

# Supplementary Material

## Analyses of factors influencing adaptation

Here we describe the general patterns of response adaptation that were observed when spike counts were quantified over a temporal analysis window that had a duration equivalent to the considered TD (i.e., 25, 40, or 100 ms). We pay particular attention to similarities and differences between the effects (i.e., partial  $\eta^2$ ) of Tone position,  $\Delta F$ , SOA, and TD on the fitted adaptation parameters based on using either TD-specific or 20-ms analysis windows to quantify spike counts. Mean ( $\pm$  s.e.m.) values of fitted adaptation parameters (from equation 1) are reported in Supplementary Fig. 1 (cf. Fig. 4 in the main text). Statistical analyses comparing the data described here are reported in Supplementary Table 1 (cf. Table 1 in the main text).

### *Initial spike counts ( $C_0$ )*

Initial spike counts ( $C_0$ ) in response to the first ABA triplet in a stimulus were strongly affected by a tone's position within a triplet (leading A, B, or trailing A), as well as differences in  $\Delta F$ , SOA, and TD (Supplementary Table 1; Supplementary Fig. 1a-c). Compared to analyses based on 20-ms time windows, differences in TD had much more pronounced effects, and initial spike counts were directly related to TD (Supplementary Fig. 1a, b). These patterns of results were also reflected in the outcomes of rmANOVAs of this parameter, in which the main effect of TD and most two-way and three-way interactions involving TD had effect sizes that were larger (Supplementary Table 1) compared to analyses based on a 20-ms analysis window (Main Text, Table 1). That TD would have effects on initial spike counts larger than those reported in the main text is entirely expected based on the longer analysis windows (25, 40, and 100 ms) used to determine spike counts here compared to analyses based on using a 20-ms analysis window to focus on the phasic onset response. The magnitudes and directions of the effects of Tone,  $\Delta F$ , and SOA were generally consistent with those reported for the 20-ms analysis window (compare Supplementary Table 1 and Fig. 1a-c with Main Text Table 1 and Fig. 4a-c, respectively).

