

Superager Elastic Net Regression: Appendix

Nathan Green

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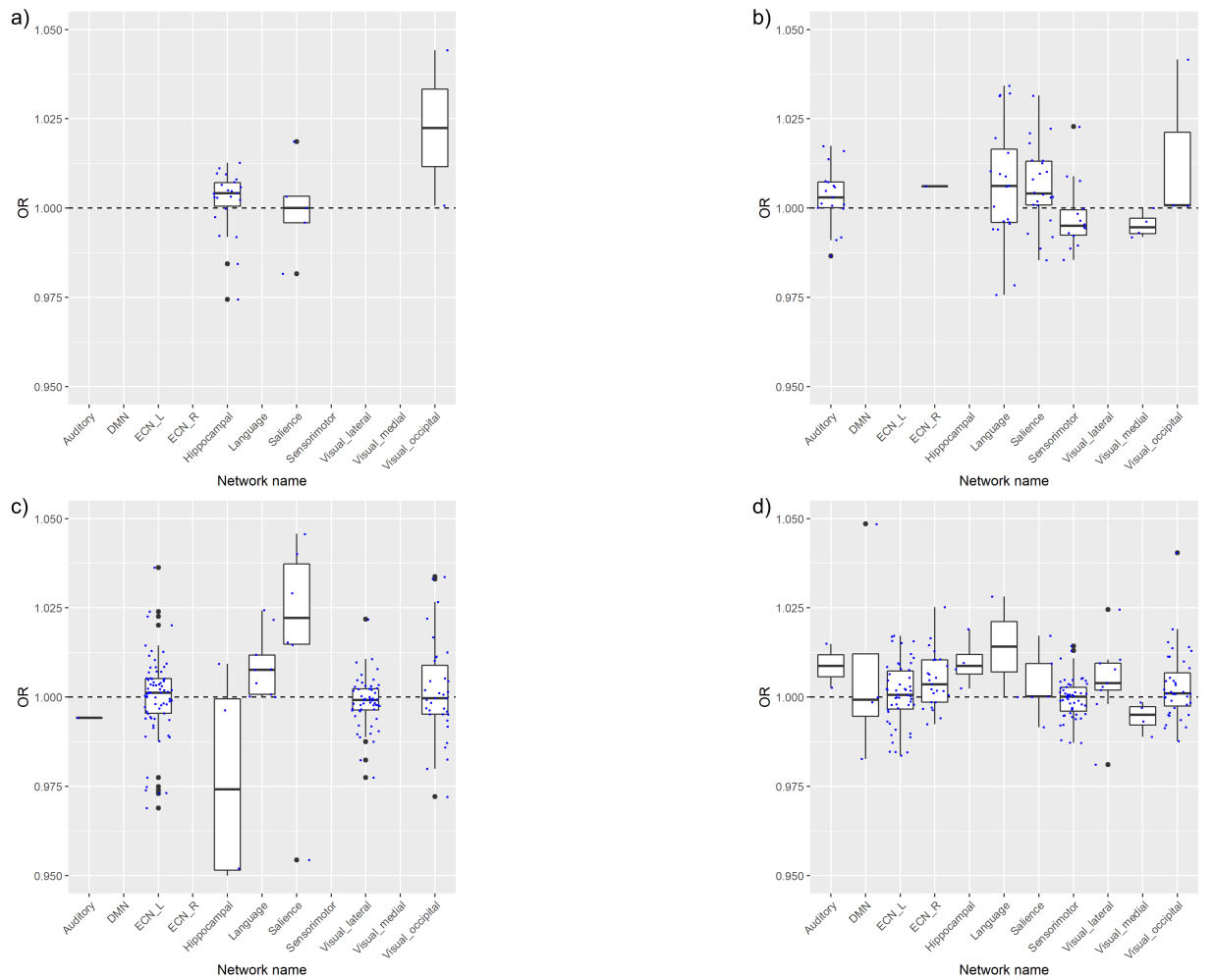


Figure 1: Box plots showing estimated coefficient values using an elastic net model fitted to different data sets and stratified by brain network. Only regions matched to each network are used in each fit. Blue points are the individual values and the black box and points show median, 25th and 75th percentile and whiskers to largest and smallest values. a) 3T b) 3T cross-over cohort c) 7T d) 3T quality cohort.

Scatter plots with regression line
 3T removing poor quality

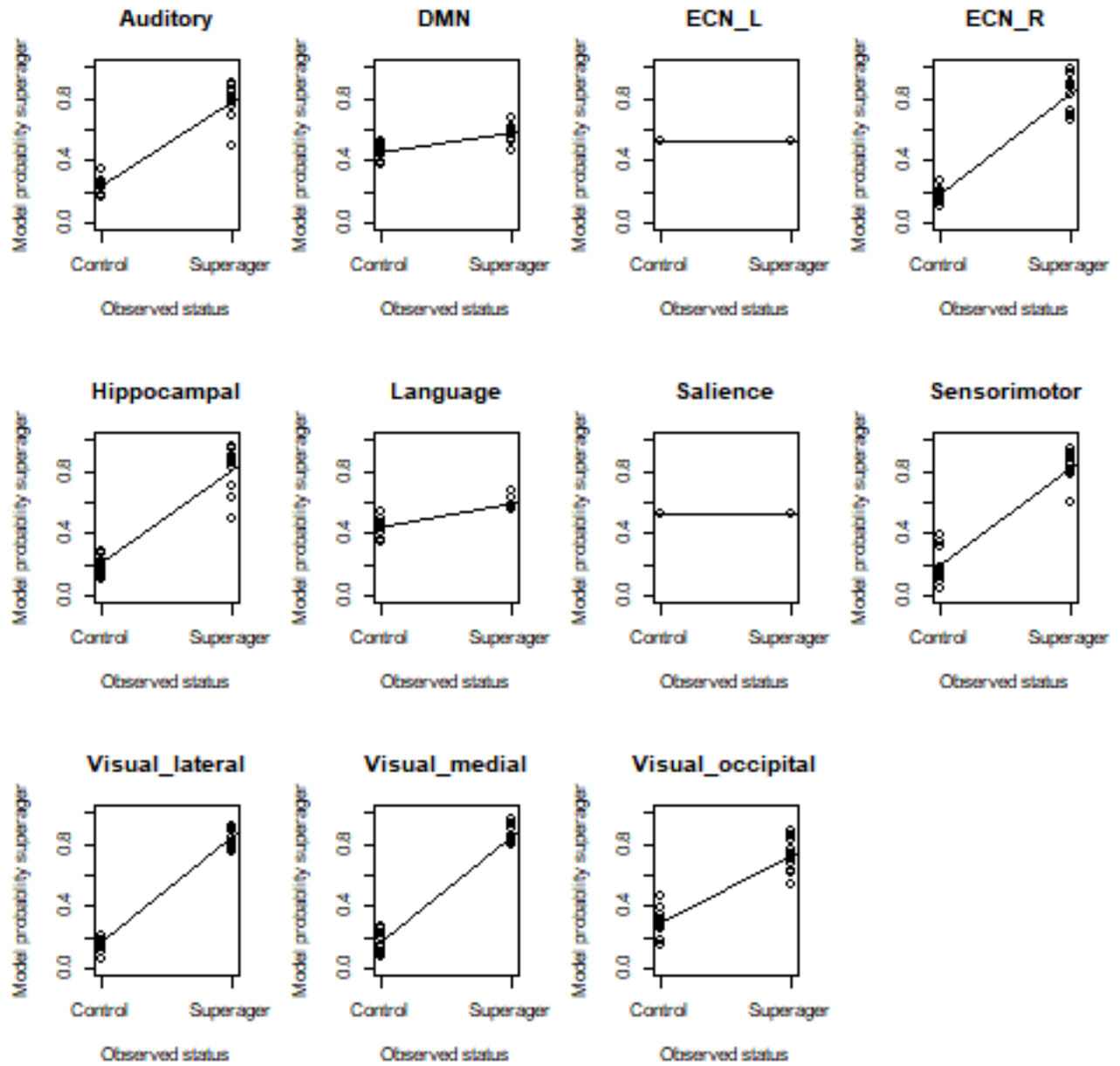


Figure 2: Scatterplot of model fits and fitted regression for 3T quality.

