Reliability and Validity of the Hungarian Version of the Maternal Antenatal Attachment Scale

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Abstract: *Objectives*: In this study, the psychometric properties of the Hungarian version of the Maternal Antenatal Attachment Scale (MAAS) were examined. Our primary aim was to investigate the validity and reliability of the MAAS. Additionally, we analyzed prenatal attachment in regard to socio-demographic determinants, characteristics of actual pregnancy, as well as the mothers' mental health during pregnancy and partnership adjustment. *Background*: Condon's MAAS has been one of the most frequently used instruments to assess prenatal attachment since 1993. Analyzing its psychometric properties is important regarding clinical practice, research of the topic and also the comparability of international research results. *Methods*: This study involved 253 women within different stages of pregnancy. Responses were assessed using the MAAS, the Prenatal Attachment Inventory (PAI), the Dyadic Adjustment Scale (DAS), and the Hospital Anxiety and Depression Scale (HADS). *Results*: The Hungarian version of the MAAS has stable psychometric properties, high internal consistency and good internal and external reliability regarding the MAAS Total score, as well as its two subscales, the Quality of maternal prenatal attachment and the Intensity of preoccupation. Our results confirm that the development of mother-foetus attachment shows a positive association with the plannedness and wantedness of pregnancy, the number of gestational weeks and the level of partnership adjustment too. Furthermore, negative correlation was found with maternal depression and anxiety level during pregnancy. *Conclusion*: According to our results, the Hungarian version of the MAAS is a reliable and valid measure of maternal prenatal attachment from an early stage of pregnancy.

Keywords: Maternal Antenatal Attachment Scale (MAAS), reliability, validity, maternal anxiety and depression, dyadic adjustment, mother-foetus attachment.

INTRODUCTION

Theoretical Background of Maternal Antenatal Attachment

Considering the theoretical antecedents of prenatal attachment research, two major areas are worth mentioning. First, in the middle of the last century some studies of psychoanalytic grounds relating mainly to clinical practice were carried out [1-4] investigating the characteristics of parent to foetus relationship and the importance of emotional engagement towards the foetus in terms of pregnancy and motherhood. Second, based on Bowlby's attachment theory [5] built upon evolutionary perspectives, the number of studies exploring the characteristics of human relationships from the aspect of attachment has increased considerably, and become more diversified and differentiated since the 1970s. Although the topic of attachment has frequently been investigated in the field of psychology, it is worth mentioning that in the beginning the majority of research focused on the infant-to-parent and adult-to-adult relationship, with

less attention being paid to assess the relationship patterns of the parents towards the infant within which maternal-foetal (prenatal) attachment could be studied. Investigating the construct is specified by the fact that in contrast to traditional attachment theories, in which characteristics of the tie are conceptualized via examination of interactions, the distinctiveness of mother-foetus relationship can be assessed merely from the mother's side, where maternal representations and experiences towards the foetus comprise a curious admixture of fantasy and reality [6, 7].

Increasing number of research has been conducted over the past 25 years with the primary aim to give deeper insights into understanding the maternal-foetal bond and the underlying variables exerting influence on it. Several theoretical models were developed to define the construct. Cranley describes mother-foetus attachment as "the extent to which women engage in behaviours that represent an affiliation and interaction with their unborn child" [8, p. 282]. Muller emphasizes a unique and personal relationship that develops between a woman and the foetus [9]. Her measure, the Prenatal Attachment Inventory (PAI), assesses the characteristics of prenatal attachment alongside five subscales: interactions-, affections-, fantasies towards

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the foetus, sharing pleasure with others and differentiation of the self from the foetus. Condon's [6] hierarchical model differentiates three levels to define prenatal attachment: the subjective core experience (which is indeed hard to be approached via conventional scientific methods), dispositions and adult attachment behaviour. Five maternal dispositions or needs are distinguished mediating between the core experience and overt behaviours, such as disposition to know, disposition to be with, disposition to avoid separation or loss, disposition to protect, and disposition to gratify needs.

Maternal attachment could be described via analyzing these dispositions and needs, as well as related behavioural pattern characteristics (e.g. searching for information, proximity seeking, protecting and pleasing). His 19-item questionnaire developed in accordance with the theoretical model to assess maternal-foetal attachment distinguishes two factors. *Quality* assesses forms and quality features related to the affective experiences, thoughts about the foetus, and reactions to experience of loss. *Intensity* indicates the frequency and the strength of preoccupation with the foetus. Maternal prenatal attachment can be characterised in terms of high and low scores on these two factors.

Due to the presence of theoretical concepts and extensive empirical research, more and more factors underlying mother-to-foetus relationship and its development have become known and explored so far.

