

Results from post-task questionnaire

Question 1: When you were playing the game with Hoki, how aware were you that she was playing the game at the same time in the other room?

Participants gave a response on a scale from 1 (not at all) to 7 (completely). The mean response was 5.5 (median: 6; range 1-7).

Question 2: Did the task feel different when you were playing against Hoki, compared with playing against the computer?

15 participants (62.5%) responded no and 9 (37.5%) responded yes. If participants responded yes they were asked what the difference was. The 9 responses were as follows: 1) “When it was the computer I could feel that there was no other person”; 2) “The computer tends to surprise at the later half of the block. I felt refreshed when it changed from Computer to Hoki”; 3) “I was more conscious when playing with Hoki”; 4) “I felt more pressure playing with Hoki”; 5) “It was easier with the computer”; 6) “It felt more rewarding when playing with Hoki”; 7) “For the surprise trials I assume the computer was random, but I might guess when Hoki will do it”; 8) “Hoki produced more surprises”; 9) “I felt the difference between a person and a computer”.

Question 3: Did you think differently or use different strategies when you were playing against Hoki versus playing against the computer?

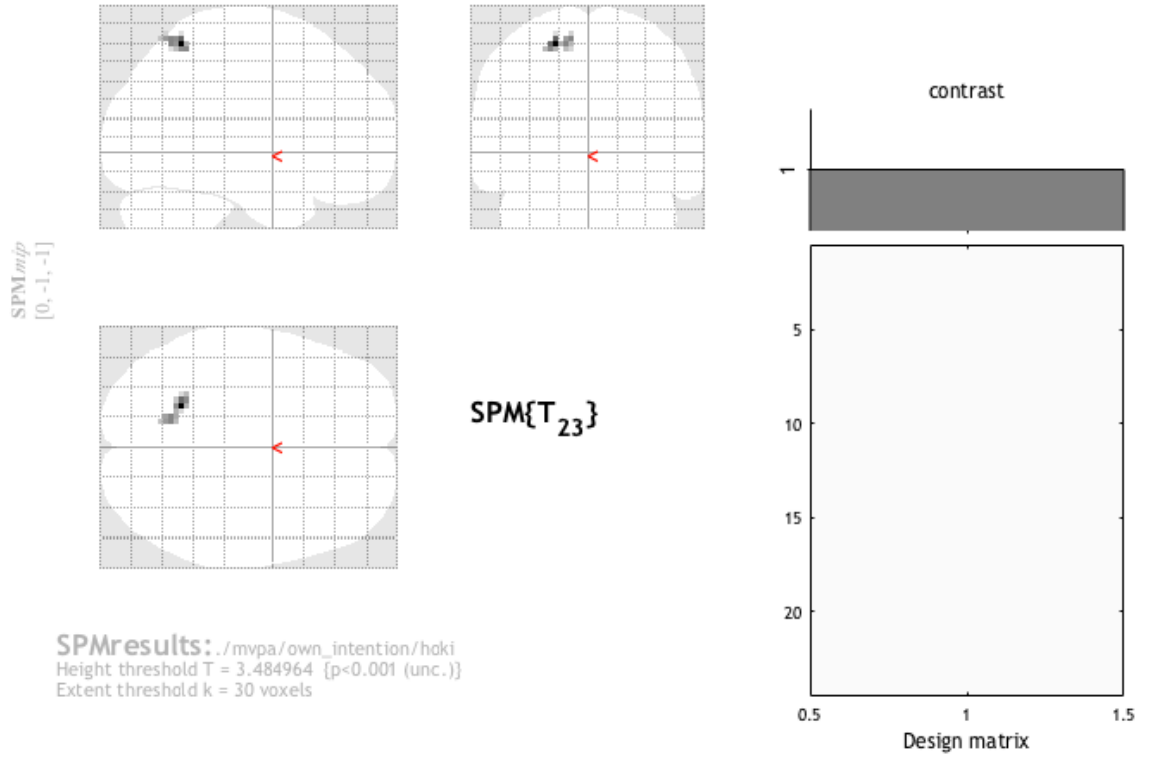
23 participants (96%) responded no and 1 (4%) responded yes (this participant said they tried harder to perform well in the human-partner condition).

Question 4: In actual fact, after you went into the scanner Hoki was no longer playing the game and you were actually playing against the computer the whole time. How surprised are you at this?

Participants gave a response on a scale from 1 (I knew this all along) to 7 (I had no idea). The mean rating was 5.9 (median: 6; range: 3-7).

Results from individual intention decoding analyses

1. First-person action-plan, human partner



SPMresults: ./mya/own_intention/hki
Height threshold T = 3.484964 [p<0.001 (unc.)]
Extent threshold k = 30 voxels