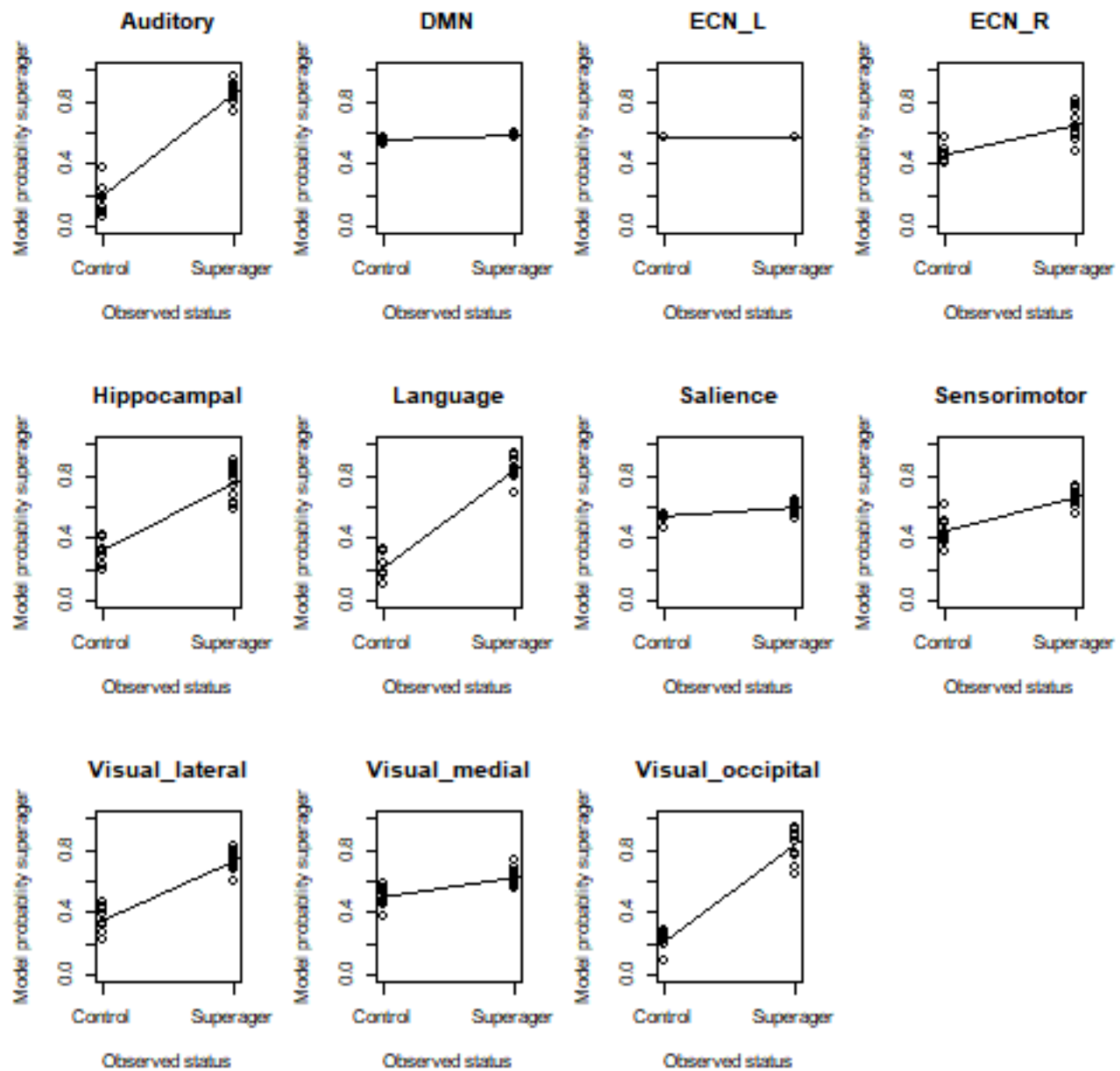


Figure 3: Scatterplot of model fits and fitted regression for 3T cross-over cohort.

