**---SUPPLEMENTARY MATERIAL---**

Title: **Associations between cognitive function and multisensory integration in The Irish Longitudinal Study on Ageing**

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***Table S1. Full Choice Response Time (CRT) model results***

| *Predictors* | *Odds Ratios* | *CI* | *p* |
| --- | --- | --- | --- |
| Intercept | 0.03 | 0.01 – 0.16 | **<0.001** |
| Age | 1.02 | 0.92 – 1.14 | 0.688 |
| SOA [150] | 0.41 | 0.36 – 0.45 | **<0.001** |
| SOA [230] | 0.49 | 0.44 – 0.54 | **<0.001** |
| CRT [Cognitive] | 1.05 | 0.95 – 1.16 | 0.346 |
| CRT [Motor] | 0.99 | 0.89 – 1.10 | 0.810 |
| Sex [Female] | 2.21 | 1.81 – 2.70 | **<0.001** |
| Education [Secondary] | 1.24 | 0.94 – 1.64 | 0.130 |
| Education [Third/Higher] | 1.67 | 1.27 – 2.21 | **<0.001** |
| Pre/Post [Pre] | 0.50 | 0.47 – 0.53 | **<0.001** |
| VAS | 1.00 | 0.91 – 1.09 | 0.946 |
| SR. hearing [Fair] | 0.66 | 0.30 – 1.43 | 0.288 |
| SR. hearing [Good] | 0.62 | 0.29 – 1.32 | 0.212 |
| SR. hearing [Very Good] | 0.51 | 0.24 – 1.08 | 0.079 |
| SR. hearing [Excellent] | 0.48 | 0.22 – 1.04 | 0.063 |
| SR. vision [Fair] | 0.23 | 0.08 – 0.65 | **0.005** |
| SR. vision [Good] | 0.19 | 0.07 – 0.49 | **0.001** |
| SR. vision [Very Good] | 0.22 | 0.08 – 0.58 | **0.002** |
| SR. vision [Excellent] | 0.26 | 0.10 – 0.71 | **0.008** |
| 1B1F [0.5] | 127.98 | 33.25 – 492.56 | **<0.001** |
| 1B1F [1] | 317.00 | 90.86 – 1105.99 | **<0.001** |
| 2B0F [0.5] | 0.66 | 0.52 – 0.83 | **0.001** |
| 2B0F [1] | 0.90 | 0.73 – 1.11 | 0.312 |
| 0B2F [0.5] | 0.52 | 0.42 – 0.64 | **<0.001** |
| 0B2F [1] | 0.45 | 0.33 – 0.61 | **<0.001** |
| Age \* SOA [150] | 0.68 | 0.63 – 0.74 | **<0.001** |
| Age \* SOA [230] | 0.61 | 0.56 – 0.66 | **<0.001** |
| SOA [150] \* CRT [Cognitive] | 0.89 | 0.82 – 0.96 | **0.003** |
| SOA [230] \* CRT [Cognitive] | 0.85 | 0.78 – 0.92 | **<0.001** |
| SOA [150] \* CRT [Motor] | 0.79 | 0.73 – 0.86 | **<0.001** |
| SOA [230] \* CRT [Motor] | 0.69 | 0.64 – 0.75 | **<0.001** |
| Sex [Female] \* SOA [150] | 0.36 | 0.31 – 0.41 | **<0.001** |
| Sex [Female] \* SOA [230] | 0.27 | 0.23 – 0.32 | **<0.001** |
| **Random Effects** | | | |
| σ2 | 3.29 | | |
| τ00 tilda\_serial | 4.82 | | |
| ICC | 0.59 | | |
| N tilda\_serial | 2920 | | |
| Observations | 17520 | | |
| Marginal R2 / Conditional R2 | 0.160 / 0.659 | | |

***Figure S1. Full Choice Response Time (CRT) model results***

Macintosh HD:Users:rebeccahirst:Documents:GitHub:TILDA-multisensory:TILDA_multisensory_cognitive:figures:CRT.pdf

