Might Prenatal Ultrasound be a risk factor for autism

Based on the comprehensive research I've conducted on prenatal ultrasound and autism risk, here's what the current scientific evidence shows:

Prenatal Ultrasound and Autism Risk: Current Evidence

Key Findings from Recent Research

The current scientific consensus indicates that prenatal ultrasound does not significantly increase autism risk. The most robust recent study, published in 2023 by Christensen et al., analyzed 1,524 singleton pregnancies using gold-standard autism assessments and found no evidence that prenatal ultrasound use increases autism spectrum disorder (ASD) risk.[1] [2] [3]

Major Studies and Their Conclusions

Large-Scale Epidemiological Evidence

The 2023 Study to Explore Early Development examined cases and controls with rigorous methodology, including in-person standardized assessments for ASD diagnosis. Key findings include:[2] [1]

- **No association** between increasing ultrasound counts and ASD case status
- **Adjusted odds ratio of 1.01** (95% CI 0.92-1.11) for pregnancies without ultrasound indications
- **No trimester-specific associations** found in supplementary analyses

Mixed Findings from Earlier Studies

While most research supports ultrasound safety, some studies have reported specific concerns:

Boston Medical Center Study (2018): Found no association between number of scans or duration of exposure and autism, but noted that children with ASD were exposed to **greater mean depth of ultrasonographic penetration** during first and second trimesters compared to controls.[4] [5] [6]

Simons Simplex Collection Analysis (2016): Reported that male children with ASD, copy number variations (CNVs), and first-trimester ultrasound exposure had decreased non-verbal IQ

and increased repetitive behaviors compared to similar children without ultrasound exposure.[7] [8]

Proposed Biological Mechanisms

Neuronal Migration Hypothesis

Animal studies, particularly research by Rakic and colleagues, demonstrated that ultrasound exposure can affect neuronal migration in developing mouse brains. When exposed to ultrasound for 30 minutes or longer during migration, some neurons failed to reach their proper cortical positions, remaining scattered in inappropriate layers.[9] [10] [11]

Triple Hit Theory

Some researchers propose a "triple hit" hypothesis for autism development, suggesting that **genetic predisposition + environmental stressor + critical timing window** may contribute to autism severity. Under this model, diagnostic ultrasound could potentially act as an environmental stressor during vulnerable developmental periods.[12] [13] [14]

Current Safety Standards and Guidelines

FDA and Professional Guidelines

The FDA has established strict safety parameters for diagnostic ultrasound:[15] [16]

- **Thermal Index (TI)** should remain ≤0.7 for pregnancy scans, preferably <1.0
- **Mechanical Index (MI)** should stay within safe ranges
- **ALARA principle** (As Low As Reasonably Achievable) guides exposure duration and intensity

Commercial "Keepsake" Ultrasounds

Both the FDA and professional organizations strongly discourage non-medical ultrasound exposure:[17] [18] [19]

- Sessions can last up to an hour with uncontrolled exposure
- Operated by untrained personnel
- No medical necessity justifying potential risks
- Connecticut has banned non-medical prenatal ultrasounds

Expert Perspectives and Limitations

Scientific Community Response

Medical experts emphasize important caveats about the research:[20] [21]

- **Association vs. Causation**: Even studies showing correlations do not establish causation
- **Confounding Variables**: Mothers receiving more ultrasounds often have higher-risk pregnancies or different demographic characteristics
- **Detection Issues**: Identifying neuronal migration abnormalities requires specialized techniques not applicable to human studies

Need for Continued Research

Researchers acknowledge several limitations in current knowledge:[10] [22]

- Animal models may not translate directly to humans
- Long-term effects of tissue heating and cavitation remain unknown
- Modern ultrasound equipment operates at higher intensities than older safety studies evaluated

Clinical Recommendations

Based on current evidence, the medical consensus supports:

1. **Continue medically indicated ultrasounds** - benefits far outweigh theoretical risks
2. **Follow ALARA principles** - minimize exposure time and intensity when possible
3. **Avoid commercial keepsake ultrasounds** - unnecessary exposure without medical benefit
4. **Monitor thermal and mechanical indices** during examinations