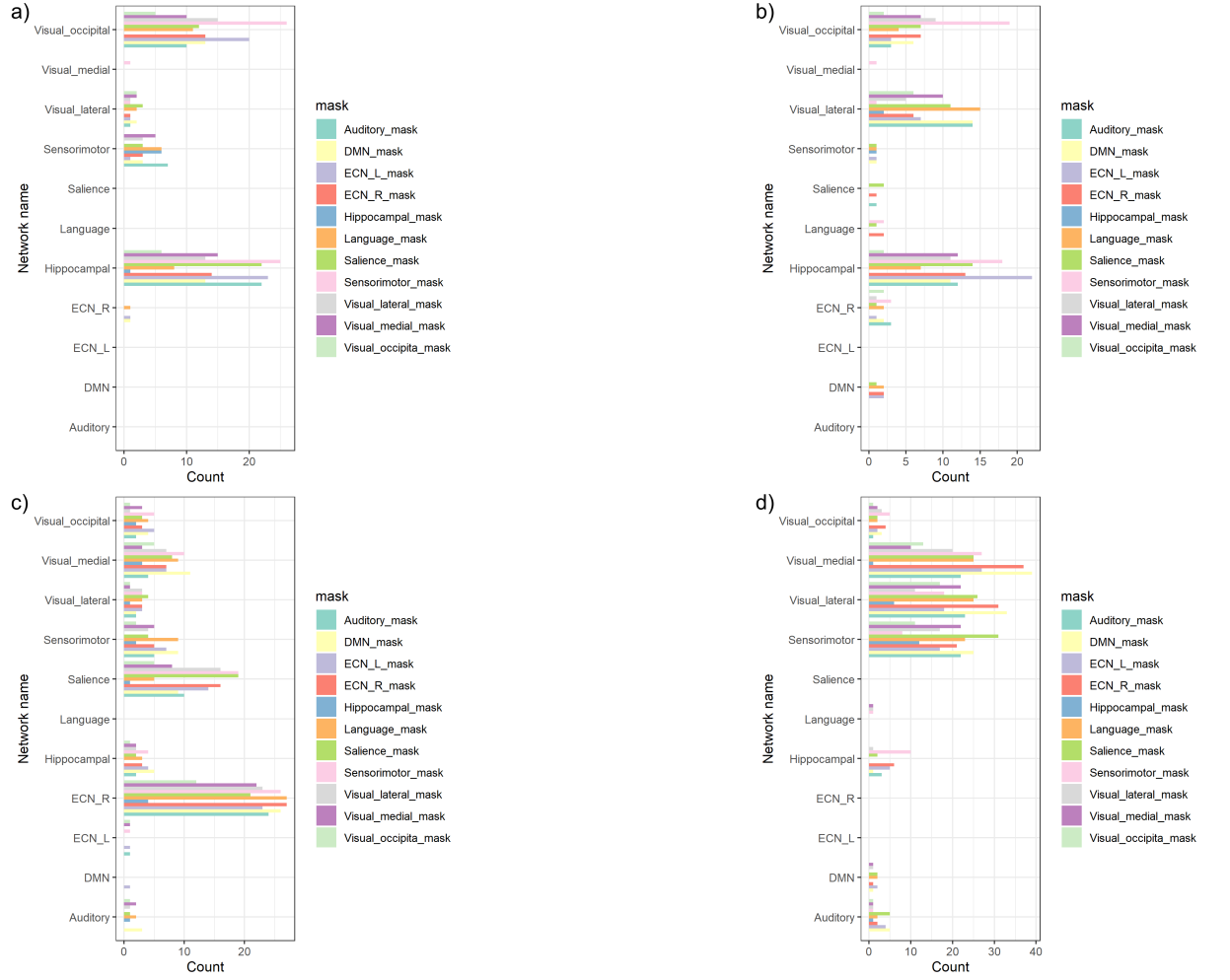


Figure 4: Bar plots by mask of counts of non-zero values coefficients using estimated coefficient values from an elastic net model fitted to different data sets and stratified by brain network. a) 3T b) 3T cross-over cohort c) 7T d) 3T quality cohort.

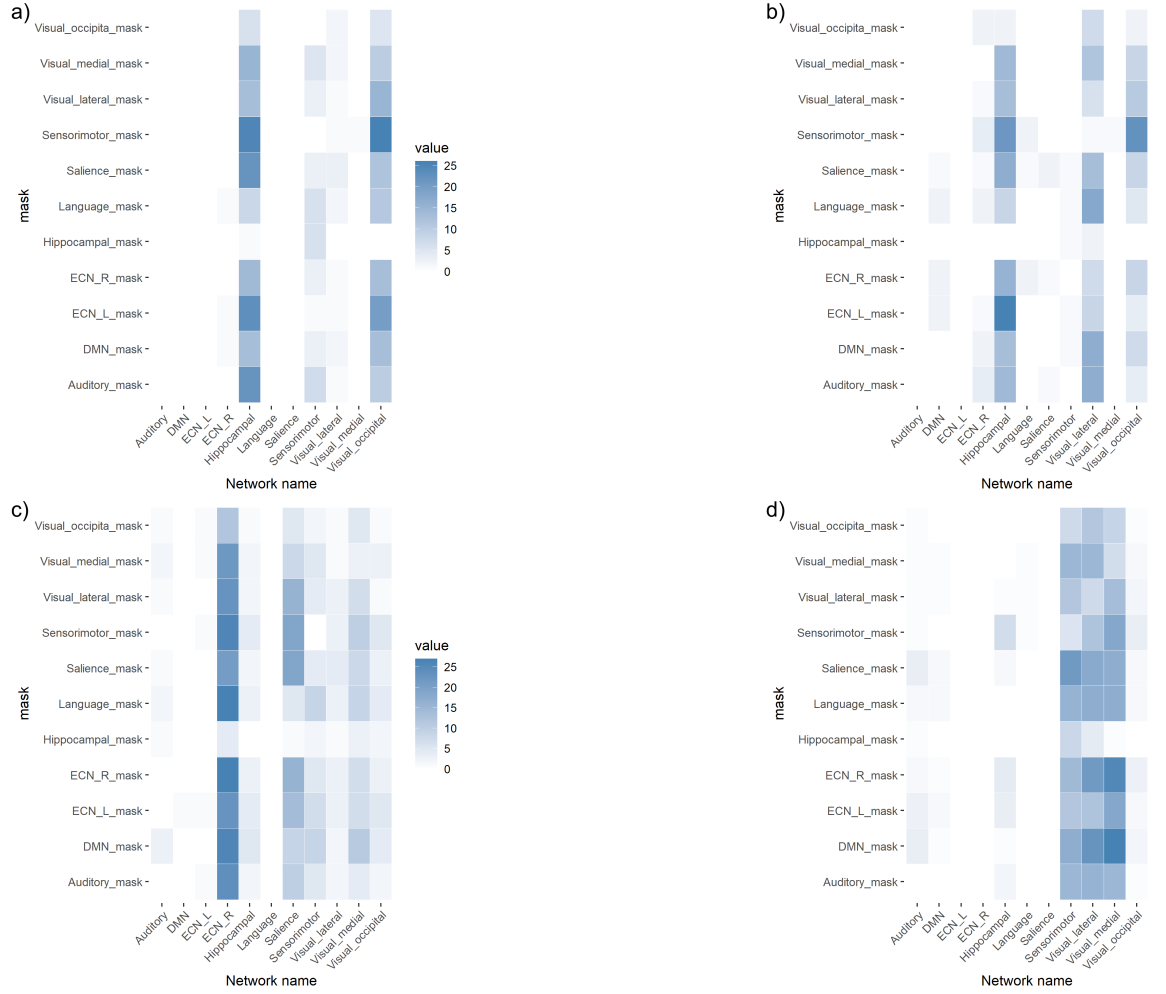


Figure 5: Tile plots by mask of counts of non-zero values coefficients using estimated coefficient values from an elastic net model fitted to different data sets and stratified by brain network. a) 3T b) 3T cross-over cohort c) 7T d) 3T quality cohort.

