The Impact of Fetus Visualization on Parents' Psychological Reactions

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Full Text: Headnote ABSTRACT: The intention of this study was to examine the short-term psychological effects on parents, if any, of ultrasound scanning-that is, of fetal visualization. The starting hypothesis was that after visualizing the fetus, parents experience a lower level of stress and anxiety. To test that hypothesis, a quasiexperimental/control type of study was conducted. The subjects, all parents (N = 296), were divided into two groups: an experimental high-feedback group that watched the ultrasound screen, and a low-feedback control group that could not see a screen. Each group had two subgroups-risk pregnancy and no-risk pregnancy. To test the level of anxiety and stress, a number of scales were administered. The results confirm the positive effect of screening. Stress and anxiety levels were reduced. Statistically significant differences between the groups are found. Additional analysis in this area should be pursued. INTRODUCTION Ultrasound diagnostics is used widely in prenatal medicine. However, many questions are still raised about the benefits and/or harm that could be caused by the ultrasound technique. In addition, there is very little known about any psychological impact that ultrasounds have on mothers, fathers, and the fetus. Ultrasounds indeed do remarkable work. They can detect fetal abnormalities and malformations. They enable us to learn more about fetal senses and behavior. We know that the fetus breathes, experiences pain, tastes, hears, sees, and cries. We can even do surgery on a fetus. The fetus has become a patient. We do have some answers about fetus behavior during and after ultrasound examination. We know quite a bit, though not enough, about the relationship between the emotions and behavior of the mother and the fetus (see, for example, Van den Bergh 1990, or Rossi et al. 1989). Van den Bergh showed in her work that fetal behavior is influenced by maternal chronic anxiety during pregnancy. She also found that there is a certain degree of correlation between fetal and neonatal movement patterns. Rossi and his colleagues gathered similar results. They found that fetuses have a significantly higher motor activity in mothers with a high level of anxiety. However, there are not many systematic answers on parents' reactions to the use of ultrasound diagnostics in pregnancy. Does ultrasound have a positive impact on mothers and fathers, in any kind of pregnancy (risky or normal), regardless of the doctor's findings? If the answer is "yes", should it be applied as a routine diagnostic procedure or not? In which cases is it more appropriate to use and in which cases is it not? Recent literature concerned with the problem of the psychological effects of the interaction of ultrasound as a procedure and parents as patients is diverse and fragmented. Studies have mostly focused on mothers' reactions and changes in their attitudes towards the pregnancy after ultrasound technique is implemented and towards the technique itself (see, for example, Endres, 1987; Campbell et al., 1982; Milne and Rich, 1984; Marteau et al., 1989; Fletcher and Evans, 1983). For example, Campbell and his colleagues (1982) sought to find out more about the short-term psychological effects of early ultrasound scans. Their results confirm the acceptability of scanning, and the powerful effect of ultrasound on maternal attitudes towards the pregnancy. They found a higher level of maternal attachment to the fetus after the exposure to the ultrasound monitor. Milne and Rich (1984) evaluated a group of women exposed to the sonography. They tried to determine if women are able to "feel" what they see on a monitor, and how that feeling influences them. The authors concluded that the ultrasound visualization has a positive impact on mothers. Brown (1988) studied the short-term impact of fetal imaging on paternal stress and anxiety. He examined some of the emotional responses of expectant fathers when viewing their unborn child. Among other findings, the study showed that fathers who were exposed to ultrasound visualization experienced significant stress reduction compared to fathers who were not exposed to fetal images. Due to the fact that ultrasound

