

A study on maternal-fetal attachment in pregnant women undergoing fetal echocardiography

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Abstract

Purpose: To investigate the possible effects of the fetal echocardiography experience on the prenatal attachment process. The predictive effect of specific women's psychological variables will be explored as well.

Design and methods: This between groups study involved 85 women with pregnancy at risk who underwent the fetal echocardiography, and 83 women who were about to undergo the morphological scan. The tools employed were: the Prenatal Attachment Inventory (P.A.I.) to explore the maternal-fetal attachment; the Maternity Social Support Scale to investigate the woman perception of being socially supported during pregnancy; both the Big Five Questionnaire and the FACES III to explore the personality traits of pregnant women and their perception of their couple relationship functioning.

Findings: The outcomes of ANOVA do not show statistically significant differences between the two groups of the mothers-to-be with regard to the scores of the P.A.I. ($F = .017$; $p = .897$; $\eta^2 = .000$), while the regression analysis of the possible effect of the maternal psychological variables on the mother-fetus relationship shows a statistically significant result only with regard to the "social support" variable ($r^2 = .061$; $df = 80$; $p = .025$).

Conclusions: It would seem that the process of the prenatal attachment develops independently whether the woman has to undergo a first level screening or a second level examination such as the fetal echocardiography.

Keywords

Maternal-fetal attachment, fetal echocardiography, personality, social support, couple functioning.

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Introduction

This study focuses on the prenatal attachment relationship of pregnant women who have to undergo the second level screening of the fetal echocardiography, after the 20th gestational week, because of a suspected congenital fetal heart disease [1-4] possibly due to maternal/family risk factors (i.e. family history of congenital cardiac pathologies, infections contracted during pregnancy, insulin-dependent diabetes or maternal autoimmune diseases, etc.), or just to fetal risk factors (i.e. fetal arrhythmia, early-onset developmental delay, chromosomal alterations, suspected structural abnormality on the first trimester screening, etc.). The recent inclusion of fetal echocardiography as an additional ultrasound test to provide a more accurate antenatal diagnosis has significantly advanced the detection of congenital heart disease [5] and, subsequently, the perinatal outcomes of pregnancies involving fetuses affected by specific types of cardiac lesions [5-7]. However, in order to improve the detection rate of fetal cardiac abnormalities also in low-risk pregnancies, both the basic and extended basic cardiac scans [8-10] should be performed by on-purpose trained health workers through the proper equipment. These screenings scan the ventricular discharges [11, 12], and the standard four cardiac chambers. This is the reason why the fetal echocardiography should be performed only in case gynaecologists detect factors that may indicate the risk of a congenital heart disease, after a comparison with the low-risk population-based screenings [8]. Nevertheless, most gynaecologists prescribe almost any patient to undergo standard prenatal examinations coupled with the fetal echocardiography either as a preventive investigation procedure, since fetal

congenital heart diseases may occur even in low-risk pregnancies [5], or as an alternative test when the equipment to carry out an in-depth scan is not available.

The goal of this study is to encourage interventions of integration between the cure and care [13-15], to establish a better assumption of responsibility of pregnancy risk conditions.

This paper is an extension of the great amount of the recent scientific literature which investigates the relationship between the quality of the state of pregnancy and the prenatal attachment [16, 17]; it is in line with the latest research projects that consider the relationship between the mother-to-be and her unborn baby as a factor which could influence the postnatal mother-infant interaction [18, 19].

The fetal echocardiography may be such an emotionally distressing condition for the pregnant woman that it could influence the development of the prenatal attachment [20] with regard to the mental, emotional and behavioural involvement of the mother-to-be towards her unborn baby [20, 21]. Going through this experience could potentially lead to antipodal responses that are revealed by either an excess of affective investment or an extremely emotional detachment [22]. Some empirical evidences demonstrate that most women, who receive a prenatal diagnosis, tend to await the results of the tests before engaging any affective bonding with the unborn baby. Such emotional and psychological attitude, called “tentative pregnancy” [23], which can be displayed, for example, by the hesitation of wearing maternity clothes or by denying to perceive fetus’ movements, would prevent pregnant women from being overwhelmed by the negative feelings that can trigger on their learning about a potential unhealthy fetus [23].

On the contrary, other studies report the absence of differences between women who went through testing and women who did not, or reveal the occurrence of a higher emotional involvement of the mothers under prenatal diagnosis.

