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| Table 1. | | | | | | |
| Accuracy and Reaction Time by Age Groups | | | | | | |
|  | 4-Year-Old (N=25) | | 6-Year-Old (N=25) | | Adults (N=26) | |
| **Gender** | Accuracy % (SD) | RT (SD) | Accuracy % (SD) | RT (SD) | Accuracy % (SD) | RT (SD) |
| F | 86.5 (6.0) | 1667 (238) | 95.3 (2.3) | 1120 (227) | 98.5 (1.3) | 875 (223) |
| M | 85.1 (6.4) | 1570 (360) | 94.1 (3.6) | 1198 (206) | 97.2 (3.4) | 795 (153) |
| Diff | 1.4 | 97 | 1.2 | -78 | 2.4 | 80 |
| **Target Sets** |  |  |  |  |  |  |
| Bird/Dog | 86.5 (6.7) | 1660 (320) | 93.6 (3.9) | 1182 (173) | 97.3 (2.8) | 939 (200) |
| Cat/Sheep | 85.2 (5.5) | 1579 (285) | 95.6 (1.6) | 1155 (263) | 98.9 (1.0) | 742 (151) |
| Diff. | 1.3 | 81 | -2 | 27 | **-1.6 +** | **197\*\*** |
| [+] indicates marginally significant difference p<.06  \*\*p<.01 | | | | | | |

1. Accuracy threshold is set at 75%, resulting the exclusion of 9 four-year-olds from the analyses.
2. Participants: 25 four-year-olds (M=54.6m, SD=2.765), 25 six-year-olds (M=79.16m, SD=3.350), 26 adults (M=342.08, SD=99.149).

GROUP EFFECT ANALYSES

Two-way ANOVA analyses were carried out separately for **Age x Gender**, and **Age x Target Sets**.

**TASK EFFECT ANALYSES**

First trial effect refers to the cost in restarting the task. There was no significant First Trial Effect in the Pure Block, p=.770, and no interaction with Age.

Cue-Alternation Effect refers to the STM priming of the same cue. Unfortunately current experiment did not manipulate this variable in an within-block setting so it may be difficult to interpret the result. There was no Cue-Alt effect, p>.100, and no interaction with Age, p>.100.

There was a no significant Response Repetition Facilitation in the Pure block, p>.100, but there is a sig interaction with Age. Post-hoc on age groups showed marginally sig. effect in 4-year-olds, p=.051, large effect size eta=.150, but small power=.506

There was a significant RR effect in the Mixed block p<.001. There was no interaction with Age.

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| Table 2. | | | | | | |  |  |
| Task Specific Effect on Accuracy and Reaction Time | | | | | | |  |
|  | 4-Year-Old (N=25) | | 6-Year-Old (N=25) | | Adults (N=26) | | Overall (N=76) | |
| **First Trial** | Accuracy (SE) | RT (SE) | Accuracy (SE) | RT (SE) | Accuracy (SE) | RT (SE) | pAccuracy | PRT |
| Pure T1 | 80.7 (2.8) | 1670 (70) | 96 (1.1) | 1171 (48) | 97.1 (1.3) | 856 (37) | - | - |
| Pure T234 | 85.7 (2.3) | 1636 (75) | 96 (0.8) | 1088 (38) | 98.2 (0.7) | 856 (42) | - | - |
| Diff | -5 | 34 | 0 | 83 | -1.1 | 0 | **.022\*** | .077 |
| **Switch** | |  |  |  |  |  |  |  |  |
| Switch | 83.5 (1.5) | 1720 (87) | 88.2 (1.1) | 1239 (54) | 96.9 (1.0) | 855 (44) | - | - |
| Repetition | 87.6 (1.3) | 1585 (61) | 95.7 (0.9) | 1186 (48) | 98.5 (0.3) | 839 (44) | - | - |
| Diff. | **4.1\*** | **135\*** | **7.5\*\*** | **53\*** | 1.6 | 16 | **.001\*\*** | **.001\*\*** |
| **Mixing** |  |  |  |  |  |  |  |  |
| Mixed T234 | 87.6 (1.3) | 1586 (61) | 95.7 (0.9) | 1186 (48) | 98.5 (0.3) | 839 (44) | - | - |
| Pure T234 | 85.7 (2.3) | 1636 (75) | 96.0 (0.8) | 1089 (38) | 98.2 (0.7) | 856 (42) | - | - |
| Diff. | 1.9 | -50 | -0.3 | 97 | 0.3 | -17 | .699 | .435 |
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| \*p<.05  \*\*p<.01 | | | | | | | | |

