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Validity and Reliability of the Arabic Version of Muller's Prenatal Attachment Inventory

Arafah, Dima

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Validity and Reliability of the Arabic Version of Muller's Prenatal Attachment Inventory

by

Dima Arafah

A THESIS

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Abstract

Increased maternal fetal attachment (MFA) is associated to improved health practices. A tool to measure MFA within an Arab cultural context was developed to help health care providers identify and help women with low MFA. Muller's 21-item Prenatal Attachment Inventory (PAI) was translated from English into Arabic and tested on 250 pregnant Arab women in Riyadh, Saudi Arabia to measure its psychometric properties and appropriateness within an Arab cultural context. A cross-sectional quantitative study was conducted in two phases. First, the tool was translated using the Universal Translation Approach and assessed for content validity. In this phase there were four new items added to the original tool and their validity was tested in the second phase. In the second phase, the tool was tested on the study population, descriptive statistics were developed, association tests were used to explore associations between demographic variables and MFA, factor analysis was conducted and reliability was assessed using Cronbach's alpha coefficient. Associations between MFA and maternal variables were found such as downloading an application to follow the baby's growth, planning to breastfeed the baby and parity. The Arabic tool could serve Arab-speaking countries and help researchers explore new associations between MFA and the social determinants of health for Arab mothers and babies.

Key words: Maternal fetal attachment, maternal antenatal attachment, psychometrics, attachment, mother-fetus attachment, Arabic maternal fetal attachment, and Arab maternal fetal attachment.

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Epigraph

“The more the child feels attached to the mother, the more secure he is in his acceptance of himself and the rest of the world. The more love he gets, the more he is capable of giving. Attachment is as central to the developing child as eating and breathing” ~ Robert Shaw, M.D.

CHAPTER 1: INTRODUCTION, OBJECTIVES AND RATIONALE

1.1 Background

Continuing developments in technology and health care have meant that maternal health concerns have improved for many women worldwide who now have access to early pregnancy detection and ultrasound imaging of the fetus. However, prior to the 20th century, women were concerned about surviving pregnancy, infectious diseases, and high maternal mortality rates (1). To illustrate, in some of the letters and diaries women wrote during the 19th century, they expressed fears of losing their babies due to miscarriage or infant death (1). But, moving forward to the present time, the World Health Organization (WHO) has reported that between 1990 and 2013 maternal mortality dropped by almost 50% worldwide (2). This reduction in maternal mortality has been observed in developed countries such as Germany and Japan, and in some developing countries such as Oman, Qatar, and Saudi Arabia, where maternal mortality is fairly low (1, 3). Today, health care workers are also focusing more on mothers' feelings and psychological factors throughout the pregnancy (1). Nevertheless, in the Middle East, new concerns regarding maternal health are emerging such as antenatal and postpartum depression (4) and low engagement in the practice of breastfeeding (5). For example, the exclusive use of breastfeeding to 6 months, which is defined as "giving the child only breast milk with no formula, soft food or juices," is 12% in Qatar and Kuwait; 31% in Oman; 31% in Saudi Arabia and 34% in Bahrain and the United Arab Emirates (UAE) (5).

Within this context, it is important to expand ways of ensuring that continued maternal-child health can be achieved by using the available resources, services, knowledge and technology within the healthcare field to encourage healthier behaviours and therefore an enjoyable maternity experience. One way to support the vision of many countries for healthier

mothers and babies in the Middle East is by studying and improving maternal-fetal attachment (MFA), which is a unique bond that develops between a pregnant woman and her baby (1). MFA can begin from the time of an acknowledged pregnancy and continue through to delivery. Usually, mothers are not aware of MFA feelings until someone or something triggers these feelings such as by viewing baby pictures or answering questions relating to motherhood (6). Specifically, in the Middle East, although there is a focus on maternal health, the term MFA is fairly new. Thus, studying the concept of MFA and having a tool that measures it in a Middle Eastern context will help discover new dimensions about women's decisions and behaviours throughout pregnancy and after giving birth that can affect MFA.

1.2 Rationale

Having a tool in Arabic that is culturally acceptable, reliable, and receives valid scores to measure MFA is important for many reasons. First, this tool will serve not just one country, but could serve more than 11 countries where the first language is Arabic. Even non-Arab countries can use this tool for Arab immigrants and refugees. Second, Arab countries have unique features in family structure and context that are different from those found in Western, European and Asian countries. For example, the Arab family structure is built upon extended families including uncles, aunts, and grandparents. Consequently, this understanding is important before a tool from any country can be applied to an Arab context. Third, such a tool can help physicians and health care providers identify women with low MFA so they can be supported and referred to needed services and personnel such as psychological consultations, health education, or social workers. Fourth, researchers could use the tool to study and explore new dimensions of public health concerns such as exploring the reasons for the very low breastfeeding (5, 7) and high postpartum

depression rates among Arab women (8, 9). Therefore, exploring the effect of culture on MFA and adding to existing knowledge while considering culture is very important as has been recommended in previous studies (1, 10).

1.2.1 Linkage of an Arabic tool for Measuring MFA to the Field of Population and Public Health

The aim of this research was to develop an Arabic tool that could be used to measure MFA and to test it for cultural acceptability, reliability, and score validity. Such a tool could provide public health professionals with the ability to plan and develop awareness programs to promote healthy maternal attachment between mothers and their unborn children. Also, this material will enable future researchers interested in public health to investigate the relationship between MFA and the mental, physical, and emotional health of a mother and her fetus. The tool could also be used to explore the factors surrounding breastfeeding, postpartum depression, and other issues that can affect the well being of a mother and her baby.

1.3 Literature Review

1.3.1 Definition of MFA

A special relationship exists between a mother and her unborn baby (11), and Rousseau (12) first defined this relationship as *maternal love*. Bowlby (13) then initiated the concept of *attachment* to describe this relationship (13), and published several papers that discussed the nature of the relationship between a mother and her baby. These studies emphasized that MFA is a natural feeling that affects the health of a baby and his/her mother (13). Bowlby (13) declared that to grow up mentally healthy, a child should experience “a warm, intimate and continuous relationship with his/her mother” and he also emphasized the importance of this attachment throughout pregnancy and even after giving birth (13). Later, Cranley (14) defined MFA as “the

extent to which women engage in behaviours that represent an affiliation and interaction with their unborn child”(14)(P.282). This follows Doan’s definition of MFA because it is comprehensive and allows for a wider scope in this relationship. Doan (15) defined MFA in the following manner: “MFA is a multi-dimensional concept expressed through a variety of behaviours, attitudes, thoughts, and feelings with different expressions occurring at different stages of gestational development and employing individual factors” (15).

It is important to highlight that most of the articles discussed MFA and very few discussed paternal fetal attachment (PFA), although both of the parents develop an emotional attachment to the unborn baby in her/his own way (16). It is impossible to generalize that mothers have more attachment than fathers as the literature reports contradictory results (16).

1.3.2 Confounders and Causality

Before discussing how MFA is linked to many behaviours and feelings, it is important to highlight that all of the associations between MFA and other factors cannot be confirmed. Consequently, it is impossible to draw a cause and effect relationship between them due to the complexity and presence of confounders. However, few studies in public health and behaviour intervention focus on the causality pathway and the methods to study this (17). Usually, in behavioural studies, multiple causal factors are present in a bi-directional way (17) their relationships are complex and exposure to a factor does not always lead to the desired behavioural outcomes (17). On the other hand, confounders can be external factors that influence the association between variables and that manipulate the true magnitude of effects (17). Factors that are considered confounders may be the causal factor(s) in the relationship, the Centers for

Disease Control and Prevention (CDC) defines confounders as the social determinants of health, and explains them in the following way:

“[they are] complex, integrated, and overlapping social structures and economic systems that include social and physical environments and health services. These determinants are shaped by the level of income, power, and resources at global, national and local levels. They are influenced not only through personal choices, but through policy choices as well.” (18)(p.iv)

Thus, there are many social determinants of health such as poverty, economic inequalities, stress, housing, access to health facilities and social support (19). Although such social and physical environmental factors cannot be controlled at an individual level, they have an important impact on an individual's health (20) such as in disease morbidity and mortality (19). Hence, understanding these concepts is essential, especially in the research studies that follow in the literature review section below in which researchers explored the linkages between MFA and other factors. Examining and studying associations will aid in understanding the prediction of outcomes such as women's behaviours (17) and are necessary to be able to induce changes that improve health outcomes.

1.3.3 Importance of MFA

It is important to measure MFA because it is associated with the choices, decisions, and behaviours expectant mothers can make during the prenatal and postnatal periods (21).

Specifically, high levels of MFA have been related to healthy behaviours (22) during pregnancy such as choosing a healthy diet, exercising, and receiving adequate prenatal care (23). Several

studies have particularly focused on the relationship between MFA and breastfeeding, anxiety, and postpartum depression (21, 24-26).

1.3.3.1 MFA and coping with anxiety and stress

A Swedish study reported that women with high MFA were found to more easily cope with stress and anxiety (27). Other studies have suggested that decreasing stress and anxiety can help women in their readiness to become mothers and caregivers (28, 29). However, there can be no cause and effect relationship drawn between such variables as many factors can affect stress and anxiety such as poverty and family support (30) since the relationships are not well understood. A systematic review done by Kingston, Tough, and Whitfield focused on prenatal and postpartum maternal psychological distress and infant development (31). In this systematic review, the authors emphasized that the maternal emotional state influences unborn babies as well as infants (31). Stress, anxiety and depression may affect the baby's cognitive, behavioural or psychomotor development (31). Finally, a study from the United States (U.S.) suggested that positive occurrences such as happy life events might reduce premature births (32).

1.3.3.2 MFA and antenatal depression and postpartum depression

Few studies have explored the link between MFA and antenatal and postnatal depression, although both kinds of depression are similar in severity (33). While a lack of evidence exists about the direct causes of antenatal depression, in some women, antenatal depression is associated with low levels of MFA (33). An American study investigated the relationship between MFA and major depressive disorders (MDD) and found that women with major depressive disorders may lack the ability and motivation to carry out lifestyle changes, experience strong feelings of worthlessness and guilt, or resist conceptualizing themselves in the

maternal role (34). Similarly, they found that women with major depressive disorders had lower levels of MFA (34).

1.3.3.3 MFA and smoking cessation

Two U.S. studies focused on pregnant women who smoke and their smoking patterns during pregnancy (35, 36). In both studies, there was an association between high MFA and lowered smoking or smoking cessation to protect the baby; the women who did so reported that they were more engaged in healthy practices and lifestyle choices that they normally would not follow, but they did because they were pregnant (35, 36).

1.3.3.4 MFA and breastfeeding

Several studies have examined the role of breastfeeding and infant and maternal health and the relationship between breastfeeding and MFA. For example, Kramer and Kakuma conducted a systematic review called the “Optimal Duration of Exclusive Breastfeeding”. (37) In this review, they examined 3,523 articles about exclusive breastfeeding for six months compared to exclusively breastfeeding for three to four months followed by mixed breastfeeding by introducing liquid and/or solid food with continued breastfeeding thereafter through six months (37). Kramer and Kakuma examined the literature to assess the different associations of these practices with a child’s health, growth, and development and maternal health. They discovered that the advantages of exclusive breastfeeding included an association with a lower risk of gastrointestinal infection and help in maternal weight loss after birth. The researchers also found that exclusive breastfeeding did not impair growth (37). In another study, researchers also conducted a systemic review which examined 117 studies that focused on breastfeeding and asthma/wheezing; they concluded that there was a positive association between breastfeeding and the reduction of asthma/wheezing (38, 39).

With respect to MFA, several studies support the association between mothers who breastfeed and higher maternal-newborn attachment compared to those mothers who choose bottle-feeding (12, 40). However, both breastfeeding and MFA are affected by economic and social factors, such as desire for the pregnancy, food security, and lack of power (41) so it is not possible to assume a direct causal relationship.

1.3.3.5 MFA and skin-to-skin contact

Women who spent more time holding their babies and practicing skin-to-skin contact also had higher MFA (42). Holding the baby so that his/her skin is on the mother's skin is called Kangaroo Care or Skin-to-Skin Care. Feldman and Eidelman concluded that premature infants who received Skin-to-Skin Care as neonates have more autonomic functioning, their sleeping patterns are more organized, they have better cognitive abilities, and they have less stress and a stronger relationship with their mothers (42). Also Skin-to-Skin Care has an effect on the mother in that there is an association between Skin-to-Skin Care and a reduction in anxiety (42).

Other studies have suggested even more direct benefits of attachment for the baby since high levels of MFA are positively associated with styles of postnatal attachment and the relationship quality received (22, 41, 43). For instance, secure mother-infant attachments have been linked to a child's future success in exploration and problem solving (43), and the child's ability to regulate emotions and seek safety or comfort when under threat (44). In addition to healthy physiological benefits, high MFA affects psychological development and resiliency to life stressors and pains in kids in future (45). However, it must be noted here that the association and relationship direction between MFA and these outcomes in the child are not clear. It is possible that mothers with high levels of MFA and these positive attributes in their offspring are due to other factors such as superior social determinants of health and having an intended

pregnancy. Yet, it appears that MFA could be used as an indicator for a mother's healthy lifestyle choices, and as a predictor of which women need additional support.

1.3.4 Recommendations from Studies

At the end of most studies discussed in the previous section, common recommendations were made, as follows. Researchers noted that identifying MFA early in pregnant women is important so that health care providers can offer help and support to improve the physical and emotional health of expectant mothers, especially when some women suffer from psychological problems or other issues that would benefit from referrals to psychologists or social workers (27, 46-48). This support may facilitate the development of attachment and also reduce maternal morbidity (28). Educational sessions are also recommended that focus on techniques for coping with stressors and that provide women with information on the importance of breastfeeding and family support to enhance MFA (28, 29, 49). In another study, Mathur and Dhingra suggested that effective antenatal counseling with effective communication might address common breastfeeding problems (50), which may also help enhance MFA. In life it is impossible to confirm the temporal association between MFA or positive mental health the inter-relationship between these constructs is complex and many factors affect them.

1.3.5 Factors Associated with Higher MFA

Several studies have also identified factors that may increase MFA (24-26). Some of the factors that help the mother relate to the fetus are ultrasound (21, 51-53), fetal movement monitoring(10, 54), and fetal sex identification (55). With regards to fetal sex identification, health care providers and researchers should be mindful that in some cultures knowing the fetus'

sex may cause harm or decreased MFA. A 2013 article on fetal sex identification highlighted that some women may choose to terminate their pregnancies if the baby's sex is not as what they wish for, even if the baby was healthy (56). In a study, it was found that fetal sex identification might have a positive effect on MFA if it matches the parent's wishes (4). Expectant parents who knew the fetal sex displayed increased prenatal attachment compared to parents who did not want to know the sex of the fetus (55). Nonetheless, it cannot be said that the direction of the cause and effect relationship is clear because perhaps parents had high MFA and that is why they desired to know the sex.

A few researchers have emphasized the importance of measuring MFA early when the mother has confirmation that she has a viable pregnancy (57); as such, MFA is typically measured at ≥ 14 weeks of gestation (57). Moreover, a fetus perceived through ultrasound is confirmation of a new life and can be an extremely important milestone for both parents (58). Exposure to any kind of ultrasound examination (2D, 3D, or 4D) has additionally been linked to higher MFA and decreased anxiety (21, 51, 53), and other studies have reported no significant difference between using 2D, 3D, or even 4D ultrasound machines (53, 59). On the other hand, another study showed that 3D/4D ultrasound resulted in more attachment because the mother was able to visualize the baby and see his/her facial features more clearly, which increased recognition and MFA (52). Such conflicting results may be expected when assessing relationships where different research designs, measurement approaches, populations, and variables are tested and applied (17).