The innovative aspect of this study lies in its interest in finding out whether and to what extent the fetal echocardiography can emotionally influence the mother-to-be’s prenatal attachment, differently from other research projects that mainly investigated what psychological effects could be detected in women undergoing other tests such as obstetric ultrasound [24], amniocentesis and/or chorionic villus sampling [25-28].

The reference theoretical background of the interest in the prenatal attachment also comprises

the studies on the fetal development that demonstrate how soon the fetus is active, sensitive, able to learn and to interact with the environmental and maternal body's stimuli [29-31]. The fetal movements from the third up to the sixth month change the maternal psychological perception of the fetus. "A physical fetus grows in the womb, bringing such deep and fast body transformations, that an imaginary baby grows in the mind, guiding the woman toward maternity" [22]; the level of prenatal attachment bond, typically, increases as the pregnancy progresses [19, 17].

In the light of these considerations and theoretical perspectives, the aim of the study is to explore the possible effects on the quality of the maternal-fetal relationship of women who experience the fetal echocardiography test by a comparison to women undergoing the morphological echography, a screening of first level that is essential for the assessment of the fetal anatomy (i.e. check of the fetal spinal column, abdomen and limbs; scanning of the cardiac chambers and ventricular discharges; etc.).

The psychological variables that may influence the prenatal attachment are presented below.

- The structure of the personality of the mother, according to the model of the five factors [32]: Agreeableness in terms of the altruistic tendency to take care of others and give them emotional support; Openness to experience in terms of being receptive to new ideas and feelings; Extraversion in terms of a trustful and enthusiastic approach to life; Emotional stability as the ability to control emotions and impulses; Conscientiousness concerning traits such as precision, accuracy and sense of responsibility. This latter factor was investigated on the basis of the often-contradictory empirical outcomes of the field. Numerous studies highlight that anxiety or depression may affect the woman's ability to engage an emotional attachment to her fetus [20, 34, 35], while others do not confirm such predictivity [17].
- The social support as woman's perception of being socially supported in the management of her pregnancy. Increased levels of social support are usually significantly correlated with higher levels of prenatal attachment [19, 21, 30, 36]. It seems that the more adequate the support to the mother-to-be is, the strongest the prenatal attachment will be [19, 37]. Similarly, an empathic as well as reciprocally supportive family climate is positively related to the prenatal attachment [38].

- The perception of the couple relationship functioning as the woman's representation of the functioning of her own relationship during the gestational period. It is analysed in terms of cohesion that is the capability of staying close and being reciprocally supportive in front of difficulties; in terms of adaptability, the couple ability of modifying relational modalities, behaviour and attitude in order to face the critical events [39]. Some studies by Cranley [40], Siddiqui et al. [18] and Bouchard [41] show that the prenatal attachment between the mother-to-be and the fetus is positively influenced by a satisfying couple relationship.

Methods

The main purpose of this study was to investigate the possible effects of the fetal echocardiography experience on the prenatal attachment process by comparing a group of pregnant women undergoing the echocardiography with another group of women experiencing the morphological screening test.

The predictive effect of the women's psychological variables above mentioned – "personality", "perceived social support" and "couple relationship functioning" – on the prenatal attachment of the mother-to-be undergoing the fetal echocardiography was also explored.

The research hypotheses were:

- verifying the existence of statistic differences with regard to the levels of prenatal attachment between the pregnant women undergoing the fetal echocardiography and those experiencing the fetal morphology scan;
- verifying whether the variables "perceived social support" and "couple relationship functioning" had a predictive effect on the prenatal attachment of women undergoing the fetal echocardiography.

Participants

This study involved a group of 85 Italian women (mean age = 31.4 years, SD = 5.7) with pregnancy at risk who underwent the fetal echocardiography at about one month after the gynaecologist's prescription (mean = 27 days, SD = 2), and a group of 83 Italian women (mean age = 29.7 years, SD = 6.5) who were about to experience the morphological scan (**Tab. 1**). The majority of the mothers-to-be had a low-medium

level of education (lower secondary education and high school diploma) (**Tab. 1**). The fetal-echocardiography group was recruited within the Unit of Neonatology of the “V. Cervello” Hospital of Palermo, while the morphological-scan group was recruited within the Unit of Midwifery/Gynaecology of the same hospital. The women had to go through testing adhering to the prescriptions of either the hospital or private gynaecologists of Palermo and province. The fetal echocardiography diagnosed only 10 cases of fetal heart defect out of 85 screenings.