The "State of Pregnancy" and Prenatal Attachment

Optimal adaptation to parenthood, prenatal attachment and early mother-infant relationship, as well as their effects on the psychological development of the foetus are influenced by a significant number of maternal and environmental factors occurring during or even prior to pregnancy. Consequently, the development of mother-foetus bond has been variously examined in terms of *demographic variables* (mother's age, number of childbirths, ethnicity, marital status), *characteristics of actual pregnancy* (gestational weeks), and *interventions related to nursing expectant women* (ultrasound tests) or *complications emerging during and prior to pregnancy* (previous prenatal loss, high-risk pregnancy, in vitro fertilization), just as *maternal psychological factors* (the mother's childhood experiences towards her parents), and *social/partner*

support [7, 10]. As it becomes apparent from above, the majority of variables can be categorised according to whether they relate to maternal, environmental factors and/or pregnancy events.

Numerous studies point out the association between prenatal attachment and permanent characteristics deriving from the mother's life events, such as her representations related to motherhood [11], childhood memories towards parents [12], and adult attachment orientation [13]. However, with respect to the development of the mother-foetus relationship, the importance of the ideal conditions regarding the time period of childbearing and maternal well-being needs to be highlighted as well. In the following, we will focus on two areas which can determine the quality of childbearing, namely the mental condition of the expectant woman and partner support during the pregnancy.

Mental State of the Mother During Pregnancy

Among various other determinants *stress, anxiety* and *depression* have been considered as the most frequently occurring variables exerting negative influence on the psychological stability of the mother. Higher scores on anxiety and depression during pregnancy indicate lower prenatal attachment [14]. These emotional states show association to other pregnancy-related events influencing the relationship, such as experiencing feelings of delivery-related disappointment [15], and postpartum depression [15, 16]. Postpartum maternal depression correlates with functional disorders of the infant and poorer quality of the mother-infant interaction. At the same time, it also increases the probability of developing avoidant or disorganised infant attachment style under the age of three [17, 18].

Being exposed to increased level of stress, as well as maternal mental states of anxiety and depression exert influence also on the foetal development through complex bio-physiological processes [19] increasing the risk of lower birth weight and/or premature birth [19-21]. There is a chance of a predictable three-fold risk of premature birth among women who experienced higher level of perceived stress during pregnancy. Women who reported increased anxiety level are twice as likely to have preterm delivery [22]. Research findings of Teixeira *et al.* [23] supported the association between maternal anxiety and fear in pregnancy, and increased

uterine artery resistance index which may lead to slower intrauterine development and low birth weight. The variables mentioned above may be considered as indicators of poorer results on scales of infant development, just as predictors of lower level mental and motor development assessed in the first eight months following childbirth [24, 25]. Maternal personality characteristics, individual resources [21] and coping strategies [26] can have ameliorating effects on variables responsible for negative outcomes. However, we need to emphasise the importance to identify high-risk groups and to develop specific prevention programs. Psychological support of pregnant women is of outstanding clinical importance regarding foetal/infant development, postpartum maternal psychological stability, and the development of mother-foetus attachment as well.

Partner and Social Support

The development of maternal-foetal attachment is greatly influenced by environmental support as well. Positive association between the quality of partner relationship (reciprocity, emotional closeness, intimacy, partner satisfaction) and mother-foetus attachment has been emphasised by numerous studies [14, 27-29]. Prenatal support was found to correlate with the infant's Apgar scores and with normal labour progress, whereas negative association was shown between prenatal support and postpartum depression [16]. The importance of information support was emphasised by Field *et al.* [24]. Their findings indicate that detailed feedback on ultrasound examination reduces prenatal anxiety and the risk of labour-related complications. Moreover, it has a positive association with the development of the baby.

Pregnancy plannedness and intention for childbearing evolve from both maternal and paternal side on partner relationship grounds in accordance with the dynamic characteristics of the relationship. Thus, the quality of and the satisfaction with the relationship can exert influence on the development of the mother-foetus attachment through particular attitudes towards pregnancy and childbearing. Pregnancy-related feelings of expectant women are influenced by the perceived partnership stability, the partner's feelings towards the pregnancy and also by emotional and instrumental support. Therefore, lower scores on these variables could be associated with the unwanted nature of the pregnancy from maternal side [30].

Importance of Assessing Mother-Foetus Attachment

Prevention and Clinical Practice

Prenatal attachment correlates with the quality of the maternal care following childbirth [11, 31]. Consequently, it is a significant determining factor with respect to the feeling of efficacy in maternal roles, the development of the infant and mother-infant relationship. Reliable measures of attachment can increase the efficiency of prevention programs aiming to offer psychological support to pregnant women. Moreover, in potential high-risk groups (such as high-risk pregnancy, previous prenatal loss, single motherhood etc.) these measures can play a great role in identifying critical circumstances related to mother-foetus relationship.

