

Variation in locations of reported white matter differences between people who stutter and people with fluent speech



Cai et al. (2014)

Variation in functional activity when the same task data was analyzed by different workflows



Carp (2013)



Effect of software on Age and Gender prediction



[Tustison et al. 2014]



Glatard (2015)

Hereisphere BegionMean Volume Volume (mm3)Mean Volume (mm3)Mean Volume (mm3)Mean Volume (mm3)Mean Volume (mm3)Mean Volume (mm3)Mean Volume (mm3)Mean Volume (mm3)Mean Volume (mm3)Mean Volume (mm3)Mean Volume (mm3)Mean Volume (mm3)Mean Volume (mm3)Mean Volume (mm3)Mean Volume (mm3)Mean VolumeMean Volum									e e Dum	Deferrer		
HemisphereMean VolumeMean VolumeSTDMean VolumeSTDMean Volume <th colspan="4">Difference</th> <th colspan="2"></th> <th colspan="2">Mac OSX (10.12.4)</th> <th colspan="2">(Docker)</th> <th></th> <th></th>	Difference						Mac OSX (10.12.4)		(Docker)			
Accumbens471.2178.8468.4181.00.9802.835.7[-72.0, 75.6]25.8Amygdala840.2257.9849.2262.90.9634-0170.8[-303.0, 84.0]32.1Caudate3842.4650.43840.5630.70.9802.0130.9[-320.6, 518.4]56.1Hippocampus327.6.2794.93264.5783.60.99711.762.0[-147.0, 185.0]44.2Pallidum1683.5316.01668.8313.60.99514.730.7[-16.8, 99.0]20.2Putamen4881.1965.44890.2952.70.9984-2259.5[-145.0, 144.0]45.4Thalamus808.61240.88108.81239.00.998-20.271.4[-135.0, 194.0]54.5Accumbens389.1147.6402.2148.50.966-13.138.5[-145.5, 32.0]24.1Amygdala882.3297.8897.6290.70.918-15.3119.3[-66.1, 48.0]20.6Caudate3781.0762.13780.3767.70.9990.727.1[-60.1, 48.0]20.6Pallidum1694.5293.81695.2289.50.997-1.9960.6[-190.0, 78.0]12.9Pallidum1694.5293.81695.2289.50.997-0.721.8[-64.0, 60.9]12.9Pallidum1694.5293.81695.2289.50.997-0.721.8<	Percent of Reference	Mean Absolute Volume	Range	STD	Mean Volume (mm3)	Correlation	STD	Mean Volume (mm3)	STD	Mean Volume (mm3)	Region	Hemisphere
Amygdala840.2257.9849.2262.90.9639.170.8[-303.0,84.0]32.1Caudate384.4650.43840.5630.70.9802.01309[-32.6,518.4]56.1Hippocampus3276.2794.93264.5783.60.99711.762.0[-147.0,185.0]44.2Pallidum1683.5316.01668.8313.60.99514.730.7[-168.9.9.0]20.2Putamen4881.1965.44890.2952.70.998-9.259.5[-145.0,144.0]45.4Thalamus808.61240.8810.8.123.900.998-20.271.4[-135.0,194.0]54.5Accumbens389.1147.6402.2148.50.966-13.138.5[-145.5,32.0]24.1Amygdala882.3297.8897.6290.70.918-15.3119.3[-64.0,021.0]66.2Caudate3781.0762.13780.3767.70.9990.727.1[-60.1,48.0]20.6Hippocampus343.4796.93453.3793.20.997-10.721.8[-46.0,60.9]12.9Pallidum1694.5293.81695.2289.50.997-0.721.8[-64.0,60.9]12.9Palmus. Proper7723.6112.067724.3112.940.999-0.752.9[-145.0,118.0]33.6CSF18985.652693.651902.932668.10.099-352.8102.2<	5.5	25.8	[-72.0, 75.6]	35.7	2.8	0.980	181.0	468.4	178.8	471.2	Accumbens	
PartialCaudate3842.4650.43840.5630.70.980.2.0130.9[-320.6, 518.4]561.1Hippocampus3276.2794.93264.5783.60.99711.762.0[-147.0, 185.0]44.2Pallidum1683.5316.01668.8313.60.99514.730.7[-168.99.0]20.2Putamen4881.1965.44890.2952.70.9989.259.5[-145.0, 144.0]45.4Thalamus8088.61240.88108.81239.00.998-20.271.4[-135.0, 194.0]54.5Accumbens389.1147.6402.2148.50.966-13.138.5[-145.5, 32.0]24.1Amygdala882.3297.8897.6290.70.918-15.3119.3[-64.0, 02.1]66.2Caudate3781.0762.13780.3767.70.9990.727.1[-60.1, 48.0]20.6Hippocampus343.4796.93453.3793.20.997-19.960.6[-190.0, 78.0]42.4Pallidum1694.5293.81695.2289.50.997-0.721.8[-64.0, 60.9]12.9Putamen4965.31017.34942.81008.00.99322.5118.0[-201.6, 397.0]78.4Pallidum1694.5293.6192.932668.10.999-0.752.9[-145.0, 118.0]33.6Proper772.6112.0772.4112.90.999	3.8	32.1	[-303.0, 84.0]	70.8	-9.1	0.963	262.9	849.2	257.9	840.2	Amygdala	£