### *Dynamic range of adaptation (D)*

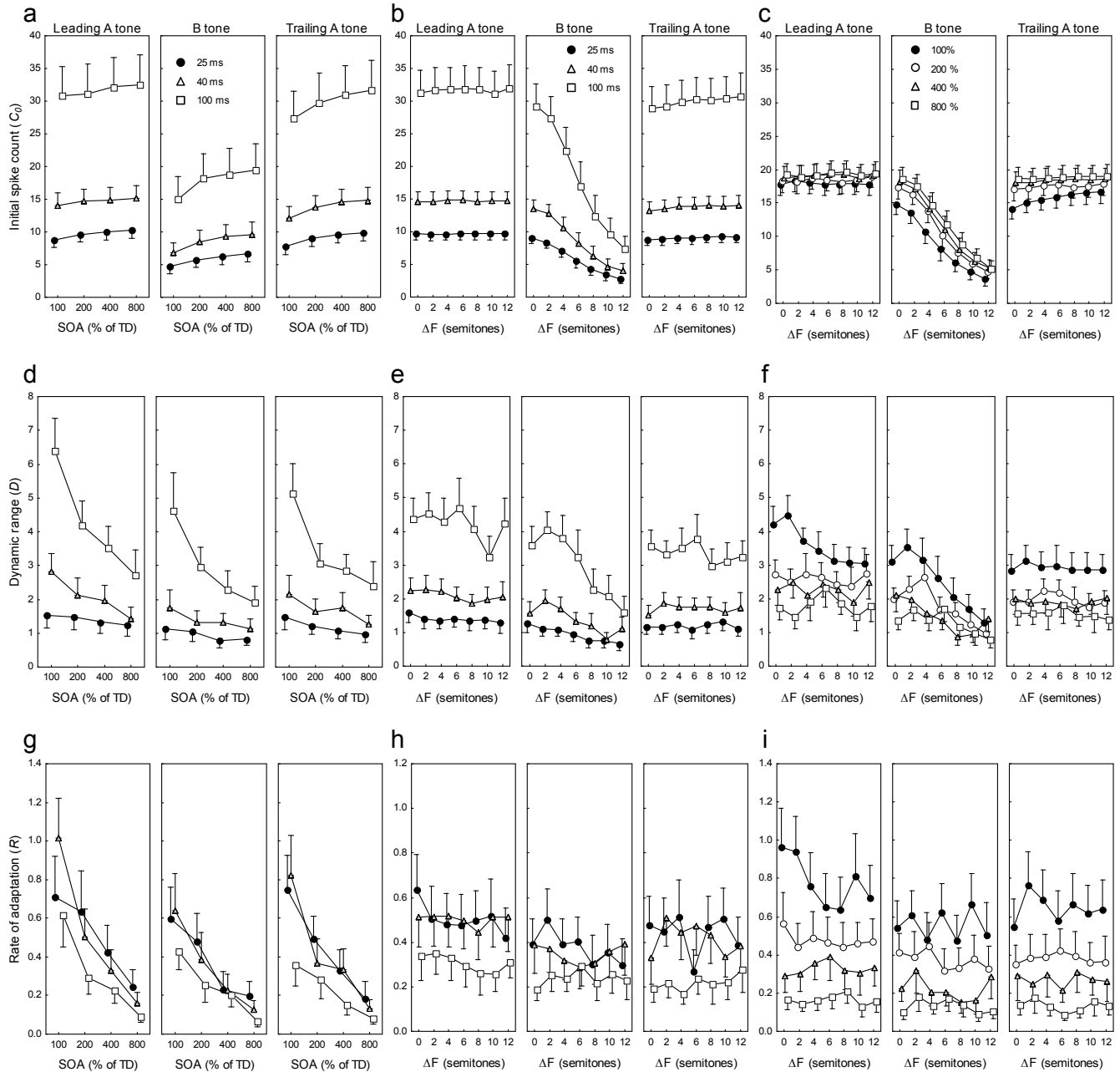
Recall that the dynamic range of adaptation ( $D$ ) corresponds to the magnitude of change that occurred between the initial spike count and the asymptotic spike counts at the end of a triplet sequence. The effects of Tone position within a triplet,  $\Delta F$ , and SOA were largely consistent between analyses based on either the 20-ms or the TD-specific analysis windows (compare Supplementary Table 1 and Fig. 1d-f with Main Text Table 1 and Fig. 4d-f, respectively). The two types of analyses differed in the extent to which TD was a factor in determining the dynamic range. Compared to analyses based on 20-ms windows, TD had much larger effects on dynamic range, and these effects were reflected in the TD main effect and the two-way interactions between SOA x TD and Tone x TD (Supplementary Table 1). As would be expected, the dynamic range of adaptation increased as TD increased (Supplementary Fig. 1d,e), and the differences in dynamic range due to differences in TD were larger in responses to the leading A tones compared to other tones, and they were more pronounced at shorter (100%) compared to longer (800%) SOAs.

### *Rate of adaptation (R)*

We assessed how rapidly spike counts decreased with repeated triplet presentations in the rate of adaptation parameter ( $R$ ), which is inversely related to the time constant of adaptation. The dependence of  $R$  on Tone position within a triplet,  $\Delta F$ , SOA, and TD was generally consistent between analyses based on TD-specific windows (Supplementary Table 1; Supplementary Fig. 1g-i) and those based on the phasic responses quantified in the 20-ms analysis windows (Main Text Table 1; Main Text Fig. 4g-i). The rate of adaptation was more dependent on Tone position within triplet using TD-specific analysis windows. Most notably, however, TD did not have larger effects on  $R$  using TD-specific analysis windows compared to the magnitude of its effect found using 20-ms analysis windows. In fact, the magnitude of the TD effect on  $R$  actually decreased slightly when we used the TD-specific analysis windows.