***Table S2. Full Sustained Attention to Response Time (SART) model results***

| *Predictors* | *Odds Ratios* | *CI* | *p* |
| --- | --- | --- | --- |
| Intercept | 0.03 | 0.00 – 0.15 | **<0.001** |
| Age | 1.01 | 0.91 – 1.12 | 0.893 |
| SOA [150] | 0.41 | 0.37 – 0.46 | **<0.001** |
| SOA [230] | 0.50 | 0.45 – 0.56 | **<0.001** |
| SART ommissions | 1.09 | 0.98 – 1.23 | 0.120 |
| SART comissions | 0.99 | 0.89 – 1.11 | 0.915 |
| Sex [Female] | 2.17 | 1.78 – 2.65 | **<0.001** |
| Education [Secondary] | 1.23 | 0.93 – 1.63 | 0.141 |
| Education [Third/Higher] | 1.68 | 1.27 – 2.23 | **<0.001** |
| Pre/Post [Pre] | 0.50 | 0.47 – 0.53 | **<0.001** |
| VAS | 1.01 | 0.92 – 1.10 | 0.911 |
| SR. hearing [Fair] | 0.66 | 0.30 – 1.44 | 0.294 |
| SR. hearing [Good] | 0.62 | 0.29 – 1.32 | 0.214 |
| SR. hearing [Very Good] | 0.51 | 0.24 – 1.09 | 0.084 |
| SR. hearing [Excellent] | 0.48 | 0.22 – 1.04 | 0.063 |
| SR. vision [Fair] | 0.26 | 0.09 – 0.73 | **0.010** |
| SR. vision [Good] | 0.21 | 0.08 – 0.55 | **0.001** |
| SR. vision [Very Good] | 0.25 | 0.09 – 0.65 | **0.005** |
| SR. vision [Excellent] | 0.30 | 0.11 – 0.81 | **0.017** |
| 1B1F [0.5] | 123.25 | 32.36 – 469.49 | **<0.001** |
| 1B1F [1] | 300.69 | 87.14 – 1037.52 | **<0.001** |
| 2B0F [0.5] | 0.66 | 0.52 – 0.84 | **0.001** |
| 2B0F [1] | 0.92 | 0.75 – 1.13 | 0.434 |
| 0B2F [0.5] | 0.52 | 0.42 – 0.65 | **<0.001** |
| 0B2F [1] | 0.46 | 0.34 – 0.62 | **<0.001** |
| Age \* SOA [150] | 0.66 | 0.61 – 0.71 | **<0.001** |
| Age \* SOA [230] | 0.58 | 0.53 – 0.62 | **<0.001** |
| SOA [150] \* SART ommissions | 0.91 | 0.83 – 0.99 | **0.033** |
| SOA [230] \* SART ommissions | 0.80 | 0.73 – 0.88 | **<0.001** |
| SOA [150] \* SART comissions | 0.89 | 0.82 – 0.97 | **0.012** |
| SOA [230] \* SART comissions | 0.88 | 0.80 – 0.97 | **0.007** |
| Sex [Female] \* SOA [150] | 0.35 | 0.30 – 0.40 | **<0.001** |
| Sex [Female] \* SOA [230] | 0.26 | 0.23 – 0.31 | **<0.001** |
| **Random Effects** | | | |
| σ2 | 3.29 | | |
| τ00 tilda\_serial | 4.83 | | |
| ICC | 0.59 | | |
| N tilda\_serial | 2920 | | |
| Observations | 17520 | | |
| Marginal R2 / Conditional R2 | 0.153 / 0.657 | | |

***Figure S2. Full Sustained Attention to Response Time (SART) model results***

Macintosh HD:Users:rebeccahirst:Documents:GitHub:TILDA-multisensory:TILDA_multisensory_cognitive:figures:SART.pdf