Hippocampus3276.2794.93264.5783.60.99711.762.0[-147.0, 185.0]44.2Pallidum1683.5316.01668.8313.60.99514.730.7[-168,99.0]20.2Putamen4881.1965.44890.2952.70.998-9.259.5[-145.0, 144.0]45.4Thalamus8088.61240.88108.81239.00.998-20.271.4[-135.0, 194.0]54.5Accumbens389.1147.6402.2148.50.966-13.138.5[-145.5, 32.0]24.1Amygdala882.3297.8897.6290.70.918-15.3119.3[-464.0, 221.0]68.2Caudate3781.0762.13780.3767.70.9990.727.1[-60.1, 48.0]20.6Hippocampus343.4796.93453.3793.20.997-19.960.6[-190.0, 78.0]42.4Putamen4965.31017.34942.81008.00.99322.5118.0[-64.0, 60.9]12.9Putamen4965.5293.81695.2289.50.997-0.721.8[-64.0, 60.9]12.9Putamen4965.51017.34942.81008.00.99322.5118.0[-201.6, 397.0]78.4Putamen4965.52693.61920.932666.10.999-0.752.9[-145.0, 118.0]33.6Putamen4965.52693.61920.932666.10.999-0.7 <td>1.5</td> <td>56.1</td> <td>[-320.6, 518.4]</td> <td>130.9</td> <td>2.0</td> <td>0.980</td> <td>630.7</td> <td>3840.5</td> <td>650.4</td> <td>3842.4</td> <td>Caudate</td>	1.5	56.1	[-320.6, 518.4]	130.9	2.0	0.980	630.7	3840.5	650.4	3842.4	Caudate	
Pallidum1683.5316.01668.8313.60.995.114.730.7[-16.8,9.9.0]20.2Putamen4881.1965.44890.2952.70.998-9.259.5[-145.0,144.0]45.4Thalamus8088.61240.88108.81239.00.998-20.271.4[-135.0,194.0]54.5Accumbens389.1147.6402.2148.50.966-13.138.5[-145.5,32.0]24.1Amygdala882.3297.8897.6290.70.918-15.3119.3[-60.1,48.0]20.6Caudate3781.0762.13780.3767.70.9990.727.1[-60.1,48.0]20.6Hippocampus343.4796.93453.3793.20.997-1.9.960.6[-190.7,8.0]42.4Pallidum1694.5293.81695.2289.50.997-0.721.8[-64.0,60.9]12.9Putamen4965.31017.34942.81008.00.99322.5118.0[-201.6,397.0]78.4Putamen4965.52693.61902.932666.10.999-0.752.9[-145.0,118.0]33.6Putamen684781.86804.868411.76617.40.999-0.752.9[-145.0,118.0]35.97Putamen684781.86804.868411.76617.31.00067.020.92[-145.0,118.0]35.97Putamen684781.86804.851380.852341.81.00063.3<	1.3	44.2	[-147.0, 185.0]	62.0	11.7	0.997	783.6	3264.5	794.9	3276.2	Hippocampus	Le,
Putamen4881.1965.44890.2952.70.998-9.259.5[-145.0, 144.0]45.4Thalamus8088.61240.88108.81239.00.998-20.271.4[-135.0, 194.0]54.5Accumbens389.1147.6402.2148.50.966-13.138.5[-145.5, 32.0]24.1Amygdala882.3297.8897.6290.70.918-15.3119.3[-464.0, 221.0]68.2Caudate3781.0762.13780.3767.70.9990.727.1[-60.1, 48.0]20.6Hippocampus3433.4796.93453.3793.20.997-19.960.6[-190.0, 78.0]42.4Pallidum1694.5293.81695.2289.50.997-0.721.8[-64.0, 60.9]12.9Putamen4965.31017.34942.81008.00.99322.5118.0[-201.6, 397.0]78.4Thalamus. Proper7723.6112.067724.31129.40.999-0.752.9[-145.0, 118.0]33.6CSF189856.526936.5190209.326668.10.999-352.81025.2[-4274.2, 20.0]359.7Gray Matter684781.886048.8684111.786173.41.000670.1209.7[-11.3, 7113.4]676.3White Matter513866.152348.3513802.852341.81.00063.3467.3[-541.2, 2192.4]125.3Brain1388504.4132850.8 <t< th=""><td>1.2</td><td>20.2</td><td>[-16.8, 99.0]</td><td>30.7</td><td>14.7</td><td>0.995</td><td>313.6</td><td>1668.8</td><td>316.0</td><td>1683.5</td><td>Pallidum</td><td rowspan="2"></td></t<>	1.2	20.2	[-16.8, 99.0]	30.7	14.7	0.995	313.6	1668.8	316.0	1683.5	Pallidum	
