Supplementary Material:

This supplementary material includes: (a) an additional experiment is reported that is provides converging evidence for the results of Experiment 1, and (b) analyses regarding participants' ethnicity in Experiments 1 and 2 of the main manuscript.

This experiment had the same methods as Experiment 1, with the following exceptions:

Participants

Seventy-three university students and community members (60 identified as female, 13 as male) participated in the study and received a payment or course credit. Their mean age was 20.64 years (*SD* = 2.76, range = 18-33). Thirty participants reported a Western ethnicity, 40 reported an Eastern ethnicity, and three reported a mixed ethnicity. Eleven participants reported being left-handed and 62 right-handed.

Stimuli

Similar to other studies (Calcott & Berkman, 2014; Gable & Harmon-Jones, 2008), the global letter subtended 3° x 3°, and each local letter subtended 0.6° x 0.6°. Stimuli were presented on a Dell computer monitor with a refresh rate of 75Hz and a screen resolution of 1152 x 864 pixels.

The results of this experiment with the intermixed baseline also support symmetrical contraction and expansion resizing costs, as per Experiment 1 in the main manuscript:

Results & Discussion

Experimental trials were considered invalid and therefore excluded if RT was very short (<100ms, reflecting anticipatory response) or long (>2.5 SDs above the participant's mean, reflecting non-compliance with the instruction to respond as quickly as possible), or when a key other than the two designated response keys, T and H, was pressed. The mean proportion of invalid trials across participants was low–Even Block: 2.79%, Mostly Global Block: 3.46%, Mostly Local Block: 3.36%. Only accurate trials were used for RT analysis. Two datasets were excluded from further analysis as they failed to achieve a minimum of 60% accuracy on one of the three blocks (where 50% accuracy is chance level). There were three main variables of interest: Global Preference RT, Contraction Cost RT, and Expansion Cost RT. In order to examine potential effect on accuracy (such as speed/accuracy trade-offs), Global Preference accuracy, Contraction Cost accuracy, and Expansion Cost Accuracy were also of interest. Therefore, these six variables were assessed for potential outliers. Four cases identified as outliers (z-score values >=+/-3.29) on these variables were removed. This left 67 cases for analysis (see Table 1 for descriptive statistics).

Table 1

Descriptive Statistics for Experimental Variables in Experiment 1

Variable	*M*	*SD*
Even Block		
Global RT	437.71	112.82
Local RT	445.73	126.49
Global Preference RT†	8.01	54.40
Global Accuracy	97.05	3.27
Local Accuracy	96.81	3.64
Global Preference Accuracy†	-.23	4.05
Mostly Global Block		
Global RT	327.67	75.53
Local RT	435.54	125.56
Contraction Cost RT†	107.87	80.19
Global Accuracy	98.14	2.48
Local Accuracy	93.02	9.01
Contraction Cost Accuracy†	-5.11	8.62
Mostly Local Block		
Global RT	425.40	129.96
Local RT	323.48	79.80
Expansion Cost RT†	101.92	70.48
Global Accuracy	93.09	9.37
Local Accuracy	97.75	2.57
Expansion Cost Accuracy†	-4.66	8.33

Note. N = 67; †difference scores; RT shown in ms, and accuracy in %. Note that accuracy difference scores were calculated in the same way as RT difference scores described in the Method section.

Repeated-measures paired *t*-tests were run for RT and accuracy for the Even Block. There was no significant difference in mean RT between global (438ms) and local trials (446ms), $t(66) = 1.21$, $p = .232$. Similarly, accuracy was equivalent for the two conditions (M = 97% for both). This demonstrates that the global and local levels were equally salient at the group level. Note that this differs from the often-reported global advantage with Navon stimuli (e.g., Baumann & Kuhl, 2005; Navon, 1977), however, the global advantage depends on the size of the stimuli, and they can be adjusted to produce patterns of equal salience (e.g., Kimchi & Palmer, 1982; Yovel, Levy, & Yovel, 2001).

