranley, 1981b; Bloom. 1998; Ahern & Ruland, 2003; Doan & Zimerman, 2003, 2008; Salisbury et al., 2003; Shieh et al., 2001; Van den Bergh & Simons, 2009), and ascribe characteristics to the baby (Anand & Hima, 2012; Condon, 1993; Cranley, 1993; Eichhorn, 2012; Müller, 1992; Salisbury et al., 2003; Shieh et al., 2001), but the items which reflected these attributes did not load on any factors in this study. As pregnant adolescents are also in the process of cognitive development, the ability to think abstractly may be immature in some pregnant adolescents (Ward, Hisley, & Kennedy, 2016). Prenatal attachment together with adolescent development in Thai pregnant adolescents needs to be further explored.

Factor 2 Preparing to care for the baby

This factor comprised 15 items with factor loadings ranging from .47-.65, and indicated good correlation between the item and its factor (Munro, 2005). The eigenvalue of this extracted factor was 6.03 which explained 17.23% of variance of the scale, representing its significance. The internal consistency using Cronbach's alpha coefficient of this factor was .90, and the item-subscale correlations were ranged from .32-.61. The results indicated that the items within factors measure the same trait (Polit & Beck, 2017). The items in this factor describe the maternal behaviors related to the preparation for and communication with the baby.

- *Preparation for*: The loaded items which reflected the preparation for the baby's coming were composed of the preparation in household, baby's items, maternal body, and the knowledge for taking care of the baby. These contents were demonstrated in "I prepare the room or house for my baby", "I prepare baby's items, such as my baby's bed, blanket, clothes, "I learn about how to take care of myself and

my baby, by using the internet, books, and television programs, etc.", "I take iron supplements, calcium, and vitamins as the doctor's suggest". These items' statements are in line with both qualitative studies (Leva-Giroux, 2002; Rauenhorst, 2001; Ross, 2012) and empirical studies (Ahern & Ruland, 2003; Bloom, 1992, 1995, 1998; Lindgren, 2001) in which the maternal attachment to their unborn baby is demonstrated in active preparation for the baby's arrival.

- *Communication with*: The loaded items in this aspect showed that the pregnant adolescents communicate with their unborn baby in many ways, such as, "I talk to my baby", "I read book out loud to the baby", "I call my baby by his or her name or nickname", "I sing songs or turn on music for my baby", "I like playing with my baby, such as gently pressing on my tummy or putting my fingers around the tummy to make my baby move". These behaviors are consistent with previous studies in that communication and interaction is one of the important maternal attachment indicators (Ahern & Ruland, 2003; Bloom, 1992, 1998; Condon, 1993; Delahoussaye, 1994; Doan & Zimerman, 2003, 2008; Leva-Giroux, 2002; Rauenhorst, 2001). Ji and Han (2010) also stated that maternal-fetal interaction represented a maternal affiliation with her baby.

These two aspects are consistent with the subdomains "Communication and interaction with the unborn child" and "Preparation for the baby's arrival" of the pre-specified domains of the PAS-Thai. However, the loaded items which reflected the subdomain of "Giving of self to nurture and protect the baby" are not notable. This task may be not easy for the pregnant adolescents. Even though some adolescents know that their health-related behaviors have influences on their babies, they might not feel that this is important (Davidson et al., 2012). This is consistent

with the study of Bloom (1995) which found that younger adolescents find it difficult to devote their personal desires or behaviors to the benefit of the baby. The qualitative study of Pungbangkadee et al. (2008) also revealed that Thai pregnant adolescents may not keep themselves and their fetus healthy because they want to respond to their desires.

Factor 3 Feeling of connectedness to the baby

This factor comprised 6 items with factor loadings ranging from .52-.71, and indicated good correlation between the item and its factor (Munro, 2005). The eigenvalue of this extracted factor was 3.32 which explained 9.48% of variance of the scale, which is the lowest eigenvalue and percentage of variance of the scale, representing its importance. The internal consistency using Cronbach's alpha coefficient of this factor was .89, and the item-subscale correlations were ranged from .41-.65. The results indicated that the items within factors measure the same trait (Polit & Beck, 2017). The items in this factor described the connectedness with and the desire to have a baby. Therefore, this factor was labeled as "Feeling of connectedness".

- *Connectedness with*: A felt connection with the unborn baby was reflected by the loaded items such as "I feel that my baby and I have a connection", "I feel that the baby can understand my feelings and emotions", "The baby knows that I love him or her", "I feel close to my baby". Bonding emotionally is an important attribute of prenatal attachment (Eddins, 2014). This is consistent with the previous studies that the pregnant women have feelings of closeness or emotional connection

toward their unborn baby (Alhusen, 2012b; Delahoussaye, 1994; Leva-Giroux, 2002; Rauenhorst, 2001; Ross, 2012; Sadler, Novick, & Meadows-Oliver, 2016).

- *Desire to have a baby*: This aspect was not predominant because there were only two loaded items that supported this aspect. The loaded items were "I want to have this baby" and "I feel pleasure to have this baby". These items' statements are in the line with the results of qualitative approaches in the step of scale content determination as the participants in this study mentioned that they felt happy to have the baby and wanted this baby. This is consistent with Delahoussaye (1994) who stated the pregnant adolescents desire to have and keep the baby. They wanted to have the baby regardless of whether or not husband or family accepted her baby. Other qualitative studies (Delahoussaye, 1994; Leva-Giroux, 2002; Rauenhorst, 2001) also found that pregnant women have feeling of happiness and excitement to have baby.

These two aspects are consistent with the subdomains "Affection toward the unborn child" and "Being connected with the unborn child" of the pre-specified domains of the PAS-Thai. However, the statements of affection such as "I feel love for my baby since I knew that I felt pregnant", "I love my baby more everyday", "The baby is important and valuable to me" were cross loaded between cognitive attachment and emotional attachment. The items' statements should be further improved for wording clarity.

All three factors extracted from factor analysis in this study supported the prenatal attachment concept as a multidimensional construct, in accordance with the literature review. When comparing the PAS-Thai with those other measurements, both similarities and differences were found as follows.

The Maternal Fetal Attachment Scale (MFAS) was developed by Cranley in 1981. The development sample were 71 adult pregnant women (*M* = 27 years) between 35 and 40 weeks gestation. MFAS emphasizes maternal role attainment and state of pregnancy as Cranley's definition "...the extent to which women engage in behaviors that represent affiliation and interaction with their unborn child" (p.282). The scale comprised five subscales: 1) differentiation of self from the fetus, 2) interaction with the fetus, 3) attributing characteristics and intentions to the fetus, 4) giving of self, and 5) role taking.

The Prenatal Attachment Scale (PAI) was developed by Müller in 1993. The scale describes maternal thoughts, feelings, and relationships to the unborn baby. The development sample were 336 low-risk adult pregnant women (*M* = 30 years) who were well educated. Gestational age ranged from 14 to 41 weeks (*M* = 31.4 weeks). Prenatal attachment was defined as "the unique, affectionate relationship that develops between a woman and her fetus" (p.201). Müller (1993) concluded that prenatal attachment is a single concept and comprised a single factor.

The Maternal Antenatal Attachment Scale (MAAS) was developed by Condon in 1993. The MAAS was developed based on expectant couples using adult attachment model. The subjects' mean age was 26 and mean gestational age was 32. The measurement purpose was to improve understanding and manage the aspects of psychosomatic obstetrics (Condon, 1993). The scale comprised two subscales: 1) quality, and 2) preoccupation.

The 3-factor solution of the PAS-Thai differs from the five subscales of MFAS (Cranley, 1981), a single factor of PAI (Muller, 1993), and the two dimensions of MAAS (Condon, 1993). The different and inconsistent results may be due to the

different groups of the sample. According to this difference, further studies should be conducted in different groups of pregnant women.

The 3-factor solution of PAS-Thai was expected to be an effective scale for measuring prenatal attachment in all cognitive, emotional, and behavioral domains of Thai pregnant adolescents, thereby contributing to improve the health of both pregnant adolescents and their babies, and maternity nursing care.

2. The psychometric properties of the PAS-Thai

The psychometric properties of the 35-item PAS-Thai were tested for its reliability and validity.

2.1 Validity

Validity is the degree to which an instrument measures what it is supposed to measure (Polit & Beck, 2017). In this study, content validity and construct validity were used to evaluate the validity of the PAS-Thai.

2.1.1 Content validity

An I-CVI of .80 is considered as an acceptable value. The I-CVIs of the PAS-Thai ranged from .80 to 1.00 which is acceptable. Polit and Beck (2006) recommended the value of .80 of S-CVI/UA as plausible. The S-CVI/UA of the PAS-Thai was .89 which is desirable. Polit and Beck (2017) suggested the S-CVI/Ave value of .90 as the standard for establishing excellent content validity. Averaging across the 55 items, I-CVIs yielded a value of .98, indicating the excellent content

validity of the scale. Thus, the CVI both at item level and scale level indicated that the PAS-Thai has excellent content validity.

2.1.2 Construct validity

1) Exploratory factor analysis (EFA)

Evaluation of construct validity through EFA using PAF extraction method with varimax rotation yielded three factors with 35 items which had eigen-values greater than 1 that together explained 46.19% of the total variance of the scale.

Factors are interpreted through their factor loadings (Hair et al, 2010; Tabachnick & Fidell, 2007). Items with higher loadings are considered more significant and have greater influence on the name to represent a factor. After a satisfactory factor solution has been obtained, the extracted three factors were named as follows: 1) having good wishes for the baby, 2) preparing to care for the baby, and 3) feeling of connectedness to the baby. These three factors are in accordance with the results of literature review and qualitative approach of this study.

Factor loading represents the correlation between an original variable and its factor. The larger size of factor loading represents the more important of the item in the factor. All factor loadings of the PAS-Thai were greater than .40 which is acceptable. Out of 35 items, 29 items (82.86%) had factor loadings ranging from .50 to .79, and 6 items (17.14%) had factor loadings ranging from .46 to .49. The results indicated the good correlation of the items and their factors (Hair et al., 2010).

The item's communality represents the amount of variance accounted for by the factor solution for each variable. The communalities are inspected to assess how much variance in a particular variable is accounted for by the factor solution.

Munro (2005) recommended that the item should have communality of .50 or greater. The factor solution revealed the communalities ranged from .28 to .68. The item c15 "I will not adopt my baby", b45 "I eat five food groups such as rice, noodle, bread, meat, milk, egg, vegetables, fruits, etc.", and b52 "I attend prenatal and birth preparation class (Parent's school) for my baby" were considered as having low communality. These three items had communality at the level of .28. However, they were retained in the analysis based on the congruence, and significant loading in its factor. These three items had factor loadings of .48, .48 and .49, respectively, indicating that the items had significant loading, but may be poorly accounted for by the factor solutions (Hair et al., 2010).

The importance of each factor is assessed by the percentage of variance it represents (Tabachnick & Fidell, 2007). Each factor should account for at least 5% of variance (Munro, 2005). The explained variance of the three factors ranged from 9.48% to 19.48%, which is desirable.

Although the explained variance for each factor is satisfactory, the total variance explained of the 3-factor PAS-Thai was only 46.19%. The total variance explained for a newly developed scale of at least 40% is acceptable (Scherer, Wiebe, Luther, & Adams, 1988). However, Hair et al. (2010) recommended a factor solution that accounts for of at least 60% of the total variance as satisfactory.

When comparing the present scale with the other similar scales, the factor solution of MAAS accounted for 39% of the total variance (Condon, 1993), the factor solution of MFAS accounted for 25.80% to 32.76% of the total variance (Hsu & Chen, 2001; Muller & Ferketich, 1993), the factor solution of the modified MFAS accounted for 37.99% of the total variance (Wang, 2012), while the factor solution of

PAI accounted for 41.23-53.90% of the total variance (Della Vedova et al., 2008; Muller, 1993; Siddiqui et al, 1999). More than 50% of the variance in previous studies was unexplained by the developed scale.

The total variance explained can less than 50% if the latent variables are difficult to identify (Morse, 2016) and the items may not sufficient to explain the model (Bogodistov, 2016). According to Morse (2016) and Bogodistov (2016) explanations, consideration of the results of present analysis found that some items measuring love and protection, which the literature (Doan & Zimerman, 2003; Shieh et al., 2001; Walsh, 2010) highlighted as important aspects of prenatal attachment, were dropped from the analysis. Examples of the dropped items were "I love and possess my baby", "I feel an attachment to my baby", "I will not cause harm to my baby", and "I am seeking a good ANC clinic for my baby". These dropped items may be the cause of total variance explained less than 50%.

Other possible reasons which might cause lower explained variance such as less sample size than desired. Fortunately, the sample size, subjects-per-item ratio in this study was 10.11: 1 (354 cases: 35 items), indicating the sample adequacy (Tabachnick & Fidell, 2007).

For adolescent development and pregnancy difficulty, the absence of immaturity in formal operational thought (Bloom, 1995; Rubin, 1984) and the egocentric reaction and concreate thinker (Broecker & Hillards, 2009) may make it difficult for the pregnant adolescent to conceptualize herself attached to the unborn child. In addition, the pregnant adolescent who has a complicated problem in family and social acceptance to have a baby tends to have attachment risks (Flaherty & Sadler, 2011; Rubin, 1984). According to the low variance explained, the further

studies may examine additional external items with evidence of construct validity to the scale. In addition, investigation of factors effecting prenatal attachment in pregnant adolescents should be conducted to gain more understanding and refine the scale.