Statistics: p-values adjusted for search volume

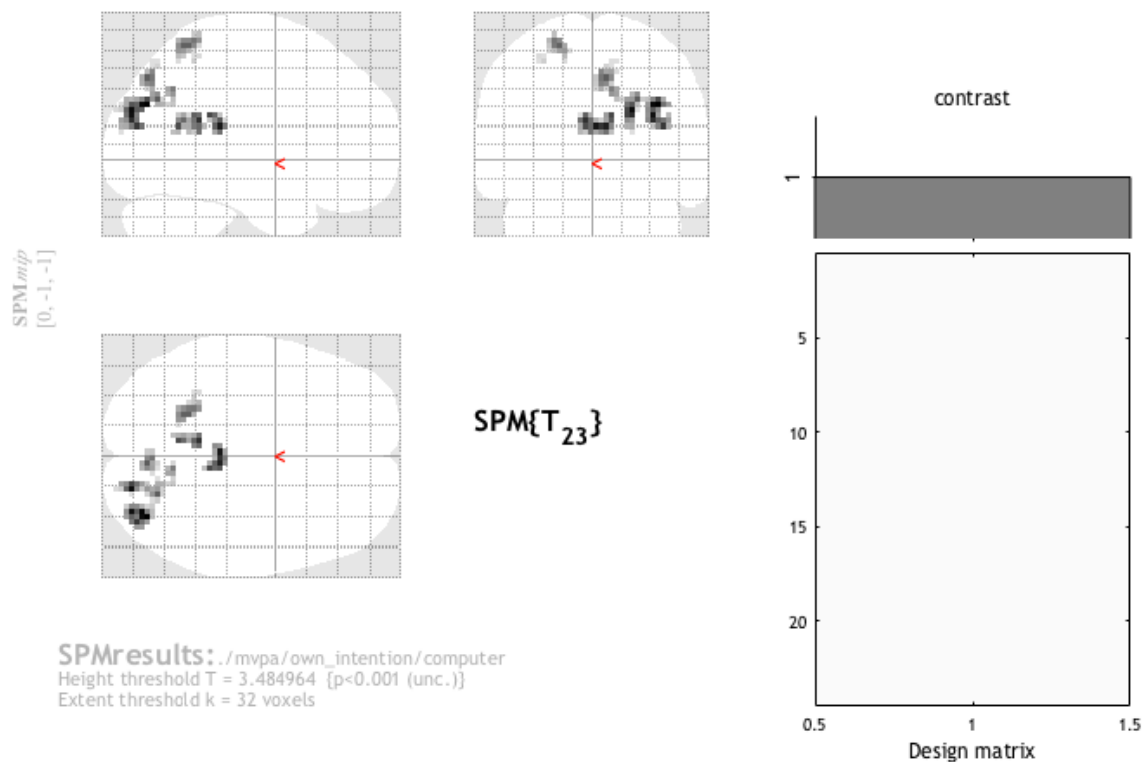
| cluster-level | | | | peak-level | | | | | mm mm mm | |
|-----------------------|-----------------------|-------|---------------------|-----------------------|-----------------------|------|-----------|---------------------|----------|--------|
| $p_{\text{FWE-corr}}$ | $q_{\text{FDR-corr}}$ | k_E | p_{uncorr} | $p_{\text{FWE-corr}}$ | $q_{\text{FDR-corr}}$ | T | $(Z_{=})$ | p_{uncorr} | | |
| 0.042 | 0.024 | 30 | 0.001 | 0.245 | 0.398 | 5.93 | 4.58 | 0.000 | -21 | -55 59 |
| | | | | 1.000 | 0.916 | 4.48 | 3.76 | 0.000 | -15 | -61 59 |

table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.48, p = 0.001 (1.000)
Extent threshold: k = 30 voxels, p = 0.001 (0.042)
Expected voxels per cluster, <k> = 2.123
Expected number of clusters, <k> = 0.04
FWEp: 6.605, FDRp: Inf, FWEc: 30, FDRc: 22

Degrees of freedom = [1.0, 23.0]
FWHM = 8.8 8.7 8.7 mm mm mm; 2.9 2.9 2.9 {voxels}
Volume: 2781189 = 103007 voxels = 3824.9 resels
Voxel size: 3.0 3.0 3.0 mm mm mm; (resel = 24.86 voxels)