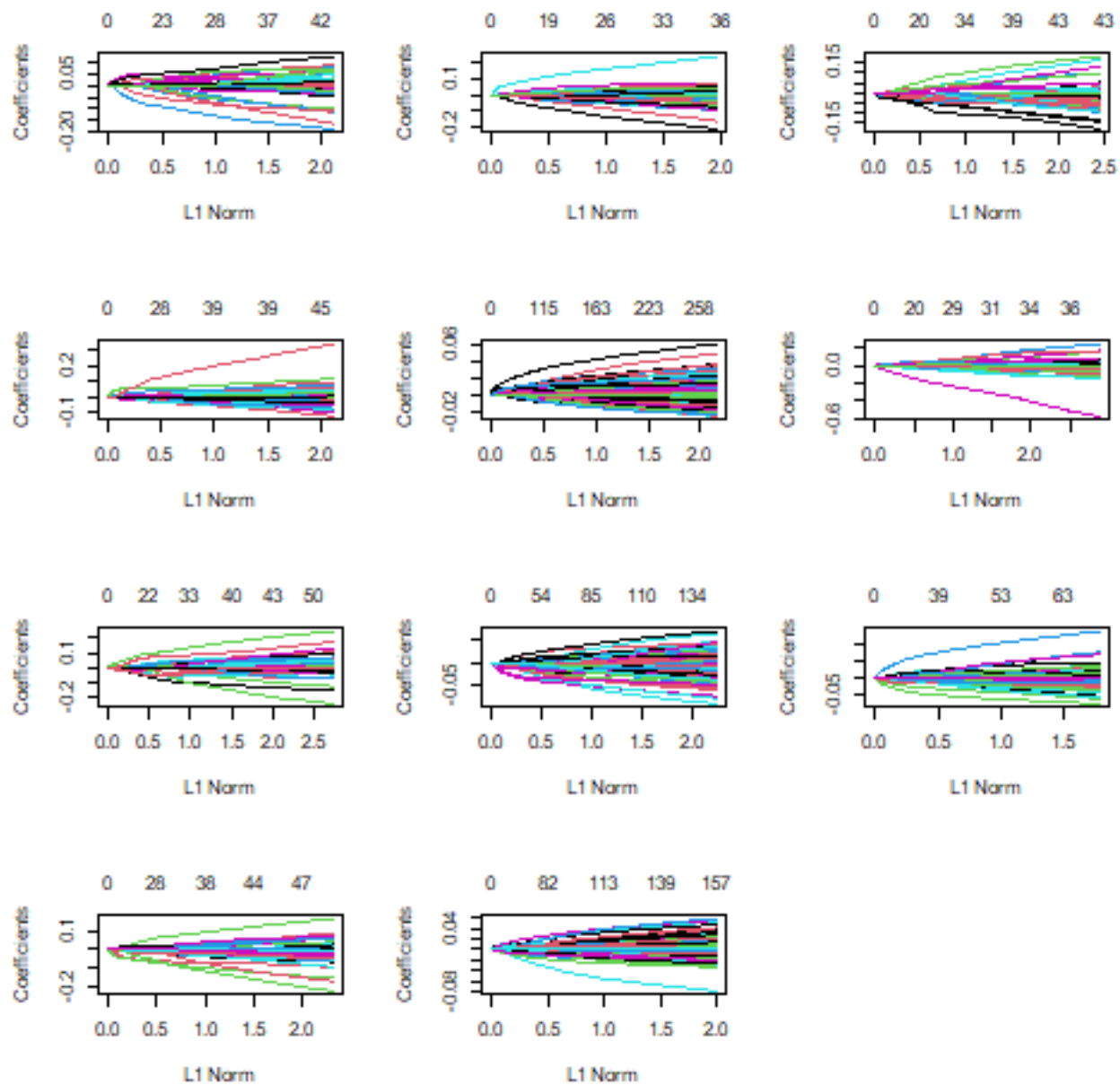


Figure 6: L1 plots for 3T.

3T same-patient cohorts

Plots of non-zero coefficient counts by mask

L1 plots

3T

7T

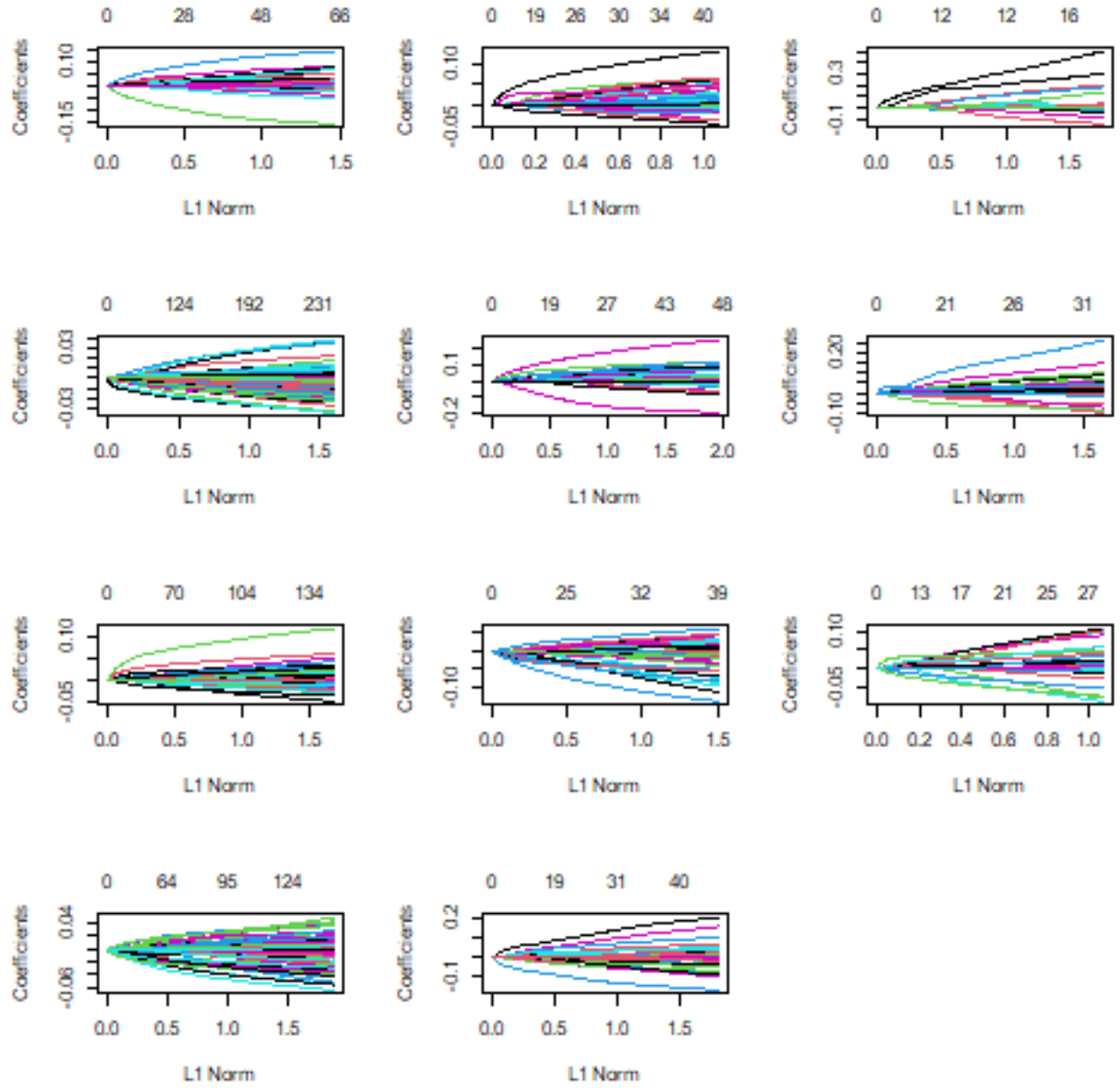


Figure 7: L1 plots for 7T.