Research of Prenatal Attachment

Since conflicting outcomes of research findings exist simultaneously, experts on the field of prenatal attachment emphasize the necessity and the importance to organize and integrate already available knowledge on the topic into a unified framework [6, 10]. Constant adaptation of relevant measures exploring prenatal attachment may have promising perspectives on the comparability of various studies.

Maternal Antenatal Attachment Scale (MAAS), a questionnaire developed by Condon to assess prenatal attachment has been frequently used in several studies since 1993. Some of them focus on investigating the psychometric characteristics of the instrument [6, 14, 32].

The questionnaire proves to be a measure of outstanding importance both in clinical practice related to pregnant women and in research studying the development of maternal-foetal bond. In this study we aimed to assess the psychometric properties of the Maternal Antenatal Attachment Scale on a Hungarian sample. In accordance with the results of international publications, we intended to confirm the stability of the scale in terms of both reliability and validity.

A further aim of the study was to identify variables, such as maternal factors (perceived anxiety and stress during expectancy), pregnancy-related features (gestational weeks, plannedness and wantedness of childbearing) and social determinants (partner support) correlating with the development of mother-foetus attachment.

METHODS

Research Design

Participants of the study were pregnant women over the age of 18 years who were registered in Hungarian national public health services. Data collection was completed through the health visitor network closely connected to medical care and controlled professionally by the National Public Health and Medical Officer Service, where the nurses maintain regular contact with pregnant women during the entire pregnancy. The ethics approval for this study was sought and approved by the Regional Ethics Committee with approval number 2009/3380. The protocol included four self-reported questionnaires and a demographic data sheet.

Participants

The study sample included 253 pregnant women. Participation was voluntary and requested through the nurses of health visitor network. Due to the indirect way of recruitment, there are no available data regarding the number and demographic features of those who declined to participate. Thus, our sample contains only those women who agreed to participate. Those who failed to fully complete the questionnaires were excluded from statistical analysis; therefore our final sample was composed of 237 women.

Procedure

The data collection period lasted from September 2010 until March 2011. Data recording was administered with the contribution of university students of psychology. They were prepared for the method of data collection in the framework of a half-a-day training session, and also to handle unexpected situations that may arise, thereby ensuring a uniform approach to data collection and the development of optimal personal conditions for data gathering as well. Following their voluntary consent, the participants were visited by the interviewers and given detailed information about the course of data collection and the methods used in the process. The interviewers were also present during the completion session, so incidentally emerging issues could be clarified.

Measures

Maternal Antenatal Attachment Scale (MAAS)

In order to assess maternal attachment Condon's [6] 19-item self-report questionnaire differentiates two subscales: Quality (11 items) and Intensity of preoccupation to measure further MAAS Intensity (8 items). The quality characteristics include the mother's internal representations, fantasies and feelings toward the foetus, and the characteristics of the interaction with the foetus, while the intensity provides information on the strength and the frequency of these maternal reactions. The responses can be indicated by a five-point Likert scale. The global scores (further MAAS Total) range from 19 to 95. In terms of the two subscales scores ranging between 11 and 55 (Quality), and between 8 and 40 (Intensity) can be assessed. The higher scores predict better quality and more intense maternal attachment. Studies focusing on the psychometric properties of the scale reported Cronbach's alphas ranging from 0.79 to 0.82 [6, 32].

While developing the Hungarian version of MAAS, Condon's original scale was translated into Hungarian by two independent experts. After the unification, the draft was back-translated again into English by experts who were not familiar with the original version. Synchronization of the different translations was based on the consensus of a team of three professionals and on reconciliation with the author of the original instrument. The final Hungarian version was constructed thereafter. In order to avoid applying a negative outcome item at the end, item 19 of the original questionnaire was inserted as item 12 in our instrument without further modifications in the order of the items.

Demographic Data Sheet

Aiming to identify data regarding participants' age, education, marital status and pregnancy events (such as the number of previous childbirths, plannedness and wantedness of actual pregnancy, gestational age) a demographic data sheet was compiled by the authors and used during the research.

Prenatal Attachment Inventory (PAI)

Muller's measure [9, 33] consists of 21 items discriminating the following five factors: fantasies (6 items), interaction (5 items), affections (3 items), differentiation of the self from the foetus (4 items), and sharing pleasure with others (3 items). Responses can be given on a four-point Likert scale with the global scores ranging from 21 to 84, where higher scores indicate stronger attachment. The internal consistency of the scale is good, with its Cronbach's alphas exceeding 0.8 [33-35]. The PAI has not been adapted to a Hungarian sample; however, its Cronbach's alpha was 0.9 in our research.