2. First-person action plan, computer partner



Statistics: *p-values adjusted for search volume*

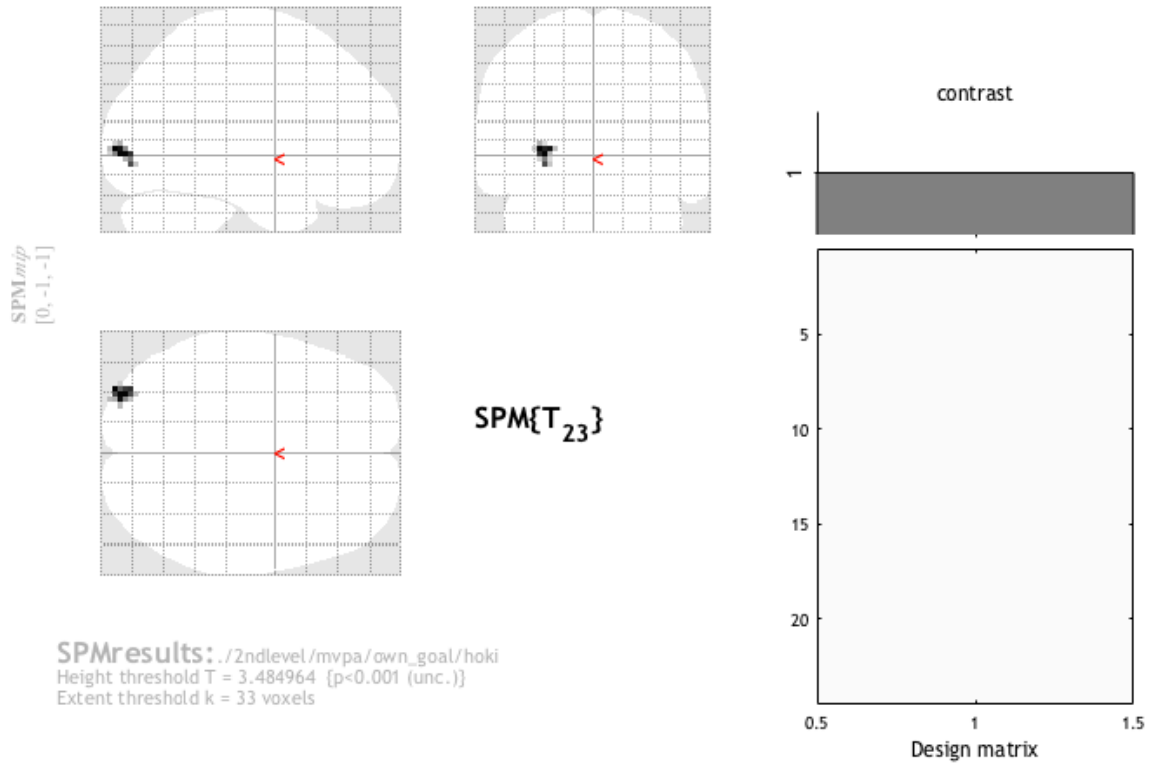
| set-level | | cluster-level | | | peak-level | | | | | | mm mm mm | | |
|-----------|----------|------------------------------|------------------------------|-----------------------|----------------------------|------------------------------|------------------------------|----------|-----------------------------|----------------------------|----------|-----|----|
| <i>p</i> | <i>c</i> | <i>p</i> _{FWE-corr} | <i>q</i> _{FDR-corr} | <i>k</i> _E | <i>p</i> _{uncorr} | <i>p</i> _{FWE-corr} | <i>q</i> _{FDR-corr} | <i>T</i> | (<i>Z</i> _{...}) | <i>p</i> _{uncorr} | | | |
| 0.000 | 5 | 0.000 | 0.000 | 140 | 0.000 | 0.749 | 0.538 | 5.44 | 4.32 | 0.000 | 36 | -76 | 29 |
| | | | | | | 0.851 | 0.538 | 5.27 | 4.22 | 0.000 | 21 | -85 | 26 |
| | | | | | | 0.868 | 0.538 | 5.24 | 4.21 | 0.000 | 33 | -85 | 23 |
| | | 0.017 | 0.003 | 38 | 0.000 | 0.899 | 0.538 | 5.17 | 4.17 | 0.000 | 0 | -34 | 17 |
| | | | | | | 0.992 | 0.578 | 4.77 | 3.94 | 0.000 | 9 | -40 | 23 |
| | | 0.025 | 0.004 | 35 | 0.001 | 0.968 | 0.578 | 4.96 | 4.05 | 0.000 | -6 | -46 | 20 |
| | | | | | | 0.996 | 0.578 | 4.72 | 3.91 | 0.000 | -6 | -58 | 17 |
| | | 0.039 | 0.005 | 32 | 0.001 | 0.999 | 0.578 | 4.58 | 3.82 | 0.000 | 6 | -76 | 44 |
| | | | | | | 1.000 | 0.960 | 3.51 | 3.11 | 0.001 | 12 | -73 | 53 |
| | | 0.010 | 0.003 | 42 | 0.000 | 0.999 | 0.578 | 4.57 | 3.82 | 0.000 | -21 | -52 | 62 |
| | | | | | | 1.000 | 0.927 | 3.63 | 3.20 | 0.001 | -30 | -49 | 53 |

table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.48, p = 0.001 (1.000)
Extent threshold: k = 32 voxels, p = 0.001 (0.039)
Expected voxels per cluster, <k> = 2.257
Expected number of clusters, <c> = 0.04
FWEp: 6.605, FDRp: Inf, FWEc: 32, FDRc: 23

Degrees of freedom = [1.0, 23.0]
FWHM = 9.0 8.9 8.9 mm mm mm; 3.0 3.0 3.0 [voxels]
Volume: 2781189 = 103007 voxels = 3597.7 resels
Voxel size: 3.0 3.0 3.0 mm mm mm; (resel = 26.43 voxels)

3. First-person goal, human-partner



Statistics: *p-values adjusted for search volume*

| cluster-level | | | | peak-level | | | | | |
|----------------|----------------|-------|--------------|----------------|----------------|------|-----------|--------------|------------|
| $P_{FWE-corr}$ | $q_{FDR-corr}$ | k_E | P_{uncorr} | $P_{FWE-corr}$ | $q_{FDR-corr}$ | T | $(Z_{=})$ | P_{uncorr} | mm mm mm |
| 0.035 | 0.006 | 33 | 0.001 | 0.999 | 0.669 | 4.57 | 3.82 | 0.000 | -33 -94 2 |
| | | | | 1.000 | 0.669 | 4.19 | 3.57 | 0.000 | -30 -85 -7 |

table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.48, p = 0.001 (1.000)
Extent threshold: k = 33 voxels, p = 0.001 (0.035)
Expected voxels per cluster, <k> = 2.273
Expected number of clusters, <c> = 0.04
FWEp: 6.605, FDRp: Inf, FWEc: 33, FDRc: 25

Degrees of freedom = [1.0, 23.0]
FWHM = 9.0 8.9 8.9 mm mm mm; 3.0 3.0 3.0 [voxels]
Volume: 2781189 = 103007 voxels = 3572.9 resels
Voxel size: 3.0 3.0 3.0 mm mm mm; (resel = 26.61 voxels)