2) Contrasted group approach

Construct validity is a key criterion for assessing the quality of the scale. In this study, the contrasted group approach was employed to test the PAS-Thai's construct validity. The group comparison method provides evidence for the construct validity of the scale (Camacho et al., 2012). The contrasted groups comprised two groups of subjects: 1) the group of pregnant adolescents who wanted and were ready to have a baby, and 2) the group of pregnant adolescents who did not want and were not ready to have a baby. The results revealed that the pregnant adolescents who wanted to have a baby had significantly higher scores on the PAS-Thai than the pregnant adolescents who did not want or were not ready to have a baby. The result demonstrated that the PAS-Thai can discriminate the group of pregnant adolescents who wanted and were ready to have a baby from the group of pregnant adolescents who did not want and were not ready to have a baby.

2.2 Reliability

The reliability of the PAS-Thai was examined on three occasions using Cronbach's alpha coefficient. The results for 53-item PAS-Thai in the pre-testing step were .94 for total scale and ranged from .86 to .92 for subscales. The results for 53-item PAS-Thai in the field-test step were .96 for total scale and ranged from .89 to .94 for subscales. In addition, the results of 35-item PAS-Thai revealed the internal

consistency of total scale was .94, and ranged from .89 to .91 for subscales. The results provided evidence of good reliability for the three versions of PAS-Thai.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

The process of development and evaluation of the psychometric properties of the Prenatal Attachment Scale for Thai Pregnant Adolescents (PAS-Thai) was guided by two research questions: 1) What are the appropriate domains for the PAS-Thai?, and 2) What are the validity and reliability of the PAS-Thai in measuring prenatal attachment among Thai pregnant adolescents?. The inductive methodological research design using the scale development guidelines set forth by DeVellis (2017) was used to create and evaluate the PAS-Thai. This chapter presents conclusion, strengths of the study, limitations of the study, recommendations for nursing research, and recommendations for nursing practices as follows.

Conclusion

Research question 1: Domains of the PAS-Thai

Exploratory factor analysis using PAF extraction method with orthogonal varimax rotation produced 35 items with three factors that are in accordance with the specified domains that emerged from the literature review and qualitative approach steps. The results of three factors were as follows.

Factor 1: Having good wishes for the baby

This factor comprised 14 items with factor loadings ranged from .46 to .79. The explained variance of the first factor was 19.48% with an eigenvalue of 6.82.

The factor solution was desirable. The items reflected maternal thoughts about good wishes for, curiosity about, and planning to take care of the baby.

Factor 2: Preparing to care for the baby

This factor comprised 15 items with factor loadings ranged from .47 to .65. The explained variance of the second factor was 17.23% with an eigenvalue of 6.03. The factor solution was desirable. The items reflected preparation for the baby's coming, communication with the baby, and self-nourishment for the benefit of the baby.

Factor 3: Feeling of connectedness to the baby

This factor comprised 6 items with factor loadings ranged from .52 to .71. The explained variance of the third factor was 9.48% with an eigenvalue of 3.32. The factor solution was desirable. The items reflected emotional connectedness with and the desire to have a baby.

Research question 2: The validity and reliability of the PAS-Thai

1) Validity

The validity of the PAS-Thai was concerned with content validity and construct validity which is important for the developed scale.

1.1) Content validity

Based on experts' evaluation, all items of the PAS-Thai had I-CVI .80-1.00. The S-CVI/UA of the PAS-Thai was .89, and the S-CVI/Ave was .98. The CVI of the PAS-Thai both at item level and scale level indicated that the PAS-Thai possessed excellent content validity.

1.2) Construct validity

The results of exploratory factor analysis provided evidence of validity for the scale structure and assessed the items represented the content domain. Factor analysis results yielded three factors that supported the proposed structures of the developed scale. All factors had eigenvalues greater than 1, the values were 6.82, 6.03, and 3.32, respectively. The explained variance of each factor was 19.48%, 17.23%, and 9.48%, respectively. Of the 35 items, factor loadings ranged from .46 to .79, .47 to .65, and .52 to .71 for factor one to factor three, respectively.

In addition, the mean score of the pregnant adolescents who wanted and ready to have a baby was 4.51 (*SD* = .21), whereas the mean score of the pregnant adolescents who did not want and were not ready to have a baby was 3.85 (*SD* = .35). The result of contrasted group approach revealed significantly different scores between the two contrasted groups ($t = 9.05$, $p < .001$), demonstrating that the PAS-Thai can discriminate between the pregnant adolescents who wanted to and were ready to have a baby and those who did not want and were not ready to have a baby. The results provided evidence to support the construct validity of the PAS-Thai (Polit & Beck, 2014).

2) Reliability

The reliability of the PAS-Thai was evaluated for its internal consistency using Cronbach's alpha coefficient. The assessments of internal consistency were performed on three occasions: pre-testing, field test, and post-test. The internal consistency resulted the values of .94, .96, and .94, respectively for the total scale. In addition, the internal consistency for subscales ranged from .86 to .92, .89 to .94, and

.89 to .91, respectively. The results provided evidence of the reliability of the PAS-Thai.

Strengths of the Study

Study design

The development and psychometric properties evaluation of the PAS-Thai used the eight steps of scale development set forth by DeVellis (2017). Both extensive literature review and qualitative approaches were conducted to gain more understanding of the pregnant adolescents whom the developed scale intended to measure.

Sample adequacy

The sample size recommend for factor analysis should be more than 300 subjects or at least 5-10 subjects per item (Polit & Beck, 2017). The data comprised 354 available cases for the analysis. The PAS-Thai consisted of 35 items. With the ratio 10.11: 1 (354 subjects: 35 cases), the subjects exceeded the criteria subject-per-item.

Representativeness of the population

Data were collected from five regions of Thailand (North, Northeastern, Central, East, and South) to enhance the representativeness of pregnant adolescents across Thailand.

Psychometric properties of the PAS-Thai

With respect to the validity of the scale, content validity of the PAS-Thai was desirable both at item level and scale level (I-CVIs = .80-1.00, S-CVI/UA = .89, S-CVI/Ave = .90). For construct validity, exploratory factor analysis generated three

factors which were congruent with the proposed factors: having good wishes for the baby, preparing to care for the baby, and feeling of connectedness. The results provide three aspects covering cognitive, emotional, and behavioral dimensions of prenatal attachment. All three factors had explained variance greater than 5% ranging from 9.48% to 19.48%. Out of 35 items, 29 items (82.86%) had a practically significant loading (greater than .50). In addition, the result of the contrasted group approach revealed significantly different scores between the group of pregnant adolescents who wanted to and were ready to have a baby and the group of pregnant adolescents who did not want and were not ready to have a baby ($t = 9.05$, $p < .001$), supporting the construct validity of the scale.

The internal consistency reliability of the PAS-Thai was very good. The three-time assessment of reliability yielded the values of .94, .96, and .94, respectively for the entire scale, and .86, .89, and .91, respectively for the cognitive attachment domain (having good wishes for the baby), .92, .91, and .90, respectively for the behavioral attachment domain (preparing to care for the baby), and .90, .94, and .89, respectively for the emotional attachment domain (feeling of connectedness to the baby).

Limitations of the Study

1. The ages of the participants in this study ranged from 13 to 19 years. This age range may not fall within WHO's definition which defines the age of adolescents between 10 and 19 years resulting in less generalizability.

2. The reliability of the PAS-Thai was evaluated using only one method, internal consistency. The stability or test-retest method was not employed in this

study because this procedure is appropriate for assessing characteristics known to be relatively stable over the time period under investigation (Waltz et al., 2010), while evidence supported that the prenatal attachment scores increase over time of the course of pregnancy (Bloom, 1995; Cannella, 2005; Doan & Zimerman, 2008; Van Bussel et al., 2010; Yarcheski et al., 2009).

Implications for Nursing

This instrument can contribute to assessment of prenatal attachment among Thai pregnant adolescents in three aspects: cognitive attachment, behavioral attachment, and emotional attachment. It can provide information for planning, implementation, and evaluation of nursing care for each pregnant adolescent in order to reduce the problems related to ineffective prenatal attachment. Consequently, appropriate prenatal attachment promotion is assumed to have benefits for both adolescent mothers and her fetus and their well-being during pregnancy and in the future and the improvement of quality of nursing care.

Recommendations for Nursing Research

1. The PAS-Thai is a valid and reliable tool measuring prenatal attachment. It can be used in studies assessing prenatal attachment of Thai pregnant adolescents in the Thai context.

2. The total variance explained of the 35-item PAS-Thai was 46.19%. More than 50% of the variance was not explained by the developed scale. Further studies may investigate additional external items with evidence of construct validity to the scale. In addition, investigation of factors effecting prenatal attachment in

pregnant adolescents should be conducted to gain more understanding and refine the scale.

3. To quantify the goodness-of-fit of the resulting factor structure and more rigorous testing of item loadings, confirmatory factor analysis is recommended for further analysis.

References

Ahern, N. R., & Ruland, J. P. (2003). Maternal-fetal attachment in African-American and Hispanic-American women. *The Journal of Perinatal Education, 12*(4), 27-35.

Alhusen, J. L. (2008). A literature update on maternal-fetal attachment. *Journal of Obstetric, Gynecologic and Neonatal Nursing, 37*(3), 315-328. doi:10.1111/ j. 1552-6909.2008.00241.x

Alhusen, J. L., Gross, D., Hayat, M. J., Rose, L., & Sharps, P. (2012a). The role of mental health on maternal-fetal attachment in low-income women. *Journal of Obstetric, Gynecologic and Neonatal Nursing, 41*, E71-E81. doi:10.1111/j. 1552-6909.2012.01385.x

Alhusen, J. L., Gross, D., Hayat, M. J., Woods, A. B., & Sharps, P. W. (2012b). The influence of maternal-fetal attachment and health practices on neonatal outcomes in low-income, urban women. *Research in Nursing and Health, 35,* 112-120. doi:10.1002/nur.21464

Anand, L., & Hima, B. (2012). Validation of Tamil version of Cranley's 24-item Maternal-Fetal Attachment Scale in Indian pregnant women. *The Journal of Obstetrics and Gynecology of India*, *62,* 630-634. doi:10.1007/s13224-012-0175-3

Beck, C. T. (1999). Available instruments for research on prenatal attachment and adaptation to pregnancy. *American Journal of Maternal Child Nursing, 24*(1), 25-32.

Bielawska-Batorowitcz, E., & Siddiqui, A. (2008). A study of prenatal attachment with Swedish and Polish expectant mothers. *Journal of Reproductive and Infant Psychology, 26*(4), 373-384. doi:10.1080/02646830802426144

Bloom, K. C. (1992). *Development of attachment behaviors in pregnant adolescents* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 9314198)

Bloom, K. C. (1995). The development of attachment behaviors in pregnant adolescents. *Nursing Research, 44*, 284-289.

Bloom, K. C. (1998). Perceived relationship with the father of the baby and maternal attachment in adolescents. *Journal of Obstetric, Gynecologic and Neonatal Nursing*, *27*(4), 420-430.

Bogodistov, Y. (2016). Re: If I have good result with low variance explanation in exploratory factor analysis, is there any problem to be proceed? [Online forum comment]. Retrieved from https://www.researchgate.net/post/If_i_have_ good _result_with_low_variance_explanation_in_exploratory_factor_analysis_is_ there_any_problem_to_be_proceed

Bouchard, G. (2011). The role of psychosocial variables in prenatal attachment: An examination of moderational effects. *Journal of Reproductive and Infant Psychology, 29*(3), 197-207. doi:10.1080/02646838.2011.592975

Brandon, A. R., Pitts, S., Denton, W. H., Stringer, A., & Evans, H. M. (2009). A history of the theory of prenatal attachment. *Journal of Prenatal and Perinatal Psychology and Health, 23*(4), 201-222.

Broecker, J., & Hillard, P. J. (2009). Pregnancy in adolescent. The global library of women's medicine. Retrieve from http://www.glowm.com/section_view/heading/Pregnancy%20in%20Adolescence/item/413

Buddhadasa Bhikkhu (2007). *Chud Thamma Pluk Jai: Hkun khong Bhida-Marnda*. Bangkok: Tatha Publication.

Burns, N., & Grove, S. K. (2007). *Understanding nursing research: Building an evidence-based practice* (4th ed.). St. Louis, MO: Saunders Elsevier.

Camacho, F. T., Weisman, C. S., Anderson, R. T., Hillemeier, M. M., Schaefer, E W., & Paul, I. M. (2012). Development and validation of a scale measuring satisfaction with maternal and newborn health care following childbirth. *Maternal and Child Health Journal, 16*, 997-1007. doi:10.1007/s10995-011-0823-8

Cannella, B. L. (2005). Maternal-fetal attachment: An integrative review. *Journal of Advanced Nursing, 50*(1), 60-68.

Chaipornpattana, S., Danpradit, P., & Singhakam, N. (2009). A development of self-care model for teenage pregnant in Phichit Province. *Journal of Phichit Hospital, 24*(1), 41-53.

Chanachote, S. (2007). *Spousal support and maternal-fetal attachment in pregnant industrial workers* (Unpublished master's thesis). Mahidol University, Thailand.

Chaturachinda, K. (2010). Pregnancy and unsafe abortion in adolescents. In W. Thithaphan, B. Manaboriboon, & T. Khorathat (Eds.), *Teenage pregnancy and preterm delivery: The challenge* (pp. 157-159). Bangkok: Amarin.

