**RESULTS**

Table 1 summarizes the surface areas measurements of V1/2/3 when presented with 1.5-7 degree (subjects 1-11) or 1.5-4 degree (subjects 12-20) dartboard stimulus. The table is organized to show the measurements as the visual areas respond to the quarter-field stimulation (e.g. activation in the dorsal area in the left hemisphere corresponds to the stimulation of right upper visual field). The differences across the hemispheres for V1 and V2 were insignificant (1219 and 1195 mm2 for V1 and 1102 and 1082 mm2 for V2). For V3 the left hemisphere was significantly larger than the right when averaged across all subjects. We observed statistically significant correlations in the sizes of V1/V2 (r=0.72, p<0.001), V1/V3 (r=0.58, p<0.001), and V2/V3 (r=0.72, p<0.001).

In the ensemble average, V1 was larger in comparison to V2 or V3; V2 was approximately 90 ±17% the size of V1 and V3 was approximately 75±18% of V1. Pair-wise t-test showed that these differences were significant with p-value of 0.002 for V1/V2 pair and less than 0.001 for V1/V3 pair. However, we note the significant variability between individual subjects. In particular, subjects 3, 12, 13, and 20 had V2 which were larger in size than V1. V3 was smaller than V1 for all subjects.

Table 1

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  | Ventral |  |  | Dorsal |  |  | Total |  |
| Subject # | Hemi | V1 | V2 | V3 | V1 | V2 | V3 | V1 | V2 | V3 |
| 1 | left | 743 | 688 | 526 | 576 | 600 | 415 | 1319 | 1288 | 940 |
| 1 | right | 841 | 602 | 412 | 859 | 496 | 424 | 1700 | 1098 | 836 |
| 2 | left | 931 | 724 | 610 | 833 | 782 | 566 | 1763 | 1506 | 1176 |
| 2 | right | 935 | 887 | 580 | 906 | 1042 | 744 | 1841 | 1929 | 1324 |
| 3 | left | 876 | 862 | 516 | 749 | 947 | 568 | 1625 | 1810 | 1084 |
| 3 | right | 527 | 674 | 403 | 667 | 809 | 815 | 1195 | 1483 | 1217 |
| 4 | left | 679 | 823 | 726 | 866 | 601 | 650 | 1545 | 1424 | 1376 |
| 4 | right | 671 | 584 | 406 | 607 | 526 | 582 | 1278 | 1109 | 987 |
| 5 | left | 629 | 735 | 480 | 558 | 603 | 650 | 1186 | 1339 | 1130 |
| 5 | right | 672 | 658 | 448 | 791 | 623 | 538 | 1463 | 1281 | 985 |
| 6 | left | 454 | 323 | 384 | 662 | 660 | 345 | 1115 | 983 | 729 |
| 6 | right | 618 | 632 | 337 | 715 | 675 | 495 | 1333 | 1306 | 832 |
| 7 | left | 738 | 778 | 681 | 804 | 516 | 722 | 1542 | 1294 | 1403 |
| 7 | right | 541 | 554 | 497 | 756 | 934 | 621 | 1297 | 1488 | 1118 |
| 8 | left | 864 | 839 | 702 | 867 | 646 | 720 | 1731 | 1485 | 1422 |
| 8 | right | 544 | 389 | 520 | 675 | 502 | 622 | 1219 | 891 | 1142 |
| 9 | left | 842 | 549 | 508 | 957 | 535 | 444 | 1799 | 1084 | 952 |
| 9 | right | 377 | 344 | 326 | 464 | 733 | 577 | 841 | 1078 | 903 |
| 10 | left | 481 | 382 | 384 | 416 | 335 | 277 | 897 | 717 | 661 |
| 10 | right | 487 | 243 | 263 | 721 | 509 | 335 | 1207 | 752 | 599 |
| 11 | left | 551 | 328 | 229 | 416 | 491 | 486 | 967 | 818 | 715 |
| 11 | right | 427 | 466 | 416 | 467 | 277 | 331 | 894 | 743 | 748 |
| 12 | left | 450 | 448 | 502 | 347 | 452 | 442 | 797 | 900 | 944 |
| 12 | right | 423 | 411 | 313 | 559 | 674 | 443 | 982 | 1086 | 757 |
| 13 | left | 460 | 445 | 305 | 373 | 630 | 664 | 833 | 1075 | 969 |
| 13 | right | 480 | 372 | 348 | 463 | 334 | 414 | 942 | 707 | 762 |
| 14 | left | 613 | 602 | 490 | 618 | 359 | 574 | 1231 | 961 | 1065 |
| 14 | right | 523 | 398 | 270 | 573 | 642 | 385 | 1096 | 1040 | 655 |
| 15 | left | 363 | 448 | 378 | 537 | 367 | 343 | 900 | 815 | 720 |
| 15 | right | 457 | 281 | 227 | 543 | 484 | 416 | 1001 | 765 | 643 |
| 16 | left | 365 | 388 | 389 | 470 | 471 | 343 | 835 | 859 | 732 |
| 16 | right | 541 | 448 | 231 | 610 | 489 | 419 | 1151 | 937 | 650 |
| 17 | left | 395 | 375 | 473 | 587 | 612 | 404 | 982 | 987 | 877 |
| 17 | right | 469 | 454 | 330 | 703 | 564 | 500 | 1172 | 1017 | 830 |
| 18 | left | 590 | 483 | 307 | 702 | 520 | 430 | 1292 | 1003 | 737 |
| 18 | right | 535 | 441 | 210 | 697 | 417 | 324 | 1232 | 859 | 534 |
| 19 | left | 437 | 344 | 453 | 520 | 398 | 471 | 957 | 742 | 924 |
| 19 | right | 493 | 449 | 537 | 548 | 486 | 359 | 1041 | 935 | 896 |
| 20 | left | 546 | 467 | 531 | 508 | 481 | 528 | 1055 | 948 | 1060 |
| 20 | right | 408 | 519 | 309 | 615 | 613 | 478 | 1023 | 1132 | 787 |
|  |  |  |  |  |  |  |  |  |  |  |
|  | mean | 574 | 521 | 424 | 633 | 571 | 497 | 1207 | 1092 | 921 |
|  | median | 538 | 460 | 409 | 613 | 531 | 475 | 1179 | 1029 | 899 |
|  | stdev | 162 | 171 | 132 | 154 | 168 | 133 | 296 | 295 | 231 |
|  | min | 363 | 243 | 210 | 347 | 277 | 277 | 797 | 707 | 534 |
|  | max | 935 | 887 | 726 | 957 | 1042 | 815 | 1841 | 1929 | 1422 |
|  |  |  |  |  |  |  |  |  |  |  |
| left | mean | 600 | 552 | 479 | 618 | 550 | 502 | 1219 | 1102 | 981 |
| right | mean | 548 | 490 | 369 | 647 | 591 | 491 | 1195 | 1082 | 860 |