technology is used very frequently and that increasing number of parents are being exposed to real-time ultrasound imaging, it seems timely to assess more deeply the psychological impact that this procedure could have. Therefore, the purpose of this study is to find more systematic and precise answers about parents', mothers' and fathers' psychological reactions to the ultrasound visualization of the fetus, particularly in terms of what impact the ultrasound has on stress and anxiety levels. METHOD In order to test the hypothesis that after parents are exposed to fetal visualization, stress and anxiety levels will be significantly reduced, a quasiexperimental/control type of study with pre-test and post-test measures was conducted. The subjects were recommended by medical doctors. All were of Caucasian origin, primigravidae, and/or for the first time exposed to ultrasound, and all were attending the Institute of Ultrasound Diagnostics Medical School at the University of Zagreb. Both groups, experimental and control, were comparable in terms of age, marital status, and education. The subjects were divided further into two sub groups-those involved in risk pregnancies and those involved in no-risk pregnancies (see Table 1). The total number of subjects was 296. The experimental group (N = 146), a high-feedback group, was shown the monitor screen and given standardized visual and verbal information. The control group, a low-feedback group (N = 150) was given a similar examination, but could not see the monitor screen and did not receive verbal feedback related to the visualization of the fetus. Instead, parents in this group received only a global verbal evaluation.

Table 1

Composition of Study Groups (N=296)

Type of Pregnancy	*Groups*	
	Experimental	*Control*
Risk	72	78
No-risk	74	72
Total	146	150

The parents were assigned to the control and experimental groups randomly. Before pre-test measures and before seeing the doctor involved in the study, all the parents were told that the clinic was conducting a study concerned with different aspects of obstetric care, and all were asked if they were willing to participate in that study. Four couples refused; two of them because the father did not want to be present during the doctor's examination. Meanwhile, those couples who went on to face bad news following the doctor's examination (e.g., the need for the termination of the pregnancy, some kind of serious fetal malformation, etc.) were excluded from the study. In addition to medical records and relevant biographical data, parents were asked to complete a number of questionnaires. Experimental pre-test and post-test measures were conducted in a room designated especially for that purpose. The women were examined by four doctors from the Institute of Ultrasound Diagnostics, the clinic with the best reputation in the area. In the pre-test period, the questionnaires took approximately 30 to 45 minutes to complete; post-test period questionnaires took around 15 minutes to complete. The following scales were used: the State-Trait Anxiety Inventory (STAI) (Spielberger et al., 1983) which is composed of two separate scales-STAI-T (measuring trait anxiety) and STAI-S (measuring state anxiety). The STAI-T scale measures how somebody feels in general, and the second subscale (STAI-S) measures how she/he feels at the present moment. Each scale consists of 20 items, all scaled with numerical values ranging from a minimum score of 20 (for low anxiety) to a maximum of 80 (for high anxiety). Another scale used was the SVF scale (Stress Reactions Scale) (Janke, Erdmann &Boucsein, 1985) made up of 114 items divided into 19 subscales. Generally speaking, this scale defines and rates subjects' reactions to stressful events. Information was also obtained from SUZ (Patient Attitude towards Ultrasound Screening), a 12-item questionnaire developed by the author for this study to define patient's attitudes, beliefs, and feelings about the use of the ultrasound technique. Another source of information was SOAS (Subjective Anxiety-Stress Scale), a

scale of 15 items, developed by the author for the purposes of this study. Subjects were asked to mark each item by indicating how she/he feels about it at that moment. Also applied was the PAPI (Paternal Attitudes towards Pregnancy Inventory) developed by Brown (see Brown 1988). This questionnaire consists of 35 items related to the subjects' basic attitudes, values, beliefs, and possible prior experiences with being an expectant father. The MAPI (Maternal Attitudes towards Pregnancy Inventory) was also used for this study. It presents a version of the PAPI, adjusted so that it can be used with mothers. In addition to these scales and/or questionnaires, the level of immunoglobulin A in saliva (S-IgA) was noted as an objective measure of stress levels. Some findings report strongly that a lower level of S-IgA is significantly associated with higher stress levels and vice versa (see, for example, Jemmott et al, 1983; McClelland et al., 1980). All scales noted above were used in the pre-test period following the completion of the doctor's initial examination. In the post-test period, the responses of subjects from both the experimental and control groups were again measured with the STAI-S Inventory and SOAS scale, and the S-IgA level was also tested again. The subjects from the experimental group also filled out a checklist. On the checklist they had to indicate what they actually saw or thought they saw on the monitor screen. (As the subjects from the control group did not see the screen, they were not asked to fill out a checklist.) Table 2 summarizes what scales and measures were used at what points in the study.