Fetal movement monitoring can also affect MFA. Fowles found that fetal movement can be a factor that might increase MFA (60), and researchers in another study suggested that

counting fetal movements may enhance the MFA process, therefore nurses should teach pregnant women how to keep a daily record of fetal movement (10, 54). There are two ways to record the baby's movements, the first is to advise women to lay down on their sides and monitor the baby's movements for an hour everyday in fixed time (10). The second is to ask women to record the time needed to have 10 movements (10). Fetal movement counts are often used clinically as an indication on the baby's wellbeing, especially in the last trimester (10). Consistent associations between fetal movement counts and MFA have not reported, as a study by Mikhail et al found no association between recording the fetal movements and MFA (10).

Other factors were also found to be associated with mothers with higher MFA, and some of these may be modifiable (24-26). For instance, a study by Ji and Mam, and another by Faucher, suggested that practicing Qi-exercise/M-Yoga could increase MFA and decrease body discomfort and symptoms of depression (61, 62). Another factor might be mothers attending educational programs that support and motivate them and that explain the importance of MFA for mothers and their babies (48); it has been found that attending such programs and educational sessions may increase MFA (48). A Turkish interventional study measured MFA and stress before and after attending an educational program in 83 primigravid mother (48). The researchers choose the cases randomly and gave them four 2-hour educational sessions held weekly during the third trimester (48). In those sessions, women were provided with information regarding the meaning of attachment, the benefits of MFA and how to try to increase MFA(48). Also, women were asked to fill Cranley's tool to measure MFA and a questionnaire to assess mental health (48). The authors reported no significant difference between the mean of the attachment scores in case and control groups before the intervention ($P = 0.51$), but it was significant after the intervention ($P < 0.001$) (48). At the end of the study the research team

concluded that there are significant differences between cases and controls, educating mothers on MFA behaviour can increase the mother's mental health and MFA (48).

Additionally, social support may be an important factor that influences MFA (63, 64) as Cohen and Ashby suggested that to have high MFA, mothers need adequate psychological and financial support (65). Psychological support includes close relationships that encourages a woman to feel comfortable and valued and that help her build her self-esteem (66). On the other hand, income level may be an indirect factor affecting MFA, as poverty is a powerful predictor of antenatal depression (30). Specifically, the rates of depression are 1.5 to 2 times higher among the lowest socioeconomic groups (30), and depression is associated with lower MFA (30).

Conversely, other factors did not show significant relationships with MFA; these included gravidity, infertility history, medical interventions during pregnancy, multiple gestations, and educational levels (21, 67). However, given the previous factors that were discussed above, it can be concluded that research and supporting evidence indicate that health care providers can initiate actions to help mothers increase their level of attachment to their unborn babies.

1.3.6 Tools to Measure MFA

Tools such as questionnaires are frequently used in the fields of psychology and health (68). In this study, examining the tools that were available to measure MFA was an essential step so that the researcher could choose which tool to adapt. Examining the tool's psychometric properties meant studying its *reliability* and *test score validity*. Reliability focuses on three concepts: first, whether the tool has been tested repeatedly on the same individuals, and if it then gives similar results. This concept is also called stability (69). Second, if different investigators

have used the tool, does it give similar results? This concept is called equivalence (69). Finally, do the items in the tool correlate with each other? This concept is called homogeneity (69). This study focuses on homogeneity which sometimes is called internal consistency. Internal consistency focuses on measuring the correlation between the items in an instrument and is the most frequently used method to assess reliability (69); it also has an advantage because it can be conducted by using a single form given at a single administration by Cronbach's alpha (70).

Alpha (α) provides the amount of measurement error in a test and is a value that ranges from 0 to 1(71); the acceptable range for Cronbach's alpha is between 0.70 to 0.95 when measuring internal validity (71). Cronbach (1951) argued that "high α is therefore to be desired, but a test need not approach a perfect scale to be interpretable. Items with quite low intercorrelations can yield an interpretable scale" (72)(p.332). Finally, alpha can be affected by a couple of factors, and a low value of alpha may be the result of a low number of items as well as by items being uncorrelated (71, 73).

Validity focuses on knowing if the tool being measured really measures what it intends to measure (69). There are two types of validity: *internal validity* that focuses on whether or not the study is free of bias or systematic error and *external validity* that focuses on whether the study can be generalized or applied to populations that did not participate in the study (70).

Furthermore, the validity of a scale can be assessed by validity assessments such as face validity, content validity, criterion validity and construct validity. In *face validity*, the researcher or experts will assess the validity of the measurement (tool) by looking at its items and decide whether these items can measure the desired variable (69). Face validity is considered not enough to be use by itself to validate a tool, due to that it has been recommended to use more than one way to assess the validity of the tool (74).

Content validity is also a judgment call that asks if the content of the measurement (tool) is representative of the construct and able to measure the domain of the desired variable. Researchers will give evaluators the tool and ask them to evaluate if the items are clear, appropriate and comprehensive (74). Some authors reported that face validity is a part of content validity(75) while other disagree with this opinion (76). Then, *criterion validity* focuses on the relationship between the scores of the test and the scores of the “gold standard test”(77). There are 2 types for criterion validity; concurrent and predictive validity (74, 78).

Finally, *construct validity* is the extent to which the measurement corresponds to theoretical concepts concerning the phenomenon under study; this is considered to be one of the most important validity measures used in psychology (79). There are many types of construct validity and the researcher should choose the best one according to his/her problem as they work in different ways (74); convergent validity, discriminant validity, known-group validity and factorial validity (74). In our study we are focusing on factorial validity which can help in exploring the tool whether it is unidimensional or multidimensional (74).

It is important to highlight the differences between the reliability and validity a measure tool as described above and the validity of a study. Internal validity of a study refers to the degree to which inferences made are accurate and well founded (80). External validity of the study focuses on whether or not the study results can be generalized to other populations (81).

A number of tools have been developed to measure MFA, and each one has been developed in a different way. The following section provides more information about these specific tools.

1.3.6.1 Cranley's (1981) MFA scale

Cranley's Maternal Fetal Attachment Scale (MFAS) was the first tool validated to measure MFA (14). Cranley designed the MFAS based on experts' interpretation of pregnant women's emotions and behaviours, rather than on women's own experiences (14). This tool lists 24 items that are divided into 5 dimensions:

1. Differentiation of self from the unborn baby (4 items) (14)(p.282)
2. Interaction with the baby (5 items) (14)(p.282)
3. Attributing characteristics and intentions to the fetus (6 items) (14)(p.282)
4. "Giving of self" (5 items) (14)(p.282)
5. "Role taking" (4 items) (14)(p.282)

These items were scored using a 5-point Likert-scale, with a sample size of 71 pregnant women who were near the end of their pregnancies (14, 67).

Cranley first assessed internal reliability by calculating Cronbach's alpha; this scale had 37 items, but Cranley removed 13 items to increase the correlation between the items (82). This left the scale with 24 items and a Cronbach's alpha coefficient of 0.85, which was considered as acceptable internal consistency (82). Then, the validity of the tool was assessed via two types of validity. It has been reported that content validity was tested by asking a group of clinicians, Lamaze teachers, and pregnant women to give their feedback on the tool (82). Predictive validity was assessed by examining the correlation between the MFAS score and the Neonatal Perception Inventory (NPI) score (82). The NPI was chosen as a reference tool as it measures the mother's perception of her infant after birth (82). Researchers predicted that if the women had high MFA at the end of their pregnancy, they would have positive feelings after giving birth. Thus, three days after the mothers gave birth, the researchers gave the participants the NPI to correlate the

scores (82). The results were unexpected as there was no correlation between the 2 inventories (82). MFA is known for being the first valid and reliable tool to measure MFA and was launched in the U.S. in 1981 (14); it has subsequently been adapted and used in India in 2012 (83), in China in 2012 (84), and in Taiwan in 2013 (85) (see Table 1.1 below).

Critical appraisal of the validity and reliability of Cranley's MFAS tool

Later, researchers such as Muller (86), Condon (87), and Kemp and Zachariah (88) stated that Cranley's definition of MFA was vague and needed more clarification to be a valid tool. Muller also criticized the reliability of Cranley's MFAS tool (88) after using this tool to study the association between stress and MFA on 3 separate occasions and obtaining inconsistent results (82). In our study, we also noted that Cranley assessed validity in two ways which was considered a strength especially that it couldn't assess it with concurrent validity by comparing the score with other tool that measures MFA because it is the first so no tools to compare with. Cranley also had an internal consistency of 0.85, which is within the acceptable range of being above 0.75. However, there were also some limitations such as Cranley did not conduct factor analysis to corroborate the 5 themes that she stated her tool measures. Furthermore, Cranley mentioned that a group of people were asked to give their feedback on the tool as a process of content validity; however, it was not clear how many people were asked to assess content validity.

1.3.6.2 Condon's (1985) Maternal Antenatal Attachment Scale

Condon aimed to focus on pregnant women's experiences during pregnancy (83); consequently, Condon designed the Maternal Antenatal Attachment Scale (MAAS), which now has 19 items based on women's experiences, specifically their feelings, behaviours and attitudes

towards their babies (83). Items were generated from literature review and interviews with pregnant women then they were scored by a Likert-scale (1 = the absence of feelings towards the fetus, 5 = very strong feelings towards the fetus). Condon went through multiple steps to establish MAAS, first she piloted it on 54 women to collect evidence of face validity; then, the items were reduced to 27 (87). Then, she recruited a sample size of 112 pregnant women to fill out the MAAS; after this, Condon reduced the items to 19 (82) to reach desired internal consistency “Cronbach’s alpha which was 0.82 “ and study power 0.80 (82), and a construct validity was performed by factor analysis; it concluded that the MAAS had two factors: quality and duration of the bond (89). This tool has been adapted and used in Holland (2010) (90), Hungary (2014) (91), and Turkey (2014) (92), (see Table 1.1 below).

Critical appraisal of the validity and reliability of Condon’s MAAS tool

Some researchers have criticized Condon’s MAAS. For example, Zimmerman and Doan (89) questioned the reliability and validity of MAAS based upon their experience using the MAAS in a study which aimed to examine the MFA between three groups of women (primigravid women, multiparous women with “healthy” children, and multiparous women with children diagnosed with Down’s syndrome)(82). They used the MAAS to measure MFA at two time points – following the first measurement of MFA, primigravid women had higher scores and showed more attachment, while at the second time point, no differences were observed between groups (82). Later, Gaffney and Mercer (90) confirmed Zimmerman & Doan’s criticism and stated that MAAS presented contradictory results(93). In our study, we also criticized this tool for not knowing if Condon assessed validity in more ways other than face validity.

1.3.6.3 Muller's (1993) Prenatal Attachment Inventory

Muller focused on pregnancy adaption and attachment (affiliation), meaning a mother's thoughts and feelings toward her unborn baby (94). Muller's items were generated from literature searches from which he established a pool of 48 items (67). The items were scored using a Likert-scale with 4 response categories that ranged from "almost always" to "almost never" (67). To study the psychometric properties of Prenatal Attachment Inventory (PAI) Muller assessed validity by sending the PAI to 11 experts for content validity whereby 19 items were eliminated, resulting in a 29-item inventory (82).

Later, Muller examined the reliability of the 29 items and had to eliminate another 8 items to raise the internal reliability, which resulted in a 21-item tool (67). Finally, Muller retested the 21-item tool on 336 women to assess concurrent validity in women with low risk pregnancies and who were between 14-41 weeks of gestation (67). Women were asked to fill out the PAI, a demographic questionnaire, the MFAS, the Marital Satisfaction Scale and the pregnancy adaption tool (82). Muller then studied the relationships among these tools, conducted factor analysis and re-assessed reliability by calculating Cronbach's alpha coefficient. Due to all of these tests and evaluations Muller modified her tool and had the PAI, this new version of the 21-item tool has been tested on 310 pregnant women and had Cronbach's alpha 0.81. This version was adapted and used in Italy (2015) (95), Sweden (2008) (96), and France (2010) (97) (see Table 1.1 below), and it has been stated in an article that Siddiqui reported that modified version of PAI have high internal consistency (82).

Critical appraisal of the validity and reliability of Muller's PAI tool

There have been mixed reviews about Muller's PAI tool. Researchers such as Siddiqui, Hagglof and Eisemann have questioned Muller's conclusion that MFA is one-dimensional as

they believed that the tool has many dimensions (60). Siddiqui stated that the PAI tool has high internal consistency ($\alpha=0.81$) (89, 98), Vedova declared that PAI was both reliable and valid (95), and others have considered it to be a promising psychometrically sound instrument (57, 67). In our study, we had mixed reviews about the PAI. For criticisms, it was noted that Muller had 11 people review the original PAI for content validity; however, no justification was provided for how this sample size was determined. Muller also included women from the 14th gestational week until the 41st in the sample, although many articles have recommended measuring the attachment only during late pregnancy (14). However, the sample size used to test validity and reliability was 336 women, which follows the WHO's recommendations of having a minimum 10 people for each item to evaluate some kinds of psychometrics properties of the scale. See Table 1.1 below that outlines the comparisons between MFAS, MAAS, and PAI.

Table 1.1: Comparisons between MFAS, MAAS, PAI

Tool	Sample Size	Number of items	Gestational weeks	Validity	Reliability	Critique
Maternal Fetal Attachment Scale (MFAS) (14)	71	24	35-40	<i>Content validity:</i> A group of experts were asked. <i>Predictive validity:</i> The NPI was chosen as a reference tool as it measures the mother's perception of her infant after birth.	Internal reliability was assessed by calculating Cronbach's alpha coefficient.	1- The predicted validity was explained in clear steps. 2- Small sample size. 3- Did not use factor analysis to conclude the themes. 4- Did not mention how many people were asked to assess content validity. 5- predictive validity was not applied
Maternal Antenatal Attachment Scale (MAAS) (87)	112	19	14-41	Condon did factor analysis and had 2 themes, but there were few psychometric data on this tool.	Assessed internal reliability by calculating Cronbach's alpha coefficient.	1- Small sample size. 2- It is not clear if psychometric properties were assessed. 3- Other researchers recommend measuring the MFA at late pregnancy, but it is more convenient for researchers to widen their inclusion criteria.
Prenatal Attachment Inventory (PAI) (57)	310	21	14-41	<i>Content validity:</i> Tested by asking 11 people. <i>Concurrent validity:</i> Tested by correlating the scores of PAI with MFAS, marital satisfaction and pregnancy adaption. <i>Construct validity:</i> Assessed using factor analysis	Assessed internal reliability by calculating Cronbach's alpha coefficient.	1- Reported how many people were involved in content validity. 2- Large sample size. 3- Other researchers recommend measuring the MFA at late pregnancy. 4- Muller did not provide an interpretation of the scores. 5- Assessed reliability only in one way.

1.3.7 Ways to Adapt the MFA Tool

Several researchers have described their process of adapting a tool for their country to measure MFA (67, 89). The following table (Table 1.2) provides a list of countries that have adapted such a tool and notes which tool has been adapted. It also includes the researchers' study design, sample size and methodology. In general all the articles reported that to adapt a tool in a certain language a quantitative study was conducted, translation steps varied but none reported detailed translation process. To assess reliability all the articles reported that they calculated Cronbach's alpha. For validity there were different ways to assess it and report it. Finally, none of the countries reported an explanation on how to interpret the scores and how to use the tool in real life.

Table 1.2: Approaches to Adapting the MFA Tools

Country	Adapted Tool	Sample Size	Study Design	Methodology
China (84)	Muller (PAI)	N=181 women	Quantitative research; cross-sectional survey design.	Went through 5 stages; translated and reviewed the tool, then translated it back to English with revision by a panel of specialists; finally, piloted the tool on a sample. Assessed reliability by calculating Cronbach's alpha coefficient and validity by assessing content and construct validity. In content validity, tested the tool with experts' opinions on the tool and then undertook factor analysis to assess construct validity.
Italy (95)	Muller (PAI)	N= 250 women	Quantitative research; cross-sectional survey design.	Translated the tool and distributed it to Italian women, then checked the reliability by calculating Cronbach's alpha coefficient and validity by implementing factor analysis and comparing the resulting factors with Muller's.
Hungary (91)	Condon (MAAS)	N= 253 Women	Quantitative research; cross-sectional survey design.	Translated the tool and then tested it to check reliability by calculating Cronbach's alpha coefficient. The validity of the Hungarian MAAS was examined by convergent validity with the Hungarian PAI.