College of Religious Study. (2014). *Maternal love and her child gratitude*. Retrieved from http://www.crs.mahidol.ac.th/thai/love_mother.htm

Colucciello, M. L. (1998). Pregnant adolescents' perceptions of their babies before and after realtime ultrasound. *Journal of Psychosocial Nursing, 36*(11), 12-19.

Condon, J. T. (1993). The assessment of antenatal emotional attachment: Development of a questionnaire instrument. *British Journal of Medical Psychology, 66*, 167-183.

Condon, J. T., & Corkindale, C. (1997). The correlates of antenatal attachment in pregnant women. *British Journal of Medical Psychology, 70*, 359-372.

Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis, *Practical Assessment Research & Evaluation*, *10*(7), 1-9.

Cox, J. E. (2008). Teenage Pregnancy. In L. S. Neinstein, C. M. Gordon, D. K. Katzman, D. S. Rosen, & E. R. Woods (Eds.), *Adolescent health care: A practical guide* (pp. 565-580). Philadelphia: Lippincott Williams & Wilkins.

Cranley, M. S. (1981a). Development of a tool for the measurement of maternal attachment during pregnancy. *Nursing Research, 30*, 281-284.

Cranley, M. S. (1981b). Roots of attachment: The relationship of parents with their unborn. *Birth Defects: Original article series*, *13*, 59-83.

Cranley, M. S. (1993). The origins of mother-child relationship: A review. *Physical and Occupational Therapy in Pediatric, 12*, 39-51.

Daley, A. M., Sadler, L. S., & Reynolds, H. D. (2013). Tailoring clinical services to address the unique needs of adolescents from pregnancy test to parenthood. *Current Problems in Pediatric and Adolescent Health Care, 43,* 71-95.

Damato, E. G. (2004). Predictors of prenatal attachment in mothers of twins. *Journal of Obstetric, Gynaecologic and Neonatal Nursing, 33,* 436-445.

Davidson, M. R., London, M. L., & Ladewig, P. A. (2012). *OLDS' Maternal-newborn nursing and women's health: Across the lifespan* (9th ed.). Upper Saddle River, NJ: Pearson Education.

Dawson, J. K. (2002). *The relationship between security of adult attachment and attachment to her unborn child in pregnant women* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. DP20523)

Delahoussaye, C. P. (1994). *A grounded theory approach to the discovery of adolescents' relationship with their unborn child* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 9514930)

Della Vedova, A. M., Dabrassi, F., & Imbasciati, A. (2008). Assessing prenatal attachment in a sample of Italian women. *Journal of Reproductive and Infant Psychology, 26*(2), 86-98. doi:10.1080/02646830701805349

DeVellis, R. F. (2017). *Scale development: Theory and applications* (4th ed.). Thousand Oaks, CA: SAGE.

Doan, H. M., Cox, N. L., & Zimerman, A. (2003). The maternal fetal attachment scale: Some methodological ponderings. *Journal of Prenatal and Perinatal Psychology and Health, 18,* 167-188.

Doan, H. M., & Zimerman, A. (2003). Conceptualizing prenatal attachment: Toward a multidimensional view. *Journal of Prenatal and Perinatal Psychology and Health, 18*(2), 109-129.

Doan, H. M., & Zimerman, A. (2008). Prenatal attachment: A developmental model. *International Journal of Prenatal and Perinatal Psychology and Medicine, 20(1/2),* 20-28.

Drake, P. (1996). Addressing developmental needs of pregnant adolescents. *Journal of Obstetric, Gynecologic and Neonatal Nursing, 25,* 518-524.

Eddins, A. (2014). *Attachment and the earliest moments of life: A literature review of the pre and immediate postnatal factors that influence relationship* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3636325)

Eichhorn, N. (2012). Maternal fetal attachment: Can acceptance of fetal sentience impact the maternal-fetal attachment relationship? *Journal of Prenatal and Perinatal Psychology and Health, 27*(1), 47-55.

Facello, D. C. (2008). *Maternal/fetal attachment: Associations among family relationship, maternal health practices, and antenatal attachment* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3326894)

Feldman, J. B. (2007). The effect of support expectations on prenatal attachment: An evidence-based approach for intervention in an adolescent population. *Child and Adolescent Social Work Journal, 24*(3), 209-234. doi:10.1007/s10560-007-0082-0

Feldman, J. B. (2012). Best practice for adolescent prenatal care: Application of an attachment theory perspective to enhance prenatal care and diminish birth risks. *Child and Adolescent Social Work Journal, 29*, 151-166. doi:10. 1007/ s10560-011-0250-0

Figueiredo, B., Bifulco, A., Pacheco, A., Costa, R., & Magarinho, R. (2006). Teenage pregnancy, attachment style, and depression: A comparison of teenage and adult pregnant women in Portuguese series. *Attachment and Human Development, 8*(2), 123-138. doi:10.1080/14616730600785686

Flaherty, S. C., & Sadler, L. S. (2011). A review of attachment theory in the context of adolescent parenting. *Journal of Pediatric Health Care, 25*(2), 114-121. doi:10.1016/j.pedhc.2010.02.005

Foster, J., Barkus, E., & Yavorsky, C. (2006). *Understanding and using advanced statistics*. London: SAGE.

Gua, M. L. & Lee, T. Y. (2003). Construct validity of the Prenatal Attachment Inventory: A confirmatory factor approach. *Journal of Nursing Research, 11*(3), 177-186.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.

Hinkin, T. R., Tracey, J. B., & Enz, C. A. (1997). *Scale construction: Developing reliable and valid measurement instruments*. Retrieved from http:// scholarship.sha.cornell.edu/articles/613

HITAP. (2013). *Adolescent pregnancy in Thailand 2013*. Nonthaburi: Health International and Technology Assessment Program. Retrieved from http:// www.hitap.net/research/17738

Hsu, T. L., & Chen, C. H. (2001). Stress and maternal-fetal attachment of pregnant women during their third trimester. *Kaohsiung Journal of Medical Science, 17,* 36-45.

Huang, H., Wang, S., & Chen, C. (2004). Body image, maternal-fetal attachment, and choice of infant feeding method: A study in Taiwan. *Birth, 31*, 183-188.

Isaranurug, S., Mo-suwan, L., & Choprapawan, C. (2006). Difference in socio-economic status, service utilization, and pregnancy outcomes between teenage and adult mothers. *Journal of the Medical Association Thailand, 89*(2), 145-151.

James, D. C. (1997). A correlational study of variables affecting adolescent pregnancy. *The Missouri Nurse Journal, 66*(3), 10.

Ji, E. S., & Han, H. R. (2010). The effects of Qi exercise on maternal-fetal interaction and maternal well-being during pregnancy. *Journal of Obstetric, Gynecologic and Neonatal Nursing, 39,* 310-318. doi:10.1111/j.1552-6909.2010.01135.x

Kaewboonruang, N. (2001). *The relationship between selected factors, self-esteem and maternal-fetal attachment of pregnant women* (Unpublished master's thesis). Mahidol University, Thailand.

Kaewjanta, N. (2012). Depression in teenage pregnancy: Factors, affect and prevention. *Journal of Nursing Science and Health, 35*(1), 83-90.

Kaiser, M. M. (2002). *Transition to motherhood in adolescence: The development of the adolescent prenatal questionnaire* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3068774)

Kala, N. (2001). *The relationship between selected factors, anxiety and prenatal attachment in women who have experienced previously perinatal loss* (Unpublished master's thesis). Mahidol University, Thailand.

Keawsiriwan, S. (2003). S*elected factors, anxiety, marital relationship and prenatal attachment in pregnant women who have experienced perinatal loss* (Unpublished master's thesis). Mahidol University, Thailand.

Kirchengast, S. (2009). Teenage-pregnancies: A biomedical and socioculture approach to a current problem. *Current Women's Health Reviews, 5*, 1-7.

Klaus, M. H., & Kennell, J. H. (1982). *Parent-infant bonding* (2nd ed.). St. Louis, MO: C.V. Mosby.

Kleinveld, J. H., Timmermans, D. R. M., Van den Berg, M., Van Eijk, J. Th. M., & Ten Kate, L. P. (2007). Does offering and performing prenatal screening influence women's attachment to their unborn child?: A longitudinal randomized controlled trial. *Prenatal Diagnosis, 27*, 757-764.

Koniak-griffin, D. (1989). Psychosocial and clinical variables in pregnant adolescents: A survey of maternity home residents. *Journal of Adolescent Health Care, 10*(1), 23-29.

Koniak-griffin, D., Lominska, S., & Brecht, M. L. (1993). Social support during adolescent pregnancy: A comparison of three ethnic groups. *Journal of Adolescence, 16*(1), 43-56.

Koniak-Griffin, D., & Verzemnieks, I. (1991). Effects of nursing intervention on adolescents' maternal role attainment. *Issues in Comprehensive Pediatric Nursing, 14*, 121-138.

Kootanavanichpong, K. (1987). *The relationship between anxiety during hospitalization, attitude toward pregnancy and maternal-fetal attachment in high-risk pregnant women* (Unpublished master's thesis). Mahidol University, Thailand.

Kullawattana, M. (2000). *Relationship between self-esteem and maternal-fetal attachment* (Unpublished master's thesis). Mahidol University, Thailand.

Kusol, G. (1993). *The relationship between spouse's support and prenatal attachment of primigravidas* (Unpublished master's thesis). Prince of Songkla University, Thailand.

Kwarat, P. (2002). *The effectiveness of prenatal attachment promotion on paternal- and maternal-fetal attachment* (Unpublished master's thesis). Mahidol University, Thailand.

Leva-Giroux, R. A. (2002). *Prenatal attachment: The lived experience* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3062593)

Lewis, M. W. (2008). The interaction model of maternal-fetal attachment: An empirical analysis. *Journal of Prenatal and Perinatal Psychology and Health, 23*(1), 49-65.

Liabsuetrakul, T. (2012). Trends of teenage pregnancy and pregnancy outcomes. *Thai Journal of Obstetrics and Gynaecology*, *20*(4), 162-165.

Liamputtong, P. (2013). *Qualitative research method* (4th ed.). South Melbourne, Victoria: Oxford.

Lindgren, K. (2001). Relationships among maternal-fetal attachment, prenatal depression, and health practices in pregnancy. *Research in Nursing and Health, 24*, 203-217.

Loadkum, D. (2014). *Role and manners of Buddhist*. Retrieved from https://sites. google.com/site/manumai070/ haelng-khwam-ru-sangkhmsuksa/phraphuthth-sasna-m-2/hnwy-thi-5-hnathi-chaw-phuthth-laea-maryath-chaw-phuthth

Mamark, N. (2007). *The effect of a program to promote spouse involvement in pregnancy and birth on marital relationships, perception of childbirth experience, maternal-infant attachment, and parental-infant attachment* (Master's thesis). Retrieved from http://dcms.thailis.or.th/dcms/basic.php

McFarland, J., Salisbury, A. L., Battle, C. L., Hewes, K., Halloran, K., & Lester, B. M. (2011). Major depressive disorder during pregnancy and emotional attachment to the fetus. *Arch Women Mental Health, 14*, 425-434. doi:10.1007/s00737-011-0237-2

Morse, D. (2016). Re: If I have good result with low variance explanation in exploratory factor analysis, is there any problem to be proceed? [Online forum comment]. Retrieved from https://www.researchgate.net/post/If_i_have_ good_result_with_low_variance_explanation_in_exploratory_factor_analysis_ is_there_any_problem_to_be_proceed

Muangpin, S., Tiansawad, S., Kantaraksa, K., Yimyam, S., & Vonderheid, S. C. (2010). Northeastern Thai adolescents' perceptions of being unmarried and pregnant. *Pacific Rim International Journal of Nursing Research, 14*(2), 149-161.

Müller, M. E. (1989). *The development and testing of the Muller Prenatal Attachment Inventory* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 8926411)

Müller, M. E. (1992). A critical review of prenatal attachment research. *Scholarly Inquiry for Nursing Practice: An International Journal, 6*(1), 5-22.

Müller, M. E. (1993). Development of the Prenatal Attachment Inventory. *Western Journal of Nursing Research, 15*(2), 199-215.

Müller, M. E., & Ferketich, S. (1992). Assessing the validity of the dimensions of prenatal attachment. *Maternal Child Nursing Journal, 20*(1), 1-10.

Müller, M. E., & Ferketich, S. (1993). Factor analysis of the maternal fetal attachment scale. *Nursing Research, 42*, 144-147.

Munoz, L. R., & Stevens, K. R. (2007). The association of maternal-fetal attachment and length of gestation with decision balance and level of smoking behavior in pregnant Mexican American adolescents. *The Journal of Multicultural Nursing and Health, 1*, 13.

Munro, B. H. (2005). *Statistical methods for the health care researcher* (4th ed.). Philadelphia: Lippincott.

Murray, S. S., & McKinney, E. S. (2010). *Foundations of maternal-newborn and women's health nursing* (5th ed.). Maryland Heights, MO: Saunders.

Narita, S., & Maehara, S. (1993). The development of maternal-fetal attachment during pregnancy. *Nihon Kango Kagakkaishi, 13*(2), 1-9.

Neamsakul, W. (2008). *Unintended Thai adolescent pregnancy: A grounded theory study* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3324613)

Nichols, M. R., Roux, G. M., & Harris, N. R. (2007). Primigravid and multigravid women: Prenatal perspectives. *Journal of Perinatal Education, 16*(2), 21-32. doi:10.1624/105812407x192019

Nirattharadorn, M. (2005). *Self-esteem, social support, and depression in Thai adolescent mothers* (Doctoral dissertation). Retrieved from http:// dcms. thailis.or.th/dcms/basic.php

Noknoi, S. (2013). Health care for adolescent pregnant women. *The Thai Journal of Primary Care and Family Medicine*, *3*(2), 63-69.