Time course comparisons

In Table 2, we compare the fit between the true (simulated) V1 time course and the corresponding time estimates from PCA and source estimation (**SE**) analysis. The comparisons were performed with *Pearson’s r* test using MATLAB’s *corrcoef* function. To test the effects of signal contamination from non-occipital sources, we have performed three separate simulations with varying levels of parietal source contributions. An arbitrary correlation value of 0.95 was chosen to denote the acceptable measure of performance. When PCA fails to produce principal component that meet the acceptance criterion, we mark the correlation values with an asterisk for emphasis.

PCA failed to produce acceptable time estimates for 5 subjects (subjects 2, 3, 7, 13, and 20) for simulations where external components were none or small. To make the connection between failed PCA attempts and the V2/V1 area composition, the subjects whose V2/V1 area ratios were larger than 0.95 were marked with the plus symbol. Every failed PCA attempts occurred when the subject’s V2 size was comparable to V1. Regardless of area ratio, when the external contributions were significantly ramped up, the PCA failed for all 20 subjects.

In contrast, we observed that the source estimation analysis produced time functions with nearly perfect agreement in the case where only small amount of parietal sources were present. Even when the signal was contaminated with significant amount of external signal, SE performed rather robustly, resulting in failed time estimates for 4 out of the 20 subjects.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **No External Sources** | | **0.1 External Sources** | | **0.5 External Sources** | |
|  | **PCA** | **SE** | **PCA** | **SE** | **PCA** | **SE** |
| Subject 1 | 0.99 | 1.00 | 0.97 | 1.00 | \*0.52 | \*0.92 |
| Subject 2+ | \*0.85 | 1.00 | \*0.84 | 1.00 | \*0.83 | 0.99 |
| Subject 3+ | \*0.91 | 1.00 | \*0.84 | 1.00 | \*0.56 | \*0.95 |
| Subject 4 | 0.99 | 1.00 | 0.99 | 1.00 | \*0.69 | 0.97 |
| Subject 5+ | 0.97 | 1.00 | 0.97 | 1.00 | \*0.39 | 0.96 |
| Subject 6 | 0.99 | 1.00 | 0.97 | 1.00 | \*0.43 | \*0.88 |
| Subject 7+ | \*0.95 | 1.00 | \*0.92 | 1.00 | \*0.34 | 0.98 |
| Subject 8 | 0.97 | 1.00 | 0.98 | 1.00 | \*0.88 | 0.99 |
| Subject 9 | 0.97 | 1.00 | 0.97 | 1.00 | \*0.77 | 0.98 |
| Subject 10 | 1.00 | 1.00 | 1.00 | 1.00 | \*0.92 | 0.99 |
| Subject 11 | 0.98 | 1.00 | 0.99 | 1.00 | \*0.67 | 0.96 |
| Subject 12+ | 1.00 | 1.00 | 1.00 | 1.00 | \*0.38 | 0.99 |
| Subject 13+ | \*0.80 | 1.00 | \*0.82 | 1.00 | \*0.73 | \*0.89 |
| Subject 14 | 1.00 | 1.00 | 1.00 | 1.00 | \*0.67 | 0.99 |
| Subject 15 | 1.00 | 1.00 | 0.99 | 1.00 | \*0.27 | 0.98 |
| Subject 16 | 1.00 | 1.00 | 0.99 | 1.00 | \*0.86 | 0.99 |
| Subject 17 | 0.96 | 1.00 | 0.94 | 1.00 | \*0.86 | 0.99 |
| Subject 18 | 0.99 | 1.00 | 0.98 | 1.00 | \*0.21 | 0.99 |
| Subject 19 | 0.99 | 1.00 | 0.98 | 1.00 | \*0.94 | 1.00 |
| Subject 20+ | \*0.85 | 1.00 | \*0.93 | 1.00 | \*0.70 | 0.99 |
| Mean | 0.96 | 1.00 | 0.95 | 1.00 | 0.63 | 0.97 |

+ denotes subjects whose V2 area is larger than 0.95\*V1