Conclusion

While some studies suggest potential associations between specific ultrasound parameters and autism characteristics, **the preponderance of evidence does not support prenatal ultrasound as a significant autism risk factor**. The largest and most methodologically rigorous studies find no increased autism risk from standard prenatal ultrasound exposure.[23] [24] [1]

However, this research underscores the importance of **judicious ultrasound use** - employing these powerful diagnostic tools only when medically indicated, with appropriate safety monitoring, and avoiding unnecessary commercial exposures that provide no medical benefit while potentially increasing cumulative exposure.[25] [15]

Future research should continue investigating potential mechanisms while maintaining current safety protocols that have served pregnancy care well for decades.

⁂

1. https://pubmed.ncbi.nlm.nih.gov/37483151/
2. https://stacks.cdc.gov/view/cdc/133511/cdc_133511_DS1.pdf

3. https://pmc.ncbi.nlm.nih.gov/articles/PMC10527947/
4. https://pmc.ncbi.nlm.nih.gov/articles/PMC5875374/
5. https://jamanetwork.com/journals/jamapediatrics/fullarticle/2672728
6. https://geneticliteracyproject.org/2018/02/15/prenatal-ultrasound-depth-frequency-lead-autism/
7. https://pmc.ncbi.nlm.nih.gov/articles/PMC5332517/
8. https://www.uwb.edu/news/2016/09/01/ultrasound
9. https://publications.aap.org/aapgrandrounds/article/16/6/65/86291/Prenatal-Exposure-to-Ultrasound-May-Affect-Brain
10. https://pmc.ncbi.nlm.nih.gov/articles/PMC1538990/
11. https://pubmed.ncbi.nlm.nih.gov/16901978/
12. https://pubmed.ncbi.nlm.nih.gov/20149552/
13. https://www.rockefeller.edu/news/18690-study-tests-the-three-hit-theory-of-autism/
14. https://www.thetransmitter.org/spectrum/triple-hit-study-may-help-explain-autisms-male-bias/
15. https://pmc.ncbi.nlm.nih.gov/articles/PMC11545858/
16. https://www.aium.org/resources/official-statements/view/prudent-use-and-safety-of-diagnostic-ultrasound-in-pregnancy
17. https://greeninglaw.com/considering-a-fetal-keepsake-ultrasound-video-the-fda-advises-you-to-reconsider/
18. https://www.cbsnews.com/news/3-d-ultrasounds-cause-concern-for-obgyn-doctors-and-fda/
19. https://www.theatlantic.com/health/archive/2014/12/fda-warning-stay-away-from-keepsake-ultrasounds/383816/
20. https://www.sciencemediacentre.org/expert-reaction-to-prenatal-ultrasonography-association-with-autism/
21. https://publications.aap.org/journal-blogs/blog/1972/Are-Prenatal-Ultrasounds-Associated-with-Autism
22. https://www.auntminnie.com/clinical-news/ultrasound/article/15615658/can-1st-trimester-ultrasound-affect-autism-severity
23. https://www.bu.edu/sph/news/articles/2018/ultrasound-exposure-unlikely-to-cause-autism/
24. https://onlinelibrary.wiley.com/doi/abs/10.1111/ppe.12998
25. https://www.volusonclub.net/empowered-womens-health/discussing-the-safety-of-ultrasound-in-pregnancy-with-patients/
26. https://www.auntminnie.com/clinical-news/ultrasound/article/15619628/study-explores-link-between-prenatal-ultrasound-and-autism
27. https://stacks.cdc.gov/view/cdc/133511
28. https://www.jwatch.org/na46124/2018/02/15/prenatal-ultrasound-exposure-and-autism-risk
29. https://www.cnn.com/2018/02/12/health/ultrasound-autism-study
30. https://www.obgproject.com/2018/03/14/prenatal-ultrasound-autism-connection/
31. https://obgyn.onlinelibrary.wiley.com/doi/full/10.1002/uog.15962
32. https://publications.aap.org/aapgrandrounds/article/39/5/54/89188/Prenatal-Ultrasound-and-the-Risk-of-Autism-An
33. https://academic.oup.com/brain/article/145/12/4519/6509260
34. https://www.isuog.org/static/uploaded/89d1db1a-551c-49cf-b5754882032e47f0.pdf