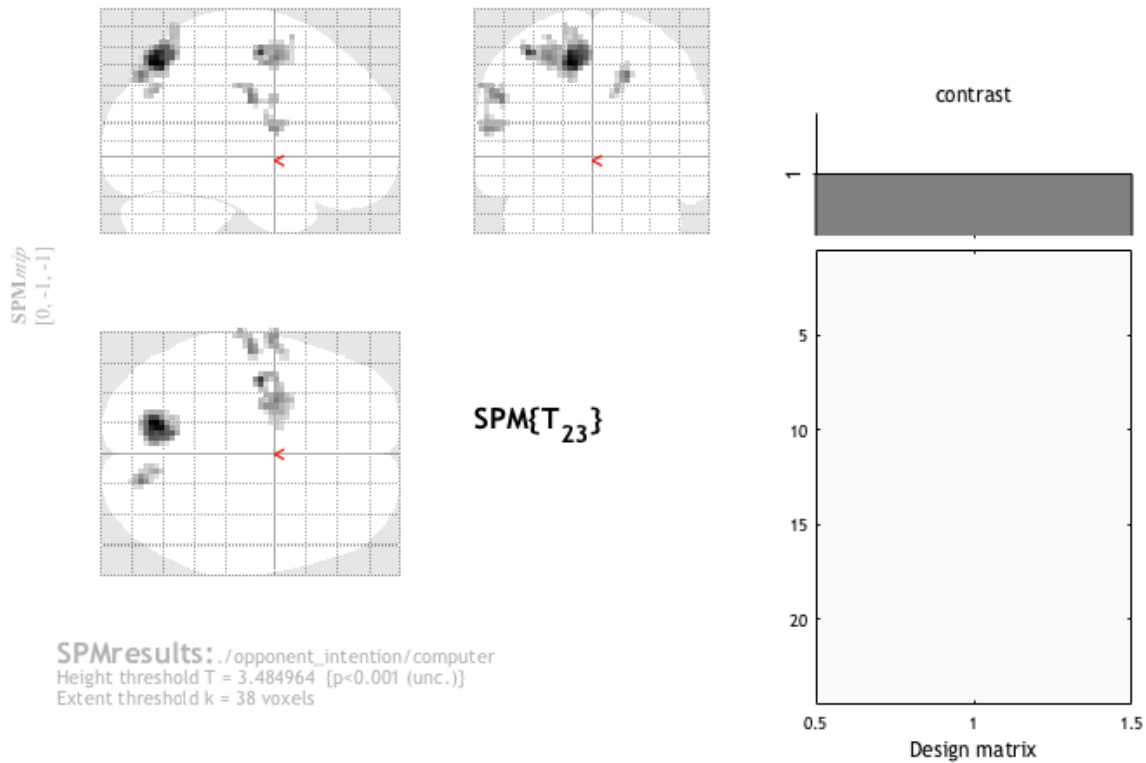
4. First-person goal, computer-partner

No significant clusters

5. Third-person action-plan, human partner

No significant clusters

6. Third-person action plan, computer partner



Statistics: *p-values adjusted for search volume*

| set-level | | cluster-level | | | | peak-level | | | | | mm mm mm | | |
|-----------|----------|------------------------------|------------------------------|-----------------------|----------------------------|------------------------------|------------------------------|----------|--------------------------|----------------------------|----------|-----|----|
| <i>p</i> | <i>c</i> | <i>p</i> _{FWE-corr} | <i>q</i> _{FDR-corr} | <i>k</i> _E | <i>p</i> _{uncorr} | <i>p</i> _{FWE-corr} | <i>q</i> _{FDR-corr} | <i>T</i> | <i>(Z_{max})</i> | <i>p</i> _{uncorr} | | | |
| 0.000 | 4 | 0.000 | 0.000 | 191 | 0.000 | 0.070 | 0.237 | 6.46 | 4.83 | 0.000 | -15 | -70 | 50 |
| | | | | | | 1.000 | 0.845 | 4.24 | 3.60 | 0.000 | -15 | -79 | 44 |
| | | | | | | 1.000 | 0.845 | 4.01 | 3.46 | 0.000 | -12 | -61 | 65 |
| | | 0.000 | 0.000 | 128 | 0.000 | 0.482 | 0.553 | 5.65 | 4.43 | 0.000 | -39 | -10 | 56 |
| | | | | | | 0.992 | 0.845 | 4.78 | 3.94 | 0.000 | -27 | -1 | 53 |
| | | | | | | 1.000 | 0.845 | 4.22 | 3.59 | 0.000 | -39 | -1 | 56 |
| | | 0.018 | 0.004 | 38 | 0.000 | 0.982 | 0.845 | 4.87 | 4.00 | 0.000 | 18 | -79 | 44 |
| | | | | | | 1.000 | 0.845 | 4.21 | 3.59 | 0.000 | 12 | -70 | 35 |
| | | 0.000 | 0.000 | 80 | 0.000 | 0.991 | 0.845 | 4.79 | 3.95 | 0.000 | -54 | -16 | 32 |
| | | | | | | 0.999 | 0.845 | 4.54 | 3.80 | 0.000 | -63 | -1 | 14 |
| | | | | | | 1.000 | 0.845 | 4.20 | 3.58 | 0.000 | -66 | -22 | 38 |

table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.48, p = 0.001 (1.000)
Extent threshold: k = 38 voxels, p = 0.000 (0.018)
Expected voxels per cluster, <k> = 2.288
Expected number of clusters, <c> = 0.02
FWEp: 6.605, FDRp: Inf, FWEc: 38, FDRc: 23

Degrees of freedom = [1.0, 23.0]
FWHM = 9.0 8.9 8.9 mm mm mm; 3.0 3.0 3.0 [voxels]
Volume: 2781189 = 103007 voxels = 3549.2 resels
Voxel size: 3.0 3.0 3.0 mm mm mm; (resel = 26.79 voxels)