Indamus8088.61240.88108.81239.00.998-20.271.4[-135.0, 194.0]54.5Accumbens389.1147.6402.2148.50.966-13.138.5[-145.5, 32.0]24.1Amygdala882.3297.8897.6290.70.918-15.3119.3[-64.0, 221.0]68.2Caudate3781.0762.13780.3767.70.9990.727.1[-60.1, 48.0]20.6Hippocampus3433.4796.93453.3793.20.997-19.960.6[-190.0, 78.0]42.4Palidum1694.5293.81695.2289.50.997-0.721.8[-64.0, 60.9]12.9Putamen4965.31017.34942.81008.00.99322.5118.0[-20.6, 397.0]78.4Thalamus. Proper7723.61120.67724.31129.40.999-0.752.9[-145.0, 118.0]33.6CSF18985.526936.519020.326668.10.999-352.81025.2[-4274.2, 20.0]359.7Gray Matter684781.886048.868411.786173.41.00067.01209.7[-11.3, 7113.4]676.3Mite Matter51386.152348.3513802.852341.81.00063.3467.3[-541.2, 2192.4]125.3Brain138850.413880.81388123.813296.51.000380.61511.6[-534.0, 695.6]425.1	0.9	45.4	[-145.0, 144.0]	59.5	-9.2	0.998	952.7	4890.2	965.4	4881.1	Putamen	
Accumbens389.1147.6402.2148.50.966-13.138.5[-145.5, 32.0]24.1Amygdala882.3297.8897.6290.70.918-15.3119.3[-464.0, 221.0]68.2Caudate3781.0762.13780.3767.70.9990.727.1[-60.1, 48.0]20.6Hippocampus343.4796.93453.3793.20.997-19.960.6[-190.0, 78.0]42.4Pallidum1694.5293.81695.2289.50.997-0.721.8[-64.0, 60.9]12.9Putamen4965.31017.34942.81008.00.99322.5118.0[-201.6, 397.0]78.4Thalamus. Proper7723.61120.67724.31129.40.999-0.752.9[-145.0, 118.0]33.6CSF189856526936.5190209.326668.10.999-352.81025.2[-4274.2, 20.0]359.7Gray Matter684781.886048.8684111.786173.41.00067.012009.7[-11.3, 7113.4]676.3White Matter513866.152348.3513802.852341.81.00063.3467.3[-541.2, 219.2.4]125.3Brain1388504.4132850.81388123.8132962.51.000380.6151.6[-534.0, 695.6.6]425.1	0.7	54.5	[-135.0, 194.0]	71.4	-20.2	0.998	1239.0	8108.8	1240.8	8088.6	Thalamus	
Amygdala 882.3 297.8 897.6 290.7 0.918 -15.3 119.3 [-464.0, 221.0] 66.2 Caudate 3781.0 762.1 3780.3 767.7 0.999 0.7 27.1 [-60.1, 48.0] 20.6 Hippocampus 3433.4 796.9 3453.3 793.2 0.997 -19.9 60.6 [-190.0, 78.0] 42.4 Pallidum 1694.5 293.8 1695.2 289.5 0.997 -0.7 21.8 [-64.0, 60.9] 12.9 Putamen 4965.3 1017.3 4942.8 1008.0 0.993 22.5 118.0 [-201.6, 397.0] 78.4 Putamen 4965.3 1017.3 4942.8 1008.0 0.999 -0.7 52.9 [-145.0, 118.0] 33.6 Proper CSF 189856.5 26936.5 19020.3 26668.1 0.999 -352.8 1025.2 [-4274.2, 20.0] 359.7 Gray Matter 684781.8 86048.8 684111.7 86173.4 1.000 63.3	6.2	24.1	[-145.5, 32.0]	38.5	-13.1	0.966	148.5	402.2	147.6	389.1	Accumbens	
Caudate 3781.0 762.1 3780.3 767.7 0.999 0.7 27.1 [-60.1, 48.0] 20.6 Hippocampus 3433.4 796.9 3453.3 793.2 0.997 -19.9 60.6 [-190.0, 78.0] 42.4 Pallidum 1694.5 293.8 1695.2 289.5 0.997 -0.7 21.8 [-64.0, 60.9] 12.9 Putamen 4965.3 1017.3 4942.8 1008.0 0.993 22.5 118.0 [-201.6, 397.0] 78.4 Thalamus. Proper 7723.6 1120.6 7724.3 1129.4 0.999 -0.7 52.9 [-1450, 118.0] 33.6 Gray Matter 684781.8 86048.8 684111.7 86173.4 0.999 -0.7 52.9 [-4274.2, 20.0] 359.7 Gray Matter 684781.8 86048.8 684111.7 86173.4 1.000 67.01 209.7 [-113, 7113.4] 676.3 Mite Matter 51386.1 52348.3 513802.8 52341.8 1.000 63.3	7.7	68.2	[-464.0, 221.0]	119.3	-15.3	0.918	290.7	897.6	297.8	882.3	Amygdala	Right
Hippocampus 3433.4 796.9 3453.3 793.2 0.997 -19.9 60.6 [-190.0, 78.0] 42.4 Pallidum 1694.5 293.8 1695.2 289.5 0.997 -0.7 21.8 [-64.0, 60.9] 12.9 Putamen 4965.3 1017.3 4942.8 1008.0 0.993 22.5 118.0 [-201.6, 397.0] 78.4 Thalamus. Proper 7723.6 1120.6 7724.3 1129.4 0.999 -0.7 52.9 [-145.0, 118.0] 33.6 Gray Matter 684781.8 86048.8 684111.7 86173.4 1.000 67.01 200.97 [-11.3, 7113.4] 676.3 White Matter 51386.1 52348.3 513802.8 52341.8 1.000 63.3 467.3 [-541.2, 2192.4] 125.3 Brain 1388504.4 132850.8 1388123.8 132962.5 1.000 380.6 1511.6 [-534.0, 6956.6] 425.1	0.5	20.6	[-60.1, 48.0]	27.1	0.7	0.999	767.7	3780.3	762.1	3781.0	Caudate	