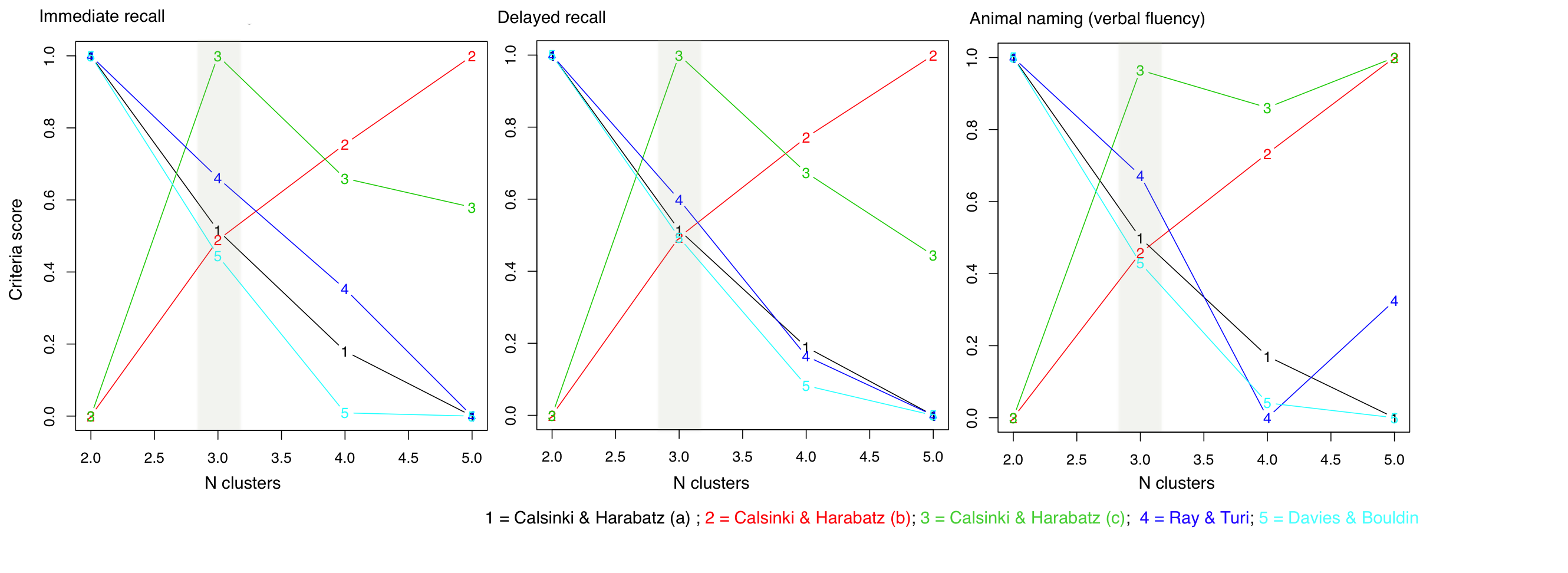
***Table S3. Full Color Trails Task (CTT) model results***

| *Predictors* | *Odds Ratios* | *CI* | *p* |
| --- | --- | --- | --- |
| Intercept | 0.03 | 0.00 – 0.16 | **<0.001** |
| Age | 0.99 | 0.89 – 1.10 | 0.852 |
| SOA [150] | 0.43 | 0.38 – 0.48 | **<0.001** |
| SOA [230] | 0.53 | 0.47 – 0.59 | **<0.001** |
| CTT1 | 1.03 | 0.92 – 1.15 | 0.593 |
| CTT delta | 1.08 | 0.97 – 1.19 | 0.153 |
| Sex [Female] | 2.22 | 1.82 – 2.71 | **<0.001** |
| Education [Secondary] | 1.17 | 0.88 – 1.55 | 0.270 |
| Education [Third/Higher] | 1.58 | 1.19 – 2.09 | **0.002** |
| Pre/Post [Pre] | 0.50 | 0.47 – 0.53 | **<0.001** |
| VAS | 0.99 | 0.90 – 1.09 | 0.828 |
| SR. hearing [Fair] | 0.67 | 0.31 – 1.45 | 0.308 |
| SR. hearing [Good] | 0.63 | 0.30 – 1.34 | 0.232 |
| SR. hearing [Very Good] | 0.51 | 0.24 – 1.10 | 0.085 |
| SR. hearing [Excellent] | 0.48 | 0.22 – 1.05 | 0.065 |
| SR. vision [Fair] | 0.25 | 0.09 – 0.70 | **0.008** |
| SR. vision [Good] | 0.19 | 0.07 – 0.51 | **0.001** |
| SR. vision [Very Good] | 0.23 | 0.09 – 0.61 | **0.003** |
| SR. vision [Excellent] | 0.28 | 0.10 – 0.75 | **0.011** |
| 1B1F [0.5] | 130.00 | 33.98 – 497.44 | **<0.001** |
| 1B1F [1] | 322.17 | 92.99 – 1116.21 | **<0.001** |
| 2B0F [0.5] | 0.67 | 0.52 – 0.85 | **0.001** |
| 2B0F [1] | 0.89 | 0.72 – 1.10 | 0.292 |
| 0B2F [0.5] | 0.52 | 0.42 – 0.64 | **<0.001** |
| 0B2F [1] | 0.45 | 0.33 – 0.61 | **<0.001** |
| Age \* SOA [150] | 0.72 | 0.66 – 0.78 | **<0.001** |
| Age \* SOA [230] | 0.66 | 0.61 – 0.72 | **<0.001** |
| SOA [150] \* CTT1 | 0.81 | 0.74 – 0.87 | **<0.001** |
| SOA [230] \* CTT1 | 0.67 | 0.62 – 0.73 | **<0.001** |
| SOA [150] \* CTT delta | 0.77 | 0.71 – 0.83 | **<0.001** |
| SOA [230] \* CTT delta | 0.73 | 0.67 – 0.79 | **<0.001** |
| Sex [Female] \* SOA [150] | 0.33 | 0.28 – 0.38 | **<0.001** |
| Sex [Female] \* SOA [230] | 0.23 | 0.20 – 0.27 | **<0.001** |
| **Random Effects** | | | |
| σ2 | 3.29 | | |
| τ00 tilda\_serial | 4.86 | | |
| ICC | 0.60 | | |
| N tilda\_serial | 2920 | | |
| Observations | 17520 | | |
| Marginal R2 / Conditional R2 | 0.160 / 0.661 | | |