The study was carried out in accordance with the ethical research guidelines, established by the Declaration of Helsinki in 1964. The informed consent of participants was obtained after providing them with a clear explanation of the study protocol.

Measures and procedures

The instruments employed are presented below.

- The Prenatal Attachment Inventory (P.A.I.) [42-44] was used to explore the maternal affective investment process developed towards the unborn baby during the pregnancy. It is a self-report questionnaire that consists of 21 Likert-type items arranged on a 4-point-response set ranging from “almost always” (4) to “almost never” (1). The total score can range from 21 to 84 (21 to 42 = low level of prenatal attachment; 43 to 64 = medium level; 65 to 84 = high level). The Italian version of the P.A.I. maintains the main psychometric characteristics of the original version (Cronbach’s $\alpha = .869$).
- The Maternity Social Support Scale (MSSS) [45, 46] was used to investigate the pregnant women’s perception of being socially sup-

ported during the gestational period. It is a self-assessment (Likert-type scale) made up of 6 items representing the social factors linked to the postnatal depression such as lack of family support, poor circle of friends, lack of help, feeling of being controlled and not loved by the husband or partner. The total score of the MSSS is obtained by summing the 6 items, and can range from 6 to 30. High scores show an adequate social level. The cut-offs proposed by the authors of this scale [45] to detect the categories of maternal social support are: 6-18 (low level), 19-24 (intermediate level), > 24 (adequate level).

- The Big Five Adjectives (B.F.A.) [47] were used to explore the personality traits of pregnant women. It is made up of 175 adjectives that allow to measure the 5 dimensions adopted to describe and evaluate the personality traits of each woman: E = Energy, associated to an enthusiastic and trustful approach to different life events; A = Agreeableness, that comprises opposite characteristics such as altruism, caring for others, providing emotional support or, on the contrary, expressing hostility towards or no interest in others; C = Conscientiousness, associated to accuracy and sense of responsibility; S = Emotional Stability, associated to the control of emotions and impulses; M = Openness to experience, in terms of being receptive to new ideas and personal feelings. 7-mark answers of Likert scale (from 1 = “not at all” to 7 = “very much”) are planned for each adjective. The psychometric characteristics of the instrument are excellent.
- The Family Adaptability and Cohesion Evaluation Scale III (FACES III) [48] was used to

Table 1. Characteristics of the sample.

Variables	Women undergoing the fetal echocardiography (n = 85)		Women undergoing the morphological scan (n = 83)	
	Mean	SD	Mean	SD
Age	31.4	5.7	29.7	6.5
Gestational week	22.7	4.1	21.1	2.3
Parity				
Primiparous	48%		54%	
Multiparous	52%		46%	
Title of study				
Lower secondary education	36%		47%	
High school diploma	42%		33%	
Degree	22%		20%	

investigate pregnant women's perception of their own relationship functioning. It is a self-report tool made up of a series of 20 items relating to the two main indicators of the couple relationship functioning such as adaptability and cohesion, according to the Olson's model. This scale requires 5-mark answers of Likert scale (1 = "almost never" to 5 = "almost always"). Very high levels of cohesion define the couple functioning as characterized by emotional enmeshment. It is a tool, whose original version by Olson [48] was translated into Italian, characterized by good psychometric qualities such as the reliability of both internal consistency ($r_{\text{total}} = .68$) and the test-retest ($> .80$ for the dimension). Moreover, the scale has exhaustive levels of validity and good levels of internal coherence (correlation among the scales = .03; correlation of each dimension with social desirability = 0). With regards to the adaptability/flexibility dimension, very low levels may reveal a rigidity of roles, functions and tasks with which partners interact together.

The study was part of a research project designed to have an immediate feedback on the clinical practice performed at the hospital, so the women undergoing the screenings were involved according to the following procedure:

- the women who were waiting to undergo the fetal or morphological echocardiography were informed by the psychologist that the Unit of Midwifery/Gynaecology and the prenatal-dedicated areas of the hospital were providing maternal/infancy accompaniment support services aimed at supporting the mother-to-be in her path towards the maternity. They were also informed that they would have been administered some tools aimed to acquire a good awareness of the importance of the prenatal attachment, and of the psychological state of pregnancy;
- after obtaining the informed consent, the psychologist administered the mother-to-be the

tools previously mentioned, trying to promote possible reflections about the issues suggested by the items;

- later, after undergoing the scan, women were asked to report their emotional experience.