Supplementary Table 1. Results of a 3 tone position (Tone, leading A, B, trailing A) x 7 frequency separation ( $\Delta F$ ) x 4 stimulus onset asynchrony (SOA) x 3 tone duration (TD) repeated measures ANOVA for the fitted values of initial spike counts ( $C_0$ ), dynamic range ( $D$ ), and the rate of adaptation ( $R$ ). Highlighting indicates either an **increase** or a **decrease** in partial  $\eta^2$  greater than 0.10 in this analysis compared to the analysis based on the first 20 ms only (cf. Main Text Table 1).

Source	df	Initial Spike Counts ( $C_0$ )			Dynamic range ( $D$ )			Rate of adaptation ( $R$ )		
		$F$	$P$	$\eta^2$	$F$	$P$	$\eta^2$	$F$	$P$	$\eta^2$
Tone	2, 90	178.6	< 0.0001	0.80	46.5	< 0.0001	0.51	<b>21.0</b>	<b>&lt; 0.0001</b>	<b>0.32</b>
$\Delta F$	6, 270	117.1	< 0.0001	0.72	10.5	< 0.0001	0.19	1.1	0.3855	0.02
SOA	3, 135	156.4	< 0.0001	0.78	43.0	< 0.0001	0.49	166.1	< 0.0001	0.79
TD	2, 90	<b>256.4</b>	<b>&lt; 0.0001</b>	<b>0.85</b>	<b>293.3</b>	<b>&lt; 0.0001</b>	<b>0.87</b>	<b>52.6</b>	<b>&lt; 0.0001</b>	<b>0.54</b>
$\Delta F$ x Tone	12, 540	147.5	< 0.0001	0.77	6.0	< 0.0001	0.12	0.6	0.8272	0.01
SOA x Tone	6, 270	30.4	< 0.0001	0.41	2.7	0.0291	0.06	2.4	0.0518	0.05
SOA x $\Delta F$	18, 810	3.4	< 0.0001	0.07	2.2	0.0159	0.05	0.8	0.6640	0.02
SOA x TD	6, 270	<b>13.3</b>	<b>&lt; 0.0001</b>	<b>0.23</b>	<b>29.6</b>	<b>&lt; 0.0001</b>	<b>0.40</b>	8.3	< 0.0001	0.16
TD x $\Delta F$	12, 540	<b>46.5</b>	<b>&lt; 0.0001</b>	<b>0.51</b>	3.6	0.0020	0.07	1.0	0.4660	0.02
TD x Tone	4, 180	<b>158.4</b>	<b>&lt; 0.0001</b>	<b>0.78</b>	<b>9.8</b>	<b>&lt; 0.0001</b>	<b>0.18</b>	1.8	0.1411	0.04
SOA x Tone x $\Delta F$	36, 1620	3.8	< 0.0001	0.08	1.4	0.1307	0.03	0.9	0.6014	0.02
SOA x Tone x TD	12, 540	<b>9.1</b>	<b>&lt; 0.0001</b>	<b>0.17</b>	1.5	0.1641	0.03	2.1	0.0359	0.05
SOA x TD x $\Delta F$	36, 1620	1.2	0.2634	0.03	1.0	0.4593	0.02	0.9	0.5740	0.02
TD x $\Delta F$ x Tone	24, 1080	<b>75.7</b>	<b>&lt; 0.0001</b>	<b>0.63</b>	2.0	0.0228	0.04	1.1	0.3105	0.02
SOA x TD x $\Delta F$ x Tone	72, 3240	1.1	0.3514	0.02	1.0	0.4046	0.02	0.7	0.8865	0.01



**Supplementary Fig. 1** Factors affecting responses to ABA- triplets based on TD-specific analysis windows for quantifying spike counts. Shown are the mean ( $\pm$  s.e.m.) fitted values for (a-c) initial spike counts ( $C_0$ ), (d-f) dynamic range ( $D$ ), (g-i) and the rate of adaptation ( $R$ ). The left column of plots shows values as functions of stimulus onset asynchrony (SOA), with tone duration (TD) as the parameter. The middle column of plots depicts values as functions of frequency separation ( $\Delta F$ ), with TD as the parameter. The right column of plots depicts values as functions of  $\Delta F$ , with SOA as the parameter.