***Figure S3. Full Color Trails Task (CTT) model results***

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***Figure S4. Cluster validation criteria***



Cluster validation metrics for 2 to 5 clusters tested with kml. Scores closer to 1 indicate better cluster compactness (i.e. reduced within cluster differences and enhanced between cluster differences). An optimal k of three clusters was identified as providing the most parsimonious number of clusters across validation metrics (shaded region). For details on each validation metric see (Genolini et al., 2015)

***Table S4. Full immediate recall model results***

| *Predictors* | *Odds Ratios* | *CI* | *p* |
| --- | --- | --- | --- |
| Intercept | 0.04 | 0.01 – 0.21 | **<0.001** |
| Age | 1.06 | 0.95 – 1.18 | 0.283 |
| SOA [150] | 0.57 | 0.48 – 0.66 | **<0.001** |
| SOA [230] | 0.84 | 0.72 – 0.99 | **0.033** |
| Trajectory Group [A] | 0.68 | 0.54 – 0.85 | **0.001** |
| Trajectory Group [C] | 0.65 | 0.48 – 0.88 | **0.005** |
| Sex [Female] | 2.07 | 1.69 – 2.53 | **<0.001** |
| Education [Secondary] | 1.12 | 0.85 – 1.48 | 0.417 |
| Education [Third/Higher] | 1.34 | 1.01 – 1.78 | **0.045** |
| Pre/Post [Pre] | 0.50 | 0.47 – 0.53 | **<0.001** |
| VAS | 0.99 | 0.91 – 1.09 | 0.885 |
| SR. hearing [Fair] | 0.70 | 0.32 – 1.52 | 0.368 |
| SR. hearing [Good] | 0.63 | 0.30 – 1.34 | 0.232 |
| SR. hearing [Very Good] | 0.51 | 0.24 – 1.09 | 0.081 |
| SR. hearing [Excellent] | 0.49 | 0.23 – 1.05 | 0.065 |
| SR. vision [Fair] | 0.26 | 0.09 – 0.71 | **0.009** |
| SR. vision [Good] | 0.20 | 0.08 – 0.53 | **0.001** |
| SR. vision [Very Good] | 0.24 | 0.09 – 0.62 | **0.003** |
| SR. vision [Excellent] | 0.28 | 0.11 – 0.76 | **0.012** |
| 1B1F [0.5] | 147.72 | 38.56 – 565.95 | **<0.001** |
| 1B1F [1] | 352.98 | 101.51 – 1227.36 | **<0.001** |
| 2B0F [0.5] | 0.65 | 0.51 – 0.83 | **<0.001** |
| 2B0F [1] | 0.87 | 0.71 – 1.07 | 0.200 |
| 0B2F [0.5] | 0.51 | 0.42 – 0.64 | **<0.001** |
| 0B2F [1] | 0.44 | 0.33 – 0.59 | **<0.001** |
| Age \* SOA [150] | 0.67 | 0.62 – 0.73 | **<0.001** |
| Age \* SOA [230] | 0.60 | 0.56 – 0.66 | **<0.001** |
| SOA [150] \* Trajectory Group [A] | 0.74 | 0.62 – 0.87 | **<0.001** |
| SOA [230] \* Trajectory Group [A] | 0.63 | 0.53 – 0.75 | **<0.001** |
| SOA [150] \* Trajectory Group [C] | 0.55 | 0.44 – 0.69 | **<0.001** |
| SOA [230] \* Trajectory Group [C] | 0.34 | 0.27 – 0.43 | **<0.001** |
| Sex [Female] \* SOA [150] | 0.31 | 0.27 – 0.36 | **<0.001** |
| Sex [Female] \* SOA [230] | 0.22 | 0.19 – 0.25 | **<0.001** |
| **Random Effects** | | | |
| σ2 | 3.29 | | |
| τ00 tilda\_serial | 4.75 | | |
| ICC | 0.59 | | |
| N tilda\_serial | 2920 | | |
| Observations | 17520 | | |
| Marginal R2 / Conditional R2 | 0.165 / 0.658 | | |