Table 2

Scales used in pre-test and post-test periods of the study in the experimental and control groups

Scales	*Exam*			
	Pre-test		*Post-test*	
	E	*C*	*E*	*C*
1. STAI-T	X	X		
2. STAI-S	X	X	X	X
3. SVF	X	X		
4. SUZ	X	X		
5. SOAS	X	X	X	X
6. PAPI/MAPI	X	X		
7. S-IgA	X	X	X	X
8. CHECKLIST			X	

Note: E= Experimental group
Note: C= Control group

Finally, during the doctors' examination, a research assistant recorded everything that was going on during the ultrasound visualization, including the tone of the communication between the parents, and between the parents and the doctor, as well as the feedback that was given to the parents. A linear array real-time ultrasound scanning system was applied. This scanner provides a two-dimensional image of the embryo/fetus, umbilical cord and placenta. Depending on the gestational age of the fetus, it is also possible to see different organs and movements if the fetus is active at the time of the examination. RESULTS AND DISCUSSION The Pre-test state-anxiety (STAI-S) scores were comparable for the control and experimental groups and for both sexes. For example, mean scores were 44.297 (standard deviation 9.661) for the experimental group mothers facing a risk pregnancy, and 47.718 (standard deviation 10.787) for the control group mothers facing a risk pregnancy. Fathers in the experimental group involved in a risk pregnancy had a mean score of 40.806 (standard deviation 10.298) and of 40.513 (standard deviation 10.908) in the control group. (See Table 3.) If we compare the above scores with those for the post-test period we will notice an obvious decrease in score values (as shown in Table

3). For example, a mean state-anxiety score in the post-test period for the experimental group mothers facing a risk pregnancy was 36.054 (standard deviation 10.855); for the experimental group fathers facing a risk pregnancy, it was 34.389 (standard deviation 8.948). Tables 4 and 5 give mean scores and standard deviations in the pre-test and post-test periods for the SOAS and S-IgA variables. Here, it is possible to note similar tendencies in the scores especially for the SOAS variable. In both the experimental and control groups both parents' anxiety-stress scores decreased in the post-test period. An analysis of variance gave some more insights into the results obtained. The analysis of variance was applied in order to test the significance of the overall differences between experimental conditions, between pre-test and post-test scores, and between group characteristics for the variables STAI-S, SOAS, and S-IgA. In Table 6, we can see that the F ratio for the difference between the results obtained in the first and second measuring, as analyzed by "group" effect, is not statistically significant for any one of them.

Table 3

Pre- and post-test scores for variable STAI-S

	Pre-test period		*Post-test period*	
	M	*SD*	*M*	*SD*
Mothers				
Experimental				
risk	44.297	9.661	36.054	10.855
no risk	41.568	9.382	31.216	7.775
Control				
risk	47.718	10.787	39.103	12.922
no risk	42.889	9.189	33.611	10.277
Fathers				
Experimental				
risk	40.806	10.298	34.389	8.948
no risk	34.162	8.251	29.811	7.023
Control				
risk	40.513	10.908	35.308	9.979
no risk	37.389	9.387	32.639	9.851

Note: M= mean score
Note: SD= standard deviation

In applying the analysis of variance, tests of the significance of the difference between the pre-test and post-test period for each variable analyzed by "sex" showed the following: a) for the variable of parents' anxiety (STAI) there are significant differences between the two sexes (F = 7.580; sign of F = .006, p <.05); b) for the variable of parents' stress (SOAS) there are significant differences between two sexes (F = 7.352; sign of F = .007, p <.05); c) for the variable of S-IgA there is no significant difference between women and men (F = .305; sign of F = .581). Even though there is an obvious need for additional statistical analysis and data interpretation, we can say that there is an evident change between the scores in pre-test and post-test settings. Data presented here are not analyzed in terms of risk variables or on the level of twoway and three-way interactions that could point out some meaningful differences as well. However, they do confirm significant differences in stress and anxiety levels between the experimental and control groups and between the pre-test and post-test test settings.