Country	Adapted Tool	Sample Size	Study Design	Methodology
Sweden and Poland (96)	Muller (PAI)	N= 171 Swedish Women N= 238 Polish Women	Quantitative research; cross-sectional survey design.	Translated the tool and then translated it back to ensure accuracy; next, distributed it to Swedish and Polish pregnant women to check reliability and to compare it between the 2 populations.
India (83)	Cranley (MFAS)	N= 230 Women	Quantitative research; cross-sectional survey design.	Translated the tool and then tested it to check reliability by calculating Cronbach's alpha coefficient and validity by using content validity. Selected 10 trained maternal healthcare nurses from the nearest primary health care centers and 10 experienced consultant obstetricians for the English version. Both of these groups were asked to rate the MFAS scales based on the following criteria: relevance, clarity, simplicity, and ambiguity. Each was further rated on a 4-point scale.
Turkey (92)	Condon (MAAS)	N= 190 Women	Quantitative research; cross-sectional survey design.	Translated the tool and then tested it for reliability by calculating Cronbach's alpha coefficient and tested validity by using content and construct validity. In content validity, the researcher asked 20 experts in maternal health to attribute a score from 1 to 4 for the suitability of each item. In this evaluation, which was directed at whether each item could be properly understood, a score of 1 expressed a valuation of "unsuitable" 2 was "somewhat suitable but the item still needs to be made suitable" 3 was "mainly suitable but needs minor adjustments" and 4 was "entirely suitable" Then, the adequacy of the sample was assessed to determine if factor analysis could be used to assess construct validity.

Country	Adapted Tool	Sample Size	Study Design	Methodology
Spain (99)	Condon (MAAS)	N= 525 Women	Quantitative research; cross-sectional survey design.	Two independent bilingual people translated MAAS items into Spanish. They then discussed their results and clarified the wording and meaning until a consensus was reached. Then, two other bilingual people who were unaware of the original MAAS version translated the version in Spanish back into English to contrast its conceptual content. No differences were found between the original and the back-translated version. Then, the Spanish version was piloted and confirmatory factor analysis (CFA) was conducted for validity. The result was a brief version of 12 items that fit under two factors and which was recommended for Spanish women.

1.4 Research Objectives

The research objectives of this study were to translate Muller's Prenatal Attachment Inventory (PAI) from English to Arabic, to examine if the Arabic version was a good fit for Arab culture and could be adapted there. Then to test it on pregnant Arab women at King Khalid University Hospital (KKUH) in Riyadh, Saudi Arabia, to explore its psychometric properties.

Muller's PAI was chosen because it was the most recent tool of the three examined (MFAS, MAAS and PAI), and it had the best psychometric properties of the three tools (67, 89, 100) with high internal consistency and showed evidence of validity in more than one type of validity. All of the researchers from other countries who had adapted Muller's PAI had not changed any item of the original tool to fit into their own culture's context. In one of the studies, a general critique was that the three tools MFAS, MAAS and PAI did not assess if the tool conformed to the culture (1); thus, It has been recommended that when other researchers want to adapt a tool, they need to assess if it fits for their culture (1). Consequently, an objective of this study was to accomplish this. The final objective of the study was to have a tool that was culturally acceptable, reliable, and had valid scores that could be generalized to other Arab countries to help health care workers and researchers fill the gap in the existing research where no researcher had yet explored a tool for the Arab culture and MFA.

CHAPTER 2: TRANSLATION OF THE PRENATAL ATTACHMENT INVENTORY FROM ENGLISH TO ARABIC

2.1 Background

Translation is the act of finding the equivalent meaning of a text in another language; the emphasis on meaning equivalence is important since in translation meaning is the object to be rendered from the source language text into the target language text (101). Ideally, the translation process should be comprised of sub-processes such as verifying cultural competencies and meaning accuracy.

With the development of health care worldwide, a number of new tools, educational materials, journal articles, and other resources have been established in diverse languages. Consequently, translation has become an important skill for health care providers to possess and for them to be aware of its theories. Moreover, before any health care provider decides to use a translated tool, he/she should check its accuracy.

However, many researchers and academics do not report how the tool, educational material, or other resources were translated. This is important, as simple translation can change the meaning of the original source tool resulting in an inaccurate tool (102). For example, a group of researchers used Google Translate to translate 10 medical statements into 26 different languages(102). To evaluate the resulting 260 new translated statements, the researchers sent these new translations to native speakers in each language for back translation (102). The results showed that Google Translate gave accurate meanings for 57.7% of the statements and

mistranslated 42.3% of them(102). Western European languages had the best translation rate at 74% accuracy (of these, Portuguese scored the highest with a 90% correct translation rate) while African languages had the worst accuracy rate at 45% (Swahili scored the lowest with only a 10% correct translation rate) (102).

Human translation is the most accurate (102, 103), thus it is important to check the accuracy of any translated tool before using it. The Universal Translation Approach (UTA) was developed to address the challenges of dealing with languages spoken in multiple countries worldwide (103). This approach does not assume that a translation produced for one country—for example, German tools—will be usable in another German-speaking country such as Austria (103). However, UTA is the most applicable in this research which focusing on translating the PAI from English to Arabic, because there are 11 countries that have Arabic as their primary language and a couple of countries with Arabic as their secondary language. Furthermore, with the current ongoing refugee and immigration crisis, Western, European, and Asian countries will need tools in Arabic to deal with newcomers.

This research is divided into two phases; this chapter focuses on the first phase during which the PAI was translated from English into Arabic. The UTA is a detailed process that the researcher follows with the help of translators and reviewers to establish the most accurate, culturally acceptable translation with content validity. Content validity is defined as “The extent to which the measurement incorporates the domain of the phenomenon under study (70)” and it is typically estimated by gathering a group of subject matter experts (SMEs) together to review the test items (104). This process is applied in the UTA where reviewers will assess the items

and give feedback to the researcher.

2.2 Methods

The UTA recommends that the source tool be simple and free of jargon (103); as the PAI items are very direct and simple, and do not have medical terminology, so we did not have concern with its initial language. Sonya and David (103) described the UTA approach well, which they explained in steps. In the first step, two independent translators translate the source document. Next, a third translator reconciles the two forwarded translations by choosing the better of the two from the previous step and resolves discrepancies between them. This version of the tool is then sent to a fourth person who translates the text back into English. This fourth person is a native English speaker who is fluent in the target language. Then, the tool is given to at least three independent reviewers who are asked to check the translation for each item or to provide alternate translations if needed. The recommendations are then reviewed by a language coordination team to reach agreement on each item. Finally, a translation expert proofreads the tool and its format (see Figure 2.1). During the translation process, the reviewers use a questionnaire to assess the aimed language tool (Arabic version of PAI) (Appendix 1) to determine whether or not the items are clear and culturally appropriate, or if they have any suggestions for making it more suitable. At the end of the questionnaire, the reviewers express their thoughts on certain words used in the Arabic version of PAI. This step is also important to ensure the readers of the tool have the same meaning, whether they read the tool in Arabic or English.

In this research, Sonya and David's (62) steps for the Universal Translation Approach were followed exactly as described. It was recommended to have at least 3 reviewers in this

study; however, the research team decided to ask seven women to review the Arabic version of PAI. Seven women were chosen to give more diversity in nationalities and educational levels (see Table 2.1). Participants were recruited from 3 distinct groups: academics, health care providers, and pregnant women. These groups were chosen for different reasons: pregnant women were chosen because they are the ultimate target population for this tool, academics were included to give expertise in reviewing the language, and health care providers were included as they might use the PAI in the future. A larger sample was also necessary to capture content validity, which is considered one of the first evidences of validity.

Table 2.1: Description of the Reviewers

	Reviewer	Reviewer category	Reviewer nationality
1	Reviewer 1	Academic	Egyptian
2	Reviewer 2	Academic	Lebanese
3	Reviewer 3	Physician	Saudi Arabian
4	Reviewer 4	Patient Educator	Qatari
5	Reviewer 5	Pregnant Woman	Syrian
6	Reviewer 6	Pregnant Woman	Saudi Arabian
7	Reviewer 7	Pregnant Woman	Canadian (an immigrant, originally from Egypt)

Figure 2.1: Universal Translation Approach

The seven reviewers were asked to complete a questionnaire that consisted of four parts. In the first part of the questionnaire, the reviewers read the introduction, instructions, and demographic questions of the Arabic version of PAI; they then answered the following questions:

- Were the previous instructions clear to you?
- If they were not clear, would you please tell us why?
- Do you have any suggestions for making them clearer?
- Would you please provide us with those suggestions?
- Was the previous translation accurate?
- If not, would you please provide us with a more accurate translation?

For the second part, the reviewers were presented with the 25-items from the PAI in a table and asked to answer the following questions for each item, and to provide additional comments, if desired:

- Was the item difficult to understand? If yes, why?
- Do you suggest another way to phrase this item? If yes, what is it?
- Was this item offensive to you? If yes, why?

In the third part, the reviewers were asked to express their thoughts and ideas regarding the meaning of words in the questionnaire that could be understood in various ways and the researcher asked the reviewers to provide their own definition of the following words:

- In the fourth item (في اعتقادي طفلي قد أصبح لديه شخصية), what does the word (personality = شخصية) mean to you?

- In the sixth item (أعلم بأن ما أقوم به من أفعال وأعمال يؤثر على طفلي), what does the word (affect = يؤثر) mean to you and how would your acts affect your baby?
- In item number 21 (أشعر بالحماس عندما أفكر بطفلي), what does the word (excited = الحماس) means to you? and how do you think excitement can increase between you and your unborn baby?

In the fourth part, the reviewers suggested more items to be added to a tool that measures the attachment between the mother and her unborn baby. Finally, the tool was sent to an expert in linguistics for the Arabic language to review and it was then formatted by the researcher.

2.3 Results

Seven women were recruited to provide feedback on the Arabic version of PAI (Table 1). In the first part of the translation, reviewers were asked to assess the clarity and translation accuracy and to provide suggestions for improving the introduction, instructions and demographic questions. Six reviewers stated that the instructions were clear, found the translation to be accurate, and did not provide any suggestions for improvement. One reviewer provided some suggestions for how the introduction could be re-phrased to improve its clarity.

For the second part of the translation, the reviewers were asked if it was difficult to understand individual items and if the items were culturally appropriate. Most reviewers agreed that the items were easy to understand with the exception of item #18, which two reviewers felt was not clear (see Table 2.2). Suggestions were also made about how to improve the clarity of items 5, 15, 18, 20, and 21.

In general, most of the suggestions were for minor changes. For example, Item #5 in English says, “I let other people put their hands on my tummy to feel the baby move.” When we translated this into Arabic, the word “others” means “strangers.” If any Arab woman were asked this question, she would answer “no;” therefore, we changed it to be, “I let close people, friends and family members put their hands on my tummy to feel the baby move.” In this way, we kept the meaning of the item but, at the same time, tailored it to fit the Arab language.

In another example, in the English version item #18 says, "I stroke the baby through my tummy". In English, the word “stroke” means “applying gentle pressure,” while in Arabic it means “hitting.” To maintain the same meaning, we changed the item to read, *أمسح على بطني حتى يشعر طفلي بي*, which means in English, “I touch my tummy so my baby can feel me.” The rest of the items had very minor changes due to grammar and sentence structure. All reviewers agreed that none of the items were offensive and all items were culturally acceptable.

Table 2.2: Results of the Second Part of the Reviewers’ Questionnaire

	Was the item difficult to understand?	Do you suggest another way to phrase this item?	Was this item offensive to you?	Comment
Item#1	7/7 no	7/7 no	7/7 no	
Item#2	7/7 no	7/7 no	7/7 no	
Item#3	7/7 no	7/7 no	7/7 no	
Item#4	7/7 no	7/7 no	7/7 no	
Item#5	7/7 no	6/7 no 1/7 yes	7/7 no	Grammar
Item#6	7/7 no	7/7 no	7/7 no	
Item#7	7/7 no	7/7 no	7/7 no	
Item#8	7/7 no	7/7 no	7/7 no	
Item#9	7/7 no	7/7 no	7/7 no	
Item#10	7/7 no	7/7 no	7/7 no	
Item#11	7/7 no	7/7 no	7/7 no	
Item#12	7/7 no	7/7 no	7/7 no	
Item#13	7/7 no	7/7 no	7/7 no	

Item#14	7/7 no	7/7 no	7/7 no	
Item#15	7/7 no	6/7 no 1/7 yes	7/7 no	
Item#16	7/7 no	7/7 no	7/7 no	
Item#17	7/7 no	7/7 no	7/7 no	
Item#18	5/7 no 2/7 yes	4/7 no 3/7 yes	7/7 no	Translation
Item#19	7/7 no	7/7 no	7/7 no	
Item#20	7/7 no	6/7 no 1/7 yes	7/7 no	Wording
Item#21	7/7 no	5/7 no 2/7 yes	7/7 no	Wording

In the third part of translation, reviewers were asked to provide their definitions for a couple of words mentioned in the tool that could be understood in different ways. Table 3 (below) reflects the results for this section.

Table 2.3: Results for the Third Part of the Reviewers' Questionnaire

1	<p>The reviewers defined the word “personality” in the following way:</p> <ul style="list-style-type: none"> - The baby will have developed certain patterns and specific behaviours that will represent him/her. - Personality may start to develop during pregnancy. - The baby’s personality is noticed right after birth. - His/her personality is developed at pregnancy and is noticed later.
2	<p>The reviewers defined the word “affect” in the following ways and mentioned a few things/acts that would affect the baby:</p> <ul style="list-style-type: none"> - My behaviours and actions will have a certain influence on my baby. - Everything I feel/eat/drink/use may affect my baby. - My emotions can affect my baby and may even affect his/her personality - There is a direct connection between my feelings and his/her feelings and development, and also my physical health, so I am obligated to take care of myself for him/her. - My health and his/her health are linked together.
3	<p>The reviewers answered “What does the word excited means to you and how do you think it can increase between you and your unborn baby?” in the following way:</p> <ul style="list-style-type: none"> - I am happy that I will have a baby soon. I am so excited to see the baby, to care for the baby, and to love the baby. - Excitement is linked to happiness.

	- I can't wait to hold him/her. - The night before my ultrasound appointment to learn the gender, I couldn't sleep because I was thinking of his/her gender all night. - Extremely happy.

For the fourth part of translation, the reviewers were asked to provide additional items they thought should be in any tool to measure maternal fetal attachment. The reviewers listed many items—some items had similarities while others were diverse. The list below outlines the sum of items mentioned in the seven reviewers' questionnaires:

1. I feel I want to talk to my baby.
2. I sing to my baby.
3. I read a book in a loud voice so the baby can hear me.
4. I prepare myself for breastfeeding.
5. I attend classes for physical and emotional care for my baby.
6. I use an application to monitor my baby's growth and to ensure everything I feel is normal.
7. I search for pictures online to estimate my baby's size in my stage of pregnancy and how he/she looks.
8. I imagine myself hugging my baby.
9. I eat healthily for my baby.
10. I stopped drinking coffee and eliminated all junk food to have a healthy baby.
11. I try my best to be relaxed and away from stress/sadness for the good of my baby so he/she will not feel it.
12. I do not like being next to a smoker.

13. I read books/websites about pregnancy and what to expect.
14. I discuss my fears and thoughts with other mothers.
15. I wonder if my baby is growing well and if the weight is normal for his/her age.
16. I make sure to attend my doctor's appointments.
17. I think about how I can provide him/her with the safest environment.
18. I think about my baby's future.
19. I wish the days would pass faster so I could hold my baby and put him/her on my chest.
20. I take care with my movements so that I will not hurt my baby or myself.
21. When I feel my baby moving abnormally, I understand that he/she is not comfortable, so
I change my position
22. My husband and I keep talking about my pregnancy and our baby.
23. I think my baby knows when I am sad.
24. I get extremely stressed out if a day has passed without feeling my baby move.

