

FETAL MOVEMENTS ARE RELATED TO MATERNAL CHARACTERISTICS: A PROSPECTIVE ULTRASOUND STUDY



INTRODUCTION

Fetal movements are key indicators of fetal health and are often used in clinical decision-making, yet current assessment relies almost exclusively on maternal perception—a subjective measure with no universal definition of normal or abnormal patterns(1). Objective methods such as ultrasound provide precise evaluation but are impractical for continuous monitoring.

Stillbirth remains a leading cause of perinatal mortality, often preceded by maternal reports of reduced movements. Yet maternal awareness campaigns (2-3) have failed to reduce perinatal mortality, suggesting limitations in subjective reporting.

OBJECTIVE

To objectively quantify fetal movements using real-time ultrasound, compare them to maternally perceived movements, and examine associations with key maternal, fetal, and pregnancy characteristics.

This study represents one of the first and largest prospective cohort investigations to synchronously compare ultrasound-detected and maternally perceived movements in real time.

METHODOLOGY

In this prospective observational study, **61** participants with singleton pregnancies were monitored at **32–34 and 36–38** weeks’ gestation in a UK inner-city maternity hospital.

Fetal movements were categorised in **30 min ultrasound scans** (breathing, startle, limb, and general movements) and recorded alongside maternal perception.

Associations with **maternal age, BMI, parity, placental location, fetal sex, estimated fetal weight (EFW), and umbilical artery pulsatility index (UA PI)** were analysed using multivariable regression. Sensitivity of maternal perception against ultrasound was calculated.

RESULTS

No gestational differences in total ultrasound movements were observed. Higher maternal BMI was associated with fewer ultrasound-detected (p = 0.048) (table 1) and maternally perceived movements (p = 0.025) (table 2), while maternal age ≥35 years was associated with higher perception (p=0.025) but not objective counts. Parity, fetal sex, EFW, Dopplers, and placental location showed no association. Maternal sensitivity remained low: 10.0% (32–34 w) and 11.4% (36–38 w) (p = 0.64). Overall, perception captured ~1 in 8 true movements.

Maternally perceived movements < 5 sec - Multivariable analysis						
	32-34 weeks			36-38 weeks		
Variables	Coeff	95% CI	p-value	Coeff	95% CI	p-value
Age	5.28	-0.06; 10.61	0.052	3.67	0.48; 6.86	0.025
BMI	-1.72	-7.30; 3.86	0.539	-3.62	-6.76; 0.47	0.025
Nulliparity	1.69	-54.73; 58.11	0.952	1.89	-30.32; 34.11	0.906
Female fetal sex	-	-71.86; 31.77	0.441	7.21	-23.00; 37.41	0.633
Anterior placental site	-	-63.07; 39.49	0.646	-3.01	-32.80; 26.79	0.840

Table 1: Multivariable linear regression between total number of Ultrasound detected fetal movements at 32-34 and 36-38 weeks and all tested parameters

Total ultrasound movements - Multivariable analysis						
	32-34 weeks			36-38 weeks		
Variables	Coeff	95% CI	p-value	Coeff	95% CI	p-value
Age	9.52	-6.83; 25.87	0.248	7.55	-8.98; 24.07	0.363
BMI	-3.65	-20.54; 13.24	0.667	-16.72	-33.31; -0.12	0.048
Nulliparity	26.27	-146.32; 198.87	0.761	-32.20	-202.66; 138.26	0.706
Female fetal sex	-89.32	-244.32; 65.68	0.253	46.67	-109.13; 202.47	0.550
Anterior placental site	-17.08	-167.53; 139.38	0.855	-107.89	-264.24; 48.47	0172

We saw no statistically significant relationship with any parameter except BMI and total ultrasound movements at the late 3rd trimester window – as BMI increased, fewer movements were detected on US.