Statistical analyses

Data were previously tested to verify the possible application of parametrical tests. Kolmogorov-Smirnov's test [49] was used to verify the normality of the distribution of the scores obtained by the tools ($p > .05$), and Levene's test to verify the homogeneity of the variances between the groups (homoscedasticity: $p > .05$). Then, data underwent a descriptive statistical analysis through the Statistical Program for the Social Sciences – SPSS® 16.0 for Windows®. With regard to the possible differences of the scores of P.A.I. between the women undergoing fetal echocardiography and those undergoing morphological scan, a univariate analysis of variance (ANOVA) between the groups was performed. A regression hierarchic analysis was also performed to assess possible predictive effects of maternal psychological variables ("personality", "perceived social support", "couple relationship functioning") in the women undergoing fetal echocardiography.

Results

The outcomes of the ANOVA test do not show statistically significant differences between the two groups of mothers-to-be with regard to the scores of the P.A.I. ($F = .017$; $p = .897$; $\eta^2 = .000$) (**Tab. 2**). It seems that the process of the prenatal attachment occurred independently whether the woman had to undergo a fundamental routine test of the first level such as the morphological scan, or a second level test like the fetal echocardiography for a suspected congenital heart disease of the fetus. Both groups scored almost medium-high levels of the P.A.I. (**Fig. 1**).

Table 2. Prenatal Attachment Inventory (P.A.I.) in pregnant women awaiting to undergo the fetal echocardiography: descriptive statistics and ANOVA.

Screening	Prenatal Attachment Inventory (P.A.I.)			
	Mean	SD	F (df1, 167)	Sign.
Fetal echocardiography (n = 85)	61.85	7.8	.017	.897
Morphological scan (n = 83)	61.68	9.2		
Total (n = 168)	61.77	8.5		

The regression analysis of the maternal psychological variables above mentioned and the possible effect on the mother-fetus relationship show a statistically significant datum only for the “perceived social support” variable ($r^2 = .061$; $df = 80$; $p = .025$), which is at the intermediate level (score range 19 to 24) in 80% of the women involved, while the effect of the perceived “couple relationship functioning”, and the “personality” traits of the mother on the prenatal attachment seem not to be statistically significant (**Tab. 3**).

Discussion

The absence of statistically significant differences between the two groups with regard to the prenatal attachment would suggest that the idea of undergoing a second level screening is not

so emotionally distressing as to affect the quality of the relationship between the mother-to-be and the fetus. This outcome would be consistent with other literature of the field that highlighted an equal emotional involvement in the relationship with the fetus, whether for women having a high-risk pregnancy, so they are forced to undergo several prenatal screening, or for women having a pregnancy without any particular complexity [16, 19]. The result of our study is in line with other studies that have analysed prenatal attachment in women undergoing prenatal diagnosis path (amniocentesis, chorionic villus sampling, etc.), noticing the absence of statistically significant differences with control groups and often showing the presence, in women undergoing antenatal screening, of adequate levels of prenatal attachment, with a growing trend during