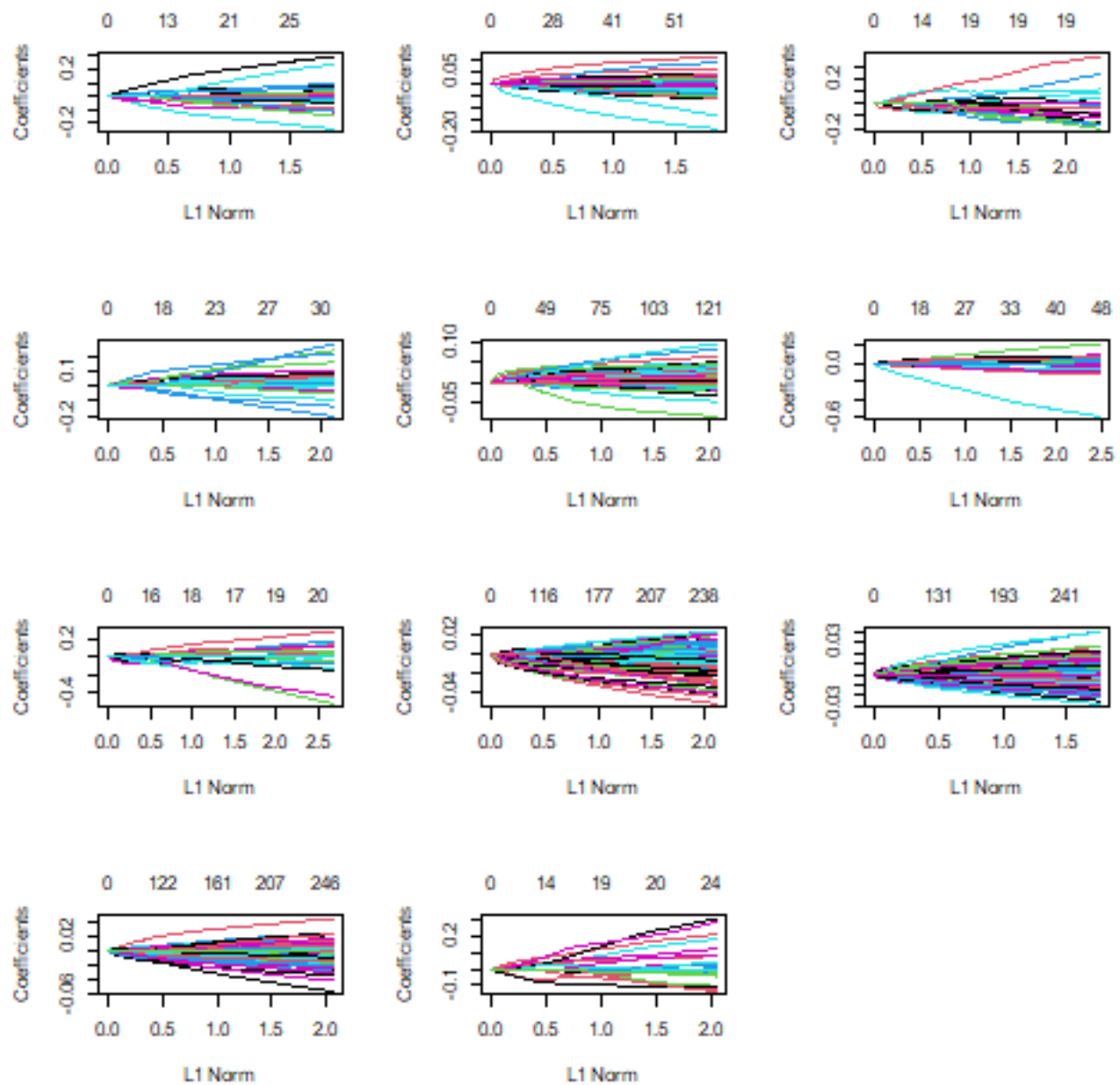


Figure 8: L1 plots for 3T quality.

3T removing poor quality

3T same-patient cohorts

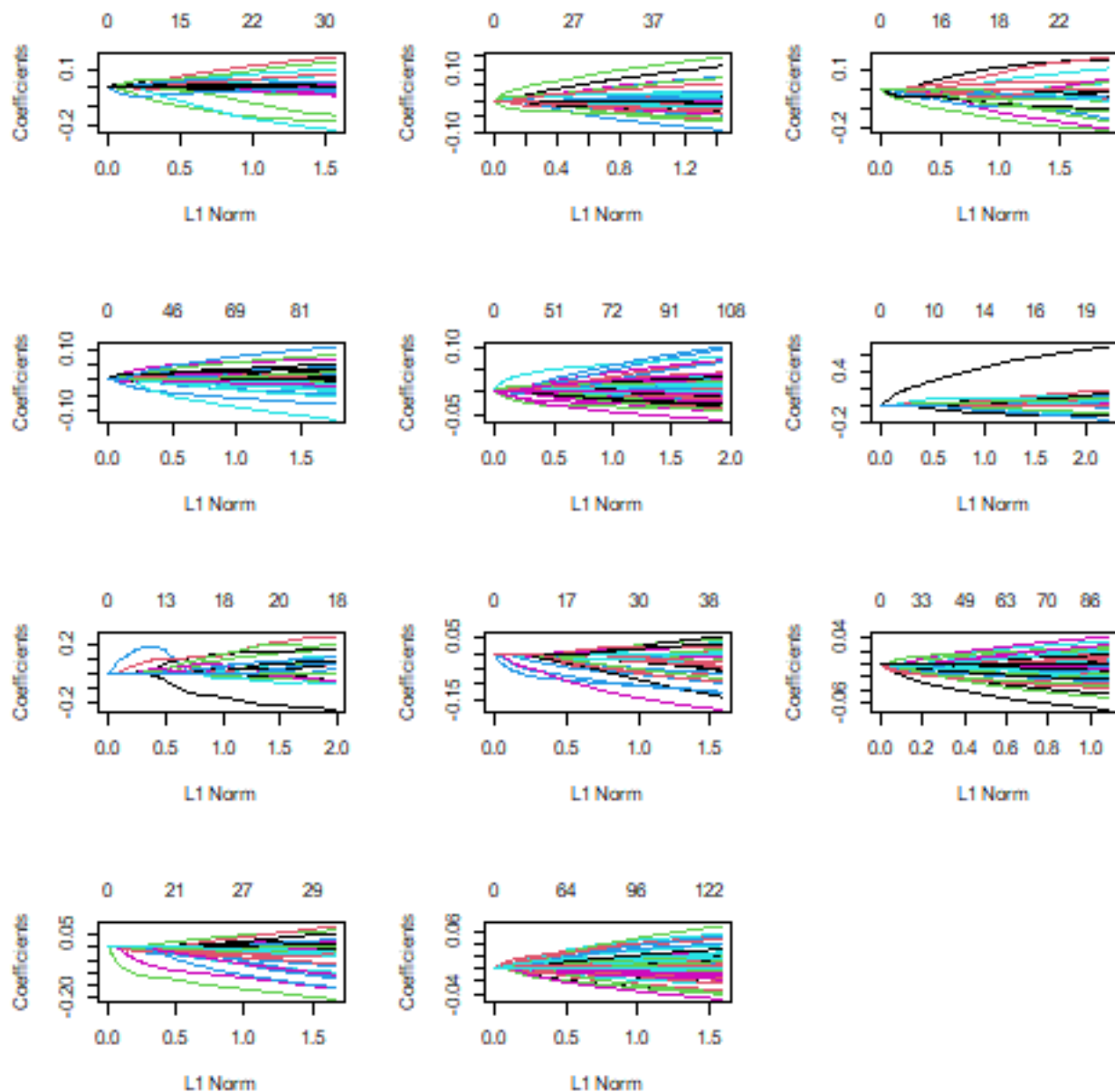


Figure 9: L1 plots for 3T cross-over cohort.