Öhman, S. G., & Waldenström, U. (2010). Effect of first trimester ultrasound screening for Down syndrome on maternal-fetal attachment: A randomized controlled trial. *Sexual and Reproductive Healthcare*, *1,* 85-90. doi: 10.1016/ j.srhc.2010.05.002

Olivier, L. (2016). *Maternal fetal attachment during teenage pregnancy* (Master's thesis, Stellenbosch University, Western Cape, South Africa). Retrieved from http://scholar.sun.ac.za/handle/10019.1/98486

Orshan, S. A. (2008). *Maternity, newborn, & women's health nursing: Comprehensive care across the lifespan*. Philadelphia: Lippincott Williams &Wilkins.

Ossa, X., Bustos, L., & Fernandez, L. (2012). Prenatal attachment and associated factors during the third trimester of pregnancy in Temuco, Chile. *Midwifery*, *28*, e689-e696. doi:10.1016/j.midw.2011.08.015

Özkan, H., & Polat, S. (2011). Maternal identity development education on maternity role attainment and my baby perception of primiparas. *Asian Nursing Research*, *5*(2), 108-117.

Pantumas, S., Kittipichai, W., Pitikultang, S., & Chamroonsawasdi, K. (2012). Self-care behaviors among Thai primigravida teenagers. *Global Journal of Health Science, 4*(3), 139-147. doi:10.5539/gjhs.v4n3p139

Panyayoung, B. (2010). *Systematic review: Teenage pregnancy*. Thailand: Thaihealth.

Pillitteri, A. (2014). *Maternal and child health nursing: Care of the childbearing and childrearing family* (7th ed.). Philadelphia: Lippincott Williams & Wilkins.

Pisoni, C., Garofoli, F., Tzialla, C., Orcesi, S., Spinillo, A., Politi, P., & Stronati, M. (2014). Risk and protective factors in maternal-fetal attachment development. *Early Human Development, 90s2*, s45-s46.

Phochathikorn, A. (2014). *Four sublime states of mind*. Retrieve from https://www.gotoknow.org/posts/25867

Polit, D. F., & Beck, C. T. (2006). The content validity index: Are you sure you know what's being reported? Critique and recommendations. *Research in Nursing and Health, 29,* 489-497. doi:10.1002/nur.20147

Polit, D. F., & Beck, C. T. (2014). *Essential of nursing research: Appraising evidence for nursing practice* (8th ed.). Philadelphia: Lippincott Williams & Wilkins.

Polit, D. F., & Beck, C. T. (2017). *Nursing research: Generating and assessing evidence for nursing practice* (10th ed.). Philadelphia: Lippincott Williams & Wilkins.

Pollock, P. H., & Percy, A. (1999). Maternal antenatal attachment style and potential fetal abuse. *Child Abuse and Neglect, 23,* 1345-1357.

Poopattayakorn, A. (1995). *The relationship between attitude to pregnancy, self-esteem and maternal-fetal attachment in adolescent pregnant women* (Unpublished master's thesis). Mahidol University, Thailand.

Pooripanyakun, S. (1996). *Effects of health education during pregnancy on maternal-fetal attachment among adolescent pregnant women who have different spousal relationship* (Unpublished master's thesis). Srinakharinwirot University, Thailand.

Pramahavuthichai Vajiramedhi. (2014*). Klom Kleng Leng Doo*. Nonthaburi: Today Book and Design.

Pungbangkadee, R., Parisanyakul, S., Kantaruksa, K., Sripichyakarn, K., & Kools, S. (2008). Experiences of early motherhood among Thai adolescents: Perceiving conflict between needs as a mother and an adolescent. *Thai Journal of Nursing Research, 12*(1), 70-82.

Ratanarungsee, P. (1987). *Knowledge of human life cycle*. Bangkok: O. S. Printing House.

Rauenhorst, J. M. (2001). *Factors influencing mother-infant attachment during pregnancy: A qualitative investigation* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3017931)

Ricci, S. S., Kyle, T., & Carman, S. (2013). *Maternity and pediatric nursing* (2nd ed.). Philadelphia: Lippincott Williams & Wilkins

Ross, E. (2012). Maternal-fetal attachment and engagement with antenatal advice. *British Journal of Midwifery, 20*(8), 566-575.

Rossoni, L., Engelbert, R., & Bellegard, N. L. (2016). Normal science and its tools: Reviewing the effects of exploratory factor analysis in management. *Revista de Administracao, 51*(2), 198-211. doi:10.5700/rausp1234

Rowe, H. J., Wynter, K. H., Steele, A., Fisher, J. R. W., & Quinlivan, J. A. (2013). The growth of maternal-fetal emotional attachment in pregnant adolescents: A prospective cohort study. *Journal of Pediatric Adolescent and Gynecology, 26*, 327-333.

Rubin, R. (1984). *Maternal identity and the maternal experience*. New York: Springer.

Saastad, E., Israel, P., Ahlborg, T., Gunnes, N., & Frøen, J. F. (2011). Fetal movement counting-effects on maternal-fetal attachment: A multicenter randomized controlled trial. *Birth, 38*, 282-293.

Sadler, L. S., Novick, G., & Meadows-Oliver, M. (2016). "Having a baby changes everything" Reflective functioning in pregnant adolescents. *Journal of Pediatric Nursing, 31*, e219-e231.

Salisbury, A., Law, K., LaGasse, L., & Lester, B. (2003). Maternal-fetal attachment. *Journal of American Medical Association, 289*, 1701.

Sa-ngiamsak, P. (2016). *The life experiences of unmarried teenage mothers in Thailand* (Doctoral dissertation, The University of Queensland, Australia). Retrieve from https://core.ac.uk/display/43402014

Sawuanprom, L. (2006). *Relationships between family factor and anxiety and maternal-fetal attachment in thalassemia carrier pregnant women* (Master's thesis). Retrieved from http://dcms.thailis.or.th/dcms/basic.php

Sherer, S., & Radzik, M. (2016). Psychosocial development in normal adolescents and young adults. In L.S. Neinstein (Ed.), *Neinstein's adolescent and young adult health care: A practical guide* (6th ed., pp. 38-42). Philadelphia: Wolters Kluwer.

Scherer, R. F., Wiebe, F. A., Luther, D. C., & Adam, J. S. (1988). Dimensionality of coping: Factor stability using the ways of coping questionnaires. *Psychological Reports, 67,* 763-770.

Shaffer, D. R., & Kipp, K. (2014). *Developmental psychology: Childhood and adolescent* (9th ed.). Belmont, CA: Wadsworth.

Shieh, C., & Kravitz, M. (2002). Maternal-fetal attachment in pregnant women who use illicit drugs. *Journal of Obstetric, Gynecologic and Neonatal Nursing, 31*(2), 156-164.

Shieh, C., Kravitz, M., & Wang, H. H. (2001). What do we know about maternal-fetal attachment? *Kaohsiung Journal of Medical Science, 17,* 448-454.

Shin, H. S., & Kim, J. H. (2011). Music therapy on anxiety, stress and maternal-fetal attachment in pregnant women during transvaginal ultrasound. *Asian Nursing Research*, *5*(1), 19-27.

Siddiqui, A., & Hägglöf, B. (2000). Does maternal prenatal attachment predict postnatal mother-infant interaction? *Early Human Development, 59,* 13-25.

Siddiqui, A., Hägglöf, B., & Eisemann, M. (1999). An exploration of prenatal attachment in Swedish expectant women. *Journal of Reproductive and Infant Psychology, 17*(4), 369-380.

Siegel, R. S., & Brandon, A. R. (2014). Adolescents, pregnancy, and mental health. *Journal of Pediatric and Adolescent Gynecology, 27,* 138-150.

Silvera, A. M. (2013). *Prenatal attachment in adolescents: Relationship with maternal identity, parent and peer attachment, and father of the baby* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3568189)

Siriumpunkool, P. (2000). *The effect of maternal-fetal bonding promoting program on maternal-fetal attachment in adolescent pregnancy women* (Master's thesis). Retrieved from http://dcms.thailis.or.th/dcms/basic.php

Somanusorn, M. (1993). *Relationship between self-concept, anxiety, and maternal-fetal attachment in pregnant women* (Unpublished master's thesis). Chiang Mai University, Thailand.

Songtrirat, D. (1997). *Self-concept, anxiety and maternal-fetal attachment of high-risk pregnant women during hospitalization* (Unpublished master's thesis). Mahidol University, Thailand.

Sriintravanit, N. (2005). *Effects of prenatal attachment promoting program on anxiety and maternal-fetal attachment in pregnant women experiencing previous prenatal loss* (Master's thesis). Retrieved from http://dcms.thailis.or.th/dcms/basic.php

Sriyasak, A. (2016). *Becoming a Thai teenage parent* (Doctoral dissertation, Malardalen University, Sweden). Retrieved from http://www.diva-portal.org/smash/record.jsf?pid=diva2%3A971196&dswid=-7296

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (4th ed.). New York: Pearson.

Taffzoli, M., Asadi, M. M., Aminyazdi, S. A., & Shakeri, M. T. (2015). The realationship between maternal-fetal attachment and mother-infant attachment behaviors in primiparous women referring to Mashhad health care centers. *Journal of Midwifery and Reproductive Health, 3*(2), 318-327.

Techainth, M., & Siriwattanapa, P. (2013). Adolescent pregnancy. *The Thai Journal of Primary Care and Family Medicine, 3*(2), 39-53.

Thaithae, S., & Thato, R. (2011). Obstetric and perinatal outcomes of teenage pregnancies in Thailand. *Journal of Pediatric and Adolescent Gynecology, 24*, 342-346. doi:10.1016/j.jpag.2011.02.009

Thato, R., Rachukul, S., & Sopajaree, C. (2007). Obstetrics and perinatal outcomes of Thai pregnant adolescents: A retrospective study. *International Journal of Nursing Studies, 44*, 1158-1164. doi:10.1016/j.ijnurstu.2006.05.016

Treiblmaier, H., & Filzmoser, P. (2010). Exploratory factor analysis revisited: How robust methods support the detection of hidden multivariate data structures in IS research. *Information & Management, 47*, 197-207. doi: 10.1016/j.2010.02 .002

Triratanapikul, K. (1990). *The relationship between social support and maternal-fetal attachment in normal primigravida women at Sapphasitthiprasong hospital, Ubon Ratchathani* (Unpublished master's thesis). Mahidol University, Thailand.

UNICEF Thailand. (2011). *Situation analysis of children and women in Thailand 2011*. Bangkok: United Nations Children's Fund. Retrieved from http:// www.unicef.org/thailand/1045_UNICEF_Final_row_res_230911.pdf

UNICEF Thailand. (2015). *Situation analysis of adolescent pregnancy in Thailand: Synthesis report 2015*. Bangkok: UNICEF Thailand. Retrieved from https://www.unicef.org/thailand/160614_SAAP_in_Thailand_report_EN.pdf

Ustunsoz, A., Guvenc, G., Akyuz, A., & Oflaz, F. (2010). Comparison of maternal- and paternal-fetal attachment in Turkish couples. *Midwifery, 26*, e1-e9. doi:10.1016/j.midw.2009.12.006

Van Bussel, J. C. H., Spitz, B., & Demyttenaere, K. (2010). Reliability and validity of the Dutch version of the maternal antenatal attachment scale. *Arch Women Mental Health, 13*, 267-277.

Van den Bergh, B. V., & Simons, A. (2009). A review of scales to measure the mother-foetus relationship. *Journal of Reproductive and Infant Psychology, 27*(2), 114-126. doi:10.1080/02646830802007480

Walker, L. O., & Avant, K. C. (2005). *Strategies for theory construction in nursing* (4th ed). Upper Saddle River, NJ: Pearson Education.

Walsh, J. (2010). Definitions matter: If maternal-fetal relationships are not attachment, what are they? *Arch Women Mental Health, 13*, 449-451. doi:10.1007/s.00737-010-0152-8

Walsh, J., Hepper, E. G., & Marshall, B. (2014). Investigating attachment, caregiving, and mental health: A model of maternal-fetal relationships. *BMC: Pregnancy and Childbirth, 14*, 383-392.

Waltz, C. F., Strickland, O. L., & Lenz, E. R. (2010). *Measurement in nursing and health research* (4th ed.). New York: Springer.

Wang, L. (2012). *The relationship of maternal-fetal attachment and health behavior among pregnant women in the rural area of South Taiwan* (Doctoral dissertation). Available from ProQuest Dissertations and Theses database. (UMI No. 3516258)

Ward, S. L., Hisley, S. M., & Kennedy, A. M. (2016). *Maternal-child nursing care: Optimizing outcomes for mothers, children, & families* (2nd ed.). Philadelphia: F.A. Davis.

Wayland, J., & Tate, S. (1993). Maternal-fetal attachment and perceived relationship with important others in adolescents. *Births, 20*, 198-203.

Weis, K., & Lederman, R. P. (2010). Prenatal spousal military deployment and maternal prenatal adaptation as predictors of postpartum maternal-infant attachment. *Southern Online Journal of Nursing Research, 10*(3), 1-16.

World Health Organization. (2018a). *Adolescent health and development*. Retrieved from http://searo.who.int/entity/child_adolescent/topics/adolescent_health/en/

World Health Organization. (2018b). *Adolescent pregnancy fact sheet*. Retrieved from http://www.who.int/mediacentre/factsheets/fs364/en/

World Health Organization. (2017). *WHO country cooperation strategy, Thailand, 2017-2021*. WHO: Regional Office for South-east Asia.