7. Third-person goal, human partner

No significant clusters

8. Third-person goal, computer partner

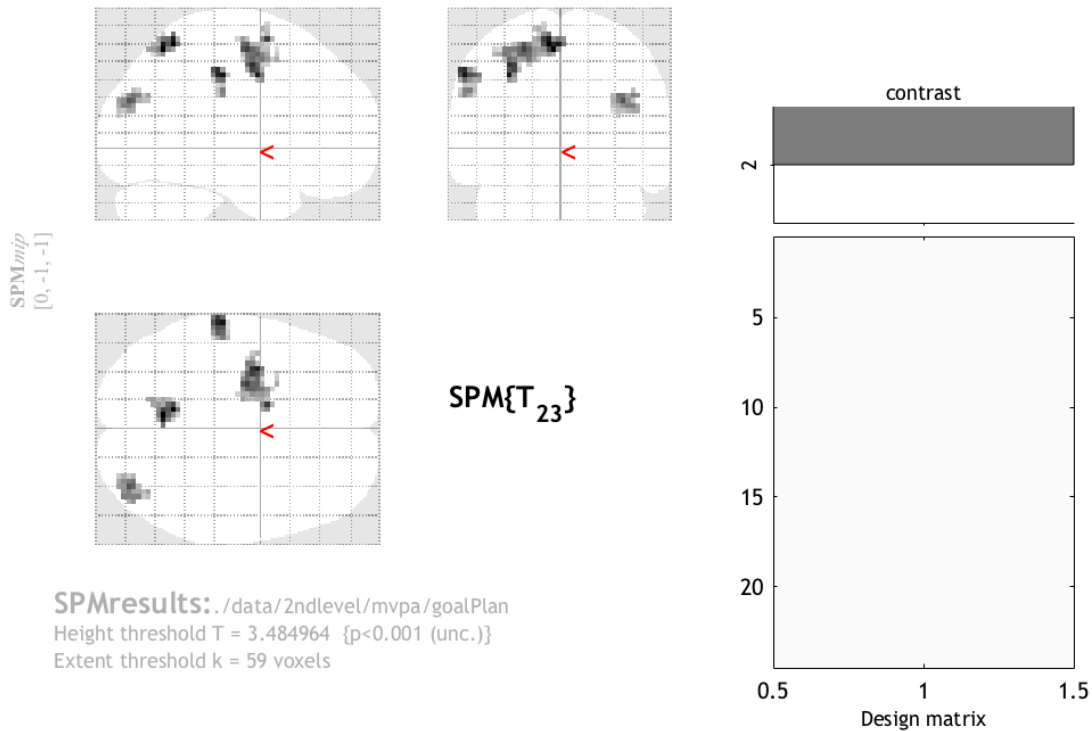
No significant clusters

Comparisons between intention components

1. Goals > plans

No significant clusters.

2. Plans > goals



Statistics: p-values adjusted for search volume

| set-level | | cluster-level | | | | peak-level | | | | | mm mm mm | | |
|-----------|---|-----------------------|-----------------------|----------------|---------------------|-----------------------|-----------------------|------|-------------------|---------------------|----------|-----|----|
| p | c | p _{FWE-corr} | q _{FDR-corr} | k _E | p _{uncorr} | p _{FWE-corr} | q _{FDR-corr} | T | (Z _≡) | p _{uncorr} | | | |
| 0.000 | 4 | 0.009 | 0.005 | 69 | 0.000 | 0.353 | 0.573 | 5.54 | 4.37 | 0.000 | -9 | -55 | 59 |
| | | 0.020 | 0.008 | 59 | 0.001 | 0.519 | 0.573 | 5.27 | 4.22 | 0.000 | -60 | -25 | 41 |
| | | | | | | 0.988 | 0.682 | 4.33 | 3.66 | 0.000 | -57 | -25 | 32 |
| | | 0.000 | 0.000 | 166 | 0.000 | 0.555 | 0.573 | 5.22 | 4.19 | 0.000 | -33 | -4 | 41 |
| | | | | | | 0.745 | 0.573 | 4.94 | 4.04 | 0.000 | -12 | 2 | 62 |
| | | | | | | 0.793 | 0.573 | 4.87 | 4.00 | 0.000 | -24 | -10 | 56 |
| | | 0.007 | 0.005 | 72 | 0.000 | 0.887 | 0.637 | 4.70 | 3.89 | 0.000 | 36 | -82 | 26 |
| | | | | | | 0.991 | 0.685 | 4.29 | 3.64 | 0.000 | 42 | -76 | 29 |

table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.48, p = 0.001 (1.000)
 Extent threshold: k = 59 voxels, p = 0.001 (0.020)
 Expected voxels per cluster, <k> = 4.330
 Expected number of clusters, <c> = 0.02
 FWEp: 6.459, FDRp: Inf, FWEc: 59, FDRc: 59

Degrees of freedom = [1.0, 23.0]
 FWHM = 11.0 11.1 11.2 mm mm mm; 3.7 3.7 3.7 {voxels}
 Volume: 1977804 = 73252 voxels = 1183.0 resels
 Voxel size: 3.0 3.0 3.0 mm mm mm; (resel = 50.70 voxels)

Comparisons between 1st person versus 3rd person decoding accuracies

1. 1st person action-plan > 3rd person action-plan (Human condition)

No significant clusters

2. 1st person action-plan < 3rd person action-plan (Human condition)

No significant clusters

3. 1st person action-plan > 3rd person action-plan (Computer condition)

No significant clusters

4. 1st person action-plan < 3rd person action-plan (Computer condition)

No significant clusters

5. 1st person goal > 3rd person goal (Human condition)