It was suggested that many items be added into a tool to measure maternal fetal attachment, so the research team gathered similar items into one theme; as a result, four new themes/items were added to the original tool (see items 22, 23, 24, 25 in Table 4 below) and the research team were also inspired to ask a new question in the section of demographic variables, which was, "Have you downloaded an app on your phone to track your baby's growth?". Table 2.4 below displays the original PAI and Table 2.5 displays the adjusted personal attachment inventory.

Table 2.4: Original Prenatal Attachment Inventory

		Almost Always	Often (80%)	Sometimes (30%)	Almost Never
1	I wonder what the baby looks like.	1	2	3	4
2	I imagine calling the baby by name.	1	2	3	4
3	I enjoy feeling the baby move.	1	2	3	4
4	I think that my baby already has a personality.	1	2	3	4
5	I let other people put their hands on my tummy to feel the baby move.	1	2	3	4
6	I know the things I do make a difference to the baby.	1	2	3	4
7	I plan the things I will do with my baby.	1	2	3	4
8	I tell others what the baby does inside me.	1	2	3	4
9	I imagine what part of the baby I'm touching.	1	2	3	4
10	I know when the baby is asleep.	1	2	3	4
11	I can make my baby move.	1	2	3	4
12	I buy/make things for the baby.	1	2	3	4
13	I feel love for the baby.	1	2	3	4
14	I try to imagine what the baby is doing in there.	1	2	3	4
15	I like to sit with my arms around my tummy.	1	2	3	4
16	I dream about the baby.	1	2	3	4
17	I know why the baby is moving.	1	2	3	4
18	I stroke the baby through my tummy.	1	2	3	4
19	I share secrets with the baby.	1	2	3	4
20	I know the baby hears me.	1	2	3	4

Table 2.5: Adjusted Prenatal Attachment Inventory

		Almost Always	Often (80%)	Sometimes (30%)	Almost Never
1	I wonder what the baby looks like.	1	2	3	4
2	I imagine calling the baby by name.	1	2	3	4
3	I enjoy feeling the baby move.	1	2	3	4
4	I think that my baby already has a personality.	1	2	3	4
5	I let close friends and family members to put their hands on my tummy to feel the baby move.	1	2	3	4
6	I know things I do make a difference to the baby.	1	2	3	4
7	I plan the things I will do with my baby.	1	2	3	4
8	I tell others what the baby does inside me.	1	2	3	4
9	I imagine what part of the baby I'm touching.	1	2	3	4
10	I know when the baby is asleep.	1	2	3	4
11	I can make my baby move.	1	2	3	4
12	I buy/make things for the baby.	1	2	3	4
13	I feel love for the baby.	1	2	3	4
14	I try to imagine what the baby is doing in there.	1	2	3	4
15	I like to sit with my arms around my tummy.	1	2	3	4
16	I dream about the baby.	1	2	3	4
17	I know why the baby is moving.	1	2	3	4
18	I touch and tap gently on my tummy so the baby can feel me.	1	2	3	4
19	I share secrets with the baby.	1	2	3	4
20	I know the baby hears me.	1	2	3	4
21	I get very excited when I think about the baby.	1	2	3	4
22	I can't wait to hold, smell, and take care of my baby.	1	2	3	4
23	I am careful with my activities so that nothing will hurt my baby.	1	2	3	4
24	If I feel that my baby is not comfortable, I will change my position.	1	2	3	4
25	I eat healthy food to have a healthy baby.	1	2	3	4

2.4 Discussion

Unfortunately, some of the publications do not explain how they translated the tool, who did the translation, and how they assessed whether it was clear and culturally acceptable. The Universal Translation Approach was used to create an Arabic version of the PAI that is clear, culturally acceptable, and contains items with the same meanings as those found in the English version. An example of addressing the culture there were couple of changes such as:

1. In the demographic questions, usually those in Western cultures will ask if women have a boyfriends; however, in Arab culture, this is unacceptable, so we limited the choices Arab women could make into married, divorced, or widowed, and eliminated boyfriend."
2. In the demographic questions, usually in Western culture it is acceptable to ask women if they want to have an abortion; this is not acceptable in Arab culture, so Arab women were asked, "How did you feel about the timing of your pregnancy?" The choices were the following: 1) "I wanted to become pregnant earlier." 2) "I wanted to become pregnant at this point in time." 3) "I wanted to become pregnant at a later point in time."

Other publications reported that they translated source tools "usually from English" to another language to have a tool to measure maternal fetal attachment; they did so by implementing the following steps:

1. Translating the source tool to the second language.
2. Back-translating.
3. Piloting the study with a group of women.

Strengths and Limitations

There are many strengths in this study; first, the translation methods used were justified and comprehensive for the target population, as we justified why many translators and seven reviewers were needed. Second, the translation process was described in a detailed way compared to other studies where a tool was translated to measure MFA, such as the Korean (105), Turkish (92) and Italian (95) tools. Third, we engaged three categories of reviewers: pregnant women were engaged to obtain their feedback as the primary users of the tool, and academics and health care providers were chosen to ensure care in the translation. A diverse range of nationalities were also used as reviewers to represent Arab women. As a result of engaging the target population, new items were generated to be considered for addition to the original PAI tool.

This study is not without its limitations. Inherent in the translation process is a potential loss of meaning as minor changes had to be applied to the original items, such as adding words to further explain meanings or using different verbs to ensure the same meaning had been captured. The potential loss of meaning was particularly noticeable in the back translation step of this study. To mitigate this, translators compared the original and back translated items in Arabic and English, and confirmed the meanings were similar.

In conclusion, a rigorously transparent process was used to adapt a validated English tool into a culturally appropriate tool in Arabic that measures maternal fetal attachment. In addition, the Arabic PAI now includes 4 extra items that were generated from the process of different women reviewing the tool.

CHAPTER 3: TESTING THE ARABIC VERSION OF THE PRENATAL ATTACHMENT INVENTORY

3.1 Background

Tools to measure behaviours, attitudes and thoughts are used in the field of health to provide health care providers and researchers with the ability to explore research participants' behavioural patterns or to identify a specific characteristic in a group of participants (68). Such tools are established in different ways and are available in many languages; as such, researchers and health care providers must determine if a specific tool can provide accurate and valid results in their population of interest (101). These tools are referred to as “psychological measurements” and checking psychological measurements is referred to as psychometrics (68). Psychometrics is a science that focuses on studying the construction, reliability, and validity of psychological measurements such as questionnaires, tests, and personality assessments (1).

In assessing the psychometric properties of the Arabic version of the Prenatal Attachment Inventory (PAI), reliability and validity were the main focus. The reliability will be assessed by internal consistency, and construct validity was used as a measure of validity. A common method used to evaluate construct validity is factor analysis (106, 107). This is a set of statistical methods for analyzing correlations among several variables to estimate the number of factors, commonly referred to as dimensions or subscales, that underline the observed data by using variances to find communalities between variables (108). Factor analysis is primarily and frequently used in psychology and education, and is considered one of the best methods to interpret self-reported questionnaire data (106). It is divided into two types— Confirmatory Factor Analysis (CFA) and Exploratory Factor Analysis (EFA) (108). CFA is used to confirm a

hypothesis on the tool structure and underlying factors (108) and provides researchers with the ability to compare factors underlying a set of questions to explain responses to the questions (109). EFA is used to explore the relationship between the items in the tool (106), and to provide researchers with an understanding of whether or not the tool is unidimensional/one-factor via grouping correlating items under one factor (106). Both CFA and EFA can also help in assessing construct validity (106) and in approving or disapproving proposed theories regarding the division of items in the tool (106).

In the literature, most of the articles focused on adapting a tool to measure Maternal Fetal Attachment (MFA) in another setting reported working through a translation phase wherein the tool is given to translators, revised, and back translated into the source language (83, 84, 92, 95, 96, 99). The tool is then tested on a group of women to check the reliability and the validity of the score (83, 84, 92, 95, 96, 99). In all of the articles, researchers assessed reliability by calculating Cronbach's alpha, but they used different methods to assess score validity. In the Chinese (84) and Turkish (92) versions of the tool, researchers conducted two validity measures: content validity wherein a panel of experts were asked to evaluate the tool (84, 92) and construct validity, which was assessed by factor analysis (84). Researchers in the Italian version used factor analysis to assess construct validity (95); while, Hungarian researchers validated Maternal Antenatal Attachment Scale (MAAS) by convergent validity with the Hungarian PAI (91).

As described in Chapter 2, Muller's PAI was translated from English to Arabic through a detailed process by examining culturally acceptability and content validity of the tool. This chapter aims to test the new Arabic tool in a group of Arab women to determine whether demographic variables were associated with MFA, and to explore the psychometric properties of

the Arabic PAI by calculating Cronbach's alpha to assess reliability and EFA to assess construct validity.

3.2 Methods

3.2.1 Sample

Pregnant women were recruited from the waiting area of the Obstetrics and Gynaecology Department in King Khalid University Hospital (KKUH), Riyadh, Saudi Arabia. KKUH is one of the largest hospitals in Riyadh, receiving many patients with complicated cases (20) and serves Saudi patients as well as the staff of King Saud University with their families. The waiting area contains three waiting rooms for the outpatient clinics, and laboratory and ultrasound departments. With the help of a resident, a member of research team approached pregnant women, briefly described the study, and invited them to participate.

Women were eligible to participate by meeting the following inclusion criteria:

1. Being from an Arab country and understanding and speaking Arabic.
2. Being pregnant and between 14-41 weeks of gestation. Muller (10) recommended this range of gestational ages because, by the second trimester, the most severe symptoms of nausea and tiredness are resolved. By this time, women have also begun to feel fetal movements (typically between weeks 14 and 16 for multigravida and by week 18 for primigravida) (8).
3. Having a low-risk pregnancy, as a high-risk pregnancy can affect the mother's thoughts and feelings toward her child, which will not give a true measure of MFA. For instance, a study in Sweden examined MFA for women with prenatally detected fetal Down syndrome and found that women's reactions varied—some women had a very strong

attachment while others experienced depression and stress (110). A Brazilian study also examined MFA in women who were told that their fetuses had a cardiac problem; in this context, MFA increased and the women became very sensitive and attached to their babies (111). Another study in England focused on how mothers who were in an appointment to diagnose chromosomal abnormalities in their babies were affected and the researchers found that MFA is impacted in such a situation (29). Finally, a study from England consists of 16-page document discussed how diagnostic tests affect mothers. This report mentioned a study in which the results revealed that diagnostic tests to check on a baby's health change the bonding process between mother and baby. As a result of such a test, the mother may feel more attached to the baby (112).

4. Being 18 years or older. This is because adolescent pregnancy has been associated with stress, disappointment, and low family support; as such, MFA should be evaluated separately for this group (66, 113).

3.2.2 Sample Size Considerations

An aim of the study was to recruit 250 participants. This sample size was determined based upon the following considerations. First, the World Health Organization's guide on the "Process of translation and adaption of instruments" recommended recruiting a minimum of 10 participants of different ages and socioeconomic status for each item (114). In this study, the Arabic PAI has 25 items (21 items from the original tool and 4 new ones), so 250 (10 participants X 25 items = 250 participants) women were needed with differing ages, and divergent socioeconomic and educational levels. Second, other researchers have recommended 2 to 20 subjects per item to ensure the validity of the score (115). Finally, for factor analysis, a

minimum sample size of 100 participants is recommended (106, 116).

3.2.3 Distributed Instrument

Women were given a two-page questionnaire that included questions from the Arabic translation of the PAI and participant demographics (see Appendix 2). If a woman addressed all of the 21 items (the original Muller's PAI), she achieved a score ranging from a minimum of 21 (representing a high MFA) to a maximum of 84 (representing a low MFA). On the other hand, if the women used the 25-item tool, they could have a score ranging from a minimum of 25 (representing a high MFA) to a maximum of 100 (representing a low MFA). As a reader, the previous scoring technique was a bit confusing, so we suggested another way of scoring in the recommendations section. From the continuous raw data, scores were categorized into thirds representing high MFA, moderate MFA, and low MFA. The following groups resulted from the 21 items:

- A group representing high MFA with scores between (21-42)
- A group representing moderate MFA with scores between (43-63)
- A group representing low MFA with scores between (64-84)

The following groups resulted from the 25 items:

- A group representing high MFA with scores between (25-50)
- A group representing moderate MFA with scores between (51-75)
- A group representing low MFA with scores between (76-100)

3.2.3 Data analysis

All analyses were conducted using STATA-13 or SPSS-19.

3.2.4.1 Descriptive statistics

Descriptive statistics were used to describe the basic characteristics of the data such as summaries about the sample and the measures. Descriptive analysis looks at frequencies, percentages with confidence intervals, means, standard deviations, and minimum and maximum values.

3.2.4.2 Association between MFA and participant demographics

To explore the association between MFA scores and demographic variables through the use of specific tests to examine the strength of the associations, two steps were undertaken. The first focused on exploring the association between the raw MFA scores “continuous” variable with the demographical variables. To do so, the distribution of the continuous variable (scores) was tested by performing the Shapiro-Wilk W test to examine if the scores were normally distributed. The test gave the p-values for both the 21-item (p-value=0.00148) and 25-item (p-value=0.00009) tool at less than 0.05, so the null hypothesis was rejected and it was concluded that both distributions were not normally distributed. This was graphically confirmed with histograms (see Figure 3.1 below).

Figure 3.1: Histograms to represent the distribution of the scores

Due to the skewness in the distribution of MFA scores, non-parametric tests were used to examine the association between MFA scores and demographic variables. The Non-Parametric Equality of Medians test focuses on the median, range (minimum value, maximum value) and p-values. If the p-value is larger than alpha (0.05), then the test indicates there is no association between the two variables; on the other hand, if the p-value is less than alpha (0.05), then the test indicates there is an association between the two variables.

In the second part, MFA scores were divided into three groups (high MFA, moderate MFA, and low MFA) and Fisher's Exact (if there was a value in the contingency table equal to 5 or less) or Pearson's Chi Square (if all values in the contingency table were greater than 5) tests were used to examine the association between the MFA categories and demographic variables

3.2.4.3 Assessing Reliability and Validity

Exploratory Factor Analysis (EFA) was used to assess the construct validity of the original 21-item PAI in the Arab population and the adapted 25-item PAI. This information was used to compare the results of this study with the original Muller's PAI and other similar studies

that focused on adapting a tool for measuring MFA. Usually, at least two or three variables must load on a factor to give a meaningful interpretation (4). If the researcher is able to have factors, he/she should start labelling them so that each factor represents a theme that has a list of items that correlate to each other. If the test shows that the loadings are distributed between the factors, this means the items cannot be divided into factors and should be characterized as unidimensional. For this study, this step was undertaken by conducting an Exploratory Factor Analysis and choosing the following commands: 1. Principal axis factoring with rotation type (VARIMAX), which considers the most common used between the rotation types (9). This focuses on rotating the items clockwise, according to their loadings, so that the researcher can more easily interpret the findings. 2. A sort command to sort the items by loadings. 3. Finally, a cut-off for the loadings, to identify the factors.

The four new items (#22, 23, 24, 25) were assessed by conducting frequency tables and examining the participant responses—specifically, whether the majority chose an answer versus if they did not answer the question, or if the responses were equally distributed between the options. Furthermore, the reliability of the Arabic version of the PAI was assessed by Internal Consistency. To determine if the tool had internal consistency, Cronbach's alpha coefficient was calculated for the 21- and 25-item tools.