Yakasem, P. (2005). *The effect of prenatal attachment promoting program on maternal-fetal attachment in abused pregnant women* (Master's thesis). Retrieved from http://dcms.thailis.or.th/dcms/basic.php

Yakasem, P., & Chaiyasung, P. (2012). Effect of prenatal attachment promoting program on maternal-fetal attachment in teenage pregnant women. *Journal of Nursing Science and Health, 35*(3), 19-25.

Yarcheski, A., Mahon, N. E., Yarcheski, T. J., Hanks, M. M., & Cannella, B. L. (2009). A meta-analytic study of predictors of maternal-fetal attachment. *International Journal of Nursing Studies, 46*, 708-715. doi:10.1016/j.ijnurstu. 2008.10.013

Young, R. (2013). The importance of bonding. *International Journal of Childbirth Education*, *28*(3), 11-16.

Zachariah, R. (1994). Maternal-fetal attachment: Influence of mother-daughter and husband-wife relationships. *Research in Nursing and Health*, *17*, 37-44.

Appendices

APPENDIX A

Institutional Review Board's Permission

ที่ ศธ ๐๕๒๑.๑.๐๕/๑๖๖๐

คณะพยาบาลศาสตร์
มหาวิทยาลัยสงขลานครินทร์
ถ.กาญจนวนิชย์
อ.หาดใหญ่ จ.สงขลา ๙๐๑๑๐

หนังสือฉบับนี้ ให้ไว้เพื่อรับรองว่า นางมณีรัศมิ์ พัฒนสมบัติสุข รหัสนักศึกษา ๕๕๑๐๔๓๐๐๐๕ นักศึกษาหลักสูตรปรัชญาดุษฎีบัณฑิต สาขาวิชาการพยาบาล (หลักสูตรนานาชาติ) คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ มีความประสงค์ที่จะทำวิทยานิพนธ์ เรื่อง "Development and Psychometric Evaluation of the Prenatal Attachment Scale for Thai Pregnant Adolescents (PAS-Thai)" โดยมี รองศาสตราจารย์ ดร.บุษกร พันธ์เมธาฤทธิ์ เป็นอาจารย์ที่ปรึกษาวิทยานิพนธ์ ทั้งนี้ วิทยานิพนธ์ของนักศึกษาได้ผ่านการพิจารณาด้านจริยธรรมจากคณะกรรมการประเมินงานวิจัยด้านจริยธรรม และสอบโครงร่างวิทยานิพนธ์ผ่าน เมื่อวันที่ ๑๙ ธันวาคม ๒๕๕๘ แล้ว

ให้ไว้ ณ วันที่ ๒๘ มิถุนายน ๒๕๖๑

(รองศาสตราจารย์ ดร.อรัญญา เขาวลิต)
คณบดีคณะพยาบาลศาสตร์

ที่ ชร ๐๐๓๒.๑๐๒/ ๗๔๑๑๒

เอกสารรับรองโครงการวิจัย
โดย
คณะกรรมการพิจารณาด้านจริยธรรมในการศึกษาวิจัยทางชีวเวชศาสตร์
โรงพยาบาลเชียงรายประชานุเคราะห์

คณะกรรมการพิจารณาด้านจริยธรรมในการศึกษาวิจัยทางชีวเวชศาสตร์ โรงพยาบาลเชียงราย ประชานุเคราะห์ ขอรับรองว่า

โครงการวิจัย : การพัฒนาและประเมินแบบวัดความรักผูกพันของหญิงตั้งครรภ์วัยรุ่นไทยที่มีต่อทารกในครรภ์ (Development and Psychometric Evaluation of the Prenatal Attachment Scale for Thai Pregnant Adolescents (PAS-Thai))

ผู้วิจัย : นางมณีรัศมี พัฒนสมบัติสุข

สังกัด : สาขาวิชาการพยาบาล (นานาชาติ) คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์

คณะกรรมการพิจารณาด้านจริยธรรมในการศึกษาวิจัยทางชีวเวชศาสตร์ โรงพยาบาลเชียงราย ประชานุเคราะห์ พิจารณาโครงการวิจัยดังกล่าวแล้ว โดยคำนึงถึงประเด็นทางด้านวิชาการ ICH-GCP และด้านจริยธรรมการวิจัย เห็นว่า ไม่มีการล่วงละเมิดสิทธิ สวัสดิภาพ และไม่ก่อให้เกิดภยันตรายแก่อาสาสมัครที่เข้าร่วมการวิจัย

จึงเห็นสมควรให้ดำเนินการวิจัยในโรงพยาบาลเชียงรายประชานุเคราะห์ตามขอบข่ายของโครงการวิจัยที่เสนอ รับรองระหว่างวันที่ ๒๘ กันยายน ๒๕๖๐ ถึง วันที่ ๒๗ กันยายน ๒๕๖๑

ออกให้ ณ วันที่ ๑๙ ตุลาคม ๒๕๖๐

ลงนาม.....
(นายแพทย์จุลพงศ์ อจลพงศ์)
ประธานกรรมการพิจารณาด้านจริยธรรม
ในการศึกษาวิจัยทางชีวเวชศาสตร์

ลงนาม.....
(นายสมศักดิ์ อุทัยพิบูลย์)
นายแพทย์ชำนาญการพิเศษ ด้านเวชกรรม
รักษาการในตำแหน่ง ผู้อำนวยการโรงพยาบาลเชียงรายประชานุเคราะห์

เอกสารรับรองจริยธรรมการวิจัยในมนุษย์ โรงพยาบาลขอนแก่น

ชื่อคณะกรรมการ: คณะกรรมการจริยธรรมการวิจัยในมนุษย์ โรงพยาบาลขอนแก่น
ที่อยู่คณะกรรมการ: 54, 56 ถนนศรีจันทร์ ตำบลในเมือง อำเภอเมือง จังหวัดขอนแก่น 40000

ชื่อผู้วิจัยหลัก: นางมณีรัศมิ์ พัฒนสมบัติสุข
หน่วยงาน : คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์

ชื่อเรื่อง: การพัฒนาและประเมินแบบวัดความรักผูกพันของหญิงตั้งครรภ์วัยรุ่นไทยที่มีต่อทารกในครรภ์ (Development and psychometric evaluation of the prenatal attachment scale for Thai pregnant adolescents: PAS-Thai)
รหัสโครงการวิจัย: KE60088
สถานที่ทำวิจัย: ห้องฝากครรภ์ งานผู้ป่วยนอก, กลุ่มงานสูตินรีเวชกรรม โรงพยาบาลขอนแก่น

รายการเอกสาร	การอ้างอิง
แบบเสนอเพื่อขอรับการพิจารณาจริยธรรมการวิจัยในมนุษย์	เวอร์ชั่น 2 ลงวันที่ 24 กรกฎาคม 2560
โครงร่างการวิจัย	เวอร์ชั่น 1 ลงวันที่ 5 เมษายน 2560
เอกสารชี้แจงข้อมูลแก่ผู้เข้าร่วมโครงการวิจัย กรณีเด็กอายุ 10 - 14 ปี	เวอร์ชั่น 2 ลงวันที่ 26 กรกฎาคม 2560
เอกสารชี้แจงข้อมูลแก่ผู้เข้าร่วมโครงการวิจัย กรณีอายุมากกว่า 15-19 ปี	เวอร์ชั่น 2 ลงวันที่ 26 กรกฎาคม 2560
เอกสารชี้แจงข้อมูลแก่ผู้เข้าร่วมโครงการวิจัย สำหรับผู้ปกครอง/ผู้แทนโดยชอบธรรม	เวอร์ชั่น 2 ลงวันที่ 26 กรกฎาคม 2560
เอกสารแสดงความยินยอมเข้าร่วมโครงการวิจัย สำหรับผู้ปกครอง/ผู้แทนโดยชอบธรรม	เวอร์ชั่น 1 ลงวันที่ 5 เมษายน 2560
เอกสารแสดงความยินยอมเข้าร่วมโครงการวิจัย สำหรับผู้ปกครอง/ผู้แทนโดยชอบธรรม และผู้เข้าร่วมโครงการวิจัยอายุ 7 - 17 ปี	เวอร์ชั่น 1 ลงวันที่ 5 เมษายน 2560
แบบบันทึกข้อมูล	เวอร์ชั่น 1 ลงวันที่ 5 เมษายน 2560
ประวัตินักวิจัย	เวอร์ชั่น 1 ลงวันที่ 5 เมษายน 2560

การพิจารณา: [ ] แบบเร็ว [√] แบบปกติ

เสนอรายงานความก้าวหน้า: ทุกๆ ☐ 3 เดือน ☐ 6 เดือน ☑ 12 เดือน

วันที่เริ่มอนุมัติ: 16 สิงหาคม 2560 วันหมดอายุ: 15 สิงหาคม 2561

ได้ผ่านการพิจารณาด้านจริยธรรมการวิจัยในมนุษย์จากคณะกรรมการจริยธรรมวิจัยในมนุษย์ โรงพยาบาลขอนแก่น โดยอ้างปฏิญญาเฮลซิงกิแล้ว และเห็นว่าผู้วิจัยต้องดำเนินการตามโครงการวิจัยที่ได้กำหนดไว้ หากจะมีการปรับเปลี่ยนหรือแก้ไขใด ๆ ควรผ่านความเห็นชอบหรือแจ้งต่อคณะกรรมการจริยธรรมวิจัยในมนุษย์ โรงพยาบาลขอนแก่นก่อน

(นางอุษณีย์ สังคมกำแหง)
นายแพทย์เชี่ยวชาญ
ประธานคณะกรรมการจริยธรรมการวิจัยในมนุษย์ โรงพยาบาลขอนแก่น

เอกสารเลขที่ 40 / 2560

รหัสวิจัย 53/60/O/h3

ใบรับรองโครงการวิจัย

โดย คณะกรรมการวิจัยและจริยธรรมการวิจัย โรงพยาบาลชลบุรี

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โครงการวิจัย : การพัฒนาและประเมินแบบวัดความรักผูกพันของหญิงตั้งครรภ์วัยรุ่นไทยที่มีต่อทารกในครรภ์

Development and Psychometric Evaluation of the Prenatal Attachment Scale for Thai Pregnant Adolescents : PAS Thai.

ผู้ดำเนินการวิจัยหลัก : นางมณีรัศมิ์ พัฒนสมบัติสุข

หน่วยงานที่รับผิดชอบ : คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์

คณะกรรมการวิจัยและจริยธรรมการวิจัย โรงพยาบาลชลบุรี ได้พิจารณาแล้วเห็นว่าสมควรให้ดำเนินการวิจัยในขอบข่ายของโครงการวิจัยที่เสนอได้

ลงนาม

(นางสาวอุษา ศิริบุญฤทธิ์)

ประธานคณะกรรมการวิจัยและจริยธรรมการวิจัย

วันที่รับรอง : 16 สิงหาคม 2560

ลงนาม

(นายสวรรค์ ขวัญใจพานิช)

ผู้อำนวยการโรงพยาบาลชลบุรี

วันหมดอายุ : 16 สิงหาคม 2561

เอกสารที่คณะกรรมการรับรอง

1) โครงการวิจัย
2) ข้อมูลสำหรับกลุ่มประชากรหรือผู้มีส่วนร่วมในการวิจัยและใบยินยอมของกลุ่มประชากรหรือผู้มีส่วนร่วมในการวิจัย
3) ผู้วิจัย
4) แบบสอบถาม
5) ใบยินยอมเข้าร่วมงานวิจัยของอาสาสมัคร

กำหนดการส่งรายงานความคืบหน้าการวิจัย

☐ ทุก 3 เดือน ☑ ทุก 6 เดือน

เงื่อนไข.....