Pallidum 1694.5 293.8 1695.2 289.5 0.997 -0.7 21.8 [-64.0, 60.9] 12.9 Putamen 4965.3 1017.3 4942.8 1008.0 0.993 22.5 118.0 [-201.6, 397.0] 78.4 Thalamus. Proper 7723.6 1120.6 7724.3 1129.4 0.999 -0.7 52.9 [-145.0, 118.0] 33.6 CSF 189856.5 26936.5 190209.3 26668.1 0.999 -352.8 1025.2 [-4274.2, 20.0] 359.7 Gray Matter 684781.8 86048.8 684111.7 86173.4 1.000 670.1 2009.7 [-11.3, 7113.4] 676.3 White Matter 513866.1 52348.3 513802.8 52341.8 1.000 63.3 467.3 [-541.2, 2192.4] 125.3 Brain 1388504.4 132850.8 1388123.8 132962.5 1.000 380.6 1511.6 [-534.0, 6956.6] 425.1	1.2	42.4	[-190.0, 78.0]	60.6	-19.9	0.997	793.2	3453.3	796.9	3433.4	Hippocampus	
Putamen 4965.3 1017.3 4942.8 1008.0 0.993 22.5 118.0 [-201.6, 397.0] 78.4 Thalamus. Proper 7723.6 1120.6 7724.3 1129.4 0.999 -0.7 52.9 [-145.0, 118.0] 33.6 CSF 189856.5 26936.5 190209.3 26668.1 0.999 -352.8 1025.2 [-4274.2, 20.0] 359.7 Gray Matter 684781.8 86048.8 684111.7 86173.4 1.000 670.1 2009.7 [-11.3, 7113.4] 676.3 White Matter 513866.1 52348.3 513802.8 52341.8 1.000 63.3 467.3 [-541.2, 2192.4] 125.3 Brain 1388504.4 132850.8 138912.8 132962.5 1.000 380.6 1511.6 [-534.0, 6956.6] 425.1	0.8	12.9	[-64.0, 60.9]	21.8	-0.7	0.997	289.5	1695.2	293.8	1694.5	Pallidum	
Thalamus. Proper 7723.6 1120.6 7724.3 1129.4 0.999 -0.7 52.9 [-145.0, 118.0] 33.6 PF CSF 189856.5 26936.5 190209.3 26668.1 0.999 -352.8 1025.2 [-4274.2, 20.0] 359.7 Gray Matter 684781.8 86048.8 684111.7 86173.4 1.000 670.1 2009.7 [-11.3, 7113.4] 676.3 White Matter 513866.1 52348.3 513802.8 52341.8 1.000 63.3 467.3 [-541.2, 2192.4] 125.3 Brain 1388504.4 132850.8 1388123.8 132962.5 1.000 380.6 1511.6 [-534.0, 6956.6] 425.1	1.6	78.4	[-201.6, 397.0]	118.0	22.5	0.993	1008.0	4942.8	1017.3	4965.3	Putamen	
CSF 189856.5 26936.5 190209.3 26668.1 0.999 -352.8 1025.2 [-4274.2, 20.0] 359.7 Gray Matter 684781.8 86048.8 684111.7 86173.4 1.000 670.1 2009.7 [-11.3, 7113.4] 676.3 White Matter 513866.1 52348.3 513802.8 52341.8 1.000 63.3 467.3 [-541.2, 2192.4] 125.3 Brain 1388504.4 132850.8 1388123.8 132962.5 1.000 380.6 1511.6 [-534.0, 6956.6] 425.1	0.4	33.6	[-145.0, 118.0]	52.9	-0.7	0.999	1129.4	7724.3	1120.6	7723.6	Thalamus. Proper	
Fp Gray Matter 684781.8 86048.8 684111.7 86173.4 1.000 670.1 2009.7 [-11.3, 7113.4] 676.3 White Matter 513866.1 52348.3 513802.8 52341.8 1.000 63.3 467.3 [-541.2, 2192.4] 125.3 Brain 1388504.4 132850.8 1388123.8 132962.5 1.000 380.6 1511.6 [-534.0, 6956.6] 425.1	0.2	359.7	[-4274.2, 20.0]	1025.2	-352.8	0.999	26668.1	190209.3	26936.5	189856.5	CSF	
P White Matter 513866.1 52348.3 513802.8 52341.8 1.000 63.3 467.3 [-541.2, 2192.4] 125.3 Brain 1388504.4 132850.8 1388123.8 132962.5 1.000 380.6 1511.6 [-534.0, 6956.6] 425.1	0.1	676.3	[-11.3, 7113.4]	2009.7	670.1	1.000	86173.4	684111.7	86048.8	684781.8	Gray Matter	Total
Brain 1388504.4 132850.8 1388123.8 132962.5 1.000 380.6 1511.6 [-534.0, 6956.6] 425.1	0.0	125.3	[-541.2, 2192.4]	467.3	63.3	1.000	52341.8	513802.8	52348.3	513866.1	White Matter	
	0.0	425.1	[-534.0, 6956.6]	1511.6	380.6	1.000	132962.5	1388123.8	132850.8	1388504.4	Brain	



