**Supplementary material**

Results of individual linear regression analyses of head lateral bending as a function of head axial rotation. r2: coefficient of determination. Grey labels indicate non-significant regression.

**Table S1.** Coupling of head lateral bending to axial rotation (Head in space).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Participants | Slope | Intercept | r2 |
| Heading | 1 | −0.487 | 0.01 | 0.907 |
| 2 | −0.373 | 0.525 | 0.62 |
| 3 | −0.388 | −2.501 | 0.706 |
| 4 | −0.545 | −0.172 | 0.92 |
| 5 | −0.455 | 0.343 | 0.898 |
| 6 | −0.549 | −0.225 | 0.785 |
| 7 | −0.453 | 0.24 | 0.924 |
| 8 | −0.362 | −0.958 | 0.758 |
| 9 | −0.255 | 1.012 | 0.772 |
| 10 | −0.269 | 0.734 | 0.616 |
| Pointing | 1 | −0.39 | -.206 | 0.925 |
| 2 | −0.515 | -1.376 | 0.86 |
| 3 | −0.141 | −7.017 | 0.046 |
| 4 | −0.325 | 0.119 | 0.898 |
| 5 | −0.587 | 1.01 | 0.894 |
| 6 | −0.576 | −4.738 | 0.886 |
| 7 | −0.48 | −3.687 | 0.913 |
| 8 | −0.308 | −8.941 | 0.689 |
| 9 | −0.338 | −0.919 | 0.804 |
| 10 | −0.407 | −0.237 | 0.923 |

Results of individual linear regression analyses of head lateral bending as a function of head axial rotation. r2: coefficient of determination. Grey labels indicate non-significant regression.

**Table S2.** Coupling of head lateral bending to axial rotation (Head versus Trunk).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Participants | Slope | Intercept | r2 |
| Heading | 1 | −0.471 | −1.598 | 0.891 |
| 2 | −0.403 | −1.169 | 0.669 |
| 3 | −0.385 | -0.603 | 0.593 |
| 4 | −0.528 | 3.244 | 0.833 |
| 5 | −0.413 | 2.105 | 0.865 |
| 6 | −0.55 | −2.741 | 0.806 |
| 7 | −0.447 | 1.279 | 0.932 |
| 8 | −0.341 | 3.034 | 0.77 |
| 9 | −0.203 | 0.052 | 0.592 |
| 10 | −0.257 | 0.485 | 0.669 |
| Pointing | 1 | −0.341 | −1.879 | 0.772 |
| 2 | −0.504 | −1.99 | 0.828 |
| 3 | 0.017 | −5.4 | 0.002 |
| 4 | −0.139 | 1.814 | 0.2 |
| 5 | −0.441 | 1.303 | 0.494 |
| 6 | −0.537 | −9.817 | 0.491 |
| 7 | −0.324 | −6.614 | 0.119 |
| 8 | −0.171 | 2.894 | 0.327 |
| 9 | −0.461 | −4.163 | 0.574 |
| 10 | −0.349 | −1.297 | 0.765 |

Data are mean ± SEM expressed in degrees and calculated by the fitting procedure (Origin Software, Levenberg Marquardt algorithm). The asterisks on the right compare heading and pointing tasks. AP: Antero-posterior tilt; LA: lateral tilt; RO Axial rotation. The asterisks at the bottom of each panel compare the reference systems (head in space / head versus trunk), (\*\*\*: p<0.001; \*\*: p<0.01; \*: p<0.05; ns non-significant).

**Table S3.** Parameters of the sinusoidal fitting of the variations of head orientation as a function of target direction.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  | Heading | Pointing | P value  (between tasks) |
| Amplitude | Head in space | AP | 13.33 ± 0.95 | 6.52 ± 0.54 | \*\*\* |
| LA | 7.18 ± 1.32 | 4.81 ± 1.07 | \*\*\* |
| RO | 15.97 ± 1.15 | 9.15 ± 0.41 | \*\*\* |
| Head vs trunk | AP | 13.78 ± 0.78 | 6.78 ± 0.87 | \*\*\* |
| LA | 6.93 ± 1.34 | 2.29 ± 0.66 | \*\*\* |
| RO | 15.49 ± 1.21 | 4.59 ± 0.45 | \*\*\* |
| P value (between frames of reference) | AP | ns | ns |  |
| LA | ns | \*\*\* |  |
| RO | ns | \*\*\* |  |
| Offset | Head in space | AP | −0.71 ± 0.67 | −2.75 ± 0.40 | \*\*\* |
| LA | −0.05 ± 1.64 | −2.98 ± 1.29 | \*\*\* |
| RO | −0.41 ± 1.36 | −2.06 ± 0.49 | \*\* |
| Head vs trunk | FE | 0.83 ± 0.55 | −4.36 ± 0.62 | \*\*\* |
| IN | −1.75 ± 1.63 | −1.06 ± 0.81 | ns |
| RO | 4.11 ± 1.46 | −5.75 ± 0.43 | \*\*\* |
| P value (between frames of reference) | FE | \*\*\* | \*\*\* |  |
| IN | \* | \*\*\* |  |
| RO | \*\*\* | \*\*\* |  |
| Period | Head in space | AP | 175.89 ± 6.56 | 180.12 ± 8.75 | ns |
| LA | 189.75 ± 37.49 | 220.84 ± 46.95 | ns |
| RO | 185.00 ± 13.71 | 181.13 ± 8.51 | ns |
| Head vs trunk | AP | 175.12 ± 5.22 | 182.05 ± 13.29 | ns |
| LA | 202.16 ± 40.51 | 198.18 ± 59.87 | ns |
| RO | 187.09 ± 15.30 | 154.32 ± 12.47 | \*\*\* |
| P value (between frames of reference) | AP | ns | ns |  |
| LA | ns | ns |  |
| RO | ns | \*\*\* |  |
| Phase | Head in space | AP | 2.48 ± 4.07 | -3.37 ± 5.27 | \* |
| LA | −92.51 ± 20.02 | −112.08 ± 23.25 | ns |
| RO | 91.03 ± 7.86 | 92.84 ± 4.86 | ns |
| Head vs trunk | AP | 0.38 ± 3.26 | 4.73 ± 7.75 | ns |
| LA | −108.69 ± 21.50 | −100.91 ± 31.34 | ns |
| RO | 93.42 ± 8.69 | 87.16 ± 7.67 | ns |
| P value (between frames of reference) | AP | ns | \* |  |
| LA | ns | ns |  |
| RO | ns | ns |  |