Table 4

Pre- and post-test scores for variable SOAS

	Pre-test period		*Post-test period*	
	M	*SD*	*M*	*SD*
Mothers				
Experimental				
risk	5.622	4.030	3.730	3.564
no risk	4.757	3.337	3.027	2.598
Control				
risk	5.231	3.490	3.513	3.136
no risk	4.250	3.667	2.694	3.152
Fathers				
Experimental				
risk	4.270	3.761	3.108	3.178
no risk	2.081	2.532	1.649	2.003
Control				
risk	3.897	3.455	2.718	3.324
no risk	2.389	2.453	2.111	2.252

Note: M= mean score
Note: SD= standard deviation

CONCLUSIONS The purpose of this study was to test for short-term effects of fetal visualization on parents' psychological reactions, particularly on their stress and anxiety levels. Quite a complex test design was applied: all subjects were parents, both mothers and fathers; all were divided in two groups, tested at two different settings; and each group had two subgroups. For the variables of anxiety and stress, there were significant decreases in post-test measures for both experimental and control groups of parents. However, while there were no significant differences between the experimental and control groups in terms of the differences between the pre-test and post-test results, when analyzed by the variable "sex" those differences were statistically significant for the STAI-S and SOAS variables. Therefore, we can conclude that there is evidence to support the hypothesis that exposure to fetal visualization, regardless of the level of feedback, could result in a significant decrease of parental anxiety and stress.

Table 5

Pre- and post-test scores for variable S-IgA

	Pre-test period		*Post-test period*	
	M	*SD*	*M*	*SD*
Mothers				
Experimental				
risk	.236	.146	.228	.144
no risk	.209	.106	.258	.148
Control				
risk	.174	.113	.134	.123
no risk	.168	.110	.174	.105
Fathers				
Experimental				
risk	.203	.139	.185	.106
no risk	.193	.137	.184	.103
Control				
risk	.126	.119	.144	.127
no risk	.153	.109	.126	.094

Note: M= mean
Note: SD= standard deviation

Table 6

Significance of the difference between the results obtained in pre-tests and post-tests for the variables STAI-S, SOAS, and S-IgA in the experimental and control groups

	DF	*F ratio*	*Sig of F*
SOAS	1	.549	.459
STAI-S	1	.524	.470
S-IgA	1	.588	.444

The findings reported in this study are comparable with those of earlier studies, mostly done with mothers. For fathers, if we just look at the mean scores of the variables listed and pay attention to those of the mothers and fathers in pre-test and post-test periods, we will notice that the mean scores of fathers are always lower than those for mothers. Bearing in mind these facts and the results of the test of significance, we are led to the conclusion that the sex of the subject plays an important role and should be explored more deeply. Most likely, stress and anxiety levels are also influenced strongly by whether or not the pregnancy is considered to be risky. IMPLICATIONS FOR FUTURE RESEARCH Ultrasound scanning does not appear to cause psychological distress. In fact, even if all the results are not significant, it appears to reduce levels of anxiety and stress. Data obtained suggests, then, that scanning-fetal visualization-is emotionally rewarding. One of the intentions of this study was to study how important it is to provide a high level of feedback during the scanning procedure. If the scanning and verbal feedback can reduce anxiety and stress levels, this could have a great impact on pregnancy development, parents' attachment to the fetus/child, complications during pregnancy and delivery, on antenatal health care, and on the mother's initial reactions to the newborn (Crandon, 1976; Klaus and Kenell, 1976; Kumar and Robson, 1978). So far, this study, as is common, raises more questions than it gives answers. Fetal visualization could have an impact on more psychological reactions other than just anxiety and stress. Future research should also define all the possible factors that are likely to contribute to stress and anxiety level reduction, and/or other influences of the ultrasound scanning. There is a big gap between the use of modern technology in medicine and our knowledge about its psychological effects. For the benefit of all of us, medical doctors, psychologists and patients-fathers, mothers and fetuses-we must overcome that gap! ACKNOWLEDGMENT I would like to thank Dr. Gary Brown, author of the PAPI inventory, for allowing me to translate the inventory into Croatian, and to use the Inventory, as well as to make some adjustments to it, for research purposes. References REFERENCES Brown, G. (1988). Short-term impact of fetal imaging on

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