3.2.4.4 Handling missing data

Prorated scores were used to address the missing data for the Arabic PAI. This technique has been used and recommended in previous studies (117, 118) and is based on the following

equation:

$$\text{Prorated total score} = \frac{([\text{Sum of scores}] \times [\text{N of items}])}{[\text{N of items answered}]}$$

Based on multiplying the total sum of the scale by the number of items in the scale, then dividing by the number of items actually answered, the prorated technique was applied to missing items as long as the overall response rate was greater than 80%. This was done twice for this study: the first time the scores for the 21 items were summed and then prorated. This technique was applied if the participants answered at least 17 out of 21 items. As a result, 9 observations out of 250 (3.6%) were lost when the response rate was less than 80% (i.e., when participants had answered less than 17 out of 21 items). Then, the prorated technique was again applied, but here the researcher summed the scores for 25 items and then prorated them and applied this technique if the participants answered at least 20 out of 25 items. As a result, 5 observations out of 250 (2%) were lost where the response rate was less than 80% (i.e., when participants answered less than 18 out of 25 items). The missing 9 observations from the 21-item list and the missing 5 observations from the 25-item list only affected the analysis regarding the scores, but not the descriptive statistics for demographic variables. The prorating technique for handling missing data is reported as a “suboptimal test” (117).

3.3 Results

3.3.1 Response rate

The response rate was high (96%), most of the women agreed to fill out the questionnaire. Some women refused to fill out the questionnaire and the researcher recorded the reasons as field notes; the following common reasons were noted:

1. The woman felt exhausted and was unable to focus.
2. The weather was too hot and the woman did not want to fill out any forms.
3. The woman was afraid that the receptionist would call her name for her appointment.
4. The woman was too rushed.

Overall, nine women who met the eligibility criteria declined to participate and 250 women agreed to be part of this study. However, other women who did not meet these criteria approached the researcher and asked if they could also participate. For example, an older woman came up to the researcher to ask if she could fill in a questionnaire, although she knew that the research was focused on women who were presently pregnant. This woman insisted on participating, and said, “I had 6 sons and daughters, so I can fill in six questionnaires.” As an investigator, I listened to her and told her that her experiences are important, but I could not use them in my research. This narrative was documented in this research because it reflects how research observers and participants can view research participation as an opportunity to feel important and to believe that their thoughts and behaviours are respected and valued.

3.3.2 Descriptive Data Analysis

The research sample consisted of pregnant woman attending appointments at the KKHU, an educational and government hospital that is partnered with King Saud University. This partnership is a strength because it offers university staff and their families access to the hospital, which allowed for some diversity in the sample. Out of 250 participants, 242 provided their nationality—as expected, 89% of the participants were Saudi Arabian. The mean maternal age of participants was 29.25 years old ($SD = 5.34$), with the oldest being 44 years old, and the youngest being 18. Moreover, all participants were married, except for two women—one who

was divorced, and the other who was widowed. A total of 64% of participants had completed a university degree while 53.6% reported that they were not presently working outside the home and were housewives. Most of the women were in their third trimester, had felt their baby's movements, and knew the baby's gender. From the sample, 58.4% of the participants reported they wanted this pregnancy during this time. Few women reported that their pregnancy was harmful to their health or to their baby's health. When women were asked if they had ever miscarried, 73.49% reported "no," knowing that abortion in Saudi Arabia is prohibited, unless there is a medical reason. At the end of the interview, almost half of the women reported that they had downloaded an application to follow the baby's growth and development on their tablet or mobile device. Finally, the participants were asked to give us their thoughts on how they planned to feed their babies—59.5% reported they would like to breastfeed their babies. See Table 3.1 below for a description of the demographic variable.

Table 3.1: Demographic variable descriptions

Variable	Frequency	Percentage	95% CI
<i>Age groups</i>			
18-22	18	7.41%	4.70 - 11.48
23-33	171	70.37%	64.28 - 75.81
34-44	54	22.22%	17.40 - 27.92
<i>Nationality</i>			
Saudi Arabian	216	86.40%	81.52 - 90.14
Others *	34	13.60%	9.85 – 18.47
<i>Education</i>			
Elementary degree	11	4.40%	2.43 - 7.79
High school degree	59	23.60%	18.71 - 29.30
Bachelor degree	162	64.80%	58.63 - 70.50
Graduate degree	18	7.20%	4.56 - 11.16
<i>Occupation</i>			
Housewife	133	53.63%	47.35 - 59.79
Student	38	15.32%	11.33 - 20.39
Employee with full-time job	65	26.21%	21.08 - 32.07
Employee with part-time job	12	4.84%	2.75 - 8.35
<i>Trimester</i>			
First trimester	8	3.27%	1.63 - 6.42
Second trimester	86	35.10%	29.34 - 41.32
Third trimester	151	61.63%	55.34 - 67.55
<i>Pregnancy timing</i>			
I have wanted to become pregnant for a long time	50	20.58%	15.92 - 26.16
I wanted to become pregnant at this time	142	58.44%	52.09 - 64.51
I wanted to become pregnant at a later time	51	20.99%	16.29 - 26.60
<i>Does this pregnancy cause any danger to your health?</i>			
Yes	16	6.45%	3.97 – 10.30
No	232	93.54%	89.69 - 96.02
<i>Does this pregnancy cause any danger to your baby's health?</i>			
Yes	17	6.88%	4.30 - 10.82
No	230	93.11%	89.17 - 95.69
<i>Number of children</i>			
This is my first child	89	36.18%	30.37 - 42.41
This is my second child	71	28.86%	23.50 - 34.87
This is my third child, or more	86	34.96%	29.21 - 41.17
<i>Have you felt the baby's movements?</i>			
Yes	225	90.73%	86.39 - 93.77
No	23	9.27%	6.22 - 13.60

Variable	Frequency	Percentage	95% CI
<i>Do you know the baby's gender?</i>			
Yes	189	76.21%	70.47 - 81.13
No	56	22.58%	17.77 - 28.24
I don't want to know	3	1.21%	0.38 - 3.71
<i>Did you download an application to follow the baby's growth?</i>			
Yes	116	46.40%	40.26 - 52.64
No	134	53.60%	47.35 - 59.73
<i>Feeding choice</i>			
Breastfeeding	147	59.51%	53.23 - 65.50
Formulated milk	16	6.48%	3.99 - 10.34
I don't know yet	84	34.01%	28.33 - 40.18

*Note: Other nationalities were: Syrian (6), Yemeni (5), Qatari (5), Egyptian (5), Palestinian (3), and Jordanian (2).

After completing the demographic variables, the women were asked to answer the Arabic 25-item tool (see Table 3.2 below). In reviewing the table, participant answers reflected a pattern— from the first item until item number 20, women checked off the four categories (almost always, sometimes, often, never) with similar frequency. However, from item number 21 to item number 25, most women tended to check off a particular category more than the rest. Also, as the table shows, some items had only one missing response while the other items ranged from having 2 up to 16 missing responses, according to the question asked. Finally, the table provides clear evidence of the acceptability of the four new items as most women answered these items with meaningful distribution of the observations between the four categories, which indicates the relevancy of these items.

Table 3.2: Participant answers to Muller’s PAI and the four new items

		Almost Always (1)	Often (80 %) (2)	Sometimes (30%) (3)	Almost Never (4)	Missing
1	I wonder what the baby looks like.	104 (41.94%)	70 (28.23%)	59 (23.79%)	15 (6.05%)	2
2	I imagine calling the baby by name.	69 (27.94 %)	54 (21.86%)	68 (27.53%)	56 (22.67%)	3
3	I enjoy feeling the baby move.	154 (63.90%)	49 (20.33%)	25 (10.37%)	13 (5.39%)	9
4	I think that my baby already has a personality.	28 (11.91%)	44 (18.72%)	69 (29.36%)	94 (40%)	15
5	I let other people put their hands on my tummy to feel the baby move.	109 (44.49%)	55 (22.45%)	40 (16.33%)	41 (16.73%)	5
6	I know the things I do make a difference to the baby.	124 (50.20%)	67 (27.13%)	44 (17.81%)	12 (4.86%)	3
7	I plan the things I will do with my baby.	120 (48.58%)	51 (20.65%)	51 (20.65%)	25 (10.12%)	3
8	I tell others what the baby does inside me.	52 (21.31%)	48 (19.67%)	67 (27.46%)	77 (31.56%)	6
9	I imagine what part of the baby I am touching.	79 (32.64%)	52 (21.49%)	54 (22.31%)	57 (23.55%)	8
10	I know when the baby is asleep.	57 (24.05%)	51 (21.52%)	67 (28.27%)	62 (26.16%)	13
11	I can make my baby move.	37 (15.42%)	47 (19.58%)	65 (27.08%)	91 (37.92%)	10
12	I buy/make things for the baby.	100 (41.15%)	68 (27.98%)	40 (16.46%)	35 (14.40%)	7
13	I feel love for the baby.	170 (69.11%)	40 (16.26%)	31 (12.60%)	5 (2.03%)	4
14	I try to imagine what the baby is doing in there.	94 (38.37%)	65 (26.53%)	55 (22.45%)	31 (12.65%)	5
15	I like to sit with my arms around my tummy.	109 (43.78%)	71 (28.51%)	46 (18.47%)	23 (9.24%)	1
16	I dream about the baby.	62 (25.20%)	53 (21.54%)	53 (21.54%)	78 (31.71%)	4
17	I know why the baby is moving.	41 (17.52%)	46 (19.66%)	73 (31.20%)	74 (31.62%)	16
18	I stroke the baby through my tummy.	128 (52.03%)	55 (22.36%)	38 (15.45%)	25 (10.16%)	4
19	I share secrets with the baby.	33 (13.64%)	28 (11.57%)	72 (29.75%)	109 (45.04%)	8
20	I know the baby hears me.	86 (35.10%)	48 (19.59%)	64 (26.12%)	47 (19.18%)	5
21	I get very excited when I think about the baby.	156 (63.93%)	52 (21.31%)	23 (9.43%)	13 (5.33%)	6
22	I can’t wait to hold, smell, and take care of my baby.	183 (73.79%)	33 (13.31%)	24 (9.68%)	8 (3.23%)	2
23	I am careful with my activities so nothing will hurt my baby.	152 (61.54%)	58 (23.48%)	28 (11.34%)	9 (3.64%)	3
24	If I feel that my baby is not comfortable, I will change my position.	179 (71.89%)	46 (18.47%)	21 (8.43%)	3 (1.20%)	1
25	I eat healthy food to have a healthy baby.	129 (51.81%)	71 (28.51%)	42 (16.87%)	7 (2.81%)	1

The 250 participant observations provided us with scores, which were then divided into categories for easier interpretation and for future use. These categories for interpretation are reflected in Table 3.3 (below).

Table 3.3: MFA scores for 21 item and 25 item groups

21 Item Group	Frequency	Percent, (95% CI)
1 (High MFA)	95	39.41 (33.40-45.77)
2 (Moderate MFA)	121	50.20 (43.88-56.52)
3 (low MFA)	25	10.37 (7.08-14.93)
25 Item Group		
1 (High MFA)	117	47.76 (41.52-54.05)
2 (Moderate MFA)	108	44.08 (37.94-50.40)
3 (Low MFA)	20	8.16 (5.31-12.34)

3.3.3 Association between demographic variables and MFA scores

3.3.3.1 Prenatal Attachment Inventory scores as raw continuous data

As seen in Table 3.4 (below), most demographic variables were not associated with continuous MFA scores for either the 21-item or 25-item groups. An association was observed between continuous MFA scores and parity, and women who were pregnant with their first baby tended to have lower MFA scores, demonstrating higher attachment. An association was also observed between continuous MFA scores and having knowledge about the baby's sex, whereby women who knew their baby's sex tended to have lower MFA scores, demonstrating more attachment. There was also an association between continuous MFA scores and feeding intentions; most of the women who planned to breastfeed their babies tended to have lower MFA scores, reflecting more attachment. Another association was found between continuous MFA

scores and downloading an application to follow the baby's growth—most of the women who downloaded the application tended to have lower MFA scores, representing more attachment.

Table 3.4: Association between continuous scores and demographic variables

Variable	Continuous scores of 21-items		Continuous scores of 25-items	
	Median (range)	P-value	Median (range)	P-value
Age groups				
18-22	38.92 (32-62)	0.089	43.74 (36-68)	0.146
23-33	45.07 (21-75)		52 (25-87.50)	
34-44	47.65 (28-77.70)		53.5 (32-91.67)	
Education				
Elementary degree	49.5 (35.7-66.15)	0.857	54 (40.63-76.04)	0.984
High school degree	46 (23.1, 77.7)		52 (27.08-91.67)	
Bachelor degree	45 (25-75)		51 (29-87.50)	
Graduate degree	44 (21-72)		50.54 (25-80)	
Occupation				
Housewife	48 (28-77.70)	0.065	53 (32-91.67)	0.170
Student	42 (27-70)		48 (31-77.08)	
Employee with full-time job	44 (23.1-74)		50 (27.08-84)	
Employee with part-time job	48.5 (21-73.50)		54.3 (25-85.42)	
Trimester				
First trimester	58 (42-75)	0.404	62 (46-85)	0.280
Second trimester	45.67 (27-72)		52.08 (31-82.29)	
Third trimester	44.1 (21-74.55)		50.5 (25-87.50)	
Pregnancy timing				
I have wanted to become pregnant for a long time	45 (23.1-75)	0.491	51 (27.08-85)	0.680
I wanted to become pregnant at this time	44 (21-74)		50 (25-82.29)	
I wanted to become pregnant at a later time	49 (28-77.70)		54 (33-91.67)	
Number of children				
This is my first child	43 (23.1-70.35)	0.018	49 (27.08-81.25)	0.041
This is my second child	48 (25-75)		52.54 (29-85)	
This is my third child, or more	50 (21-77.70)		54.5 (25-91.67)	
Have you felt the baby's movements?				
Yes	44.1 (21-74.55)	0.235	51 (25-87.50)	0.255
No	54.5 (27-77.70)		57.5 (31-91.67)	
Do you know the baby's gender?				
Yes	44 (21-74.55)	0.019	50 (25-87.50)	0.047
No	52 (28-77.70)		55 (33-91.67)	
I don't want to know	52 (39-66)		58.33 (44-72)	
Did you download an application to follow the baby's growth?				
Yes	42 (21-74)	<0.001	48 (25-84)	<0.001
No	50 (28-77.70)		55 (32-91.67)	
Feeding Choice				
Breastfeeding	42.5 (23.1-71)	<0.001	48 (27.08-79)	<0.001
Formulated milk	50.5 (21-77.70)		55.5 (25-91.67)	
I don't know yet	51 (25-75)		57.3 (29-87.50)	

3.3.3.2 Dealing with the scores as categorized data

In both tables 3.5 and 3.6 (see below), most of the demographic variables did not have an association with the MFA score groups. However, there were two variables that showed an association in both tools with MFA scores: 1. downloading an application to follow the baby's growth, and 2. planning to breastfeed the baby. More than half of the women in the high MFA group tended to plan to breastfeed their baby and more than half of the women in the high MFA group had downloaded an application to follow their baby's growth and development. However, the association between parity and the MFA score group was only found in the 21-item tool. Most of the women who completed the 21-item tool and were pregnant with their first baby were in the high MFA group.