ที่ สข ๐๐๓๒.๒๐๒.๑ /๓๙๔

โรงพยาบาลสงขลา
๖๖๖ หมู่ที่ ๒ ต.พะวง
อ.เมือง จ.สงขลา ๙๐๑๐๐

๒๐ เมษายน ๒๕๖๐

เรื่อง อนุญาตให้เก็บข้อมูลวิจัย

เรียน คณบดีคณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์

อ้างถึง หนังสือคณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ ที่ ศธ ๐๕๒๑.๑.๐๕/๘๔๖
ลงวันที่ ๑๖ มีนาคม ๒๕๖๐

ตามหนังสือที่อ้างถึงคณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ ขออนุญาตให้ นางมณีรัศมิ์ พัฒนสมบัติสุข นักศึกษาหลักสูตรปรัชญาดุษฎีบัณฑิต สาขาวิชาการพยาบาล(นานาชาติ) เข้าเก็บข้อมูลวิจัยโดยใช้แบบสอบถามกับหญิงตั้งครรภ์วัยรุ่นอายุต่ำกว่า ๒๐ ปี จำนวน ๙๐ ราย ที่มาตรวจฝากครรภ์ ณ โรงพยาบาลสงขลา ระหว่างเดือนเมษายน – กันยายน ๒๕๖๐ ตามรายละเอียดแจ้งแล้วนั้น

โรงพยาบาลสงขลาพิจารณาแล้ว ยินดีให้นางมณีรัศมิ์ พัฒนสมบัติสุข นักศึกษาหลักสูตรปรัชญาดุษฎีบัณฑิต สาขาวิชาการพยาบาล(นานาชาติ) คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ เข้าทำการเก็บรวบรวมข้อมูลการวิจัยเรื่องดังกล่าว ณ โรงพยาบาลสงขลา ตามวัน เวลา ที่กำหนด

จึงเรียนมาเพื่อโปรดทราบ

ขอแสดงความนับถือ

(นางณิชาภา สวัสดิกานนท์)
นายแพทย์เชี่ยวชาญ(ด้านเวชกรรม สาขาวิสัญญีวิทยา)ปฏิบัติราชการแทน
ผู้อำนวยการโรงพยาบาลสงขลา

กลุ่มพัฒนาระบบบริการสุขภาพ
งานผลิตและพัฒนาบุคลากร
โทร.๐ ๗๔๓๓ ๘๑๐๐ ต่อ ๑๐๔๒
โทรสาร ๐ ๗๔๔๘ ๐๐๔๙

ที่ ศธ 0521.1.05/ ๒52

คณะพยาบาลศาสตร์
มหาวิทยาลัยสงขลานครินทร์
ถ.กาญจนวณิชย์
อ.หาดใหญ่ จ.สงขลา 90110

16 มีนาคม 2560

เรื่อง ขออนุญาตเก็บข้อมูลวิจัย

เรียน ผู้อำนวยการโรงพยาบาลส่งเสริมสุขภาพศูนย์อนามัยที่ 12 ยะลา

ด้วยนางมณีรัศมิ์ พัฒนสมบัติสุข รหัสนักศึกษา 5510430005 นักศึกษาหลักสูตรปรัชญาดุษฎีบัณฑิต สาขาวิชาการพยาบาล (นานาชาติ) คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ กำลังดำเนินการทำวิทยานิพนธ์เรื่อง"Development and Psychometric Evaluation of the Prenatal Attachment Scale for Thai Pregnant Adolescents (PAS-Thai)" โดยมี รองศาสตราจารย์ ดร.บุษกร พันธ์เมธาฤทธิ์ เป็นอาจารย์ที่ปรึกษาวิทยานิพนธ์ซึ่งในกระบวนการดังกล่าว นักศึกษามีความจำเป็นต้องเก็บข้อมูลวิจัยเพื่อประกอบการทำวิทยานิพนธ์

ในการนี้ คณะพยาบาลศาสตร์ มหาวิทยาลัยสงขลานครินทร์ จึงขออนุญาตให้ นางมณีรัศมิ์ พัฒนสมบัติสุข เก็บข้อมูลวิจัยโดยใช้แบบสอบถามกับหญิงตั้งครรภ์วัยรุ่นอายุต่ำกว่า 20 ปี จำนวน 30 ราย ที่มาตรวจคลินิกแม่วัยรุ่น ณ โรงพยาบาลของท่าน ระหว่างเดือนพฤษภาคม-ตุลาคม 2560 ทั้งนี้หากต้องการรายละเอียดเพิ่มเติมโปรดติดต่อนางมณีรัศมิ์ พัฒนสมบัติสุขโทรศัพท์มือถือ 08-6945-6945 หรือ E-mail: piamsook_nun@yahoo.com

จึงเรียนมาเพื่อโปรดพิจารณาให้ความอนุเคราะห์ด้วย จะเป็นพระคุณยิ่ง

ขอแสดงความนับถือ

(รองศาสตราจารย์ ดร.อรัญญา เชาวลิต)
คณบดีคณะพยาบาลศาสตร์

เรียน ผู้อำนวยการศูนย์ฯ
☑ เพื่อโปรดทราบ
☐ เพื่อโปรดพิจารณา
☑ เห็นสมควรมอบ/แจ้ง

(นายประวิทย์ ชัยกองเกียรติ)
นายแพทย์เชี่ยวชาญ รักษาราชการแทน ผู้อำนวยการศูนย์อนามัยที่ 12

5 เม.ย. 2560

สำนักงานเลขานุการ
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APPENDIX B

List of Experts for Content Validity Evaluation

1. นพ.กิตติพงศ์ แซ่เจ็ง	ผู้อำนวยการสำนักอนามัยเจริญพันธุ์ กรมอนามัย กระทรวงสาธารณสุข
Dr. Kittipong Saejeng, MD	Director of the Bureau of Reproductive Health, Department of health, Ministry of Public Health, Thailand
2. ดร.สุดารัตน์ ธีระวร	นักวิชาการสาธารณสุขชำนาญการพิเศษ สาธารณสุขนิเทศน์งานอนามัยแม่และเด็กสาธารณสุขเขต 12
Dr. Sudarat Teeraworn	Public health supervisor for maternal and child health, Public Health Center 12 Yala, Thailand
3. รศ. ดร. ศิริพันธุ์ ศิริพันธุ์	คณะพยาบาลศาสตร์ มหาวิทยาลัยนราธิวาสราชนครินทร์
Assoc. Prof. Siripan Siripan	Nurse instructor, Faculty of Nursing, Princess of Naradhiwas University
4. นส.จุฬาภรณ์ เพชรเรือง	หัวหน้าแผนกผู้ป่วยนอก โรงพยาบาลศูนย์ยะลา (ผู้เชี่ยวชาญด้านการดูแลหญิงตั้งครรภ์วัยรุ่น)
Ms. Chulaporn Pethroung	Registered nurse, Yala Hospital
5. นางสศิกร กอวิวัฒนาการ	พยาบาลวิชาชีพชำนาญการ แผนกฝากครรภ์ โรงพยาบาลส่งเสริมสุขภาพ เขต 12
Mrs.Sasikorn Korviwattanakarn	Registered nurse, Health Promotion Hospital, Center 12

APPENDIX C

Demographic Data of Participants of Qualitative Approach

Table 12

Demographic characteristics of participants of individual in-depth interview and focus group discussion (N = 13)

Demographic characteristics	Frequency	Percent
Age		
15	2	15.40
16	2	15.40
17	1	7.70
18	2	15.40
19	6	46.10
M = 17.62, SD = 1.61, Md = 19, Min = 15, Max = 19		
Skewness value -1.09, Kurtosis value -1.06		
Gestational age (weeks)		
20 - 24 week	1	7.70
25 - 28 week	2	15.40
29 - 32 week	4	30.70
33 - 36 week	3	23.10
37 - 40 week	3	23.10
M = 32.23, SD = 4.44, Md = 32, Min = 24, Max = 38		
Skewness value -0.60, Kurtosis value -0.24		
Educational level before pregnancy		
No schooling	7	53.80
Secondary school	4	30.40
Vocational school	1	7.70
Bachelor degree	1	7.70

Table 12 (continued)

Demographic characteristics	Frequency	Percent
Religion		
Buddhist	7	53.80
Muslim	6	46.20
Marital status		
Not married	8	61.50
Married before pregnancy	5	38.50
Living arrangement		
Live with husband	4	30.80
Live with parents	3	23.10
Live with boyfriend's parents	3	23.10
Live with cousin	2	15.40
Live with boyfriend	1	7.70
Planned pregnancy		
Not plan	10	76.90
Plan	3	23.10

APPENDIX D

Comparisons the Three Versions of PAS-Thai's Items

The first draft of PAS-Thai Literature review and qualitative approaches (56 items)	The second draft of PAS-Thai Expert review (*N* = 5) (55 items)	The third draft of PAS-Thai Pre-testing (*N* = 30) (55 items)
Cognitive attachment domain (18 items)	**Cognitive attachment domain (17 items)**	**Cognitive attachment domain (17 items)**
1. I want to know the gender of my baby	*1. I want to know if my baby will be a boy or a girl*	1. I want to know if my baby will be a boy or a girl
2. I wonder what my baby will look like or who my baby will look like, me or his father?	*2. I wonder how my baby will look like?*	2. I wonder how my baby will look like?
3. I want to know that my baby be heathy or not?	3. I want to know *if* my baby be heathy or not?	3. I want to know if my baby be heathy or not?
4. I select the name for my baby	4. I select the *good* name for my baby	4. I select the good name for my baby
5. I think about dressing for my baby	5. I think about *how should I dress* for my baby	5. I think about how should I dress for my baby
6. I want the baby looks like me or his father	6. I want to know *if the baby* looks like me or his father	6. I want to know if the baby looks like me or his father
7. I want the baby to be a good person	7. I want *my* baby to be a good person	7. I want my baby to be a good person
8. I want my baby to be happy	~~*8. I want my baby to be happy*~~	
9. I want my baby have a good future	9. I want my baby have a good future	8. I want my baby have a good future
10. I want my baby to be heathy and not disable	*10. I want my baby to be heathy*	9. I want my baby to be heathy
11. I want to see my baby	11. I want to see my baby	10. I want to see my baby
12. I want to hold my baby	12. I want to hold my baby	11. I want to hold my baby
13. I want to raise my baby as best as I can	13. I want to raise my baby as best as I can	12. I want to raise my baby as best as I can
14. I think that the baby needs its mother the same as me	14. I think that the baby needs its mother the same as me	13. I think that the baby needs its mother the same as me
15. I think that I will make my baby happy	15. I think that I will make my baby happy	14. I think that I will make my baby happy

The first draft of PAS-Thai Literature review and qualitative approaches 56 items	The second draft of PAS-Thai Expert review (N = 5) 55 items	The third draft of PAS-Thai Pre-testing (N = 30) 55 items
16. I will not adopt my baby	16. I will not adopt my baby	15. I will not adopt my baby
17. I will raise the baby myself	17. I will raise the baby myself	16. I will raise the baby myself
18. I plan to give breastfeeding myself	18. I plan to ~~*give*~~ breastfeeding myself	17. I plan to breastfeeding myself
Affective attachment domain (17 items)	**Affective attachment domain (17 items)**	**Affective attachment domain (17 items)**
19. I love my baby whether he is a boy or she is a girl	19. I *will* love my baby whether he is a boy or she is a girl	18. I will love my baby whether he is a boy or she is a girl
20. I feel love my baby since I knew that I felt pregnant	20. I feel love *for* my baby since I knew that I felt pregnant	19. I feel love for my baby since I knew that I felt pregnant
21. I love my baby more everyday	21. I love my baby more everyday	20. I love my baby more everyday
22. I feel attach to my baby	21. I feel *an* attach*ment* to my baby	21. I feel an attachment to my baby
23. The baby is mine	23. The baby is mine	22. The baby is mine
24. I love and possess my baby	24. I love and ~~*(enjoy)*~~ possess my baby	23. I love and possess my baby
25. The baby is alive in my body	25. The baby is alive in my body	24. The baby is alive in my body
26. The baby is important or much valuable for me	26. The baby is important *and* much valuable *to* me	25. The baby is important and much valuable to me
27. I feel pleasure to have a baby	27. I feel pleasure ~~*(privileged)*~~ to have *this* baby	26. I feel pleasure to have this baby
28. I am happy to have baby	28. I am happy to have my baby	27. I am happy to have my baby
29. I concern about my baby	29. I concerned about my baby	28. I concerned about my baby
30. I feel worry that my baby may be not heathy	29. I feel worried that my baby may be not be heathy	29. I feel worried that my baby may be not be heathy
31. I want this baby	31. I want to have this baby	30. I want to have this baby
32. I feel close to my baby	32. I feel close to my baby	31. I feel close to my baby
33. I feel that me and my baby, we can connect	32. I feel that my baby and I have a connection	32. I feel that my baby and I have a connection
34. I feel that the baby can understand my feelings and emotions	34. I feel that the baby can understand my feelings and emotions	33. I feel that the baby can understand my feelings and emotions

The first draft of PAS-Thai Literature review and qualitative approaches 56 items	The second draft of PAS-Thai Expert review (N = 5) 55 items	The third draft of PAS-Thai Pre-testing (N = 30) 55 items
35. The baby knows that I love him/her	35. The baby knows that I love him *or* her	34. The baby knows that I love him or her
Behavioral attachment domain (21 items)	**Behavioral attachment domain (21 items)**	**Behavioral attachment domain (21 items)**
36. I rub or touch my tummy when baby moves	36. I rub or touch my tummy when baby moves	35. I rub or touch my tummy when baby moves
37. I like playing with my baby such as gently press on tummy or put the fingers around the tummy to make my baby move	36. I like playing with my baby such as gently press*ing* on my tummy or put*ting* my fingers around the tummy to make my baby move	36. I like playing with my baby such as gently pressing on my tummy or putting my fingers around the tummy to make my baby move
38. I talk with my baby	38. I talk *to* my baby	37. I talk to my baby
39. I call my baby by name or nickname	39. I call my baby by *his or her* name or nickname	38. I call my baby by his or her name or nickname
40. I tell my baby that I love him/her	40. I tell my baby that I love *him or her*	39. I tell my baby that I love him or her
41. I sing song or turn on music for my baby	41. I sing song*s* or turn on music for my baby	40. I sing songs or turn on music for my baby
42. I read out loud for the baby	42. I read out loud to the baby	41. I read out loud to the baby
43. I do not want to have an abortion	43. I do not having an abortion	42. I do not having an abortion
44. I will not do harm for my baby such as drinking alcohol, beers, caffeine or hang out in the night	44. I will not cause harm to my baby such as drinking alcohol, beers, caffeine or loiter during in the night	43. I will not cause harm to my baby such as drinking alcohol, beers, caffeine or loiter during in the night
45. I beware of myself to protect the baby from harm	45. I am aware that I must protect the baby from harm	44. I am aware that I must protect the baby from harm
46. I eat 5 food groups	46. I eat five food groups such as rice, noodle, bread, meat, milk, egg, vegetables, fruits etc.	I eat five food groups such as rice, noodle, bread, meat, milk, egg, vegetables, fruits etc.
47. I take iron supplement, Calcium, or vitamin as doctor's suggestions	47. I take iron supplements, Calcium, and vitamins as the doctor's suggest	46. I take iron supplements, Calcium, and vitamins as the doctor's suggest