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| Table 3.  Response repetition facilitation in milliseconds by blocks, and within-subject 1.96 SE (in parentheses). | | | | |
|  | 4-Year-Olds (N=25) | 6-Year-Olds  (N=25) | Adults  (N=25) | Overall  p-value |
| Pure Block |  |  |  |  |
| Single Response | 1681(47) | 1065(38) | 862(21) | - |
| Repeated Response | 1582(47) | 1113(38) | 846(21) | - |
| Diff. | 99 | -48 | 16 | n.s. |
| Mixed Block |  |  |  |  |
| Single Response | 1667(44) | 1253(23) | 867(18) | - |
| Repeated Response | 1476(44) | 1098(23) | 803(18) | - |
| Diff. | 191 | 155 | 64 | **.001\*\*** |
| \*p<.05  \*\*p<.01 |  |  |  |  |
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**BASELINE ANALYSES**

Two-way ANOVAs on Age x Target Set were carried out separately for Visual Targets and Auditory Targets.

There was no significant effect of Target Set among the visual stimuli for any age group, ps>.1. There was no significant Target Set effect among the auditory stimuli among children ps>.10, but a moderately significant effect in Adults, F(1,9)=4.947, p=.057.

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| Table 3. | | | | | | |
| Baseline Processing Speed by target sets [set 1: bird-dog; set 2: car-sheep] | | | | | | |
|  | 4-Year-Old (N=10) | | 6-Year-Old (N=11) | | Adults (N=10) | |
| **Targets** | Visual | Auditory (SE) | Visual (SE) | Auditory (SE) | Visual (SE) | Auditory (SE) |
| Bird-Dog | 1218 (121) | 1487 (136) | 788 (33) | 1072 (74) | 681 (84) | 755 (90) |
| Cat-Sheep | 1092 (73) | 1351 (230) | 803 (151) | 895 (182) | 512 (68) | 479 (67) |
| Diff. | 126 | 136 | -15 | 177 | 169 | **276+** |
| [+] indicates marginally significant difference p<.06 | | | | | | |

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**BASELINE ANALYSES**

Significant main effect of modality, F(1, 28)=19.544, p<.001, and significant interaction with Age, F(2,28)=3.404, p<.05. Post-hocs …

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| Table 4. | | | |
| Baseline Processing Speed by modalities | | | |
|  | 4-Year-Old (N=10) | 6-Year-Old (N=11) | Adults (N=10) |
| **Modalities** | RT (SE) | RT (SE) | RT (SE) |
| Visual | 1167 (78) | 795 (67) | 614 (61) |
| Auditory | 1433 (117) | 991 (91) | 645 (73) |
| Diff | **-266\*** | **-196\*\*** | -31 |
| \*p<.05  \*\*p<.01 | | | |

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Two-way analyses of variance on **Age and Cross-Modal Distractor Effect** (‘no distractor’ baseline v.s. ‘distractor’ pure block) were carried out separately for visual and auditory targets.

Extracted Data: Baseline data excluding first trial after the cue; T234 data from Pure block

There were significant distractor effect for visual target detection F(1, 28)=22.560, p<.001, and significant interaction with Age F(2,28)=4.542, p<.05. Post-hoc tests by Age groups revealed that 4-year-olds and adults experienced significant auditory distractor effect F(1,9)=10.808, p<.001 [4-year-old]; F(1,9)=44.308, p<.001 [adult], but the effect was marginal for 6-year-olds, F(1,10)=4.168, p=.068.