Table 3.5: Percentage of categorized scores for 21 items (95% Confidence Interval)

Variable	High MFA % (95% CI)	Moderate MFA % (95% CI)	Low MFA % (95% CI)	P-value
<i>Age Groups</i>				
18-22	61.11 (37.09-80.72)	38.88 (19.27-62.90)	0.00	0.309
23-33	39.75 (32.54-47.44)	49.39 (41.80-57.02)	10.84 (6.91-16.60)	
34-44	34.00 (22.14-48.27)	54.00 (40.02-67.37)	12.00 (5.42-24.48)	
<i>Education</i>				
Elementary degree	30.00 (9.27-64.23)	60.00 (28.19-85.14)	10.00 (1.22-49.78)	0.927
High school degree	43.85 (31.48-57.04)	49.12 (36.31-62.04)	7.01 (2.62-17.45)	
Bachelor degree	37.82 (30.50-45.73)	50.64 (42.77-58.47)	11.53 (7.36-17.62)	
Graduate degree	44.44 (23.42-67.66)	44.44 (23.42-67.66)	11.11 (2.66-36.37)	
<i>Occupation</i>				
Housewife	33.85 (26.10-42.58)	55.90 (47.09-64.35)	10.23 (6.00-16.90)	0.300
Student	54.05 (37.84-69.45)	40.54 (25.88-57.09)	5.40 (1.32-19.62)	
Employee with full-time job	42.85 (31.14-55.42)	42.85 (31.14-55.42)	14.28 (7.53-25.41)	
Employee with part-time job	41.66 (17.63-70.43)	50.00 (23.36-76.63)	8.33 (1.04-43.81)	
<i>Trimester</i>				
First trimester	14.28 (1.64-62.40)	57.14 (20.79-87.13)	28.57 (6.31-70.35)	0.223
Second trimester	36.45 (26.39-47.41)	56.25 (45.12-66.77)	7.50 (3.37-15.83)	
Third trimester	42.28 (34.54-50.41)	46.97 (39.04-55.07)	10.73 (6.65-16.87)	
<i>Pregnancy timing *</i>				
I have wanted to become pregnant for a long time	39.58 (26.68-54.11)	45.83 (32.21-60.10)	14.58 (7.03-27.82)	0.371
I wanted to become pregnant at this time	41.60 (33.58-50.09)	51.82 (43.41-60.13)	6.56 (3.43-12.20)	
I wanted to become pregnant at a later time	34.69 (22.61-49.12)	51.02 (37.09-64.78)	14.28 (6.88-27.30)	
<i>Number of children</i>				
This is my first child	48.83 (38.36-59.41)	45.34 (35.07-56.03)	5.81 (2.41-13.33)	0.031
This is my second child	30.43 (20.65-42.37)	60.86 (48.80-71.73)	8.69 (3.91-18.19)	
This is my third child, or more	35.36 (25.71-46.37)	47.56 (36.91-58.43)	17.07 (10.31-26.91)	
<i>Have you felt the baby's movements?</i>				
Yes	40.63 (34.28-47.32)	50.68 (44.04-57.30)	8.67 (5.58-13.24)	0.081
No	30.00 (13.78-53.46)	45.00 (24.80-66.99)	25.00 (10.50-48.62)	
<i>Do you know the baby's gender?</i>				
Yes	42.47 (35.51-49.74)	49.46 (42.28-56.66)	8.06 (4.90-12.99)	0.059
No	28.00 (17.20-42.12)	54.00 (40.02-67.37)	18.00 (9.54-31.34)	
I don't want to know	33.33 (2.53-90.56)	33.33 (2.53-90.56)	33.33 (2.53-90.56)	
<i>Did you download an application to follow the baby's growth?</i>				
Yes	53.98 (44.67-63.02)	42.47 (33.63-51.83)	3.53 (1.32-9.13)	<0.001
No	26.56 (19.58-34.95)	57.03 (48.25-65.39)	16.40 (10.90-23.93)	
<i>Feeding Choice</i>				
Breastfeeding	50.00 (41.89-58.10)	47.26 (39.23-55.42)	2.73 (1.02-7.12)	<0.001
Formulated milk	25.00 (9.33-51.90)	50.00 (26.55-73.44)	25.00 (9.33-51.90)	
I don't know yet	23.37 (15.17-34.22)	54.54 (43.25-65.38)	22.07 (14.11-32.82)	

Note: All of the tests in this table used Fisher's Exact Test, except (*), which was a Pearson Chi Square test.

Table 3.6: Percentage of categorized scores for 25 items (95% Confidence Interval)

Variable	High MFA % (95% CI)	Moderate MFA % (95% CI)	Low MFA % (95% CI)	P-value
<i>Age Groups</i>				
18-22	57.82 (49.63-65.60)	40.13 (32.46-48.32)	2.04 (0.65-6.19)	0.236
23-33	37.50 (17.34-63.17)	37.50 (17.34-63.17)	25.00 (9.33-51.89)	
34-44	32.50 (23.07-43.59)	51.25 (40.29-62.09)	16.25 (9.61-26.13)	
<i>Education</i>				
Elementary degree	45.45 (19.25-74.43)	45.45 (19.25-74.43)	9.09 (1.13-46.60)	0.993
High school degree	47.36 (34.69-60.39)	45.61 (33.08-58.72)	7.01 (2.62-17.45)	
Bachelor degree	47.79 (40.08-55.61)	44.02 (36.45-51.88)	8.17 (4.78-13.62)	
Graduate degree	50.00 (27.77-72.22)	38.88 (19.27-62.90)	11.11 (2.66-36.37)	
<i>Occupation</i>				
Housewife	42.30 (34.04-51.02)	49.23 (40.66-57.83)	8.46 (4.72-14.70)	0.225
Student	64.86 (48.13-78.59)	32.43 (19.22-49.18)	2.70 (0.36-17.37)	
Employee with full-time job	51.56 (39.31-63.62)	37.50 (26.43-50.04)	10.93 (5.25-21.38)	
Employee with part-time job	41.66 (17.63-70.43)	50.00 (23.36-76.63)	8.33 (1.04-43.80)	
<i>Trimester</i>				
First trimester	28.57 (6.31-70.34)	42.85 (12.86-79.20)	28.57 (6.31-70.34)	0.186
Second trimester	45.78 (35.30-56.64)	49.39 (38.71-60.13)	4.81 (1.80-12.26)	
Third trimester	50.00 (42.00-57.99)	41.33 (33.67-49.43)	8.66 (5.07-14.41)	
<i>Pregnancy Timing *</i>				
I have wanted to become pregnant for a long time	46.93 (33.35-60.99)	38.77 (26.10-53.16)	14.28 (6.88-27.30)	0.146
I wanted to become pregnant at this time	51.42 (43.11-59.66)	44.28 (36.21-52.66)	4.28 (1.92-9.27)	
I wanted to become pregnant at a later time	40.81 (27.88-55.15)	48.97 (35.21-62.90)	10.20 (4.25-22.52)	
<i>Number of children</i>				
This is my first child	56.32 (45.65-66.42)	39.08 (29.33-49.78)	4.59 (1.71-11.72)	0.135
This is my second child	42.85 (31.71-54.77)	50.00 (38.36-61.64)	7.14 (2.97-16.19)	
This is my third child, or more	41.66 (31.53-52.55)	45.23 (34.85-56.05)	13.09 (7.35-22.24)	
<i>Have you felt the baby's movements?</i>				
Yes	49.32 (42.73-55.93)	43.89 (37.44-50.55)	6.78 (4.11-10.98)	0.126
No	36.36 (18.95-58.27)	45.45 (26.00-66.39)	18.18 (6.79-40.38)	
<i>Do you know the baby's gender?</i>				
Yes	51.33 (44.14-58.47)	41.71 (34.80-48.95)	6.95 (4.06-11.64)	0.176
No	35.84 (24.02-49.69)	50.94 (37.55-64.20)	13.20 (6.35-25.42)	
I don't want to know	33.33 (2.53-90.56)	66.66 (9.43-97.46)	0.00	
<i>Have you downloaded an application to follow the baby's growth?</i>				
Yes	60.86 (51.59-69.42)	35.65 (27.37-44.88)	3.47 (1.29-8.97)	<0.001
No	36.15 (28.29-44.82)	51.53 (42.91-60.07)	12.30 (7.64-19.22)	
<i>Feeding Choice</i>				
Breastfeeding	57.82 (49.63-65.60)	40.13 (32.46-48.32)	2.04 (0.65-0.61)	<0.001
Formulated milk	37.50 (17.34-63.17)	37.50 (17.34-63.17)	25.00 (9.33-51.89)	
I don't know yet	32.50 (23.07-43.59)	51.25 (40.29-62.09)	16.25 (9.61-26.13)	

Note: Note: All of the tests in this table used Fisher's Exact Test, except (*), which was a Pearson Chi Square test.

3.3.4 Assessing Validity and Reliability

Factor analysis for 21 items

An exploratory factor analysis for the 21-item tool was performed (see Appendix 3). As the Appendix 3 table shows, the loadings of some items repeated in more than one factor in similar values. This means that dividing the tool into factors is meaningless, and all of the items correlate with each other. Muller and this study concluded that the tool is unidimensional, which means it cannot be divided into factors. The results were explained by a 56% item variance, and a 0.38 cut-off was chosen for the loadings.

Factor analysis for 25 items

An exploratory factor analysis was performed for the 25-item tool (see Appendix 4). In the Appendix 4 table, the loadings of some items were repeated in more than one factor for similar values. This means that dividing the tool into factors is meaningless and all of the items correlate with each other. We concluded that the tool is unidimensional, which means it cannot be divided into factors. The results were explained by a 57% item variance, and the cut-off for the loadings was chosen as 0.4.

Reliability

Cronbach's alpha coefficient was calculated to assess the reliability of both tools. In the 21-item tool, Cronbach's alpha coefficient was 0.92. This means there is 0.16 error variance in the tool, which was calculated by $(0.92 \times 0.92 = 0.84)$, then $(1 - 0.84 = 0.16)$. In the 25-item tool, Cronbach's alpha coefficient was $(\alpha = 0.89)$. This means there is 0.21 error variance in the tool, which was calculated by $(0.89 \times 0.89 = 0.79)$, then $(1 - 0.79 = 0.21)$.

3.4 Discussion

This part of the study evaluated the reliability and validity of the score of the Arabic version of the PAI with the four new items. Both the 21-item and 25-item tools were found to be reliable and their scores valid. In studying the association between the scores and demographic variables, there were almost consistent findings that most of the women with high MFA tended to be pregnant with their first baby, knew their baby's gender, had downloaded an application to follow the baby's growth, and planned on breastfeeding their baby.

In this study and in the literature, there were common variables that were not associated with MFA scores such as the mother's age, educational level, and the timing of the pregnancy (21, 94). This study also provided new variables whose relationship with MFA was explored such as downloading an application to follow the baby's growth, which was found to have a significant association between having the application and having high MFA. Also, planning to breastfeed the baby was found to have a significant association with MFA, so most of the women who had high MFA scores also said they had chosen to breastfeed their babies.

The first section focused on demographic variables, a total of 250 women answered then the 25-item list. The following observations were noted (see Table 3.2), specifically, item number 17 ("I know why the baby is moving") had the highest number of missing answers because there were 23 women in the sample who had not yet felt their baby's movement; this explains why there were 16 missing responses. Consequently, in future, there should be a "Not applicable" choice for such a question and population. Furthermore, the four new items had the lowest missing data; this might be explained by the fact that these items were generated from

other women so respondents may have felt that these questions were strongly related to their own experiences.

In studying the association between demographic variables and scores, confounders and causality issues should be mentioned first. It is impossible to conclude with certainty that two variables are 100% associated because health determinants and social factors play major roles as potential confounders that may explain the relationships between variables. Also, if the study concluded there is an association between two variables, the research team cannot confirm causality. For example, it is impossible to confirm whether MFA increased because the mother downloaded an application to follow her baby's growth. This is because the reason may in fact be the opposite, that is, because mothers had high MFA, they tended to download the application. This is why even a perfect correlation or association test may indicate but not mean causality (119).

The association seen between selected demographic variables in this study differs from what has been reported in the literature. For example, in Muller's (10) original study, she concluded that *parity* was not associated with MFA score and reported that "prenatal attachment is a relationship with a specific individual that is differentiated from woman's previous experience as a mother and from her relationship with previous children" (p.208). Also, another study similarly discussed the association between parity and MFA by reporting that the number of previous children will not affect the mother's attachment with the current pregnancy (14, 24). However, this study showed conflicting results whereby the 25-item tool supported the previous theory of no association between MFA and parity, but the 21-item tool revealed an association between parity and categorized scores and it was found also when the scores were continuous for

both tools 21-item and 25-item tools. Each test has its own methods, p-values, and characteristics that might give different results. Although the same sample was used, the type of variable affects whether the data was continuous or categorized and the number of items in the tool.

A study from Portugal reported that MFA was significantly associated with gestational age, that is, as a woman moved closer to giving birth, the level of MFA increased (120). However, no such association was observed in this current study where gestational age did not show an association with MFA. In another study found in the literature, researchers reported that a mother knowing the sex of her fetus may positively affect MFA, especially if the sex matches the wishes of the parents (55). However, in this study, the association between a woman knowing the sex of her baby and the resulting MFA score showed conflicting results. Initially, there was an association, but when the scores were divided into categories, this association was not found. It is important to emphasize that even though those associations were found in our sample, researchers and health care providers should be cautious when promoting the identification of baby's sex as this might cause undesirable outcomes in some cultures and communities.

Moreover, in another study in the United States exploring MFA and fetal movement with movement counting, the researchers concluded that feeling the baby move and counting the movements could enhance the MFA process (10, 21, 54). However, no such similar conclusion was reached in the present study where MFA scores, continuous or categorized, did not show an association with baby movements.

In the current study, factors such as marital status, nationality, miscarriage, or if the current pregnancy was dangerous to a mother's or baby's health were not tested to determine whether there was an association between them and MFA. This is because all of the women

participants, with the exception of 2 (i.e., 1 widowed, 2 divorced), were married; thus, applying a statistical test was impossible. There was a similar occurrence in the nationality variable where 90% of the women were Saudi Arabian; therefore, a statistical test would not have been appropriate in exploring the link between nationality and MFA.

Also, losing a fetus raised a potentially unclear understanding of a question. Specifically, since abortion is prohibited in Saudi Arabia unless for medical reasons, the women who answered affirmatively that they had miscarried may either have meant that they intentionally aborted outside a Gulf country, or miscarried spontaneously. The potential confusion resulting from this question led to the researcher to not study this variable. As a result, a recommendation from this research study is that future research should include a culturally sensitive and appropriate question that asks whether a woman has ever miscarried a fetus. Moreover, in two research studies, researchers studied the relation between the history of losing a baby and MFA. One study suggested that if a woman had gone through such a difficult experience, her feelings toward her next pregnancy would be different (121). The other study reported that a history of losing a baby was not associated with MFA (21). In this study, although the inclusion criteria ensured that women were undergoing a safe pregnancy, a few women reported that their current pregnancy might affect either their own or their baby's health. Because their numbers were small and maybe there was misclassification that's why an association was not tested between these women and MFA because the values will not be valuable or useful.

In the next section, the validity of the score by construct validity was assessed. Many research studies that explored adapting a tool to a new setting such as the Chinese (84), Turkish (92) and Italian (95) versions have used factor analysis to assess construct validity. In this study,

both the 21-item and 25-item tools were unidimensional, which was also supported by Muller in the original tool (10). Muller reported that after examining the items loading, she found 5 factors; under the first factor were 11 items with different themes so dividing the items into factors did not make sense and thus she concluded that her tool was unidimensional (10). Therefore, having the same outcome in this study with Muller's original tool may be considered as evidence of construct validity. Also, there was evidence of validity regarding the four new items that were generated by reviewers and that lead to a recommendation to add them in the Arabic version tool to measure MFA.

Finally, the researchers from all research study articles reviewed PAI—the Chinese (84), Turkish (92), Italian (95), Indian (83), Swedish (96) and Spanish (99)—calculated Cronbach's alpha to assess internal consistency as evidence of reliability. Some studies suggested that the acceptable range of alpha is between 0.7 and 0.95(71), while others reported that alpha should be above 0.75(122). In both cases, alpha in this study was above the cut-off and fit within the acceptable range where Cronbach's alpha coefficient was ($\alpha=0.92$) for the original tool in Arabic. In the 25-item Arabic tool, Cronbach's alpha coefficient was ($\alpha=0.89$). Another study assessed the psychometric properties of the original PAI and calculated alpha; they reported that alpha was 0.89 (123), which is the same values in this study.

As the Arabic PAI has been deemed a reliable and valid instrument to measure MFA, future work should examine the clinical usefulness of this tool in routine practice. To improve its clinical usefulness, the research team created groups for MFA scores that will help health care providers and researchers to interpret the results of the tool and this is important to identify women with low MFA and provide for them help and support to have healthier outcomes.