The first draft of PAS-Thai Literature review and qualitative approaches 56 items	The second draft of PAS-Thai Expert review (N = 5) 55 items	The third draft of PAS-Thai Pre-testing (N = 30) 55 items
48. I do exercise for my baby	48. I ~~*do*~~ exercise for my baby	47. I exercise for my baby
49. I attend antenatal care as appointments	*50. I am seeking a good ANC clinic for my baby*	48. I am seeking a good ANC clinic for my baby
50. I seek the good ANC clinic for my baby	*49. I attend antenatal care as appointments*	49. I attend antenatal care as appointments
51. I prepare baby's items such as baby bed, blanket, clothes etc.	51. I prepare baby's items such as *my baby's* bed, blanket, clothes, etc.	50. I prepare baby's items such as my baby's bed, blanket, clothes, etc.
52. I prepare the room/house for my baby	52. I prepare the room *or* house for my baby	51. I prepare the room or house for my baby
53. I propose to attend prenatal class (parents' school) for my baby	53. I ~~*propose to*~~ attend prenatal class *and birth preparation* (parents' school) for my baby	52. I attend prenatal class and birth preparation (parents' school) for my baby
54. I search about how to take care of myself and my baby from internet, books, TV, etc.	54. I *learn* about how to take care of myself and my baby *by using the* internet, books, and *television programs*, etc.	53. I learn about how to take care of myself and my baby by using the internet, books, and television programs, etc.
55. I ask about how to raise the baby from the experienced person such as my parents, cousin, friends, etc.	55. I ask about how to raise the baby from the experienced *people* such as my parents, cousins, friends, etc.	54. I ask about how to raise the baby from the experienced people such as my parents, cousins, friends, etc.
56. I ask about how to take care of myself and prepare for giving birth from doctors or nurses	56. I ask about how to take care of myself and prepare for *the* birth *by talking to* doctors or nurses	55. I ask about how to take care of myself and prepare for the birth by talking to doctors or nurses

Note. The revised wordings and items are expressed in italic writing.

APPENDIX E

Content Validity Index Calculation

Table 13

The content validity index calculation of the PAS-Thai (N = 5)

Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Number in Agreement	Item CVI
1	✓	✓	✓	✓	✓	5	1.00
2	✓	✓	✓	✓	✓	5	1.00
3	✓	✓	✓	✓	✓	5	1.00
4	✓	✓	✓	✓	✓	5	1.00
5	✓	×	✓	✓	✓	4	0.80
6	✓	×	✓	✓	✓	4	0.80
7	✓	✓	✓	✓	✓	5	1.00
8	✓	×	redundant ✓	✓	✓	4	0.80
9	✓	×	✓	✓	✓	4	0.80
10	✓	✓	✓	✓	✓	5	1.00
11	✓	✓	✓	✓	✓	5	1.00
12	✓	✓	✓	✓	✓	5	1.00
13	✓	✓	✓	✓	✓	5	1.00
14	✓	✓	✓	✓	✓	5	1.00
15	✓	✓	✓	✓	✓	5	1.00
16	✓	✓	✓	✓	✓	5	1.00
17	✓	✓	✓	✓	✓	5	1.00
18	✓	✓	✓	✓	✓	5	1.00
19	✓	✓	✓	✓	✓	5	1.00
20	✓	✓	✓	✓	✓	5	1.00
21	✓	✓	✓	✓	✓	5	1.00
22	✓	✓	✓	✓	✓	5	1.00
23	✓	✓	✓	✓	✓	5	1.00
24	✓	✓	✓	✓	✓	5	1.00
25	✓	✓	✓	✓	✓	5	1.00
26	✓	✓	✓	✓	✓	5	1.00
27	✓	✓	✓	✓	✓	5	1.00
28	✓	✓	✓	✓	✓	5	1.00
29	✓	✓	✓	✓	✓	5	1.00
30	✓	✓	✓	✓	✓	5	1.00
31	✓	✓	✓	✓	✓	5	1.00
32	✓	✓	✓	✓	✓	5	1.00
33	✓	✓	✓	✓	✓	5	1.00

Table 13 (continued)

Item	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Number in Agreement	Item CVI
34	✓	✓	✓	✓	✓	5	1.00
35	✓	✓	✓	✓	✓	5	1.00
36	✓	✓	✓	✓	✓	5	1.00
37	✓	✓	✓	✓	✓	5	1.00
38	✓	✓	✓	✓	✓	5	1.00
39	✓	✓	✓	✓	✓	5	1.00
40	✓	✓	✓	×	✓	4	0.80
41	✓	✓	✓	×	✓	4	0.80
42	✓	✓	✓	✓	✓	5	1.00
43	✓	✓	✓	✓	✓	5	1.00
44	✓	✓	✓	✓	✓	5	1.00
45	✓	✓	✓	✓	✓	5	1.00
46	✓	✓	✓	✓	✓	5	1.00
47	✓	✓	✓	×	✓	4	0.80
48	✓	✓	✓	✓	✓	5	1.00
49	✓	✓	✓	✓	✓	5	1.00
50	✓	✓	✓	✓	✓	5	1.00
51	✓	✓	✓	✓	✓	5	1.00
52	✓	✓	✓	✓	✓	5	1.00
53	✓	✓	✓	✓	✓	5	1.00
54	✓	✓	✓	✓	✓	5	1.00
55	✓	✓	✓	✓	✓	5	1.00
56	✓	✓	✓	✓	✓	5	1.00
Proportion Relevant	1.00	0.95	1.00	0.95	1.00		
					56-item	Mean I-CVI	0.97
						S-CVI/UA	0.87

After delete 1 item (c8)

					55-item	Mean I-CVI	0.98
						S-CVI/UA	0.89

APPENDIX F

Demographic Data of Participants in Pre-testing Step

Table 14

Frequency, percentage, mean (M), standard deviation (SD), minimum-maximum of demographic data of pre-testing sample (N =30)

Items	Frequency	Percentage
Age (years)		
15-17	14	46.70
18-19	16	53.30
M = 17.57, SD = 1.36, Md = 19, Min =15, Max = 19		
Skewness value -1.50, Kurtosis value -0.65		
Gestational age (weeks)		
20-24	6	20.00
25-28	5	16.70
29-32	8	26.70
33-36	7	23.30
37-40	4	13.30
M = 30.50, SD = 5.19, Md = 32, Min =20, Max = 39		
Skewness value -0.51, Kurtosis value -1.27		
Religion		
Buddhism	24	80.00
Islam	6	20.00
Marital status		
Married and live with husband	24	80.00
Not married and live as couple	3	10.00
Divorce/Separate	2	6.70
Single	1	3.30

Table 14 (continued)

Items	Frequency	Percentage
Educational level		
Primary school	1	3.30
Lower secondary school/	6	20.00
Upper secondary school/Vocational certificate	11	36.70
High vocational certificate	1	3.30
Bachelor	2	6.70
Non-formal education	1	3.30
No schooling	8	26.70
Occupation		
Unemployed	14	46.70
Worker	8	26.70
Student	7	23.30
Street vendor	1	3.30
Income		
Have income and enough	20	66.70
Have income but not enough	4	13.30
Have no income	6	20.00
Living with/at		
Live with husband	21	70.00
Live with husband parents	6	20.00
Live with own parents	2	6.70
Live with friend	1	3.30
Family planning method		
Non-contraceptive	14	46.70
Coitus interruptus	5	16.70
Billings ovulation method	5	16.70
Oral pill	3	10.00
Emergency contraceptive pill	2	6.70
Condom	1	3.20

Table 14 (continued)

Items	Frequency	Percentage
Plan of pregnancy		
Not Plan	15	50.00
Plan	15	50.00
Readiness to take care of the baby		
Ready	30	100.00
Wanted to have the baby		
Wanted	27	90.00
Not wanted	3	10.00
Plan of feeding method		
Breast feeding	17	56.70
Breast and bottle feeding	12	40.00
Bottle feeding	1	3.30

APPENDIX G

Normality Test of the PAS-Thai

Table 15

The skewness and kurtosis of items of the PAS-Thai (N = 354)

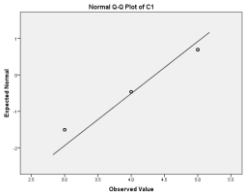
Item	Skewness	Kurtosis	Z-Skewness	Z-Kurtosis	Note
c1	-0.63	-0.778	-4.84	-3.00	SE of skewness = .130
c2	-0.54	-0.90	-4.12	-3.48	
c3	-1.20	0.05	-9.22	0.20	SE of Kurtosis = .259
c4	-0.35	-0.39	-2.70	-1.52	
c5	-0.22	-0.84	-1.67	-3.25	
c6	-0.59	-0.30	-4.53	-1.17	
c7	-1.34	-0.22	-10.27	-0.84	
c8	-1.77	1.14	-13.61	4.39	
c9	-2.37	3.63	-18.22	14.02	
c10	-1.28	-0.37	-9.83	-1.43	
c11	-1.34	0.58	-10.31	2.22	
c12	-1.46	0.13	-11.22	0.49	
c13	-1.12	0.24	-8.63	0.92	
c14	-0.95	-0.70	-7.30	-2.69	
c15	-1.40	-0.05	-10.74	-0.20	
c16	-0.87	-0.48	-6.66	-1.86	
c17	-1.10	-0.11	-8.45	-0.42	
a18	-1.55	1.38	-11.95	5.34	
a19	-1.17	0.28	-8.99	1.08	
a20	-1.22	0.31	-9.42	1.20	
a21	-1.09	0.06	-8.36	0.23	
a22	-0.83	-0.81	-6.35	-3.14	
a23	-1.29	-0.05	-9.91	-0.17	
a24	-1.24	-0.46	-9.54	-1.79	
a25	-1.17	-0.64	-8.98	-2.47	
a26	-0.94	-0.23	-7.25	-0.88	
a27	-0.75	-1.24	-5.75	-4.80	
a28	-1.59	0.54	-12.25	2.09	
a29	-1.72	2.11	-13.22	8.14	
a30	-0.84	-0.53	-6.45	-2.06	
a31	-1.01	0.02	-7.78	0.09	
a32	-0.71	-0.48	-5.47	-1.86	
a33	-0.80	-0.35	-6.14	-1.33	
a34	-0.71	-0.61	-5.46	-2.36	
b35	-0.89	-0.52	-6.83	-1.99	

Table 15 (continued)

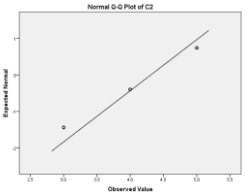
Item	Skewness	Kurtosis	Z-Skewness	Z-Kurtosis	Note
b36	-0.53	-0.41	-4.05	-1.58	
b37	-0.39	-0.22	-3.02	-0.85	
b38	-0.43	-0.43	-3.28	-1.66	
b39	-0.62	-0.70	-4.79	-2.71	
b40	-0.62	-0.57	-4.79	-2.20	
b41	-0.07	-1.03	-0.51	-3.98	
b42	-1.06	1.22	-8.13	4.73	
b43	-0.79	-0.46	-6.11	-1.78	
b44	-0.69	-0.49	-5.31	-1.88	
b45	-0.52	-0.62	-4.02	-2.41	
b46	-0.83	-0.31	-6.37	-1.19	
b47	-0.57	-0.07	-4.40	-0.26	
b48	-0.52	-0.64	-4.02	-2.47	
b49	-0.98	-0.05	-7.55	-0.20	
b50	-0.70	-0.20	-5.35	-0.77	
b51	-0.51	-0.32	-3.92	-1.25	
b52	-0.30	-1.21	-2.29	-4.65	
b53	-0.55	-1.02	-4.22	-3.94	
b54	-0.72	-0.58	-5.50	-2.25	
b55	-0.37	-0.81	-2.85	-3.14	

Normal Q-Q of PAS-Thai's Items

Item c1



Item c2



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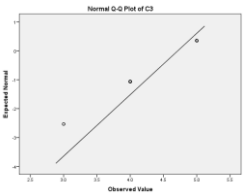

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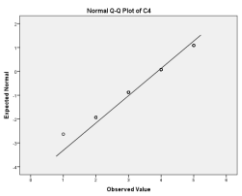

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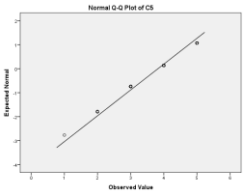

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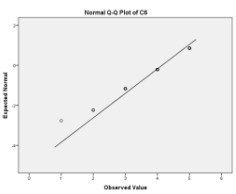

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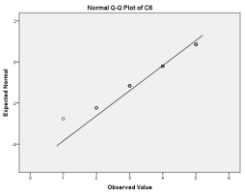

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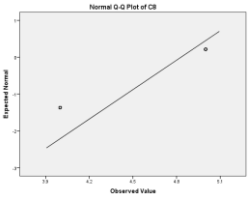

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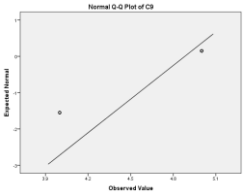

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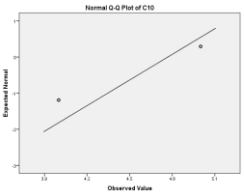

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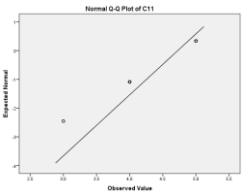