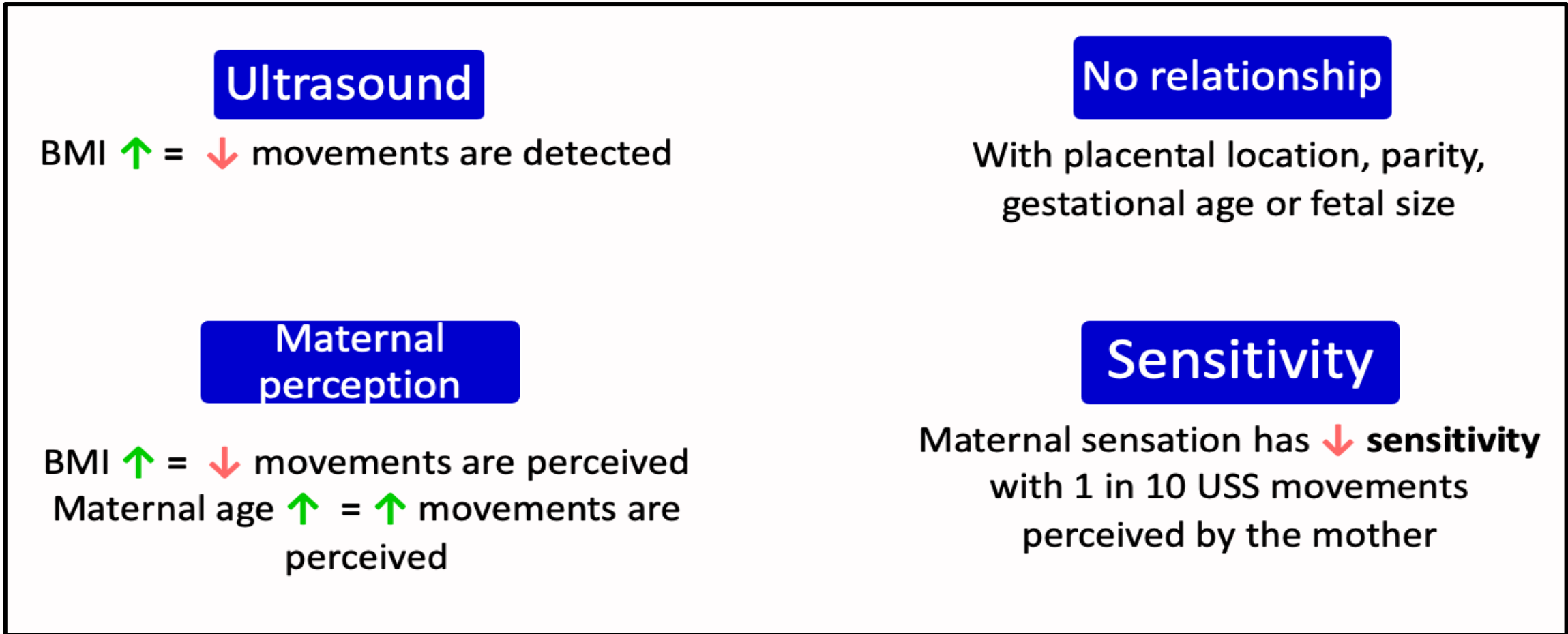
We saw no statistically significant relationship with any parameter except maternal age and BMI in the late 3rd trimester – older women felt more movements and as BMI increased, fewer movements were perceived.

Table 2: Multivariable linear regression between maternally perceived movements <5 seconds from an Ultrasound detected fetal movement at 32-34 and 36-38 weeks and all tested parameters.

DISCUSSION

To our knowledge, this is the **largest contemporaneously reported study** (4-10) to directly compare maternal perception of fetal movements with ultrasound-detected fetal movements. This study provides the first direct comparison between ultrasound-detected fetal movements and pregnancy parameters. By undertaking objective assessment with ultrasound, this research does not support associations that are anecdotally assumed with reduced perception of fetal movements, for example, anterior placental localisation.

Although the number of ultrasound detected fetal movements does not increase as maternal age increases, participants perceive more fetal movements as they get older. However, this study did not blind participants to movement ‘call out’ by the researcher and hence may have created bias toward perceived fetal movements.



That there is an effect of **greater BMI** with **reduced perceived and objectively detected fetal movements** is unexpected. While it is possible that ultrasound movements are reduced due to lower detection because of a poorer acoustic window with larger BMI participants, the same effect was seen for maternal perception. Although one of the largest fetal movement studies comparing objective movement detection, the sample size was relatively small. As a result, the ability to generalise these findings to broader populations is limited.

CONCLUSION

Maternal perception **substantially underestimates** true fetal movement which emphasizes the need for objective, standardised fetal monitoring. Increasing BMI **independently** reduces both perceived and observed movement counts, whereas maternal age increases perception. Objective ultrasound assessment **refutes** long-held beliefs about fetal movements such as an anterior placenta reducing maternal perception of fetal movements. This study provides a benchmark dataset and a reproducible framework for future translational fetal surveillance technologies (8). Future studies are needed to identify if a relationship exists between perinatal morbidity and mortality and objective fetal movements.

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