***Figure S4. Full immediate recall model results***

***Macintosh HD:Users:rebeccahirst:Documents:GitHub:TILDA-multisensory:TILDA_multisensory_cognitive:figures:immediate recall.pdf***

***Table S5. Full delayed recall model results***

| *Predictors* | *Odds Ratios* | *CI* | *p* |
| --- | --- | --- | --- |
| Intercept | 0.02 | 0.00 – 0.14 | **<0.001** |
| Age | 1.02 | 0.92 – 1.13 | 0.750 |
| SOA [150] | 0.55 | 0.47 – 0.65 | **<0.001** |
| SOA [230] | 0.82 | 0.70 – 0.96 | **0.015** |
| Trajectory Group [A] | 0.99 | 0.79 – 1.24 | 0.951 |
| Trajectory Group [C] | 1.03 | 0.77 – 1.37 | 0.855 |
| Sex [Female] | 2.21 | 1.81 – 2.71 | **<0.001** |
| Education [Secondary] | 1.22 | 0.92 – 1.61 | 0.167 |
| Education [Third/Higher] | 1.60 | 1.20 – 2.12 | **0.001** |
| Pre/Post [Pre] | 0.50 | 0.47 – 0.53 | **<0.001** |
| VAS | 1.00 | 0.91 – 1.10 | 0.970 |
| SR. hearing [Fair] | 0.69 | 0.32 – 1.50 | 0.346 |
| SR. hearing [Good] | 0.63 | 0.30 – 1.34 | 0.235 |
| SR. hearing [Very Good] | 0.52 | 0.25 – 1.12 | 0.094 |
| SR. hearing [Excellent] | 0.49 | 0.23 – 1.06 | 0.069 |
| SR. vision [Fair] | 0.26 | 0.09 – 0.73 | **0.010** |
| SR. vision [Good] | 0.20 | 0.08 – 0.54 | **0.001** |
| SR. vision [Very Good] | 0.24 | 0.09 – 0.64 | **0.004** |
| SR. vision [Excellent] | 0.30 | 0.11 – 0.79 | **0.015** |
| 1B1F [0.5] | 131.61 | 34.39 – 503.69 | **<0.001** |
| 1B1F [1] | 327.39 | 94.35 – 1136.05 | **<0.001** |
| 2B0F [0.5] | 0.66 | 0.52 – 0.84 | **0.001** |
| 2B0F [1] | 0.92 | 0.74 – 1.13 | 0.413 |
| 0B2F [0.5] | 0.52 | 0.42 – 0.65 | **<0.001** |
| 0B2F [1] | 0.46 | 0.34 – 0.62 | **<0.001** |
| Age \* SOA [150] | 0.66 | 0.61 – 0.72 | **<0.001** |
| Age \* SOA [230] | 0.59 | 0.54 – 0.64 | **<0.001** |
| SOA [150] \* Trajectory Group [A] | 0.71 | 0.60 – 0.85 | **<0.001** |
| SOA [230] \* Trajectory Group [A] | 0.60 | 0.51 – 0.71 | **<0.001** |
| SOA [150] \* Trajectory Group [C] | 0.64 | 0.52 – 0.80 | **<0.001** |
| SOA [230] \* Trajectory Group [C] | 0.43 | 0.35 – 0.54 | **<0.001** |
| Sex [Female] \* SOA [150] | 0.32 | 0.27 – 0.37 | **<0.001** |
| Sex [Female] \* SOA [230] | 0.22 | 0.19 – 0.26 | **<0.001** |
| **Random Effects** | | | |
| σ2 | 3.29 | | |
| τ00 tilda\_serial | 4.82 | | |
| ICC | 0.59 | | |
| N tilda\_serial | 2920 | | |
| Observations | 17520 | | |
| Marginal R2 / Conditional R2 | 0.155 / 0.657 | | |

***Figure S5. Full delayed recall model results***

***Macintosh HD:Users:rebeccahirst:Documents:GitHub:TILDA-multisensory:TILDA_multisensory_cognitive:figures:delayed recall.pdf***

