## *Supplementary Online Material*

Supplementary analyses showed that eye movement, reaction times, or response criterion were not responsible for the finding that adapting to high SF but not low SF interacted with attention and reduced the benefits of endogenous attention.

Eye movements. To ensure that participants voluntarily deployed their covert spatial attention to the cued location without moving their eyes, we analyzed the mean eye position and gaze-to-fixation distance during stimulus presentation. Only 2.27%±0.8% of all gaze positions were outside a central fixation area of 1° radius of visual angle at the moment of stimulus presentation. Importantly, there was neither a significant main effect of attention on the gaze-to-fixation distance nor interaction with any other variables (all *p>.1*). In other words, participants' gaze was at fixation during stimulus presentation in both valid and neutral trials, regardless of the target eccentricity or adaptation condition. These results confirm that the effects we observed on sensitivity were the consequence of voluntary shifts in covert spatial attention.

Reaction times. Participants were asked to be as accurate as possible and had no response time constraint; nevertheless, we analyzed mean reaction times to rule out any speed-accuracy trade-offs (**Fig.S1**). A three-way ANOVA revealed main effects of eccentricity ($F(1.9,20.9) = 7.64$, $p = .004$, $\eta_p^2 = .41$) and attention ($F(1,11) = 45.00$, $p < .001$, $\eta_p^2 = .80$) but no effect of adaptation ($F(2,22) = 1.11$, $p = .346$, $\eta_p^2 = .09$). Reaction times followed a U-shaped pattern, being faster at mid-eccentricities where performance peaked and slower at more central and more peripheral locations where performance also dropped. The valid attention cue resulted in faster reaction times relative to the neutral cue. Hence, participants were more sensitive and responded faster with attention, rejecting speed-accuracy trade-offs. Importantly, none of the interactions were significant (all *p>0.1*), indicating that reaction times cannot account for the interaction between adaptation and adaptation on performance.

Criterion. Although changes in sensitivity (*d′*) are independent from changes in response criterion, we also analyzed changes in criterion, $c = -.5*(z(\text{hit rate}) + z(\text{false-alarm rate}))$ (**Fig.S2**). A three-way ANOVA revealed main effects of eccentricity ($F(6,66) = 32.48$, $p < .001$, $\eta_p^2 = .75$) and attention ($F(1,11) = 36.9$, $p < .001$, $\eta_p^2 = .77$) but no effect of adaptation ($F(2,22) = 0.074$, $p = .93$, $\eta_p^2 = .007$). Participants' response criterion followed a U-shaped pattern; being less conservative at both mid-peripheral locations where sensitivity peaked and reaction times were the fastest. Overall,

