**Supplementary file 1**

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| **Supplementary file 1-Table 1.** Minimum number of trials per bin across participants for all four sequences. |
|  | Bin number |
|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| Sin | 61 | 54 | 60 | 55 | 52 | 54 | 66 | 55 | 54 | 54 | 66 | 54 | 62 | 53 | 56 | 53 | 61 | 52 | 62 | 52 |
| RW1 | 52 | 55 | 56 | 56 | 56 | 54 | 54 | 57 | 56 | 55 | 57 | 56 | 62 | 59 | 58 | 56 | 57 | 56 | 56 | 55 |
| RW2 | 75 | 88 | 77 | 84 | 77 | 90 | 77 | 88 | 71 | 85 | 74 | 87 | 75 | 84 | 78 | 85 | 80 | 85 | 71 | 86 |
| Sinusoidal jumps | 44 | 47 | 48 | 48 | 45 | 50 | 50 | 49 | 49 | 50 | 51 | 50 | 50 | 48 | 49 | - | - | - | - | - |
| **Note:** The sinusoidal jump sequence had less trials per bin because the sequence was analyzed in three pooled sub-types of up- and down-jumps. |

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| **Supplementary file 1-Table 2.** The influence of the visual location on the previous trial on A) the perceived sound location of the current trial and its correlation with visual noise in B) the current and C) the previous trial. |
|  | Mean across participants ± SEM | t | df | p |
| **A** | ßVprevious |  |  |  |
| Sinusoidal | -0.017±0.007 | -2.545 | 24 | 0.018 |
| RW1 | -0.024±0.008 | -2.913 | 32 | 0.006 |
| RW2 | -0.009±0.012 | -0.771 | 18 | 0.45 |
| Sinusoidal jumps | 0.019±0.009 | 2.046 | 17 | 0.057 |
| **B** | r(ßVprevious,bin, σVcurrent,bin) |  |  |  |
| Sinusoidal | -0.082±0.059 | -1.377 | 24 | 0.181 |
| RW1 | -0.003±0.056 | -0.052 | 32 | 0.959 |
| RW2 | -0.069±0.067 | -1.04 | 18 | 0.312 |
| Sinusoidal jumps | 0.155±0.061 | 2.567 | 17 | 0.020 |
| **C** | r(ßVprevious,bin, σVprevious,bin) |  |  |  |
| Sinusoidal | -0.076±0.052 | -1.454 | 24 | 0.159 |
| RW1 | 0.004±0.057 | 0.071 | 32 | 0.944 |
| RW2 | 0.009±0.062 | 0.149 | 18 | 0.883 |
| Sinusoidal jumps | 0.080±0.055 | 1.463 | 17 | 0.162 |
| **A** The subject-specific ßVprevious quantifythe influence of the visual location on the previous trial on the perceived sound location of the current trial averaged across all bins. They were entered into a one-sample t-test (against zero) at the group level. **B** We correlated ßVprevious,bin with the bin-average standard deviation of the visual cloud of dots in the *current* trial r(ßVprevious,bin, σVcurrent,bin) over bins within each subject and entered these subject-specific Fisher z-transformed correlation coefficients r(ßVprevious,bin, σVcurrent,bin) into one-sample t-tests (tested against zero) at the group level.**C** We correlated ßVprevious,bin with the with the bin-average standard deviation of the visual cloud of dots in the *previous* trial r(ßVprevious,bin, σVprevious,bin) over bins within each subject and entered these subject-specific Fisher z-transformed correlation coefficients r(ßVprevious,bin, σVprevious,bin) into one-sample t-tests (tested against zero) at the group level.For A, B, C we report across participants‘ mean (±SEM), t-value, df = degree of freedom and p-value. |