No significant clusters

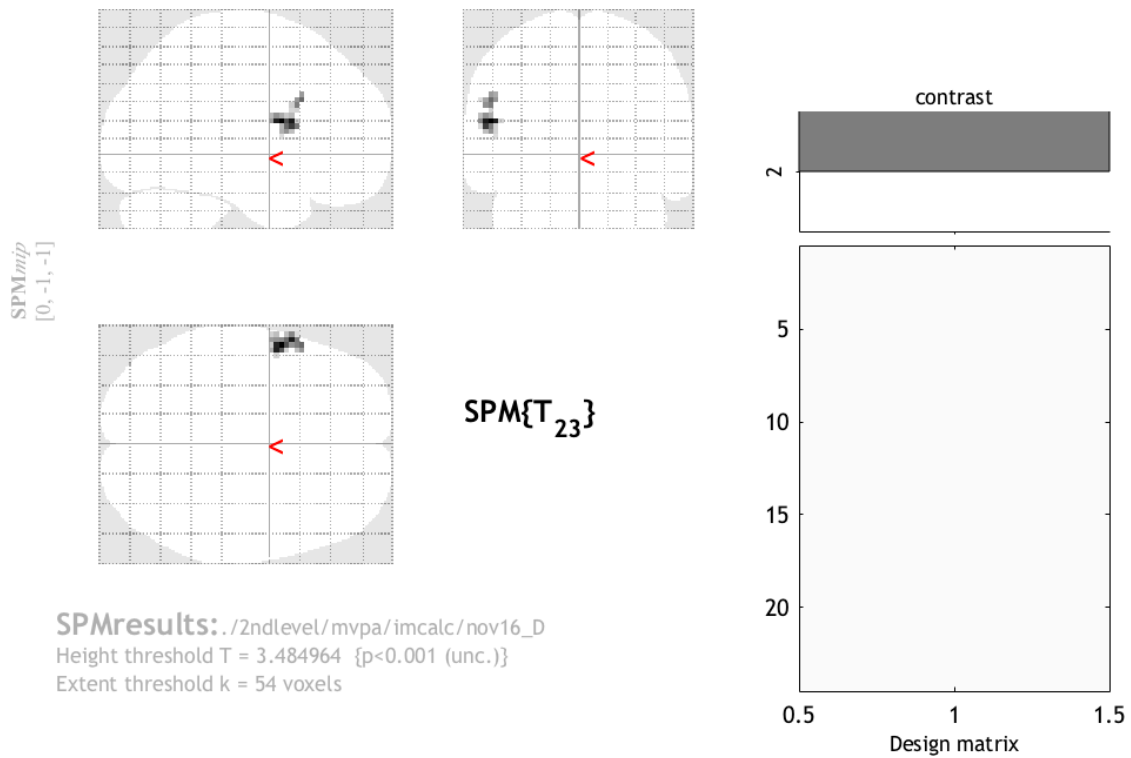
6. 1st person goal < 3rd person goal (Human condition)

No significant clusters

7. 1st person goal > 3rd person goal (Computer condition)

No significant clusters

8. 1st person goal < 3rd person goal (Computer condition)



Statistics: *p-values adjusted for search volume*

| cluster-level | | | | peak-level | | | | | | mm mm mm | | |
|----------------|----------------|-------|--------------|----------------|----------------|------|----------------|--------------|-----|----------|----|--|
| $P_{FWE-corr}$ | $q_{FDR-corr}$ | k_E | P_{uncorr} | $P_{FWE-corr}$ | $q_{FDR-corr}$ | T | (Z_{\equiv}) | P_{uncorr} | | | | |
| 0.026 | 0.037 | 54 | 0.001 | 0.722 | 0.968 | 4.99 | 4.07 | 0.000 | -54 | 5 | 17 | |
| | | | | 0.995 | 0.968 | 4.24 | 3.61 | 0.000 | -54 | 17 | 29 | |

table shows 3 local maxima more than 8.0mm apart

| | |
|--|--|
| Height threshold: T = 3.48, p = 0.001 (1.000) | Degrees of freedom = [1.0, 23.0] |
| Extent threshold: k = 54 voxels, p = 0.001 (0.026) | FWHM = 10.9 11.0 11.1 mm mm mm; 3.6 3.7 3.7 {voxels} |
| Expected voxels per cluster, <k> = 4.215 | Volume: 1973187 = 73081 voxels = 1212.6 resels |
| Expected number of clusters, <c> = 0.03 | Voxel size: 3.0 3.0 3.0 mm mm mm; (resel = 49.35 voxels) |
| FWEp: 6.458, FDRp: Inf, FWEc: 54, FDRc: 54 | |

9. 1st person action-plan (collapsed over partners) > 3rd person action-plan

No significant clusters

10. 1st person action-plan (collapsed over partners) < 3rd person action-plan

No significant clusters

11. 1st person goal (collapsed over partners) > 3rd person goal

No significant clusters

12. 1st person goal (collapsed over partners) < 3rd person goal

No significant clusters

13. 1st person intentions (averaged over action-plans/goals) > 3rd person intentions

No significant clusters

14. 1st person intentions (averaged over action-plans/goals) < 3rd person intentions

No significant clusters

Comparisons between 3rd-person decoding accuracies for Human vs Computer condition

1. 3rd person action-plan (Human) > 3rd person action-plan (Computer)

No significant clusters

2. 3rd person action-plan (Human) < 3rd person action-plan (Computer)

No significant clusters

3. 3rd person goal (Human) > 3rd person goal (Computer)

No significant clusters

4. 3rd person goal (Human) < 3rd person goal (Computer)