Summary tables

Table 1: Summary table for 3T quality cohort.

X	network_name	OR	L95	U95	min	max	count	prop
1	Auditory	1.002	0.929	1.081	0.918	1.101	13	1

X	network_name	OR	L95	U95	min	max	count	prop
2	DMN	1.002	0.992	1.016	0.992	1.018	4	1
3	Hippocampal	1.009	1.000	1.028	1.000	1.032	26	1
4	Language	0.990	0.980	1.000	0.980	1.000	2	1
5	Sensorimotor	0.997	0.979	1.007	0.975	1.009	137	1
6	Visual_lateral	1.001	0.989	1.013	0.985	1.022	147	1
7	Visual_medial	0.996	0.979	1.009	0.964	1.031	183	1
8	Visual_occipital	1.013	0.926	1.090	0.919	1.095	14	1

Table 2: Summary table for 3T cross-over cohort.

X	network_name	OR	L95	U95	min	max	count	prop
1	DMN	0.999	0.994	1.005	0.994	1.005	2	1
2	ECN_R	1.007	0.993	1.019	0.992	1.019	9	1
3	Hippocampal	1.007	0.969	1.071	0.950	1.080	83	1
4	Language	1.057	1.001	1.204	1.000	1.222	5	1
5	Salience	1.046	1.002	1.111	1.001	1.115	3	1
6	Sensorimotor	0.969	0.954	0.979	0.953	0.979	3	1
7	Visual_lateral	0.996	0.981	1.012	0.968	1.013	39	1
8	Visual_medial	0.946	0.946	0.946	0.946	0.946	1	1
9	Visual_occipital	1.004	0.990	1.018	0.988	1.021	45	1

Performance

Model predictions

3T

```
#> $Auditory
#> [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 0 0 0 0 1 1
#> Levels: 0 1
#>
#> $DMN
#> [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
#> Levels: 0 1
#>
#> $ECN_L
#> [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 0 1 0 1
#> Levels: 0 1
#>
#> $ECN_R
#> [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 0 1 1 0 1 1 0 1 1
#> Levels: 0 1
#>
#> $Hippocampal
#> [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 0 1 1 1 1 1 1 0 1
#> Levels: 0 1
#>
#> $Language
#> [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 0 1 1 1 1 1 1 1 1
#> Levels: 0 1
#>
```

```

#> $Salience
#> [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
#> Levels: 0 1
#>
#> $Sensorimotor
#> [1] 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1
#> Levels: 0 1
#>
#> $Visual_lateral
#> [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1
#> Levels: 0 1
#>
#> $Visual_medial
#> [1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 1 0 0 1 0 0 1
#> Levels: 0 1
#>
#> $Visual_occipital
#> [1] 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 1 1 1 1 0 0 0 0 0 1 0 0 0
#> Levels: 0 1

```

The estimated probabilities of being either control or superager. Values near 0.5 cannot distinguish individuals.

```

#> $Auditory
#>      0      1
#> 1  0.6562140 0.3437860
#> 2  0.5515183 0.4484817
#> 3  0.5763823 0.4236177
#> 4  0.5619996 0.4380004
#> 5  0.5680457 0.4319543
#> 6  0.6194403 0.3805597
#> 7  0.5810941 0.4189059
#> 8  0.5522682 0.4477318
#> 9  0.5340724 0.4659276
#> 10 0.6126570 0.3873430
#> 11 0.6246901 0.3753099
#> 12 0.5722820 0.4277180
#> 13 0.5557892 0.4442108
#> 14 0.5397288 0.4602712
#> 15 0.5674940 0.4325060
#> 16 0.5397728 0.4602272
#> 17 0.6344221 0.3655779
#> 18 0.4636694 0.5363306
#> 19 0.4453037 0.5546963
#> 20 0.5136510 0.4863490
#> 21 0.5529969 0.4470031
#> 22 0.5288473 0.4711527
#> 23 0.5304912 0.4695088
#> 24 0.5020998 0.4979002
#> 25 0.5322673 0.4677327
#> 26 0.5445084 0.4554916
#> 27 0.5533864 0.4466136
#> 28 0.5002017 0.4997983
#> 29 0.5182988 0.4817012
#> 30 0.4745032 0.5254968
#> 31 0.4919722 0.5080278

```

```

#>
#> $DMN
#>           0           1
#> 1  0.5483871 0.4516129
#> 2  0.5483871 0.4516129
#> 3  0.5483871 0.4516129
#> 4  0.5483871 0.4516129
#> 5  0.5483871 0.4516129
#> 6  0.5483871 0.4516129
#> 7  0.5483871 0.4516129
#> 8  0.5483871 0.4516129
#> 9  0.5483871 0.4516129
#> 10 0.5483871 0.4516129
#> 11 0.5483871 0.4516129
#> 12 0.5483871 0.4516129
#> 13 0.5483871 0.4516129
#> 14 0.5483871 0.4516129
#> 15 0.5483871 0.4516129
#> 16 0.5483871 0.4516129
#> 17 0.5483871 0.4516129
#> 18 0.5483871 0.4516129
#> 19 0.5483871 0.4516129
#> 20 0.5483871 0.4516129
#> 21 0.5483871 0.4516129
#> 22 0.5483871 0.4516129
#> 23 0.5483871 0.4516129
#> 24 0.5483871 0.4516129
#> 25 0.5483871 0.4516129
#> 26 0.5483871 0.4516129
#> 27 0.5483871 0.4516129
#> 28 0.5483871 0.4516129
#> 29 0.5483871 0.4516129
#> 30 0.5483871 0.4516129
#> 31 0.5483871 0.4516129
#>
#> $ECN_L
#>           0           1
#> 1  0.5078843 0.4921157
#> 2  0.5730399 0.4269601
#> 3  0.5776009 0.4223991
#> 4  0.6060933 0.3939067
#> 5  0.5469922 0.4530078
#> 6  0.5724856 0.4275144
#> 7  0.5917607 0.4082393
#> 8  0.5766549 0.4233451
#> 9  0.5361099 0.4638901
#> 10 0.5386168 0.4613832
#> 11 0.6336345 0.3663655
#> 12 0.5454437 0.4545563
#> 13 0.5965964 0.4034036
#> 14 0.5478064 0.4521936
#> 15 0.6427697 0.3572303
#> 16 0.6001933 0.3998067
#> 17 0.6073597 0.3926403