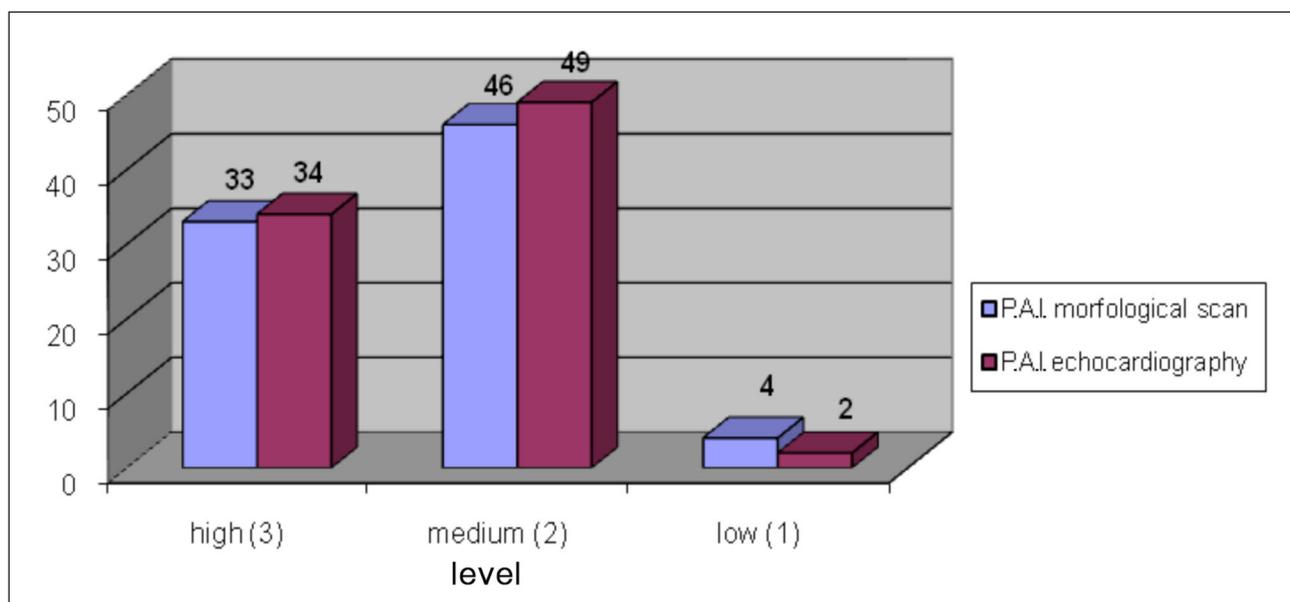


Figure 1. Levels of Prenatal Attachment Inventory (P.A.I.).

Table 3. Hierarchic regression analysis relating to the social support, the couple relationship functioning and the personality traits (n = 85).

Variables	R	R square	R square change	F change	df1	df2	Sig. F change
Social support	.247	.061	.061	5.197	1	80	.025
Couple cohesion	.299	.089	.028	2.472	1	79	.120
Couple adaptability	.300	.090	.000	.021	1	78	.884
Energy/Extraversion	.302	.091	.001	.115	1	77	.735
Agreeableness	.309	.095	.004	.349	1	76	.557
Conscientiousness	.311	.097	.002	.128	1	75	.722
Emotional Stability	.311	.097	.000	.009	1	74	.926
Openness to experience	.327	.107	.010	.825	1	73	.367

the months of pregnancy [19, 50, 51]. During our research, indeed, all the women who had to undergo the morphological or the fetal echocardiography test scored a medium-high level of P.A.I.

In spite of the awareness of a possible fetal congenital heart defect, the mothers-to-be did not change the intensity of thoughts, emotions and verbal interactions with the fetus even after experiencing the test. Such a result may be ascribed to the woman's representation of this kind of screening as a routine examination that may induce the same anxiety as any other ultrasound exam already experienced.

Although it is a second level screening, the fetal echocardiography is often mistakenly considered as a routine screening addressed to all pregnant women. The reason can be that most gynaecologists tend to prevent pregnant women from the risk of unexpected fetal abnormalities and, at the same time, they try to minimize women's anxiety provoked by the threat of an unhealthy fetus. Moreover, women can easily have access to a lot of information about antenatal diagnosis by consulting pregnancy-dedicated sites on the Internet, and exchanging experience talking to each other. This approach has induced mothers-to-be to think that they should undergo the fetal echocardiography even when their pregnancies are at low risk of fetal heart disease, whereas an accurate morphological scan, performed through the appropriate equipment by on-purpose trained health workers – as specified by the international guidelines [8] – can be adequate enough to detect about 50-70% of the fetal heart defects. Yet, the tendency of medicalizing pregnancy is more and more recurrent [52], while women become less aware that a second level screening implies the potential risk of detecting fetal abnormalities [53, 54]. This approach, therefore, leads the mother-to-be to consider the experience almost normal, minimizing her anxiety, which results equal to or even lower than the one suffered before undergoing the morphological scan.

The medium-high levels of the prenatal attachment of women undergoing the fetal echocardiography confirm the incremental nature of it [19, 17], that is undoubtedly significant for the postnatal mother-baby relationship [18, 53, 54], and that suggests the importance of the psychological support provided in the midwifery/gynaecology area. In case of an undesired diagnosis, the cooperation between professionals and paediatric

cardiologists of the outpatient clinics, where the fetal echocardiography is performed, can provide an extremely useful support to pregnant women [52]. A strong prenatal attachment may lead women to experience a painful condition greater than it could have been if, learning the importance of the test, they had already activated a sort of interruption of the emotional attachment to the fetus. When pregnant women are diagnosed with an abnormality, they are referred to the antenatal diagnosis hospital, often on the same day of execution of the fetal scan, in order to investigate whether a genetic syndrome is the cause of the heart defect. It is very likely that this implies an extremely distressing condition for the women and couples concerned.