No significant clusters

5. 3rd person intentions (Hoki; averaged over action-plans/goals) > 3rd person intentions (Computer)

No significant clusters

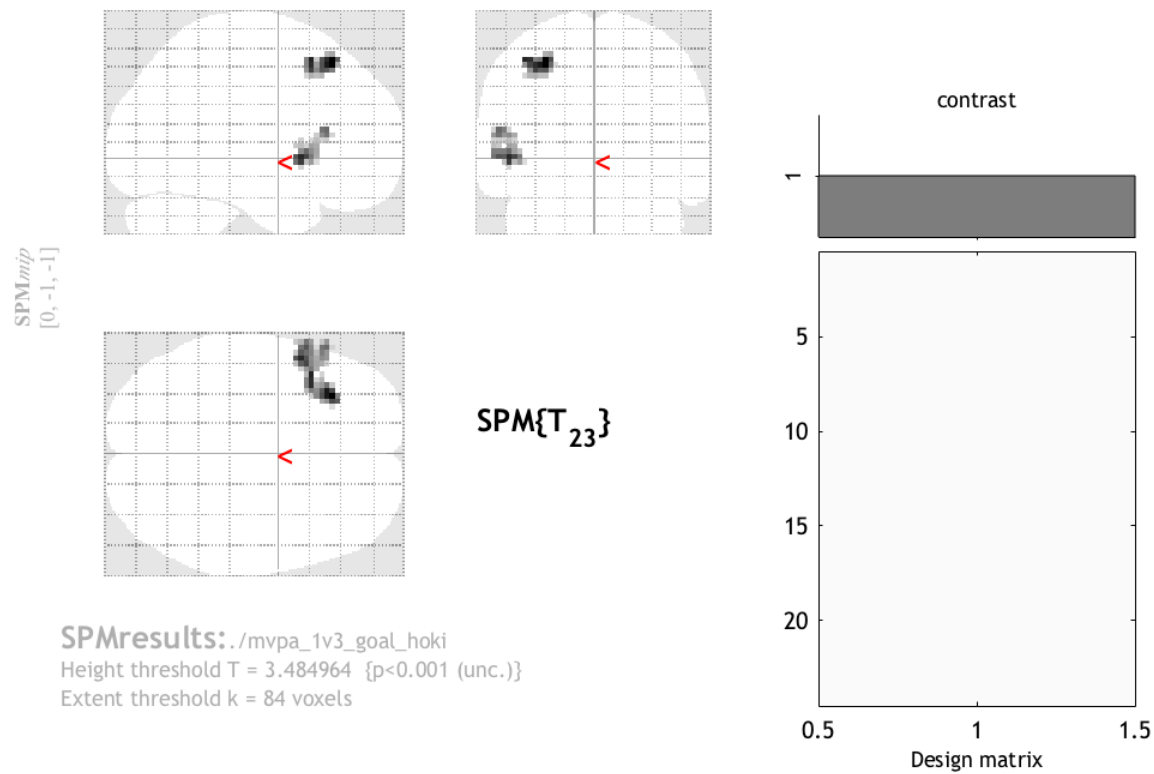
6. 3rd person intentions (Hoki; averaged over action-plans/goals) < 3rd person intentions (Computer)

No significant clusters

Decoding intention-specific activity patterns

In the following set of analyses we searched for activity patterns that distinguished 1st-person versus 3rd person intentions by training a classifier to distinguish 1st-person versus 3rd-person maps, where each map represented a subtraction between the two intention-states. For example, the 1st-person map for action-plans would represent a subtraction between 1st-person switch versus stay trials, while the 3rd-person map represented a subtraction between 3rd-person switch versus stay trials. Likewise, the 1st- and 3rd-person maps for goals represented subtractions between left versus right trials. These maps were generated separately for each scanning session, and we used the same procedure as the main decoding analyses to search for brain regions from which it was possible to decode 1st versus 3rd-person maps. We also used an equivalent procedure to decode 3rd-person intention maps generated from the human-partner versus computer-partner conditions.

1. 1st-person versus 3rd-person goals, human-partner condition



Statistics: *p-values adjusted for search volume*

| set-level | | cluster-level | | | | peak-level | | | | | mm mm mm | | |
|-----------|-----|-----------------------|-----------------------|-------|---------------------|-----------------------|-----------------------|------|----------------|---------------------|----------|----|----|
| p | c | $p_{\text{FWE-corr}}$ | $q_{\text{FDR-corr}}$ | k_E | p_{uncorr} | $p_{\text{FWE-corr}}$ | $q_{\text{FDR-corr}}$ | T | (Z_{\equiv}) | p_{uncorr} | | | |
| 0.000 | 2 | 0.000 | 0.000 | 84 | 0.000 | 0.917 | 0.435 | 5.00 | 4.07 | 0.000 | -30 | 29 | 53 |
| | | | | | | 0.986 | 0.435 | 4.71 | 3.90 | 0.000 | -42 | 17 | 53 |
| | | 0.000 | 0.000 | 95 | 0.000 | 0.990 | 0.435 | 4.68 | 3.88 | 0.000 | -51 | 11 | -1 |
| | | | | | | 1.000 | 0.502 | 4.25 | 3.61 | 0.000 | -57 | 26 | 14 |

table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.48, p = 0.001 (1.000)
 Extent threshold: k = 84 voxels, p = 0.000 (0.000)
 Expected voxels per cluster, <k> = 2.915
 Expected number of clusters, <c> = 0.00
 FWEp: 6.605, FDRp: Inf, FWEc: 84, FDRc: 84