Programs and educational sessions should be created for each group to help and support women in their pregnancy increase their MFA. Usually health care facilities suffer from budgetary restraints and in most cases it is not feasible to provide three different programs for each category, but there should be accessible services that can be available for all pregnant women such as downloading an application to follow the baby's growth or consultations in case women were going through difficult time physically or emotionally. Such programs/sessions might emphasize the importance of planning to breastfeed and knowing the baby's gender as some women in our study reported not wanting to know their baby's gender beforehand. Even motivating women to download an application to follow the baby's growth might be an intervention for the prenatal clinics whereby staff members could help women download such an application on their mobile or tablet devices. A couple of studies also emphasized the importance of having such educational sessions (48, 124), and that nurses play a major role in supporting women and may additionally identify women who need help or are experiencing low MFA(12, 125, 126). Finally, it has been recommended to invite the father to some of the educational centres during pregnancy to provide family-centred prenatal care and aim for better health outcomes for the whole family (16).

Strengths and Limitations

One of the first strengths, this research provided a justified sample size, were in many psychometric and validation studies it is rarely justified a priori. This study also assessed reliability by Cronbach's alpha, as did the following studies that were examined: Korean (105),

Turkish (92), Italian (95), Hungarian (91), Chinese (84) and Swedish (96). Also, the response rate was high and there was only a small amount of missing data. Adding four new valid items to Muller's tool to measure MFA in Arabic was an additional major strength whereby the reviewers generated new items, which were then tested for validity. Moreover, this study provided an interpretation of the MFA scores that will help those in clinical practice move beyond merely providing information to giving suggestions on how to apply it in clinical setting.

On the other hand, there were couple of limitations such as our sampling strategy was convenience sampling, which may have led to the under-representation of Arab women because participants did not represent the full diversity of cultures in the Middle East. It was believed that collecting the sample from a university hospital that served Saudi Arabian patients and staff who worked in King Saud University and their families would provide enough diversity. Moreover, this hospital provided the research team with the promptest ethics approval whereas other hospitals needed 5 to 9 months, and such timeframes were not feasible for the study. Since most of the participants were Saudi Arabian, having a wider range of women from different Middle Eastern nationalities would have provided more ability to generalize the results from this study. Consequently, the sample may not fully represent the true Arab population. Yet, Saudi Arabia is certainly a well-known and critical representative of Arab culture, so the participants, even though mostly Saudis, are also important and key representatives of Arab culture.

Finally, reliability was only assessed by calculating Cronbach's alpha; there were other types of assessment such as test-retest, but it was only feasible for the research team to assess reliability in one way. Moreover, the validity of the score was assessed only by content and construct validity, although convergent validity may also have been beneficial in comparing the

results of two tools that measure MFA. However, the research team could not apply this because there were no tools available in Arabic and translating more than one tool was beyond the scope of the study.

Recommendations and future implications

As a result of this research study, it is recommended that the 25-item tool—where four new items have been generated for Arab women—be used in Arab culture to identify women with low MFA and provide the needed help, services and advice to have healthier pregnancies and better health outcomes. This tool has been assessed and shown evidence of reliability and validity. It is also recommended that programs be created for each MFA group (high-moderate-low) and that a longitudinal study be conducted to examine their effect, as well as how to improve the programs and increase MFA. Also, studying how MFA can indicate health concerns of the mother and her baby in Arab culture is important in achieving the goal of improving maternal health. Finally, the last recommendation is to change the way that researchers in the literature score this tool. Based on this research study, it is argued that a high MFA should be scored as 4, and that a low MFA should be scored as 1. Scoring in this manner would improve the interpretability of the scale, as a high score would represent high MFA.

CHAPTER 4: GENERAL DISCUSSION, CONCLUSION AND FUTURE RECOMMENDATIONS

4.1 Objective and Rational Review

This study had clear objectives: to translate Muller's Prenatal Attachment Inventory (PAI) from English into Arabic, to study whether it could be adapted for the Arab culture, and to assess the Arabic version's psychometric properties for reliability and validity.

Using such a tool in health facilities and academic settings is important because it enables health care providers and researchers to measure the attachment between a mother and her unborn baby. Identifying women with low MFA is crucial and most of the programs and services should focus on them and addressing their need. Our aim is to increase MFA because high maternal-fetal attachment (MFA) is associated to mother-infant attachment (127). Researchers have also found that mothers with high MFA during pregnancy tend to have a baby who may handle stressors better than other children (42, 45) and to have more organized sleeping patterns (42). Furthermore, high MFA is positively correlated with styles of postnatal attachment and relationship quality (41, 43). Specifically, secure mother-infant attachments have been linked to a child's future success in exploring and problem solving. MFA is also linked to healthy maternal practices such as skin-to-skin contact, which has been suggested to improve respiratory functions (42), and to enhance child cognitive development (42). Moreover, mothers with high MFA tended to cope more effectively with stress and anxiety (46), to breastfeed their babies (12), and to have decreased chances of having antenatal or postpartum depression (128). In addition, if a mother has high MFA and smokes, she tends to attend cessation classes more often

and to quit smoking to protect her baby (21, 35, 36). Finally, high MFA is found to be linked to less chance of having a premature birth (32, 43). All of these benefits mean better health outcomes, which are the goal of health care providers, especially when the outcomes are linked not only to the mother, but also to the baby (22, 129).

It is important to note that the attachment between a mother and her unborn baby can be affected throughout a pregnancy. Specifically, certain events may increase maternal attachment such as having an ultrasound which can help by seeing and visualizing the baby (21, 53, 59, 110), and keeping a daily record of the baby's movements (10, 54). Also, increased MFA is linked to knowing the baby's gender, attending educational sessions that address the mother's concerns and prepare them for breastfeeding, and discussing pregnancy milestones (4, 55). This is because in such settings women are supported and well heard, and they be supported to obtain further referrals or guidance as needed in such sessions (48, 124). Also linked to increased MFA is practicing yoga and surrounding oneself with a positive environment (32, 62). Furthermore, understanding the social determinants of health and the external factors that are harder to modify are essential such as social supports that have a great impact on MFA (30). Low income may be an important indicator of poor MFA, as it was linked to MFA in an indirect way because poverty may cause stress and this can affect the mother's mental health and her bonding with her unborn baby (30, 130). These elements are also important for researchers exploring MFA in Arab cultures as to how they may affect MFA.

Having a tool to measure MFA in Arabic is vital because there is a gap in the literature—specifically, the research team could find no tool that measured MFA in the Arabic language, although there were tools to measure MFA in many other languages such as Turkish (92),

Chinese (84), Korean (105), Dutch (90), Swedish (96), Tamil (83) and Italian (95). The Arabic tool could serve more than 11 countries that have Arabic as their first or second language; equally important is that with the current global refugee crises, even Western countries will need such tools in Arabic to communicate with Arabic speaking newcomers. Researchers can also use such a tool to explore the social, physical and behavioural factors (68) that affect MFA and their impacts on mothers and their babies. Updating this tool as new technologies are adapted with new factors will also be critical. For example, the reviewers in this research study's translation phase provided the research team with the idea of downloading an application to follow the baby's growth; this idea was subsequently found to be associated with high levels of MFA—similar innovative suggestions will result in studies that will help the body of knowledge about MFA.

4.2 Strengths and Limitations

In general, such research studies where women are involved are not only valuable for the delivery of health care but also for the psychological well-being and empowerment of women. Through participating in such studies, women can feel that their opinions, experiences, thoughts, and behaviours are important, and that they are contributing to developing new knowledge. As limitations in general, although there were three tools to measure MFA (67), this study only focused on studying and translating Muller's PAI because it was beyond the scope of this project and not feasible to translate more than one tool. Moreover, although this research filled a research gap (because few publications have described the Arab context and how that may or may not affect the adaptation of new tools to improve health care delivery), additional research is

both recommended and required to have a more complete body of knowledge.

4.3 Potential Contributions and Moving Beyond Descriptions

There is a paucity of literature on the interpretation of scores; thus, this study aimed to interpret the meaning of the study's scores such as the value, the cut-offs, and how to merge this information for clinical use. This part of knowledge transfer is important as health care providers and researchers could use the findings of this study as a step for further work, in which there should be a link between the users of research and the producers of such research (131). Another study recommended that further research should focus on screening instruments to identify parents with attachment problems to provide adequate interventions for both mothers and fathers (24), and this study has developed a 25-item tool that provides scores for measuring MFA in an Arab context. This study also proposed an interpretation for the scores. Specifically, it was suggested in this study that MFA scores be divided into three groups of women: high MFA for those with scores between 25-50, moderate MFA for those with scores between 51-75, and low MFA for those with scores between 76-100. Based on the score, researchers or health care providers could categorize the MFA of pregnant women and offer them the appropriate help and support. This is important because, as another research study pointed out, only 20% of research articles reported on how to use, in the real world, the research information gained (131). The importance of presenting the score as categories in clinical use was discussed by Stephen Few (132) as he reported that to give meaningful and useful quantitative information the reader should have the number "score" and the categories to understand what the score represents(132). In this study we provided the following categories to help researchers and readers to understand

what the questionnaire score means, we had “low MFA”, “moderate MFA” and “high MFA”. On the other hand, categorizing a continuous score may cause loss of information and decrease the power of the study (133).

It is known that helping women increase their MFA may improve their lifestyle and health (21, 24, 127). Specifically, previous studies about MFA have suggested that health care providers should identify women with low MFA and offer programs and educational sessions to help them (48). Insights from the findings of this study indicate that women with low MFA should have the most intensive program where they can express their thoughts, concerns, and problems and be given support. In this group, health care providers should monitor women closely and offer them the help of a psychologist, social worker or other as needed. Such recommendations have been supported in the literature. For example, some studies contended that measuring MFA is important and that identifying women with low MFA early on is recommended so that health care workers can provide help and refer women for professional counseling, if needed (22, 24). Recognizing a woman’s vulnerabilities during pregnancy is also vital because they may signal that help and intervention is needed to modify maternal attitudes (125). Furthermore, a study that focused on anxiety during pregnancy recommended that multidisciplinary treatment that provides access to psychological support is beneficial, especially for pregnant women who are experiencing anxiety (29), and that recognizing women with low MFA and high levels of depressive symptoms can predict their poor health practices (23). A further study suggested that implementing health education sessions that concentrate on addressing mothers’ concerns and questions with giving them support and guidance may achieve the goal of increasing MFA and decreasing antenatal and postnatal depression (48). Such

sessions that teach mothers how to cope with stress and control their anxiety may have health effects not only on mothers but also their babies (48). Here, the focus should be on factors that can be changed such as psychological issues (24), where serious psychopathological symptoms can be quickly identified in pregnancy. Unfortunately, lower MFA and emotional disturbance are ignored although such issues occur in pregnant women (24). Usually, such symptoms are passed over because they are linked to the new state of pregnancy and pregnant women may find it hard to express their unhappiness during pregnancy (24). Psychological factors such as the importance of family support should be included in educational sessions (24, 27).

The role of nurses was also highlighted in some articles regarding MFA as nurses can intervene to improve health practices before childbirth, and to therefore assist in improving the health of a mother and her baby (23, 24). As an on-going process, nurses should assess MFA (126) to identify if there are changes in the mother's status, attachment patterns, and areas of concern (126). The nurse's role is also to reassure those who have developed high MFA and to motivate those who are unaware of their attachment to their fetus (126). Moreover, most articles directed MFA interventions to nurses. At the KKUH in Saudi Arabia, nurses or health educators implement such sessions, and the results of this study also suggested that there should be collaboration between all health care providers to achieve the best results. This was additionally confirmed in another study that suggested the importance of close collaboration between obstetrics, gynaecology, and psychological and psychiatric services during the perinatal period. (24)

Considering other studies that argued for the importance of these programs and the results of this study, it is suggested that adding the measurement of MFA to the routine of care

for pregnant women should be implemented. However, such programs may also have some limitations since MFA is complicated and many confounders and factors play a role in pregnancy that might affect a woman's psychological or physical health. For example, nurses and health educators may identify women with low MFA but not have the ability to refer them to needed resources. Because of this, such programs should be well planned, evaluated and updated. They should also involve decision makers in approving their implementation and delivery. However, more research into this area is required especially studies that focuses on how to strengthen and improve educational sessions and what is the effect of increasing MFA on the mother and the baby's health (25).

4.4 Maternal fetal attachment in the Middle East

I worked with health educators and nurses in Saudi Arabia and Qatar, during my internship we planned and implemented many educational sessions and noticed that MFA has been never mentioned or talked about. Most of the time, the educational sessions focused on diet, physical activity, milestones throughout pregnancy, breastfeeding and other traditional topics. I believe that women feel the attachment with their unborn baby but they are not aware of the terminology of MFA as it has been never highlighted in educational sessions. Adding MFA topics to the educational sessions may help increase awareness of MFA and may help women identify tasks that would increase their MFA such as downloading an application to follow the baby's growth. This idea has been supported by a study that recommended that measuring MFA should be added to routine care because it is directly linked to clinical work (134).

4.5 Conclusion

It is clear that the earliest relationship does not begin at birth (11). MFA is a bond between a mother and her fetus and this study aimed to measure this bond with a tool in Arabic, which was previously unavailable. This research study concluded that to have a valid and a reliable tool in the Arabic language, a detailed process of translation and revisions was needed as well as piloting the tool with its target population and studying its psychometric properties. This research resulted in a tool in Arabic that can measure MFA, has strong evidence of internal and external validity and reliability, and is culturally appropriate and acceptable.

Based on the results of this research and previous studies on MFA, it is recommended that healthcare workers and researchers collaborate in establishing a program for pregnant women that focuses on MFA. It is also recommended that researchers develop cohort studies to evaluate such programs and to explore how they affect a mother's MFA, lifestyle, personal health choices, and her baby's health. Such studies will provide important insights into how to improve maternal health so that women can have joyful and safe pregnancies. There should also be more studies about MFA across nations and cultures, especially in developing countries so that there is a diverse body of nursing knowledge that continues to expand about MFA (25).

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APPENDIX

1. Phase 1: Step 3 Reviewing the Arabic version of PAI and exploring if it can be adapted
2. Phase 2: Testing Prenatal Attachment Inventory
3. Factor Analysis results for 21-items tool
4. Factor Analysis results for 25-items tool
5. The Arabic Version of PAI

APPENDIX 1. Phase 1: Step 3 Reviewing the Arabic version of PAI and exploring if it can be adapted

Reviewing the Arabic version of PAI and exploring if it can be adapted

Please read the following questionnaire and start answering from the word (**START**) in red to the end. The aim of this is to know if the Arabic version of Prenatal Attachment Inventory is clear, understandable and culturally appropriate.

Date:

Reviewer number:

Reviewer name:

				العمر	١
				الجنسية	٢
				الحالة الاجتماعية	٣
				هل يوجد لديك دعم عائلي ؟	٤
				المستوى التعليمي	٥
مطلقة	ارملة	متزوجة	لا	نعم	ابتدائي
فوق الجامعي	جامعي	ثانوي	متوسط	نعم	ربة منزل
موظفة بنصف دوام	موظفة بدوام كامل	طالبة	لا	نعم	هل انت حامل
				نعم	في أي اسبوع/شهر من الحمل؟
				نعم	ما هو اليوم الذي حدده الطبيب للولادة (ان شاء الله)
				نعم	هل خططت لهذا الحمل؟ أم حصل بدون تخطيط؟
				نعم	هل هذا
				نعم	هل أجهضت من قبل ؟
				نعم	هل يشكل حملك خطر على صحتك؟
				نعم	هل يشكل حملك خطر على جنينك؟
				نعم	هل تشعرين بحركة الجنين
				نعم	هل عرفت جنس المولود
لا	لا	لا	لا	لا	لا

English PAI	Arabic PAI
Title: Validity and Reliability of the Arabic Version of Prenatal Attachment Inventory	أداة قياس تعلق الأم بالجنين لـ "ميلر"
<p>The following sentences describe thoughts, feelings, and situations women may experience during pregnancy. We are interested in your experiences during the past month. Please circle the number under the word that applies most to you.</p> <p>1= Almost always 2= Often (80%of the time) 3= Sometimes (30%of the times) 4= Almost never</p>	<p>الجملة التالية تصف أفكار، مشاعر و ظروف قد تعيشها الأم خلال فترة الحمل. في الشهر الماضي ما مدى تكرار هذه المشاعر والأفكار لديك من خلال تجربتك اثناء الحمل. يرجى وضع دائرة حول الرقم تحت الكلمة التي تنطبق عليك أكثر.</p> <p>١ = دائماً ٢ = غالباً (٨٠٪ من الوقت) ٣ = بعض الأحيان (٣٠٪ من الوقت) ٤ = نادراً</p>

START

Q1	Where the previous instructions clear to you?
	Yes (if yes, please skip to Q5)
	No
Q2	If they weren't clear would you please tell us why?
Q3	Do you have any suggestions to make them more clear?
	Yes
	No
Q4	Would you please provide us with those suggestions
Q5	Was the previous translation accurate ?
	Yes
	No
Q6	If No, would you please provide us with more accurate translation

- Would you please answer the following questions.