```

```

#> 18 0.5425101 0.4574899
#> 19 0.4418051 0.5581949
#> 20 0.5340477 0.4659523
#> 21 0.4575288 0.5424712
#> 22 0.5603809 0.4396191
#> 23 0.5212796 0.4787204
#> 24 0.5451887 0.4548113
#> 25 0.5514210 0.4485790
#> 26 0.5462328 0.4537672
#> 27 0.5250749 0.4749251
#> 28 0.5236562 0.4763438
#> 29 0.4766173 0.5233827
#> 30 0.5130868 0.4869132
#> 31 0.4601819 0.5398181
#>
#> $ECN_R
#>      0      1
#> 1 0.7109579 0.2890421
#> 2 0.6508675 0.3491325
#> 3 0.6661753 0.3338247
#> 4 0.6540557 0.3459443
#> 5 0.6722577 0.3277423
#> 6 0.7274764 0.2725236
#> 7 0.6832938 0.3167062
#> 8 0.6516496 0.3483504
#> 9 0.5973561 0.4026439
#> 10 0.6187362 0.3812638
#> 11 0.7007383 0.2992617
#> 12 0.6693067 0.3306933
#> 13 0.6898250 0.3101750
#> 14 0.6259158 0.3740842
#> 15 0.5757979 0.4242021
#> 16 0.6244795 0.3755205
#> 17 0.6045847 0.3954153
#> 18 0.4203017 0.5796983
#> 19 0.3063687 0.6936313
#> 20 0.4943435 0.5056565
#> 21 0.4936060 0.5063940
#> 22 0.3739744 0.6260256
#> 23 0.5222465 0.4777535
#> 24 0.4299738 0.5700262
#> 25 0.2233517 0.7766483
#> 26 0.5509266 0.4490734
#> 27 0.4761897 0.5238103
#> 28 0.4293142 0.5706858
#> 29 0.6523103 0.3476897
#> 30 0.2687086 0.7312914
#> 31 0.2349016 0.7650984
#>
#> $Hippocampal
#>      0      1
#> 1 0.86743195 0.1325680
#> 2 0.70235917 0.2976408
#> 3 0.86832835 0.1316716

```

```

#> 4  0.81247237 0.1875276
#> 5  0.76081758 0.2391824
#> 6  0.70794968 0.2920503
#> 7  0.72983981 0.2701602
#> 8  0.79773879 0.2022612
#> 9  0.84608135 0.1539187
#> 10 0.81500246 0.1849975
#> 11 0.75517238 0.2448276
#> 12 0.75809400 0.2419060
#> 13 0.82416838 0.1758316
#> 14 0.73795836 0.2620416
#> 15 0.84230308 0.1576969
#> 16 0.85105534 0.1489447
#> 17 0.84858604 0.1514140
#> 18 0.16821344 0.8317866
#> 19 0.07274415 0.9272559
#> 20 0.25681806 0.7431819
#> 21 0.06203306 0.9379669
#> 22 0.22363533 0.7763647
#> 23 0.55566462 0.4443354
#> 24 0.11011996 0.8898800
#> 25 0.19163179 0.8083682
#> 26 0.47509039 0.5249096
#> 27 0.33965452 0.6603455
#> 28 0.08556664 0.9144334
#> 29 0.21564463 0.7843554
#> 30 0.57846644 0.4215336
#> 31 0.13935828 0.8606417
#>
#> $Language
#>      0      1
#> 1  0.8242432 0.1757568
#> 2  0.6638120 0.3361880
#> 3  0.5768146 0.4231854
#> 4  0.8057701 0.1942299
#> 5  0.7784958 0.2215042
#> 6  0.6257359 0.3742641
#> 7  0.5991518 0.4008482
#> 8  0.8146732 0.1853268
#> 9  0.6871525 0.3128475
#> 10 0.5901893 0.4098107
#> 11 0.7199504 0.2800496
#> 12 0.6700618 0.3299382
#> 13 0.7637927 0.2362073
#> 14 0.8133566 0.1866434
#> 15 0.7227949 0.2772051
#> 16 0.6228210 0.3771790
#> 17 0.7233410 0.2766590
#> 18 0.3911262 0.6088738
#> 19 0.2339091 0.7660909
#> 20 0.1947396 0.8052604
#> 21 0.3990250 0.6009750
#> 22 0.3162295 0.6837705
#> 23 0.5360888 0.4639112

```

```

#> 24 0.4040389 0.5959611
#> 25 0.3567565 0.6432435
#> 26 0.4592738 0.5407262
#> 27 0.4077505 0.5922495
#> 28 0.2521028 0.7478972
#> 29 0.4062513 0.5937487
#> 30 0.3947444 0.6052556
#> 31 0.2458121 0.7541879
#>
#> $Salience
#>      0      1
#> 1 0.5806810 0.4193190
#> 2 0.5512254 0.4487746
#> 3 0.5356080 0.4643920
#> 4 0.5639906 0.4360094
#> 5 0.5468808 0.4531192
#> 6 0.5616728 0.4383272
#> 7 0.5682816 0.4317184
#> 8 0.5596077 0.4403923
#> 9 0.5508202 0.4491798
#> 10 0.5675225 0.4324775
#> 11 0.5606658 0.4393342
#> 12 0.5490662 0.4509338
#> 13 0.5426971 0.4573029
#> 14 0.5519341 0.4480659
#> 15 0.5751367 0.4248633
#> 16 0.5780879 0.4219121
#> 17 0.5557576 0.4442424
#> 18 0.5216456 0.4783544
#> 19 0.5292166 0.4707834
#> 20 0.5285952 0.4714048
#> 21 0.5539329 0.4460671
#> 22 0.5284706 0.4715294
#> 23 0.5561593 0.4438407
#> 24 0.5640433 0.4359567
#> 25 0.5281016 0.4718984
#> 26 0.5289735 0.4710265
#> 27 0.5385206 0.4614794
#> 28 0.5099687 0.4900313
#> 29 0.5244161 0.4755839
#> 30 0.5535635 0.4464365
#> 31 0.5348982 0.4651018
#>
#> $Sensorimotor
#>      0      1
#> 1 0.9396937 0.0603063
#> 2 0.4516344 0.5483656
#> 3 0.7290147 0.2709853
#> 4 0.8822036 0.1177964
#> 5 0.8520837 0.1479163
#> 6 0.4450107 0.5549893
#> 7 0.7044426 0.2955574
#> 8 0.7087318 0.2912682
#> 9 0.7138473 0.2861527

```

```

#> 10 0.7405309 0.2594691
#> 11 0.7750641 0.2249359
#> 12 0.8372905 0.1627095
#> 13 0.6381539 0.3618461
#> 14 0.8101152 0.1898848
#> 15 0.8791336 0.1208664
#> 16 0.8751577 0.1248423
#> 17 0.9219842 0.0780158
#> 18 0.1739822 0.8260178
#> 19 0.2385343 0.7614657
#> 20 0.4106598 0.5893402
#> 21 0.2653897 0.7346103
#> 22 0.3686464 0.6313536
#> 23 0.4505325 0.5494675
#> 24 0.2646650 0.7353350
#> 25 0.4206446 0.5793554
#> 26 0.2040168 0.7959832
#> 27 0.3317036 0.6682964
#> 28 0.2193240 0.7806760
#> 29 0.2248310 0.7751690
#> 30 0.3477298 0.6522702
#> 31 0.1753290 0.8246710
#>
#> $Visual_lateral
#>      0      1
#> 1 0.7851093 0.21489072
#> 2 0.6969403 0.30305975
#> 3 0.7221887 0.27781134
#> 4 0.7725017 0.22749826
#> 5 0.7426766 0.25732336
#> 6 0.7405679 0.25943206
#> 7 0.6990404 0.30095955
#> 8 0.6537980 0.34620204
#> 9 0.6659015 0.33409850
#> 10 0.8776997 0.12230034
#> 11 0.7999553 0.20004471
#> 12 0.7528874 0.24711260
#> 13 0.7698572 0.23014284
#> 14 0.7486611 0.25133885
#> 15 0.9154690 0.08453097
#> 16 0.7275959 0.27240409
#> 17 0.8315209 0.16847909
#> 18 0.1633343 0.83666566
#> 19 0.1820663 0.81793371
#> 20 0.1867735 0.81322649
#> 21 0.3610411 0.63895885
#> 22 0.2046937 0.79530626
#> 23 0.3118960 0.68810399
#> 24 0.3913842 0.60861580
#> 25 0.2902494 0.70975061
#> 26 0.3588057 0.64119429
#> 27 0.2497882 0.75021182
#> 28 0.2143186 0.78568145
#> 29 0.4560160 0.54398405