Hospital Anxiety and Depression Scale (HADS)

This 14-item measure was developed by Zigmond and Snaith [36] to assess the degree of depression (7 items) and anxiety (7 items) using a four-point Likert scale. Scores on both scales range from 0 to 21, with the clinical cut point being identified at 8 [37]. The reliability of the instrument is high (HADS-A Cronbach's alpha: 0.82; HADS-D Cronbach's alpha: 0.83). The scale was adapted to a Hungarian sample by Muszbek *et al.* [38].

Dyadic Adjustment Scale (DAS)

The questionnaire developed by Spanier [39] assesses dyadic adjustment. The 32-item questionnaire consists of four subscales: consensus (13 items), satisfaction (10 items), cohesion (5 items), and expression of emotions (4 items). Except for two nominal items responses are made on five, six- or seven-point Likert scales. These items yield scores ranging from 0 to 151, with the higher score indicating a higher level of dyadic adjustment. The questionnaire has good psychometric values regarding the global scale (Cronbach's alpha: 0.96), and each subscales (Cronbach's alphas ranging from 0.73 to 0.94). The scale has not been adapted to a Hungarian sample, in the present study the Cronbach's alpha was 0.95 for the global scale and 0.71 - 0.9 for the subscales.

Data Analysis

For data analysis SPSS 17.0 software package was used. Descriptive statistics are presented in terms of means and standard deviations, medians, minimum and maximum values, ranges, absolute numbers and percentages. With respect to missing data no imputation was carried out. In order to compare group differences regarding the global scores of MAAS and the two subscales, either Student's t test or Mann-Whitney test was performed depending on whether the data were normally distributed or not. For investigating the correlations among the variables Pearson's correlation coefficient is presented for scales, whereas Spearman's coefficient is declared for ordinal data.

RESULTS

Characteristics of the Study Population

Demographic Data

A total of 237 pregnant women were involved in the research. The average age of the sample group was 30.7 years (ranging 18-44, standard deviation [further SD] = 4.88). With regard to their educational attainment 7 persons (3%) graduated from primary school, 90 participants (38%) were secondary graduates, while 140 (59%) reported an advanced degree. In terms of marital status the majority of the sample, 146 women (61.6%) lived in conjugal relation, 77 (32.5%) were cohabiting with their partner, and 14 (5.9%) were classified into the category of others (e.g. some of them were living in a relationship, or did not provide information about marital status).

Pregnancy Events

With respect to pregnancy events 144 participants (60.8%) were expecting their first child, 73 (30.8%) have already given birth to one child, 17 (7.2%) have delivered two children, and 4 (1.2%) have had three or more successful prior pregnancies. In our further analysis these were differentiated into primigravidous and multigravidous groups. Regarding the duration of the ongoing pregnancy the average was 25.45 gestational weeks (range: 7-40, SD = 8.53). The majority of women, 188 (79.3%), reported planned pregnancy, while 49 (20.7%) indicated unplanned nature of their pregnancy. As for the intention of childbearing 4.2% of the sample (n = 10) reported unintended pregnancy from the maternal, whereas 9.7% (n = 23) from the paternal side. Based on the data on quickening known in gynaecological-obstetrical practice [40] the study sample was categorised by gestation age as well. At the time of data collection 27.8% of the participants (n=66) had pregnancies with less than 19 weeks of gestation, whereas 72.2% (n=171) were beyond the 20th gestational weeks.

Descriptive Statistics

According to the results of the Kolmogorov-Smirnov test, the MAAS Intensity of preoccupation subscale is normally distributed (p > 0.05), whereas the MAAS Total and MAAS Quality are not (p < 0.05). Therefore, nonparametric tests were used in the case of MAAS Total and MAAS Quality subscale.

The overall mean for MAAS Total was 80.5 (SD = 8.16), whereas scores of 45.96 (SD = 3.89) and 30.08 (SD = 4.76) for the Quality and Intensity subscale were computed, respectively. The means, standard deviations, medians, minimum and maximum values of the MAAS Total and the two subscales are displayed in Table **1**.