35. https://www.bumc.bu.edu/camed/2018/02/15/study-explores-prenatal-ultrasound-depth-and-childhood-developmental-diagnoses/
36. https://www.healthandenvironment.org/docs/Facts_-_Electronic_10-6.docx.pdf
37. https://www.fda.gov/news-events/press-announcements/fda-responds-evidence-possible-association-between-autism-and-acetaminophen-use-during-pregnancy
38. https://www.nature.com/news/2006/060807/full/news060807-2.html
39. https://www.sciencedirect.com/science/article/abs/pii/S0149763418300289
40. https://www.frontiersin.org/journals/neuroscience/articles/10.3389/fnins.2022.803356/full
41. https://www.medscape.com/viewarticle/869072
42. https://www.keyautismservices.com/blog/autism-during-pregnancy
43. https://www.childneurologyfoundation.org/disorder/neuronal-migration-disorders/
44. https://www.sciencedirect.com/science/article/abs/pii/S0301562910001195
45. https://www.sciencedirect.com/science/article/pii/S0306987720327389
46. http://www.princeton.edu/~sswang/Antenatal_Ultrasound_Risk_ASD.pdf
47. https://www.sciencedirect.com/science/article/pii/S2667174325000898
48. https://www.sciencepublishinggroup.com/article/10.11648/j.ajp.20210704.12
49. https://www.psychiatryadvisor.com/news/autism-and-depth-of-prenatal-ultrasonographic-penetration-is-there-a-link/
50. https://www.sciencedirect.com/science/article/abs/pii/S0306987710000319
51. https://obgyn.onlinelibrary.wiley.com/doi/full/10.1002/uog.3983
52. https://www.sciencedirect.com/science/article/abs/pii/S016517812400074X
53. https://doublecareaba.com/post/do-baby-monitors-cause-autism
54. https://www.frontiersin.org/journals/endocrinology/articles/10.3389/fendo.2023.1126036/full
55. https://obgyn.onlinelibrary.wiley.com/doi/10.1002/pd.5520
56. https://www.acog.org/clinical/clinical-guidance/committee-statement/articles/2025/04/access-to-obstetric-and-gynecologic-care-for-patients-with-disabilities
57. https://www.nbcnews.com/health/health-news/ultrasounds-unlikely-cause-autism-study-finds-n847246
58. https://timesofindia.indiatimes.com/life-style/health-fitness/health-news/can-paracetamol-use-in-pregnancy-cause-autism-after-trumps-explosive-claim-who-clears-the-air-the-evidence-remains-/articleshow/124083857.cms
59. https://www.scientificamerican.com/article/researchers-find-no-strong-link-between-prenatal-ultrasounds-and-autism/
60. https://www.medicalbrief.co.za/sa-expert-groups-dismiss-trumps-paracetamol-link-to-autism/
61. https://www.aium.org/resources/official-statements/view/statement-on-biological-effects-of-ultrasound-in-vivo
62. https://pmc.ncbi.nlm.nih.gov/articles/PMC5059366/
63. https://acertaralabs.com/2024s-compliance-updates-for-quality-assurance-in-ultrasound/
64. https://onlinelibrary.wiley.com/doi/full/10.1002/jum.15565
65. https://www.accessdata.fda.gov/cdrh_docs/pdf24/K242444.pdf
66. https://www.fda.gov/radiation-emitting-products/medical-imaging/ultrasound-imaging

67. https://onlinelibrary.wiley.com/doi/abs/10.1002/jum.16406
68. https://www.youtube.com/watch?v=WifuREWENik
69. https://obgyn.onlinelibrary.wiley.com/doi/full/10.1002/uog.10148
70. https://obgyn.onlinelibrary.wiley.com/doi/10.1002/uog.27538
71. https://www.topsfield-ma.gov/sites/g/files/vyhlif5086/f/uploads/warning_about_fetal_keepsake_images_heartbeat_monitors.pdf
72. https://unbornultrasound.org/ultrasound-safety/
73. https://www.ncbi.nlm.nih.gov/sites/books/n/statpearls/article-129476/