	Items	Was the item difficult to understand ?		If yes, Why?	Do you suggest other way to phrase this item?		If yes, What is it?	Was this item offensive to you?		If yes, Why?
1	أتساءل كيف يبدو شكل طفلي وملامحه	No	Yes		No	Yes		No	Yes	
2	أتخيل نفسي وانا أنادي طفلي باسمه	No	Yes		No	Yes		No	Yes	
3	أستمع بإحساسي لحركات طفلي	No	Yes		No	Yes		No	Yes	
4	في اعتقادي طفلي قد أصبح لديه شخصية	No	Yes		No	Yes		No	Yes	
5	اسمح للمقربين مني (زوجي-امي...) بوضع أيديهم على بطني ليتحسسوا يتحرك طفلي	No	Yes		No	Yes		No	Yes	
6	أعلم بأن ما أقوم به من أفعال وأعمال يؤثر على طفلي	No	Yes		No	Yes		No	Yes	
7	أخطط للأمور التي سأفعلها مع طفلي إن شاء الله	No	Yes		No	Yes		No	Yes	
8	أخبر المقربين مني بما يفعله طفلي في بطني	No	Yes		No	Yes		No	Yes	
9	أتخيل أي جزء من جسم طفلي سألمس (يده-قدمه...) عندما أتحمس بطني	No	Yes		No	Yes		No	Yes	
10	أعلم متى يكون طفلي نائما	No	Yes		No	Yes		No	Yes	
11	أستطيع أن أجعل طفلي يتحرك	No	Yes		No	Yes		No	Yes	

12	أشتري و أصنع أشياء للتجهيز لقدوم الطفل	No	Yes		No	Yes		No	Yes	
13	أشعر بالحب الشديد لطفلي من قبل مولده	No	Yes		No	Yes		No	Yes	
14	أحاول أن أتخيل ما الذي يفعله طفلي في داخلي	No	Yes		No	Yes		No	Yes	
15	عند جلوسي أحب أن تحيط يديّ ببطني	No	Yes		No	Yes		No	Yes	
16	أحلم بطفلي	No	Yes		No	Yes		No	Yes	
17	أعلم لماذا يتحرك طفلي	No	Yes		No	Yes		No	Yes	
18	أمسد و أطبب على طفلي وهو في بطني	No	Yes		No	Yes		No	Yes	
19	أشارك طفلي بعض الأسرار	No	Yes		No	Yes		No	Yes	
20	أعرف بأن طفلي يسمعي	No	Yes		No	Yes		No	Yes	
21	أشعر بالحماس عندما أفكر بطفلي	No	Yes		No	Yes		No	Yes	

Finally, would you please express your thoughts and answer the following questions:

- 1- In the fourth item (في اعتقادي طفلي قد أصبح لديه شخصية) what does the word (personality= شخصية) means to you?
- 2- In the sixth item (أعلم بأن ما أقوم به من أفعال وأعمال يؤثر على طفلي) what does the word (affect= يؤثر) means to you and how your acts would effect your baby?
- 3- In item number 21 (أشعر بالحماس عندما أفكر بطفلي) what does the word (excited= الحماس) means to you and how do you think it can increase between you and your unborn baby?
- 4- Would you please provide us with anything else you would add to this tool to help us to measure maternal fetal attachment?

APPENDIX 2. Phase 2: Testing Prenatal Attachment Inventory

Participant #

Prenatal Attachment Inventory

Thank you for taking part in our survey. This survey will explore your feelings, thoughts and behaviours toward your unborn baby. Your participation will only require approximately 5 minutes and will remain anonymous. There are no risks to taking part in this research. Filling this survey is optional; however, once you return the survey to the research team you will not be able to withdraw as this survey is anonymous and we will be unable to identify which survey is yours. By returning this survey to the research team, you are providing consent to participate in this study. Your refusal to participate in the study will not affect the health care you receive. All of the surveys will be used for research purposes only and will be kept in Canada for a period of 5 years.

**Please fill and circle the appropriate answer for the following questions.*

1	Today's date (yyyy/mm/dd)				
2	Age				
3	Marital status	Married	Widow	Divorced	
4	Nationality				
5	Educational level	Primary school	High school	University Degree	Graduate Degree
6	Occupation	House wife	Student	Full time employee	Part time employee
7	Are you pregnant?	YES	NO		
If "NO", please stop here. Thank you for your time.					
8	How many weeks in your pregnancy?				
9	When is your due date?	(yyyy/mm/dd) (/ /)			
10	How did you feel about the timing of your pregnancy?	I wanted to become pregnant earlier	I wanted to become pregnant at this point in time	I wanted to become pregnant at a later point in time	
11	Is this your	First child	Second child	3 and more children	
12	Have you ever had a miscarriage?	Yes	No		
13	Do you have any complications in this pregnancy?	Yes	No		
14	Have you felt the baby move yet?	Yes	No		
15	Do you know the sex of the baby?	Yes	No		
16	I downloaded an app on my phone to track my baby's growth	Yes	No		
17	How do you plan to feed your baby?	Breastfeeding	Formula Milk	I don't know	

The following sentences describe thoughts, feelings, and situations women may experience during pregnancy. We are interested in your experiences during the past month. Please circle the number under the word that applies most to you.

		Almost Always	Often (80%)	Sometimes (30%)	Almost Never
1	I wonder what the baby looks like.	1	2	3	4
2	I imagine calling the baby by name.	1	2	3	4
3	I enjoy feeling the baby move.	1	2	3	4
4	I think that my baby already has personality.	1	2	3	4
5	I let close friends and family members to put their hands on my tummy to feel the baby move.	1	2	3	4
6	I know things I do make a difference to the baby.	1	2	3	4
7	I plan the things I will do with my baby.	1	2	3	4
8	I tell others what the baby does inside me.	1	2	3	4
9	I imagine what part of the baby I'm touching.	1	2	3	4
10	I know when the baby is asleep.	1	2	3	4
11	I can make my baby move.	1	2	3	4
12	I buy/make things for the baby.	1	2	3	4
13	I feel love for the baby.	1	2	3	4
14	I try to imagine what the baby is doing in there.	1	2	3	4
15	I like to sit with my arms around my tummy.	1	2	3	4
16	I dream about the baby.	1	2	3	4
17	I know why the baby is moving.	1	2	3	4
18	I touch and tap gently on my tummy so the baby can feel me.	1	2	3	4
19	I share secrets with the baby.	1	2	3	4
20	I know the baby hears me.	1	2	3	4
21	I get very excited when I think about the baby.	1	2	3	4
22	I can't wait to hold, smell, and take care of my baby.	1	2	3	4
23	I am careful with my activities so nothing will hurt my baby.	1	2	3	4
24	If I feel that my baby is not comfortable, I will change my position.	1	2	3	4
25	I eat healthy food to have healthy baby.	1	2	3	4

Optional

If you are interested in knowing more about this topic and receiving emails with links to other resources, please provide your email address. Your email address will not be linked in your survey responses as it will be saved in a different database.

Email : Thank you

APPENDIX 3. Factor Analysis results for 21-items tool

	Component			
	1	2	3	4
Item13	.728	.204	.269	.078
Item21	.716	.310	.157	.103
Item3	.706	.100	.290	.100
Item2	.606	.395	.025	.036
Item7	.560	.340	.087	.423
Item1	.517	.351	-.142	.123
Item12	.468	.152	.361	.066
Item4	.437	.256	.336	.241
Item5	.402	.079	.384	.245
Item16	.283	.735	.062	.149
Item15	.302	.690	.150	-.012
Item19	.239	.639	.242	.266
Item17	.083	.609	.411	.222
Item9	.291	.540	.420	-.218
Item20	.164	.528	.255	.438
Item18	.378	.527	.298	.117
Item14	.482	.488	.166	.069
Item8	.254	.390	.382	.231
Item11	.105	.235	.805	.077
Item10	.175	.163	.756	.097
Item12	.156	.121	.122	.852

APPENDIX 4. Factor Analysis results for 25-items tool

	Component					
	1	2	3	4	5	6
Item22	.736	.153	.355	.016	.177	-.014
Item21	.727	.205	.279	.053	.177	.019
Item13	.710	.095	.237	.166	.221	.005
Item3	.662	.023	.157	.217	.174	.065
Item2	.554	.380	-.024	.025	-.086	-.033
Item7	.536	.356	.013	.151	.030	.416
Item1	.494	.297	-.303	-.176	.014	.081
Item14	.428	.416	.184	.079	.136	.000
Item4	.412	.245	-.012	.409	-.223	.181
Item16	.287	.718	.034	.038	-.038	.055
Item19	.137	.664	.126	.128	.136	.100
Item17	.024	.586	.103	.390	.035	.123
Item15	.272	.576	.254	-.046	.258	-.167
Item20	.083	.511	.233	.088	.357	.298
Item9	.261	.461	.081	.332	.119	-.353
Item18	.353	.421	.352	.130	.306	-.009
Item24	.143	.177	.793	.023	.063	.123
Item23	.278	.149	.720	.128	-.056	.048
Item25	.044	.177	.677	.140	-.063	.026
Item11	.004	.131	.184	.752	.214	-.064
Item10	.109	.063	.151	.745	.080	0.032
Item12	.364	.119	-.062	.379	.107	.064
Item5	.243	.028	-.045	.136	.751	.072
Item8	.124	.344	-.064	.161	.620	.041
Item6	.088	.078	.158	.030	.108	.849

APPENDIX 5. The Arabic Version of PAI

أداة قياس مدى تعلق الأم بالجنين ل "ميلر"

شكراً لك على المشاركة في هذا الاستبيان. تتمحور هذه الدراسة حول استكشاف مشاعرك، أفكارك و سلوكياتك تجاه جنينك. سيتطلب منك ملء هذا الاستبيان خمسة دقائق فقط، لن يستطيع فريق البحث معرفة هويتك عن طريق المعلومات المعطاة لذا لن نستطيع سحب الاستبيان الخاص بك بعد استلامه. سوف تستخدم هذه الدراسة الاستقصائية فقط لهدف البحث العلمي و ستحفظ جميع الاستبيانات و المعلومات في خزانة لمدة خمس سنوات في مكتب الباحث الرئيسي. أخيراً، ملء هذا الاستبيان اختياري و تستطيعين رفض المشاركة متى ما أردت و هذا لن يؤثر على الخدمة الطبية المقدمة لك.

إذا رغبت تلقي بعض المقالات و الروابط الالكترونية المتعلقة بهذا الموضوع فيمكنك تزويدنا ببريدك الالكتروني في آخر الاستبيان و لن يرتبط ذلك بأجوبتك.

١	التاريخ اليوم (اليوم/الشهر/ السنة)		
٢	العمر		
٣	متزوجة	أرملة	مطلقة
٤	الجنسية		
٥	متوسط	ثانوي	جامعي
٦	ربة منزل	طالبة	موظفة بدوام جزئي
٧	هل أنت حامل ؟		
	نعم لا (الرجاء التوقف و عدم ملء الاستبيان)		
	في أي اسبوع/ شهر من الحمل؟		
٩	ما هو اليوم الذي حدده الطبيب للولادة (إن شاء الله)		
١٠	كنت أرغب بحدوث الحمل قبل ذلك	كنت أرغب بحدوث الحمل في هذا الوقت	كنت أرغب بحدوث الحمل في وقت لاحق
١١	هل هذا	طفلك الأول	طفلك الثاني و أكثر
١٢	هل أجهضت من قبل ؟	نعم	لا
١٣	هل يشكل حملك خطراً على صحتك؟	نعم	لا
١٤	هل يشكل حملك خطراً على جنينك؟	نعم	لا
١٥	هل تشعرين بحركة الجنين	نعم	لا
١٦	هل عرفت جنس المولود	نعم	لا لا أريد أن أعرف
١٧	قمت بتحميل تطبيق على جهاز الجوال لمتابعة نمو الجنين	نعم	لا
١٨	كيف ستقومين بتغذية طفلك	عن طريق الرضاعة الطبيعية	عن طريق الحليب الصناعي لا أعلم

تصف الجمل التالية ظروفاً قد تعيشها الأم خلال فترة الحمل. يرجى وضع دائرة حول الرقم تحت الكلمة التي تنطبق عليك أكثر.

١= دائماً ٢= غالباً ٨٠٪ من الوقت ٣= أحياناً ٣٠٪ من الوقت ٤= نادراً

دائماً	غالباً	أحياناً	نادراً	
١	٢	٣	٤	١ أتساءل كيف يبدو شكل طفلي وملامحه
١	٢	٣	٤	٢ أتخيل نفسي وأنا أنادي طفلي باسمه
١	٢	٣	٤	٣ استمتع بإحساسي بحركات طفلي
١	٢	٣	٤	٤ في اعتقادي طفلي أصبحت لديه شخصية
١	٢	٣	٤	٥ أسمح للمقربين مني (زوجي- أمي...) بوضع أيديهم على بطني ليتحسسوا حركات طفلي
١	٢	٣	٤	٦ أعلم بأن ما أقوم به من أفعال وأعمال يؤثر على طفلي
١	٢	٣	٤	٧ أخطط لأمر سأعملها مع طفلي إن شاء الله
١	٢	٣	٤	٨ أخبر المقربين مني بما يفعله طفلي في بطني
١	٢	٣	٤	٩ عندما ألمس جزءاً من طفلي أستطيع تخيل أي جزء من جسمه هو (يده- قدمه...)
١	٢	٣	٤	١٠ أعلم متى يكون طفلي نائماً
١	٢	٣	٤	١١ أستطيع أن أجعل طفلي يتحرك
١	٢	٣	٤	١٢ أشتري و أصنع أشياء للتجهيز لقدم الطفل
١	٢	٣	٤	١٣ أشعر بالحب الشديد لطفلي من قبل مولده
١	٢	٣	٤	١٤ أحاول أن أتخيل ما الذي يفعله طفلي في داخلي
١	٢	٣	٤	١٥ عند جلوسي أحب أن أحيط بطني بيدي
١	٢	٣	٤	١٦ أحلم بطفلي
١	٢	٣	٤	١٧ أعلم لماذا يتحرك طفلي
١	٢	٣	٤	١٨ أمسح على بطني حتى يشعر طفلي بي
١	٢	٣	٤	١٩ أشارك بعض أسرارتي مع طفلي
١	٢	٣	٤	٢٠ أعلم بأن طفلي يسمعي عندما أكلمه أو أغني له
١	٢	٣	٤	٢١ أشعر بالسعادة و الحماس عندما أفكر بطفلي
١	٢	٣	٤	٢٢ أتشوق لحمل طفلي بين يدي لأشم رائحته و لأعتني به
١	٢	٣	٤	٢٣ أكون خذرة في حركتي حتى لا أؤذي طفلي
١	٢	٣	٤	٢٤ عندما أشعر بأن وضعية جلوسي غير مريحة لطفلي، أقوم بتغييرها لأوفر له الراحة
١	٢	٣	٤	٢٥ أتناول طعاماً صحياً لأنجب طفلاً بصحة جيدة بإذن الله

إن كنت ترغبين بتلقي بعض المقالات أو الروابط الإلكترونية المتعلقة بهذا الموضوع فيمكنك

كتابة بريدك الإلكتروني هنا