Table 1.   Means (M), Standard Deviations (SD), Medians (Md), Minimum (Min) and Maximum (Max) Values of the MAAS Total and the Quality and Intensity of Preoccupation Subscales with the Results of the Comparison of Groups Regarding the Existence of Foetal Movement

		N	M	SD	Md	Min	Max	U[a]	t[a]
MAAS Total	Total sample	237	80.5	8.16	82	54	95		
	Before foetal movement	66	78.8	7.68	80	55	92	4506**	
	After foetal movement	171	81.15	8.27	83	54	95		
MAAS Quality	Total sample	237	45.96	3.89	47	31	50		
	Before foetal movement	66	45.65	3.95	47	33	50	5229.5#	
	After foetal movement	171	46.08	3.88	47	31	50		
MAAS Intensity of preoccupation	Total sample	237	30.08	4.76	30	16	40		
	Before foetal movement	66	28.61	4.48	29	16	38		-3.02**
	After foetal movement	171	30.65	4.75	31	19	40		

** $p < 0.01$; # $p > 0.05$
[a]As the MAAS Intensity of preoccupation subscale is normally distributed, Student's t values are displayed, whereas Mann-Whitney U values can be seen in the case of the MAAS Total and MAAS Quality.

Table 2:   Means (M), Standard Deviations (SD), Medians (Md), Minimum (Min) and Maximum (Max) Values of Questionnaires Measuring Prenatal Attachment, Maternal Mental Health, and Partner Relationship

Measures	N	M	SD	Md	Min	Max
Prenatal attachment						
PAI Total	237	62.24	9.6	63	37	80
Depression and anxiety						
HADS Depression	237	2.99	2.79	2	0	18
HADS Anxiety	237	5.15	3.74	5	0	20
Partner relationship						
DAS Total	237	122.37	16.99	126	30	147
DAS Consensus	237	53.02	7.62	54	19	65
DAS Expression of emotions	237	9.91	1.98	10	1	14
DAS Satisfaction	237	41.19	6.5	43	5	49
DAS Cohesion	237	18.24	3.23	18	5	23

Descriptive statistics of PAI, HADS and DAS questionnaires are shown in Table **2**.

Reliability

Reliability of the Hungarian version of Maternal Antenatal Attachment Scale was examined for the total sample, and for both the period prior to and following the quickening, respectively. Cronbach's alphas were 0.87 for the MAAS Total, whereas 0.8 for the Quality subscale and 0.77 for the Intensity subscale. Moderately strong correlation was found between the Quality subscale and the Intensity subscale ($r = 0.6$, $p < 0.001$).

As for the duration before the perception of foetal movements Cronbach's alphas of 0.83 for MAAS Total,

0.8 for Quality subscale and 0.71 for Intensity subscale were identified. A moderately strong correlation was observed between the two subscales ($r = 0.53$, $p < 0.001$).

Subsequently to the perception of quickening, the MAAS Total as well as the two subscales were found to be reliable indicating Cronbach's alphas of 0.88 for MAAS Total, 0.8 for Quality and 0.79 for Intensity. Similarly to the previous results above, the two subscales correlated significantly ($r = 0.63$, $p < 0.001$).

The duration of pregnancy in gestational weeks slightly correlated with the MAAS Total ($r = 0.24$, $p < 0.001$), and the Intensity subscale as well ($r = 0.28$, $p < 0.001$), but not with the Quality subscale ($r = 0.13$, $p > 0.05$).

Table 3:   Correlations between Maternal Prenatal Attachment Measured by the Hungarian Version of MAAS and Related Variables

	N	MAAS Total	MAAS Quality	MAAS Intensity of preoccupation
Prenatal Attachment	237			
PAI Total		0.65***	0.47***	0.67***
Depression and anxiety	237			
HADS Depression		-0.49***	-0.5***	-0.41***
HADS Anxiety		-0.46***	-0.55***	-0.34***
Partner Relationship	237			
Length of relationship		0.08#	0.05#	0.07#
DAS Total		0.6***	0.58***	0.53***
DAS Consensus		0.51***	0.52***	0.43***
DAS Expression of emotions		0.49***	0.41***	0.46***
DAS Satisfaction		0.45***	0.47***	0.4***
DAS Cohesion		0.56***	0.48***	0.51***

*** $p < 0.001$; # $p > 0.05$

Convergent Validity

The correlation between the MAAS Total and the global scores of PAI ($r = 0.65$, $p < 0.001$) and also between the Quality subscale and PAI ($r = 0.47$, $p < 0.001$) proved to be moderately strong. Likewise, strong correlation was observed between the scores of Intensity subscale and PAI ($r = 0.67$, $p < 0.001$) (Table **3**).