participants were less conservative in the cued than in the neutral condition. Eccentricity interacted with adaptation ($F(12,132) = 3.15$, $p = .001$, $\eta_p^2 = .22$), as well as with attention ($F(2.31,25.4) = 6.3$, $p = .004$, $\eta_p^2 = .36$). Critically, there was no significant interaction between adaptation and attention, ($F(2,22) = 0.52$, $p = .601$, $\eta_p^2 = .045$) indicating a similar criterion change with attention across all adaptation conditions (**Fig.S2D**). Therefore, the reduced attentional benefit in *d´* following high-SF adaptation (**Fig.4**) was not associated with a corresponding change in criterion.
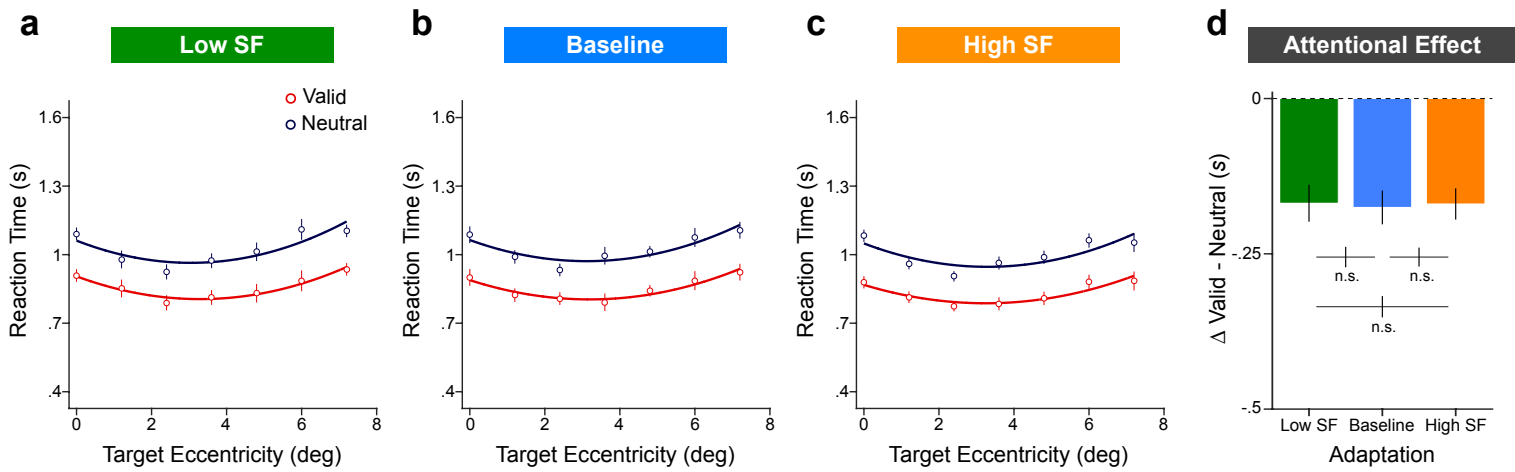
Figure S1. *Effects of attention on reaction times (in seconds) as a function of spatial frequency (SF) adaptation.* Attention resulted in faster reaction times in all 3 adaptation SF conditions (**a-c**), despite the fact that participants were asked to be as accurate as possible and had no response time pressure. The effects of attention (**d**) were similar across all 3 adaptation conditions. Error bars represent ±1 within-subject *SEM* (Morey, 2008). All R^2>.9.
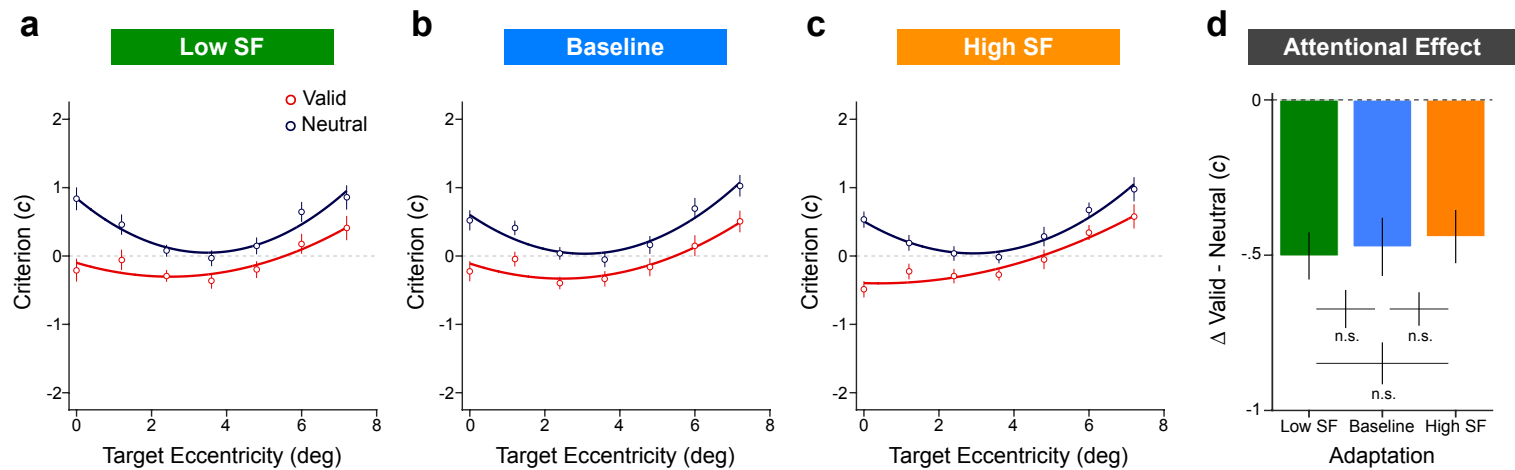
Figure S2. *Effects of attention on criterion as a function of spatial frequency (SF) adaptation.* Attention resulted in less conservative response criterion in all 3 SF adaptation conditions (**a-c**). Changes in criterion with attention (**d**) were similar across all 3 adaptation conditions. Error bars represent ±1 within-subject *SEM* (Morey, 2008). All R^2>.9.