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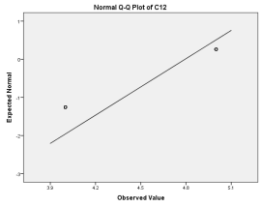

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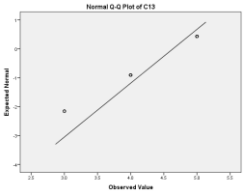

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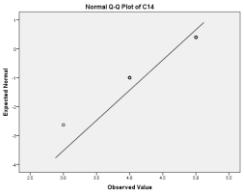

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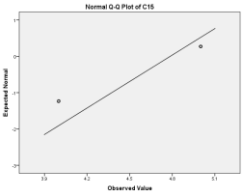

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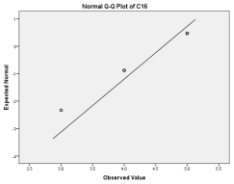

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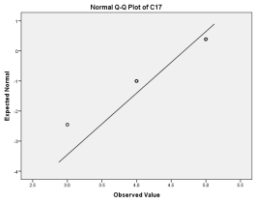

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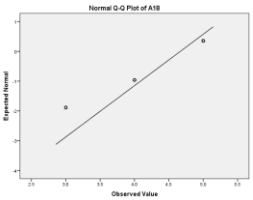

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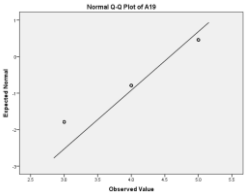

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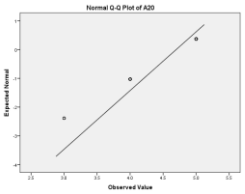

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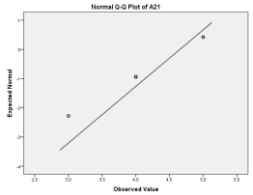

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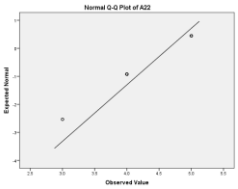

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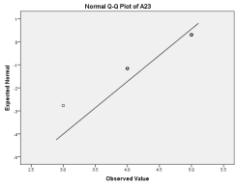

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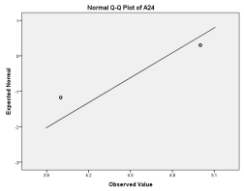

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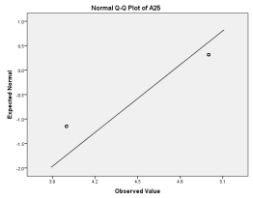

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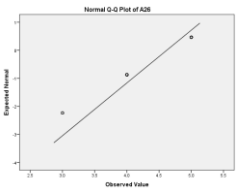

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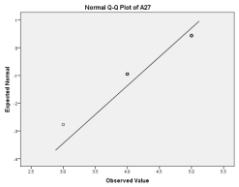

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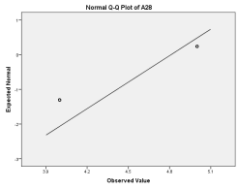

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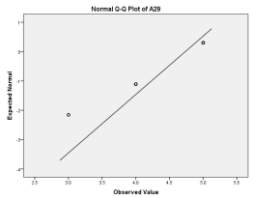

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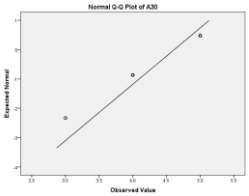

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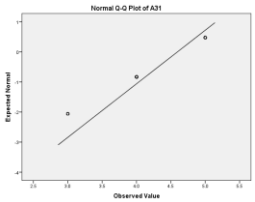

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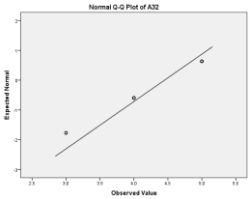

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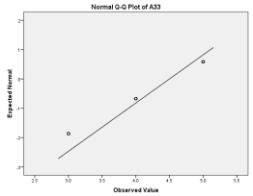

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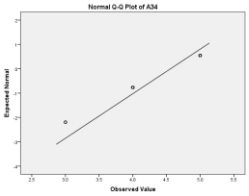

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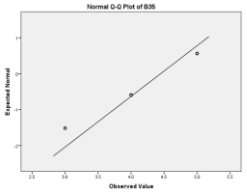

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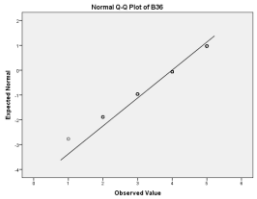

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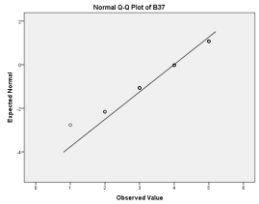

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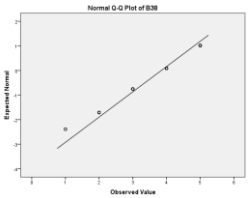

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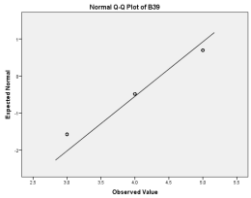

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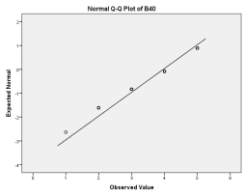

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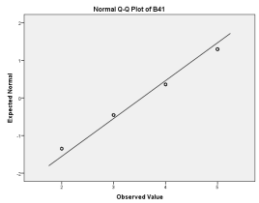

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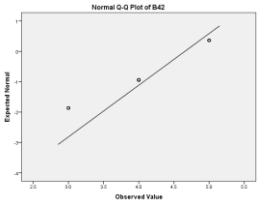

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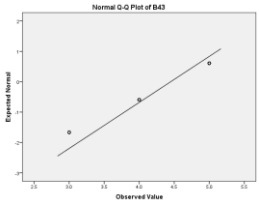

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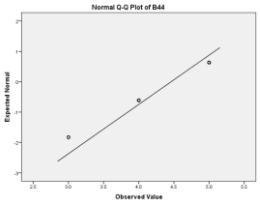

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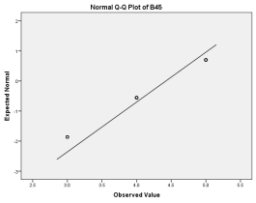

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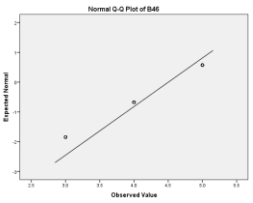

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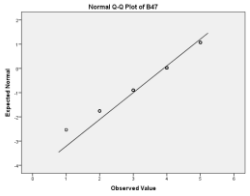

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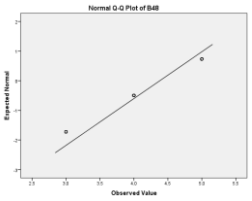

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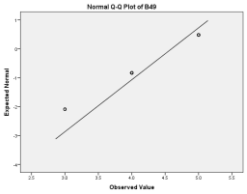

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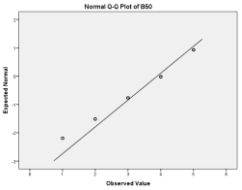

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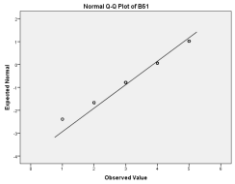

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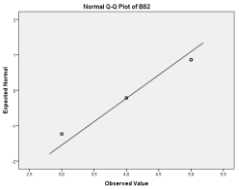

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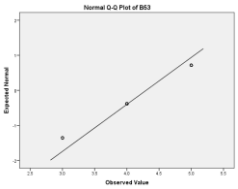

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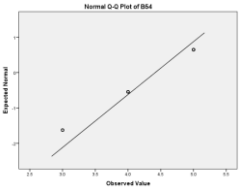

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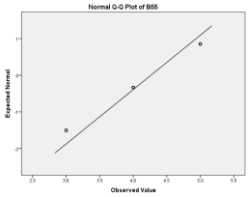

APPENDIX H

Comparisons the Two Versions of 3- factor Extraction Solutions

Table 16

Total variance explained, number of items loading, and number of cross-loadings of the two versions of 3-factor extraction solution

Total Variance Explained											
Component	Initial Eigenvalues (Max-Min)			Extraction Sums of Squared Loadings (Max-Min)			Rotation Sums of Squared Loadings (Max-Min)			Number of items loading	Number of cross-loadings
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %		
3 factors 53 items Factor loading = .40	18.60 to 1.01	35.10 to 1.91	35.10 to 64.75	18.08 to 1.62	34.11 to 3.05	34.11 to 43.86	10.15 to 5.72	19.14 to 10.80	43.86	49	7
3 factors 35 items Factor loading = .40	12.47 to 1.03	35.61 to 2.94	35.61 to 64.41	11.95 to 1.15	34.14 to 3.28	34.11 to 46.19	6.82 to 3.32	19.48 to 9.48	46.19	35	0

APPENDIX I

Independent T-Test Assumption

Table 17

The assumptions of T-Test for contrasted group analysis (n = 31 per group)

Assumptions for the Independent t-test	35-item PAS-Thai	
	Want to have a baby	Not want to have a baby
1. Variables are at the interval or ratio level of measurement	✓	✓
2. Normal distribution	Skewness value = 0.51 Kurtosis value = 0.77	Skewness value = 1.65 Kurtosis value = 0.19
3. No outliers	no outliers (box plot)	no outliers (box plot)
4. Homogeneity of variance (Levene's test)	F = 7.338, *p* = .009	

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Research Papers

Chunpetch, A., Sivadamrongpong, W., & **Sombutsook, P.** (2002). An evaluation of the program of Diploma in Nursing Science and the program of Diploma in Nursing Science (2 Year Curriculum): Boromarajonani College of Nursing, Yala.

Sombutsook, P. (2003). Knowledge and attitude toward AIDS, and the using of universal precautions in obstetric nursing practice of nursing students in program of Diploma in Nursing Science at Boromarajonani College of Nursing in Southern Network, Thailand.

Sombutsook, P., & Kajornkittiya, K. (2004). An evaluation of the program of Diploma in Nursing Science (Revised Edition) and the program of Diploma in Nursing Science (2 Year Curriculum): Boromarajonani College of Nursing, Yala.

Sombutsook, P., Chitpakdee, A., & Petchruang, C. (2005). Relationships between Psychosocial states and Health patterns of pregnant woman.

Sombutsook, P. (2005). Effectiveness of academic system along the quality assurance system: Boromarajonani College of Nursing, Yala in academic year 2005.

Raksa, P., & **Sombutsook, P.** (2007). After action research: After action review "Local Fund Health Security by NHSO" of Sub District Administration Organization (Tambon Yansue, Amphur Kuandone, Satun Province; Tambon Chalung, Amphur Chalung, Satun Province; Tambon Thakam, Amphur Thakam, Songkhla Province).

Plianbumroong, D., Kajornkittiya, K., & **Sombutsook, P.** (2007). The satisfaction of curriculum administration: The Bachelor of Nursing Science Program B.E. 2545

Kajornkittiya, K., Plianbumroong, D., & **Sombutsook, P.** (2008). Bringing the necessary personal characteristic of nursing career to learning activities via rubric assessment form.

Kajornkittiya, K., Plianbumroong, D., & S**ombutsook, P.** (2008). The promotion of self-directed learning by using the need and experience record in the first practicum nursing.

Krinara, P., Plianbumroong, D., Phosuwan, P. & **Sombutsook, P.** (2008). An evaluation of the Bachelor of Nursing Science Program B.E. 2545

Chunpetch, A., **Sombutsook, P.,** & Clungmun, A. (2010). The desirable characteristics of graduate nurses in Southern Provinces, Thailand

Kajornkittiya, K., & **Sombutsook, P.** (2010). Development of the rubic assessments for measuring the nine desirable professional characteristics in nursing students.

Paper and Poster Presented at Conferences

Sombutsook, P., Dumrongsaree, P., Niha, S., Wanwilai, P. (2008). Thoughtful caring behaviour as perceptions of Thai and Muslim professional nurses in Yala Province, Thailand. Oral presentation: The International Conference: Health and the Changing World at Rama Garden Hotel, Bangkok, Thailand (11-13 November 2008)

Sombutsook, M. (2010). Nursing needs in postpartum care of cesarean- mothers. Poster presentation: The 4th Hong Kong International Nursing Forum at The University of Hong Kong (4-5 June 2010)

Sombutsook, P., Chunuan, S. (2013). A literature review of interventions for promoting prenatal attachment. Oral presentation: The 2013 international nursing conference on health, healing, & harmony: nursing values. Phuket Orchid Resort and Spa, Phuket, Thailand (1-3 May 2013)

Sombutsook, P., & Boonyoung, N. (2013). Health policy for adolescent pregnancy reduction in Thailand. Poster presentation: The 2013 international nursing conference on health, healing, & harmony: nursing values. Phuket Orchid Resort and Spa, Phuket, Thailand (1-3 May 2013)

Sombutsook, P., Chunuan, S., & Punthmatharith, B. (2015). A Concept analysis of prenatal attachment. Oral presentation: More than two decades of graduate nursing study conference. Prince of Songkla University, Hatyai, Thailand (16-17 May 2015)

Sombutsook, P., Punthmatharith, B., & Chunuan, S., (2017). Attributes of prenatal attachment: An extensive literature review. Oral presentation: 15th International Conference on Nursing & Midwifery. Kuala Lumper, Malaysia (24-25 June 2017)