Regarding the period prior to foetal movement the scores on the MAAS Total ($r = 0.54$, $p < 0.001$) and on the Intensity subscale ($r = 0.6$, $p < 0.001$) had moderately strong correlation with PAI, whereas a slightly weaker connection was shown with the Quality subscale ($r = 0.33$, $p < 0.01$). As for the period after quickening stronger correlation was observed regarding all three coefficients between MAAS and PAI. Our results show a strong correlation for MAAS Total and PAI ($r = 0.66$, $p < 0.001$), MAAS Quality and PAI ($r = 0.53$, $p < 0.001$), as well as MAAS Intensity and PAI ($r = 0.67$, $p < 0.001$).

Determinants of Maternal Antenatal Attachment

Socio-Demographic Factors

For identification of the determinants related to the maternal antenatal attachment four significant socio-demographic features were investigated: marital status, maternal age, educational attainment and the number of children.

As for maternal age and educational attainment no correlation was found with either the MAAS Total or the scores on the two subscales.

In regard to marital status, we found a significant difference between married mothers compared to women living in cohabitation. Expectant women living within a conjugal relationship had significantly higher scores on the MAAS Total ($p < 0.05$), and on the Quality subscale ($p < 0.05$), in contrast to cohabiting women. Regarding the Intensity subscale, however, no significant difference was observed between the scores of the two groups ($p > 0.05$) (Table **4**).

Considering the number of children, primigravidous women did not differ from mothers already having one or more children regarding their scores on MAAS Total ($p > 0.05$) and Quality subscale ($p > 0.05$). However, with respect to the Intensity subscale, first-time-pregnancy group showed significantly higher scores, compared to multigravidous women ($p < 0.05$) (Table **4**).

Determinants of Actual Pregnancy

Foetal movement, pregnancy plannedness and the wantedness of the current pregnancy were examined in our study in terms of their influence on maternal antenatal attachment.

Based on the experience of the perception of quickening, participants were divided into two groups.

Table 4: Socio-Demographic Determinants of Maternal Antenatal Attachment

	N	MAAS Total			MAAS Quality			MAAS Intensity of preoccupation		
		Mean	SD	U[a]	Mean	SD	U[a]	Mean	SD	t[a]
Marital status[b]										
Married	146	82.05	6.87	4694.5*	46.84	2.83	4488.5*	30.7	4.55	-1.48 #
Cohabiting	77	79.39	8.46		45.26	4.35		29.74	4.69	
Number of children										
Primigravidous	144	80.8	8.94	5823#	45.69	4.43	6635.5#	30.66	4.82	2.34*
Multigravidous	93	80.03	6.8		46.38	2.85		29.19	4.54	

* p < 0.05; # p > 0.05
[a]As the MAAS Intensity of preoccupation subscale is normally distributed, Student's t values are displayed, whereas Mann-Whitney U values can be seen in the case of the MAAS Total and MAAS Quality.
[b]This statistical analysis does not include 14 women belonging to the category of Others regarding their marital status, See: Demographic data

Statistically significant difference was found between the two groups for the MAAS Total (p < 0.01), also for the MAAS Intensity (p < 0.01). However, no difference was shown regarding the scores on the MAAS Quality subscale (p > 0.05) (Table **1**).

Compared to those who expressed unplanned nature of their pregnancy, our results show that women reporting planned pregnancy gave higher scores on MAAS Total (p < 0.001) and both the Intensity- (p < 0.001) and the Quality subscale (p < 0.001).

As for the maternal wantedness of the pregnancy, a significant difference was observed between the two groups regarding the MAAS Total (p < 0.001), the Quality (p < 0.001) and Intensity scores as well (p < 0.001). Women expressing their wish for childbearing scored significantly higher on all scales compared to women having an unwanted pregnancy (Table **5**).

Pregnancy desire from paternal side had also an influential effect on maternal antenatal attachment. Women perceiving positive desire from their partner towards childbearing scored higher on the MAAS Total (p < 0.001) and both subscales, compared to the group who described unwanted pregnancy from their partner's side (Quality: p < 0.001; Intensity: p < 0.001) (Table **5**).

Maternal Mental Health During Actual Pregnancy

Scores on the two HADS subscales showed significant slight and moderately strong negative correlations with the MAAS scores. On the one hand, negative correlation was observed between the HADS Depression subscale and the MAAS Total (r = -0.49, p < 0.001), just as the Quality subscale (r = -0.5, p < 0.001), and the Intensity subscale (r = -0.41, p < 0.001). Similarly, HADS Anxiety showed negative correlation with the MAAS Total (r = -0.46, p < 0.001),

Table 5: Determinants of Pregnancy Related Variables on the Maternal Antenatal Attachment