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| **Supplementary file 1-Table 3.** Analyses of the temporal asymmetry of the relative auditory weights across the four sequences of visual noise using repeated measures ANOVAs with the factors sequence part (1st vs. flipped 2nd half), bin and jump position (only for the sinusoidal sequences with intermittent jumps) when controlling for the location of the cloud of dots in the previous trial. |
|  | Effect | F | df1 | df2 | p | Partial η2 |
| Sinusoid | Part | 9.483 | 1 | 24 | 0.005 | 0.283 |
| Bin | 86.285 | 2.924 | 70.176 | <0.001 | 0.782 |
| PartXBin | 2.165 | 2.633 | 63.190 | 0.109 | 0.083 |
| RW1 | Part | 14.206 | 1 | 32 | <0.001 | 0.307 |
| Bin | 78.099 | 5.003 | 160.081 | <0.001 | 0.709 |
| PartXBin | 1.454 | 5.055 | 161.755 | 0.207 | 0.043 |
| RW2 | Part | 3.502 | 1 | 18 | 0.078 | 0.163 |
| Bin | 61.008 | 3.276 | 58.968 | <0.001 | 0.772 |
| PartXBin | 3.450 | 4.655 | 83.799 | 0.008 | 0.161 |
| Sinusoid with intermittent jumps | Jump | 6.493 | 1.034 | 17.586 | 0.020 | 0.276 |
| Part | 9.295 | 1 | 17 | 0.007 | 0.353 |
| Bin | 64.629 | 2.274 | 38.662 | <0.001 | 0.792 |
| JumpXPart | 0.100 | 1.020 | 17.336 | 0.760 | 0.006 |
| JumpXBin | 13.259 | 4.043 | 68.732 | <0.001 | 0.438 |
| PartXBin | 0.769 | 4.311 | 73.283 | 0.558 | 0.043 |
| JumpXPartXBin | 2.180 | 4.820 | 81.945 | 0.066 | 0.114 |
| **Note:** The relative auditory weights were computed in a regression model that included the location of the cloud of dots in the previous trial as a nuisance covariate. The factor bin comprised 9 levels in the first three and 7 levels in the fourth sequence. In this sequence, the factor Jump comprised three levels. If Mauchly tests indicated significant deviations from sphericity (p < 0.05), we report Greenhouse-Geisser corrected degrees of freedom and p values. |

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| **Supplementary file 1-Table 4.** The effect of the visual STD in the current bin and the difference in STD between the current and the previous bin on the relative auditory weights when controlling for the location of the cloud of dots in the previous trial. |
|  |  | t | df | p | Cohen’s d |
| Sinusoid | ßσV | 15.188 | 24 | <0.001 | 3.038 |
| ßΔσV | -3.444 | 24 | 0.002 | -0.689 |
| RW1 | ßσV | 16.221 | 32 | <0.001 | 2.824 |
| ßΔσV | -2.815 | 32 | 0.008 | -0.490 |
| RW2 | ßσV | 13.017 | 18 | <0.001 | 2.986 |
| ßΔσV | -2.530 | 18 | 0.021 | -0.580 |
| Sinusoid with intermittent jumps | ßσV | 11.593 | 17 | <0.001 | 2.733 |
| ßΔσV | -4.915 | 17 | <0.001 | -1.159 |
| **Note**: The relative auditory weights wA,bin were computed in a first regression model that included the location of the cloud of dots in the previous trial as a nuisance covariate. Then we computed a second regression model to assess whether wA,bin was predicted not only by the visual cloud’s STD of the current, but also of the previous bin using the following regression model: wA,bin= σV,bin \* ßσV + (σV,bin – σV,bin-1)\* ßΔσV  + ßconst + ebin with wA,bin= relative auditory weight in bin b; σV,bin = mean visual STD in current bin b or previous bin b-1; ßconst = constant term; ebin = error term. To allow for generalization to the population level, the parameter estimates (ßσV, ßΔσV)for each subject were entered into two-sided one-sample t-tests at the between-subject random-effects level. |