Repeatable Can the same lab repeat all steps of an experiment?

Replicable Can another lab redo the experiment?

Reproducible Can we get similar results - input to output relation?

Reusable Can someone reuse your data/code/samples/hardware?

Peng (2011), Science; Goble (2014), GigaScience; Drummond (2009), ICML;

Spectrum of Reproducibility

- Orig Data + Analysis = Result
- Exact Same Data + Exact Same Analysis should yield the Re-Ex Exact Same Result
 - Exact Same Data + Nominally 'Similar' Analyses should yield a 'Similar' Result (i.e. FreeSurfer subcortical volumes compared to FSL FIRST)
- Generalization
 Nominally 'Similar' Data + Exact Same Analysis should yield a 'Similar' Result (i.e. my kids with autism compared to your kids with autism)
 - Nominally 'Similar' Data + Nominally 'Similar' Analyses should yield a 'Similar' Result
 - Because we do not really characterize data, analysis and \bullet results very precisely in the current literature, 'Similar' has lots of wiggle room for interpretation (both to enhance similarity and discount differences).

Example

Replicate this:

My paper concludes:

 Increase in resting state connectivity between Right Superior Temporal Gyrus and the Right Superior Frontal Gyrus in subjects with autism, and this connectivity correlated with diagnostic severity.

How does one go about replicating this?

Example





repronim.org