	N	MAAS Total			MAAS Quality			MAAS Intensity of preoccupation		
		Mean	SD	U[a]	Mean	SD	U[a]	Mean	SD	t[a]
Planned pregnancy										
Yes	188	82.68	6.1	1672.5***	47.06	2.65	1549.5***	31.09	4.18	-7.04***
No	49	72.12	9.62		41.73	4.91		26.2	4.87	
Intentional childbearing from mother's side										
Yes	227	81.23	7.32	183***	46.34	3.34	193***	30.4	4.53	-5.14***
No	10	63.9	9.06		37.3	5.52		22.9	4.12	
Intentional childbearing from father's side										
Yes	214	81.89	6.71	529.5***	46.63	3.05	644.5***	30.75	4.32	-7.22***
No	23	67.52	9.14		39.78	5.3		23.91	4.27	

*** p < 0.001
[a]As the MAAS Intensity of preoccupation subscale is normally distributed, Student's t values are displayed, whereas Mann-Whitney U values can be seen in the case of the MAAS Total and MAAS Quality.

as well as with the Quality subscale (r = -0.55, p < 0.001), and with the Intensity subscale (r = -0.34, p < 0.001) (Table **3**).

Partnership and Prenatal Attachment

Our findings suggest that maternal antenatal attachment has not been significantly influenced by the length of partnership. Contrastively, moderately strong correlations were obtained between the dyadic adjustment and MAAS Total scores (r = 0.6, p < 0.001), and also with the quality (r = 0.58, p < 0.001) and the intensity of maternal antenatal attachment (r = 0.53, p < 0.001) (Table **3**).

A similar tendency became visible regarding the subscales of the DAS. The correlation coefficients ranged from 0.45 to 0.56 for the MAAS Total and the DAS subscales, from 0.41 to 0.52 for MAAS Quality and the DAS subscales, as well as, from 0.4 to 0.51 for the MAAS Intensity and the DAS subscales. All correlations were significant at the level of p < 0.001 (Table **3**).

DISCUSSION

Reliability and Convergent Validity of the MAAS

In this study, we investigated the psychometric properties of the Hungarian version of the Maternal Antenatal Attachment Scale (MAAS) [6]. The MAAS Total and its two subscales (Quality and Intensity of preoccupation) were found to be valid and reliable. As for the internal consistency, the Cronbach's alphas slightly exceeded those of the original version of MAAS published by Condon [6] and those of the Dutch version, too [32]. The strength of correlations between the subscales was found similar to the original version [14] and the results published by van Bussel *et al.* [32].

As for the validity of the Hungarian MAAS, we examined its convergence with the PAI. The concordance between the two measures reinforces the fact that the Hungarian version of MAAS is a suitable instrument to assess maternal antenatal attachment. In addition, we point out an important difference between the two measures. Several items in the PAI are connected to foetus movements; therefore the scale is suggested to be used from the second half of the pregnancy. In contrast, the MAAS can efficiently report about the mother-foetus attachment from an early stage of gestation. Thus, it proves to be a reliable scale of assessing prenatal attachment at any time during the entire pregnancy.

Determinants of Maternal Antenatal Attachment

Demographic Variables and Prenatal Attachment

There are various assumptions regarding whether different demographic variables show association, and if so, to what extent, to the development of prenatal attachment. Some research results suggest that there is a negative correlation between the age of a pregnant woman and attachment. This could be explained partly by more intense concerns about pregnancy-related changes at an advanced maternal age [32, 35, 41]. Another contributing factor for the inverse correlation could be the fears deriving from the higher risk of pathologic foetal development or prenatal loss among older women. However, at the same time some authors claim that age-related differences cannot be verified [14], while others suggest that they tend to disappear merely by the advance of gestation and/or by the reassuring results of medical examinations focusing on foetal development [42, 43]. In our study neither the quality nor the intensity of mother-foetus attachment were found to have association to the age of pregnant women.

Regarding the Hungarian sample antenatal attachment characteristics and maternal age proved to be independent from each other.

Similarly to Condon and Corkindale's findings [14], no correlation was found in our study between the length of partnership and antenatal attachment. However, the difference proved to be significant between the groups in terms of the form of partnership. Married women showed higher mother-foetus attachment in contrast to women cohabiting with their partner. A possible explanation for the difference might be the fact that the decision of getting married declares a more persistent commitment in a couple's life, thus increasing their feeling of security.

Various research findings have been recorded in the literature in regard to investigating the relationship between the number of children and the characteristics of maternal-foetal attachment [14, 32, 35, 44, 45]. With respect to the quality of attachment, our results show no difference between women expecting their first child and those who already gave birth to one or more children. However, as for the intensity of attachment higher scores were assessed among primiparous women. We suggest that the novelty of pregnancy-related experiences is of increased level during the first expectancy which exerts its influence on the *intensity* of

the development of mother-foetus attachment, as opposed to the *quality* of attachment, which proves to be a more static variable, irrespectively of the number of children.