There was a significant Distractor effect for Auditory target detection F(1,28)=18.285), p<.001; but there was no interaction between Distractor and Age, p>.1. (significant levels on tables/graphs were from post-hoc analyses of each age group)

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| Table 5. | | | | | | |
| Global Distractor Cost (Basline Condition v.s. Pure Block Condition) | | | | | | |
|  | 4-Year-Old (N=10) | | 6-Year-Old (N=11) | | Adults (N=10) | |
| **Distractor Effect** | Visual Target | Auditory Target | Visual Target | Auditory Target | Visual Target | Auditory Target |
| Pure T234 | 1732 (186) | 1692 (113) | 954 (61) | 1107 (76) | 780 (82) | 1026 (90) |
| Baseline | 1167 (78) | 1433 (117) | 794 (67) | 991 (91) | 614 (61) | 645 (73) |
| Diff. | **565\*\*** | 259 | **160+** | 116 | **166\*\*** | **381\*\*** |
| \*\*p<.001  [+] indicates marginally significant difference p<.07 | | | | | | |

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**Modalities by Blocks**

Two-way ANOVAs on Modality X Age were carried out separately for Pure condition and Mixed Condition.

Pure Block: There was a significant main effect of Modality, F(1,73)=6.583, p<.05, with a moderate effect size, eta=.083. There was no significant interaction between Modality and Age, p>.05. (Significant levels in the graphs were from post-hoc analyses).

Mix Block: There was a significant main effect of Modality, F(1,73)=59.624, with a large effect, eta=.45, p<.001. The interaction between Modality and Age was significant, F(2,73)=3.315, p<.05, with a moderate effect size, eta=.083. Post-hoc analyses on age groups revealed that the main effect of Modality was significant for all ages, ps<.001, eta>.450.

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**Modality Shift Effect (MS)**

Extracted Data: T234, Trials with a single response (not preceded by either visual or auditory target) were excluded from the analyses to control for response repetition effect). The analyses investigate the cost of shifting target detection from an alternative modality at N-1, to the current modality at N.

Pure Block:

MS-Visual: The MS-Visual variable is at two levels (Visual-to-Visual vs. Auditory-to-Visual). There was no MS effect to the visual targets, F(1, 72)=1.495, p.100. There was no interaction with Age, p>.500.

MS-Auditory: The MS-Auditory variable is at two levels (Auditory-to-Auditory vs. Visual-to-Auditory). There was a significant MS effect to the auditory targets, F(1,71)=15.394, p<.001, eta=.178. There was no interaction with Age.

Mixed Block:

MS-Visual: There was a significant MS effect to the visual target, F(1,73)=33.166, eta=.312; but no interaction with Age p>.100.

MS-Auditory: There was no significant MS effect to the auditory targets p>.500, and no interaction with Age, p>.500.

**TASK & MODALITY-Mixing Cost in Target Detection of Visual and Auditory Modalities**

VISUAL: There was no significant Mixing Effect on Visual target detection, p>.1. There was a significant Age X Mixing, F(2,73)=3.112, p<.05, with a moderate effect size, eta=.079, however the observed power was not high enough to confidently conclude that the observed effect was reliable, power=.582. Post-hoc tests by age groups showed no significant main effect of mixing, ps>.05 suggesting that the observed effect may not be attributed to the main factor of Mixing tasks.

AUDITORY:

There was a significant Mixing Effect on Auditory target detection, F(1,73)=11.058, p<.001, with a medium effect size, eta=.132 (large power=.907), and a significant interaction with Age, F(2,73)=3.433, p<.05. Post-hoc tests by Age groups returned significant Mixing Effect only in 6-year-olds, F(1,24)=26.475, p<.001, with a large effect, eta=.525. No other age groups showed any significant Mixing Effect on Auditory target detection.

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