Degrees of freedom = [1.0, 23.0]
 FWHM = 9.8 9.7 9.7 mm mm mm; 3.3 3.2 3.2 {voxels}
 Volume: 2781189 = 103007 voxels = 2785.9 resels
 Voxel size: 3.0 3.0 3.0 mm mm mm; (resel = 34.13 voxels)

2. 1st-person versus 3rd-person goals, computer-partner condition

No significant clusters

3. 1st-person versus 3rd-person goals, collapsed across human-partner and computer-partner conditions

No significant clusters

4. 1st-person versus 3rd-person action-plans, human-partner condition

No significant clusters

5. 1st-person versus 3rd-person action-plans, computer-partner condition

No significant clusters

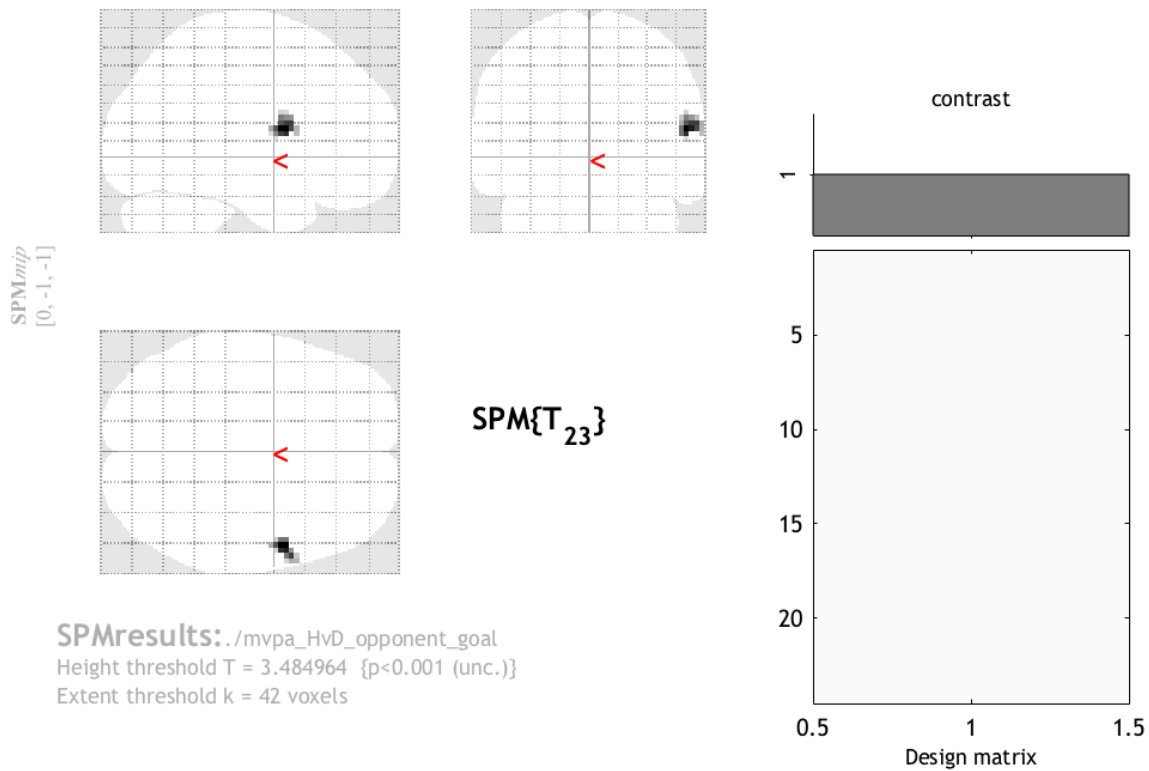
6. 1st-person versus 3rd-person action-plans, collapsed across human-partner and computer-partner conditions

No significant clusters

7. 1st-person versus 3rd-person intentions, collapsed across both goals and action-plans and human-partner / computer-partner conditions

No significant clusters

8. Human-partner versus computer-partner conditions for 3rd-person goals



Statistics: *p-values adjusted for search volume*

| cluster-level | | | | peak-level | | | | | mm mm mm | | |
|-----------------------|-----------------------|-------|---------------------|-----------------------|-----------------------|------|----------------|---------------------|----------|---|----|
| $p_{\text{FWE-corr}}$ | $q_{\text{FDR-corr}}$ | k_E | p_{uncorr} | $p_{\text{FWE-corr}}$ | $q_{\text{FDR-corr}}$ | T | (Z_{\equiv}) | p_{uncorr} | | | |
| 0.012 | 0.002 | 42 | 0.000 | 0.942 | 0.380 | 5.04 | 4.09 | 0.000 | 54 | 2 | 14 |
| | | | | 0.999 | 0.399 | 4.57 | 3.82 | 0.000 | 60 | 8 | 17 |

table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.48, p = 0.001 (1.000)
Extent threshold: k = 42 voxels, p = 0.000 (0.012)
Expected voxels per cluster, <k> = 2.351
Expected number of clusters, <c> = 0.01
FWEp: 6.605, FDRp: Inf, FWEc: 42, FDRc: 42

Degrees of freedom = [1.0, 23.0]
FWHM = 9.1 9.0 9.0 mm mm mm; 3.0 3.0 3.0 {voxels}
Volume: 2781189 = 103007 voxels = 3454.1 resels
Voxel size: 3.0 3.0 3.0 mm mm mm; (resel = 27.53 voxels)

9. Human-partner versus computer-partner conditions for 3rd-person action-plans

No significant clusters

10. Human-partner versus computer-partner conditions for 3rd-person intentions (collapsing across goals and action-plans)

No significant clusters