In accordance with Condon and Corkindale's [14] findings, our study explored no correlation between prenatal attachment and maternal educational attainment.

Relationship between Actual Pregnancy and Prenatal Attachment

Most of the attachment research emphasises the increase of mother-foetus attachment as gestation advances, especially following the appearance of quickening [32, 41, 43, 46-48]. Supporting previous research findings in the topic, our study also proved that prenatal attachment increases over time with the gestational weeks. Although the development of mother-foetus attachment has been variously examined in terms of the trimesters, it is important to emphasise that in almost every case the most dynamic increase can be observed between the scores of the first and second trimester. Hence, it indicates a change in attachment related to the initial appearance of quickening. For this reason, we investigated prenatal mother-foetus attachment focusing on the perception of foetal movements as well. According to our findings, mothers who have already felt the initial motion of the foetus show stronger attachment, as opposed to those who have not experienced it yet. The difference between the two groups (before and after the perception of foetus movement) can be explained with the increasing intensity of prenatal attachment.

Perception of foetal activity can also play a great role in enhancing mother-foetus interaction. Moreover, it can help distinguishing the mother's representations towards the foetus, and different states attributed to the foetus, which appear in the forms of affections, intentions and needs. All these processes can simultaneously contribute to the strengthening of the maternal-foetal attachment at the time of the quickening. Furthermore, our findings also confirm that pregnancy wantedness and its planned nature both from the maternal and the paternal side exert influence on the advancement of antenatal attachment. Although these features primarily make sense in the context of the quality and dynamics within a partner-relationship, they can respectively be influential factors behind the early development of mother-foetus attachment.

Maternal Mental Health and Prenatal Attachment

Several studies have confirmed the existing association of antenatal attachment with maternal health behaviour during expectancy, and with pregnant women's mental health as well [14, 32, 49]. Prenatal depression and anxiety can be mentioned among the most frequently measured negative variables related to mother-foetus bond. In line with the findings of other studies, our results confirmed that women suffering from higher level of depression and/or anxiety show a lower level of attachment to their foetus. These effects can manifest both in the quality and the intensity of the prenatal attachment. Maternal mental health has a complex influence on the characteristics of pre- and postnatal attachment. Therefore, protecting pregnant women's health as well as screening mental problems and supporting high-risk populations can considerably contribute to the optimal development of prenatal attachment.

Partnership Characteristics and Prenatal Attachment

Our study points out that better dyadic adjustment assessed during the pregnancy shows an association with more auspicious outcomes regarding mother-foetus bond. Several characteristics of the partnership, such as satisfaction, cohesion, consensus between partners, and expression of emotions are associated with stronger attachment features among the participants in our study. The results may suggest that a partnership which is rated good facilitates the strengthening of maternal-foetal attachment via providing a secure basis. The importance of partner support and the quality of partnership has been noted by other studies as well [14, 27, 50, 51]. Therefore, we would like to emphasize the relevance to develop interventions within pregnancy-related professional care services aiming to enhance partner's involvement and joint parental preparation for the arrival of the baby during the pregnancy.

Limitation of the Study and Recommendations for Future Research

Limitations of this research could be that it does not involve or identify high-risk groups in terms of prenatal attachment. Being a single parent, high-risk pregnancy or the experience of loss related to a previous pregnancy can have decisive significance on the advance of antenatal attachment. Therefore, future research must pay attention to explore factors that negatively influence the mother-foetus bond, and

accordingly, to identify high-risk groups as well. In our study the unplanned or unwanted nature of pregnancy was associated with lower prenatal attachment both from the maternal and paternal side. However, due to the small population number of these subgroups the generalisation of the results must be taken with caution. Further research is recommended on a larger sample population to explore factors behind unplanned and unwanted pregnancies and their associations to the advance of prenatal attachment.

CONCLUSION

The Hungarian version of the Maternal Antenatal Attachment Scale (MAAS) is a reliable and valid measure of the mother-foetus relationship during pregnancy. This self-report questionnaire makes it possible to successfully assess quality and intensity features of prenatal attachment. A remarkable advantage of the scale is its capability for providing time-efficient assessment, in contrast to attachment interview techniques. Moreover, it is suitable to uncover mother-foetus attachment from the earliest stage of pregnancy. This instrument allows professionals to gain results that help care services in the field of prevention, early screening and supportive interventions, as well. By exploring strong evidences for the psychometric stability of the MAAS, it has been supported that the Hungarian version of Maternal Antenatal Attachment Scale is a relevant measure both for clinical practice and in scientific research focusing on mother-foetus attachment.

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