This study shows that only 10 out of 85 women who underwent the fetal echocardiography had the undesired diagnosis. An ethical question can be asked: "How many women amongst them could have avoided this examination?"

Another negative aspect of considering the fetal echocardiography as a routine test is that it has become a burden on the public spending because it is performed mainly at the public hospital units. In the light of this consideration, the fetal echocardiography should be prescribed cautiously.

For all the reasons given, the study encourages the integrated gynaecologist-psychologist cooperation in obstetric units/services to better choose whether to subject pregnant women to specific prenatal screening or not. With regard to the maternal variables and to what extent they can weigh on the predictivity of the prenatal attachment, it seems that the perceived social support can have a remarkable effect on the pregnant woman's wellbeing. Feeling to be helped and/or emotionally supported by the most significant figures of her life like her partner, a relative, or a friend of hers, will be beneficial for her self-care and the relationship with her unborn baby [19]. The social support [46] is one of the main external resources for a pregnant woman for its mediating role, moderator of the possible anxiety, fear and doubts peculiar to pregnancy. As a matter of fact, pregnancy is a physiological condition, a peak of the woman's life, which can be amazing for many aspects, as well as very complex, sometimes even extremely distressing [55].

Conversely, the perceived couple functioning is not confirmed as a variable that may affect the prenatal attachment [18, 40, 41]. The data seem to show that it is not fundamental to the prenatal

attachment whether the relationship with the partner is more or less close and adjustable to manage the changes brought by the pregnancy. The reason can be ascribed to the intimate nature of the deep relationship the woman has just built with the baby before his/her birth; a bond made of thoughts, sensations and unique contacts, where the father hardly gets into. Unlikely the mother-fetus attachment, the father-fetus bond does not increase as the pregnancy progresses, but it develops within the first trimester to maintain the same level until the end of the pregnancy [55, 56]. For many fathers-to-be the birth of the baby is the real moment when they realize their paternity, while the previous period is dedicated to support their pregnant partner rather than to share with her thoughts, emotions and words addressed at the fetus [57].

With regard to the lack of statistically significant influence of the “woman’s personality structure” variable, it can only be hypothesized that the presence of psychopathologic alterations of the woman’s personality traits can make it more difficult to build the mother-fetus attachment. Therefore, further studies are required to delve into such aspect.

Lastly, the study suggests that women undergoing the prenatal diagnosis, such as the amniocentesis and/or the chorionic villus sampling, should also be considered in the prenatal attachment comparison with women undergoing the fetal echocardiography. Such comparisons would be of great interest for the development of the research in the field, given that we can only find studies which compare women who underwent the prenatal diagnostic screening aimed at the evaluation of possible chromosomal alterations of the fetus (such as amniocentesis or chorionic villus sampling) with control groups (women not sent to prenatal diagnosis path). However, a comparison has never been made between women in prenatal diagnosis and women who, even without being inside a prenatal diagnostic path, are subjected to second-level surveys to investigate the presence or absence of a congenital heart malformation of the fetus. Indeed, although the fetal echocardiography is certainly characterized as unobtrusive screening (it is an ultrasound) compared to other major screening of prenatal diagnosis mentioned above, it is always a stressful condition for the woman and for the couple, as long as it is going to evaluate whether the risk that the evolutionary trajectory of the fetus is taking shape in terms of atypicalness.

Finally, it can be pointed out that a limitation of the study can be traced in its essentially quan-

titative nature, certainly reducing the chance of having information on the specificity of the “stories of pregnancy” and on the weight that specific representations of pregnant women as future mothers may have in the building of the prenatal link with the child. However, one cannot but emphasize that the quantitative nature of the study responds strongly to the need to use a valid and recognized database in the literature field, and therefore, the need to ensure the rigor of the heuristic path. Thus, considering this critical aspect of the research, it is assumed, in the continuation of the research, the introduction of further more qualitative measures; in this case, it would be desirable, for instance, to investigate the maternal competence perceived while pregnant, through the use of a self-report instrument such as the Q-Sort and semi-structured interviews designed to explore the meaning and significance of the pregnancy in the single woman’s life. Finally, it is conjectured to explore, through expressing writing segments, if the woman during pregnancy has experienced high emotional intensity events, which may have impacted on the process of building attachment to the fetus.

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Declaration of interest

The Authors declare that there is no conflict of interest.

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