Appendix 1

Derivation of relative temperature

The total difference in phase evolution is measured as the difference between the phase change after the SSFSE and the phase change at baseline:

$$\Delta\phi_{total} = \Delta\phi_{t2} - \Delta\phi_{t1} \quad [1]$$

where $\Delta\phi_{t2}$ is the phase change after the SSFSE, and $\Delta\phi_{t1}$ is the phase change before the SSFSE. $\Delta\phi$s are found by first performing complex division and then taking the argument of the phase: $\Delta\phi = \angle|\psi_2/\psi_1|$, where ψ are the complex valued 2D GRE images. Relative phase changes are obtained by calculating the difference in average phase changes within the fetal brain to the control region in the mother gluteal tissue at each time point:

$$\Delta\phi^{relative} = \frac{1}{|N_f|}\sum_{i\in N_f}\Delta\phi_{fetalROI_i} - \frac{1}{|N_m|}\sum_{j\in N_m}\Delta\phi_{motherROI_j} \quad [2]$$

where N_f and N_m are the set of pixels belonging to the independent intersections of the mother and fetal ROIs between all GREs respectively. The resulting total relative phase change is then calculated according to:

$$\Delta\phi^{relative}_{total} = \Delta\phi^{relative}_{t2} - \Delta\phi^{relative}_{t1} \quad [3]$$

Once total relative phase measurements, $\Delta\phi^{relative}_{total}$, are obtained, they are converted to temperature measurements through the PRF method (15),

$$\Delta T = \frac{\Delta\phi^{relative}_{total}}{\gamma\alpha B_0 TE} \quad [4]$$

where gamma is the gyromagnetic ratio (267.507 rad/T*ppm*sec), alpha is the PRF change coefficient (0.01 ppm/℃), B_0 is the field strength (3T), and TE is the echo time (12 ms).

Separate analysis of participants followed for fetal cardiac abnormalities

We performed additional temperature analysis for both the control group and the participants with cardiac abnormalities followed for brain maturation separately. The LOF and movement removal were used as described in the original analysis, using the entire cohort of participants. After spurious phase removal, the cohort was split into two groups: the control group (n=15 after outlier removal), and the group of participants with cardiac abnormalities followed for changes in brain maturation (n=17 after outlier removal). The average relative temperature change for the control group was 0.14±0.67 and was 0.22±0.78 for the participants in the cardiac brain maturation study, shown in *Table S1*. The difference in relative temperature changes between groups was found not be statistically significant by a two tailed Welch's *t*-test implemented in SciPy 1.6.2 (P=0.76). Linear regression analysis between image rate and relative temperature was also performed for each group resulting in coefficient of regression of –0.18, R-squared value of 0.23 (P=0.07) for the control group and –0.04, 0.04 (P=0.43) for the participants with cardiac abnormalities, shown in *Figure S1*. These results indicate similar findings to the original analysis. For both groups independently, no linear relationship between image rate and relative temperature changes was observed, indicating that the fetal brain dissipated energy similar to the mother regardless of the RF energy deposited during a clinical T2 SSFSE fetal exam.

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Table S1 Statistics for relative temperatures in healthy controls and participants with cardiac abnormalities followed for brain maturation

Groups of participants	Mean ± standard deviation relative temperature (℃)	Maximum relative temperature (℃)	Minimum relative temperature (℃)	Median relative temperature (℃)
Control	0.14±0.67[a]	1.67	−0.85	0.16
Cardiac brain maturation	0.22±0.78[b]	2.04	−1.09	−0.03
All	0.19±0.73	2.04	−1.09	0.05

Superscripts [a] and [b] denote groups that were compared for statistical differences. There was no statistical significance between [a] and [b] (P=0.76).

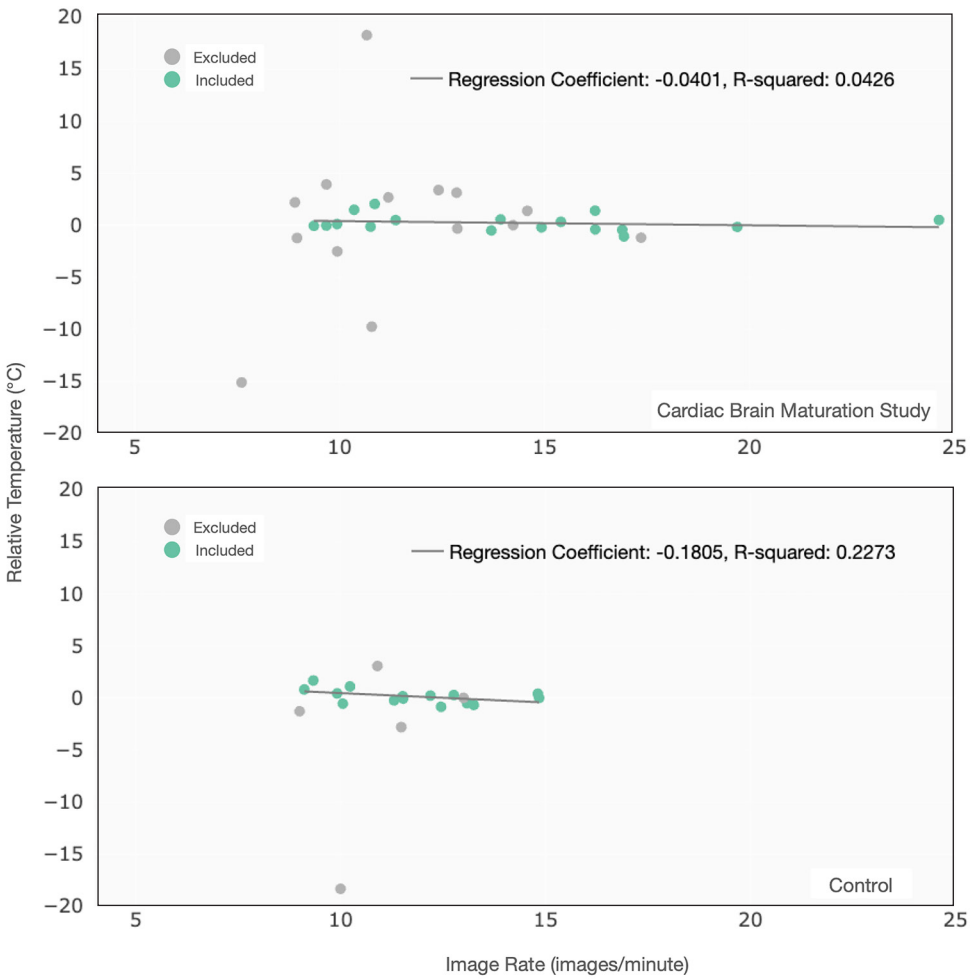

Figure S1 Linear regression analysis performed for the healthy controls and the participants with cardiac abnormalities followed for brain maturation separately. Participants included in the analysis are shown in teal and those excluded are shown in gray. The regression coefficients and R-squared values are shown with F-statistic P values of 0.43 and 0.07 for the cardiac brain maturation and control group respectively, indicating no linear relationship between image rate and relative temperature for both groups.

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