```



```

#> 30 0.4886980 0.51130195
#> 31 0.2386091 0.76139095
#>
#> $Visual_medial
#>      0      1
#> 1 0.6082004 0.3917996
#> 2 0.6088421 0.3911579
#> 3 0.5301669 0.4698331
#> 4 0.5467554 0.4532446
#> 5 0.5361469 0.4638531
#> 6 0.6398459 0.3601541
#> 7 0.5497666 0.4502334
#> 8 0.6358814 0.3641186
#> 9 0.5515636 0.4484364
#> 10 0.5837467 0.4162533
#> 11 0.5883513 0.4116487
#> 12 0.5320569 0.4679431
#> 13 0.5747028 0.4252972
#> 14 0.5842969 0.4157031
#> 15 0.5598966 0.4401034
#> 16 0.5461013 0.4538987
#> 17 0.5444071 0.4555929
#> 18 0.5158655 0.4841345
#> 19 0.4488640 0.5511360
#> 20 0.5289768 0.4710232
#> 21 0.5380799 0.4619201
#> 22 0.5144056 0.4855944
#> 23 0.5415420 0.4584580
#> 24 0.5834955 0.4165045
#> 25 0.4923851 0.5076149
#> 26 0.5517816 0.4482184
#> 27 0.5279426 0.4720574
#> 28 0.4890783 0.5109217
#> 29 0.5522627 0.4477373
#> 30 0.5212580 0.4787420
#> 31 0.4733736 0.5266264
#>
#> $Visual_occipital
#>      0      1
#> 1 0.5735211 0.4264789
#> 2 0.5985426 0.4014574
#> 3 0.6098590 0.3901410
#> 4 0.6567960 0.3432040
#> 5 0.5382496 0.4617504
#> 6 0.5684065 0.4315935
#> 7 0.5637184 0.4362816
#> 8 0.5981885 0.4018115
#> 9 0.5961144 0.4038856
#> 10 0.5773607 0.4226393
#> 11 0.5896351 0.4103649
#> 12 0.5322189 0.4677811
#> 13 0.4748444 0.5251556
#> 14 0.5879567 0.4120433
#> 15 0.5578993 0.4421007

```

```

#> 16 0.5767109 0.4232891
#> 17 0.6806913 0.3193087
#> 18 0.4186776 0.5813224
#> 19 0.4329058 0.5670942
#> 20 0.4868050 0.5131950
#> 21 0.4958194 0.5041806
#> 22 0.4951924 0.5048076
#> 23 0.5618699 0.4381301
#> 24 0.5190425 0.4809575
#> 25 0.5336983 0.4663017
#> 26 0.5295681 0.4704319
#> 27 0.5480201 0.4519799
#> 28 0.4174615 0.5825385
#> 29 0.5666785 0.4333215
#> 30 0.5657879 0.4342121
#> 31 0.5478399 0.4521601

```

Contingency tables

3T

```

#> $Auditory
#>
#>
#> |   | 0 | 1 |
#> |:--|--:|--:|
#> |0 | 17| 10|
#> |1 |  0|  4|
#>
#> $DMN
#>
#>
#> |   | 0 | 1 |
#> |:--|--:|--:|
#> |0 | 17| 14|
#> |1 |  0|  0|
#>
#> $ECN_L
#>
#>
#> |   | 0 | 1 |
#> |:--|--:|--:|
#> |0 | 17| 10|
#> |1 |  0|  4|
#>
#> $ECN_R
#>
#>
#> |   | 0 | 1 |
#> |:--|--:|--:|
#> |0 | 17|  3|
#> |1 |  0| 11|
#>
#> $Hippocampal
#>

```

```

#>
#> |   | 0| 1|
#> |:--|--:|--:|
#> |0 | 17| 2|
#> |1 | 0| 12|
#>
#> $Language
#>
#>
#> |   | 0| 1|
#> |:--|--:|--:|
#> |0 | 17| 1|
#> |1 | 0| 13|
#>
#> $Salience
#>
#>
#> |   | 0| 1|
#> |:--|--:|--:|
#> |0 | 17| 14|
#> |1 | 0| 0|
#>
#> $Sensorimotor
#>
#>
#> |   | 0| 1|
#> |:--|--:|--:|
#> |0 | 15| 0|
#> |1 | 2| 14|
#>
#> $Visual_lateral
#>
#>
#> |   | 0| 1|
#> |:--|--:|--:|
#> |0 | 17| 0|
#> |1 | 0| 14|
#>
#> $Visual_medial
#>
#>
#> |   | 0| 1|
#> |:--|--:|--:|
#> |0 | 17| 10|
#> |1 | 0| 4|
#>
#> $Visual_occipital
#>
#>
#> |   | 0| 1|
#> |:--|--:|--:|
#> |0 | 16| 8|
#> |1 | 1| 6|

```

7T

```
#> $Auditory
#>
#>
#> |   | 0| 1|
#> |:--|--:|--:|
#> |0 | 7| 0|
#> |1 | 2| 12|
#>
#> $DMN
#>
#>
#> |   | 0| 1|
#> |:--|--:|--:|
#> |0 | 0| 0|
#> |1 | 9| 12|
#>
#> $ECN_L
#>
#>
#> |   | 0| 1|
#> |:--|--:|--:|
#> |0 | 8| 1|
#> |1 | 1| 11|
#>
#> $ECN_R
#>
#>
#> |   | 0| 1|
#> |:--|--:|--:|
#> |0 | 9| 0|
#> |1 | 0| 12|
#>
#> $Hippocampal
#>
#>
#> |   | 0| 1|
#> |:--|--:|--:|
#> |0 | 9| 0|
#> |1 | 0| 12|
#>
#> $Language
#>
#>
#> |   | 0| 1|
#> |:--|--:|--:|
#> |0 | 9| 0|
#> |1 | 0| 12|
#>
#> $Salience
#>
#>
#> |   | 0| 1|
```

```

#> |:--|--:|--:|
#> |0 | 9| 1|
#> |1 | 0| 11|
#>
#> $Sensorimotor
#>
#>
#> | | 0| 1|
#> |:--|--:|--:|
#> |0 | 0| 0|
#> |1 | 9| 12|
#>
#> $Visual_lateral
#>
#>
#> | | 0| 1|
#> |:--|--:|--:|
#> |0 | 9| 0|
#> |1 | 0| 12|
#>
#> $Visual_medial
#>
#>
#> | | 0| 1|
#> |:--|--:|--:|
#> |0 | 9| 0|
#> |1 | 0| 12|
#>
#> $Visual_occipital
#>
#>
#> | | 0| 1|
#> |:--|--:|--:|
#> |0 | 9| 0|
#> |1 | 0| 12|

```