***Table S6. Full animal naming model results***

| *Predictors* | *Odds Ratios* | *CI* | *p* |
| --- | --- | --- | --- |
| Intercept | 0.03 | 0.01 – 0.17 | **<0.001** |
| Age | 1.03 | 0.93 – 1.14 | 0.612 |
| SOA [150] | 0.53 | 0.44 – 0.63 | **<0.001** |
| SOA [230] | 0.83 | 0.70 – 0.99 | **0.039** |
| Trajectory Group [A] | 0.74 | 0.57 – 0.96 | **0.025** |
| Trajectory Group [B] | 0.80 | 0.60 – 1.06 | 0.122 |
| Sex [Female] | 2.21 | 1.81 – 2.69 | **<0.001** |
| Education [Secondary] | 1.21 | 0.92 – 1.60 | 0.174 |
| Education [Third/Higher] | 1.49 | 1.12 – 1.97 | **0.006** |
| Pre/Post [Pre] | 0.50 | 0.47 – 0.53 | **<0.001** |
| VAS | 0.99 | 0.90 – 1.09 | 0.871 |
| SR. hearing [Fair] | 0.67 | 0.31 – 1.47 | 0.320 |
| SR. hearing [Good] | 0.64 | 0.30 – 1.36 | 0.244 |
| SR. hearing [Very Good] | 0.53 | 0.25 – 1.12 | 0.095 |
| SR. hearing [Excellent] | 0.49 | 0.23 – 1.06 | 0.069 |
| SR. vision [Fair] | 0.27 | 0.10 – 0.74 | **0.011** |
| SR. vision [Good] | 0.22 | 0.08 – 0.58 | **0.002** |
| SR. vision [Very Good] | 0.26 | 0.10 – 0.68 | **0.006** |
| SR. vision [Excellent] | 0.31 | 0.12 – 0.84 | **0.020** |
| 1B1F [0.5] | 137.68 | 35.81 – 529.41 | **<0.001** |
| 1B1F [1] | 332.51 | 95.34 – 1159.61 | **<0.001** |
| 2B0F [0.5] | 0.66 | 0.52 – 0.83 | **0.001** |
| 2B0F [1] | 0.90 | 0.73 – 1.11 | 0.329 |
| 0B2F [0.5] | 0.52 | 0.42 – 0.65 | **<0.001** |
| 0B2F [1] | 0.44 | 0.33 – 0.60 | **<0.001** |
| Age \* SOA [150] | 0.65 | 0.60 – 0.71 | **<0.001** |
| Age \* SOA [230] | 0.58 | 0.53 – 0.63 | **<0.001** |
| SOA [150] \* Trajectory Group [A] | 0.86 | 0.71 – 1.04 | 0.129 |
| SOA [230] \* Trajectory Group [A] | 0.69 | 0.57 – 0.84 | **<0.001** |
| SOA [150] \* Trajectory Group [B] | 0.61 | 0.49 – 0.75 | **<0.001** |
| SOA [230] \* Trajectory Group [B] | 0.38 | 0.31 – 0.47 | **<0.001** |
| Sex [Female] \* SOA [150] | 0.34 | 0.30 – 0.40 | **<0.001** |
| Sex [Female] \* SOA [230] | 0.26 | 0.22 – 0.30 | **<0.001** |
| **Random Effects** | | | |
| σ2 | 3.29 | | |
| τ00 tilda\_serial | 4.79 | | |
| ICC | 0.59 | | |
| N tilda\_serial | 2920 | | |
| Observations | 17520 | | |
| Marginal R2 / Conditional R2 | 0.160 / 0.658 | | |

***FigureS6. Full animal naming model results***

***Macintosh HD:Users:rebeccahirst:Documents:GitHub:TILDA-multisensory:TILDA_multisensory_cognitive:figures:animal naming.pdf***

***S7. Word recall tasks (immediate and delayed)***

|  |  |  |  |
| --- | --- | --- | --- |
| Word List A | Word List B | Word List C | Word List D |
| Hotel  River  Tree  Skin  Gold  Market  Paper  Child  King  Book | Sky  Ocean  Flag  Dollar  Wife  Machine  Home  Earth  College  Butter | Women  Rock  Blood  Corner  Shoes  Letter  Girl  House  Valley  Engine | Water  Church  Doctor  Palace  Fire  Garden  Sea  Village  Baby  Table |

**Table S7.** Example words used in the word recall tasks.