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| **Supplementary file 1-Table 5**. Nested model comparison of linear mixed-effects models predicting the relative auditory weights wA,bin by the visual STD in the current bin (reduced model) and additionally the difference in STD between the current and the previous bin (full model). |
|  | LLRT | p | BIC diff |
| Sinusoidal | 33.584 | <0.001 | -27.369 |
| RW1 | 26.074 | <0.001 | -19.582 |
| RW2 | 39.049 | <0.001 | -33.109 |
| Sinusoidal jump | 21.205 | <0.001 | -14.508 |
| The full and reduced linear mixed-effects models were fitted using maximum likelihood estimation and statistically compared using a likelihood ratio test (LLRT). The difference in model fit is indicated by the difference in Bayesian information criterion (BIC). Negative BIC values indicate greater evidence for the full model relative to the reduced model. |

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| **Supplementary file 1-Table 6.** Observers’ and models’ relative auditory weights before versus after the up- and down jumps and their deviations from model predictions. |
|  |  | Up-jump | Down-jump |
|  |  | t | df | p | t | df | p |
| wA | Behavior | -3.430 | 15 | 0.004 | 1.649 | 15 | 0.12 |
| Instantaneous learner | -9.950 | 15 | <0.001 | 7.164 | 15 | <0.001 |
| Bayesian learner | -9.774 | 16 | <0.001 | 4.947 | 14 | <0.001 |
| Exponential learner | -8.542 | 17 | <0.001 | 5.872 | 15 | <0.001 |
| Squared error of models | Instantaneous learner | 1.599 | 13 | 0.134 | 2.376 | 13 | 0.034 |
| Bayesian learner | 1.235 | 14 | 0.237 | 2.350 | 12 | 0.037 |
| Exponential learner | 1.085 | 15 | 0.295 | 2.335 | 13 | 0.036 |
| **Note:** We computed wA selectively for sampling time points at 0.1 s before and 0.1 s after the jumps (pooled over all jump types). wA was compared before and after jumps in paired t-tests. We computed the squared error (SE) as (wA,behavior – wA,model)2 , i.e. the squared difference between the wA based on observers’ behavior and the predictions of the instantaneous, the exponential and the Bayesian learner separately for sampling time points at 0.1 s before and 0.1 s after the jumps (pooled over all jump types). Because time points included only few trials in some participants, individual wA values that were smaller or larger than three times the scaled median absolute deviation were excluded from the analysis. We compared the SEs before versus after the jumps at the group level using two-sided paired t tests. |

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| **Supplementary file 1-Table 7.** Percentage of bias and variability of model parameters from model recovery. |
| Model | Para-meter | Bias | Variability |
|  |  | Q1 | Median | Q3 | Q1 | Median | Q3 |
| Instantaneous learner |  | -5.36 | -0.53 | 1.62 | 2.00 | 2.13 | 2.95 |
| Pcommon | -4.23 | -1.49 | 0.15 | 2.12 | 2.34 | 3.80 |
|  | -3.12 | 1.81 | 5.01 | 2.62 | 3.42 | 9.45 |
| Bayesian learner |  | -6.70 | -0.17 | 2.15 | 2.36 | 3.22 | 5.52 |
|  | -9.51 | 9.71 | 68.16 | 14.71 | 32.09 | 85.62 |
| Pcommon | -3.86 | -1.13 | 7.00 | 1.62 | 2.07 | 3.84 |
|  | -2.26 | 2.68 | 4.97 | 3.00 | 4.45 | 6.79 |
| Exponential learner |  | -6.67 | -1.57 | 1.76 | 2.96 | 3.09 | 3.12 |
|  | -5.43 | 4.43 | 8.02 | 6.17 | 7.11 | 12.69 |
| Pcommon | -4.92 | -2.23 | 0.18 | 2.63 | 3.28 | 4.47 |
|  | -3.5 | 2.13 | 5.86 | 2.68 | 4.24 | 6.95 |
| Note: The bias is computed by the percentage deviation from the true generating value. Variability is computed by the percentage absolute deviation from the true generating value. Q1 = first quartile; Q3 = third quartile |