Next, efficiency of resizing was examined. For this, mean RT was submitted to a 2 (Condition: Mostly Global versus Mostly Local) x 2 (Target Level: Global versus Local) repeated-measures ANOVA. This revealed no significant main effect of Condition (F<1), no significant main effect of Target Level (F<1), but a significant Condition by Target Level interaction, $F(1, 66) = 239.05$, $p < .001$, $\eta_p^2 = .784$. This cross-over interaction was likely driven by the fact that the responses appeared faster in the majority trials for both blocks, and slower in the minority trials for both blocks (see Figure 1).

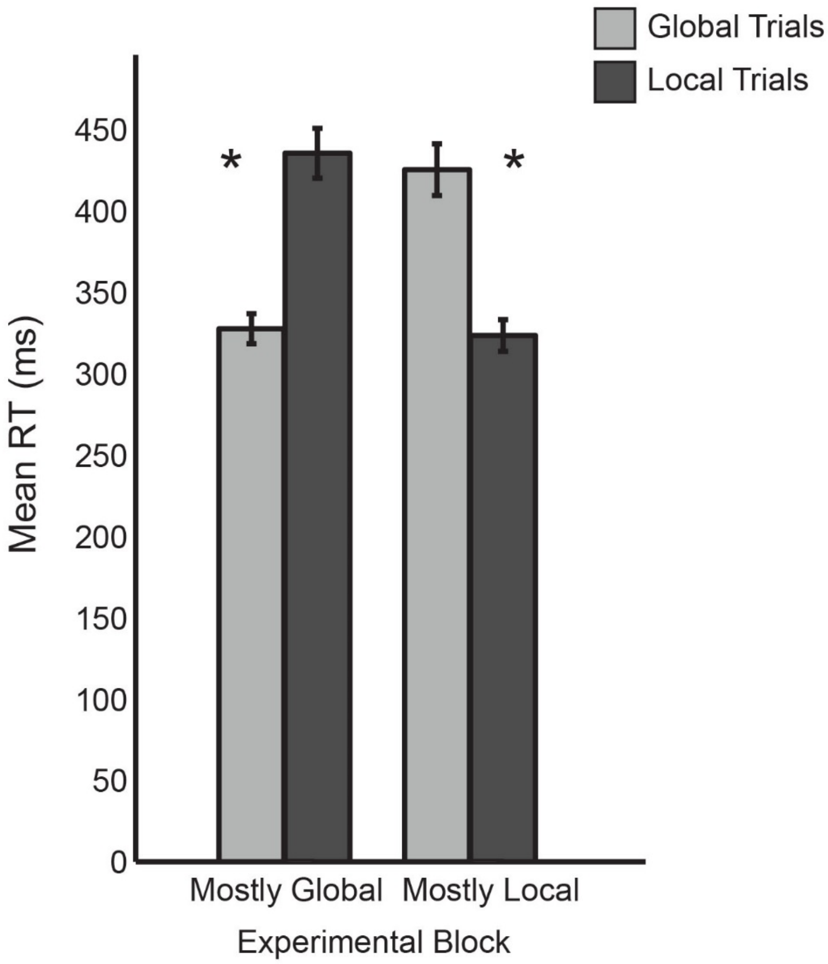

Figure 1. Mean RT for the global and local trials in each the Mostly Global and Mostly Local blocks in Experiment 1. Error bars reflect standard errors.

Repeated-measures *t*-tests were used to follow-up this interaction. In the Mostly Global Block, RT on global trials (328ms) was significantly faster than in local trials (436ms), $t(66) = 11.01$, $p < .001$. This indicates that participants shifted their attentional breadth to be broader to accommodate the majority global trials, and incurred a corresponding cost to resize their attentional breadth to be narrower on the local trials. In the Mostly Local Block, RT for local trials (323ms) was significantly faster than for global trials (425ms), $t(66) = -11.84$, $p < .001$. This suggests that participants adopted a narrower attentional breadth to accommodate the majority local trials, and incurred a corresponding cost to resize their attentional breadth to be broader on the global trials. There were no indications of speed-accuracy trade-offs. In both the Mostly Global and Mostly Local blocks, accuracy was higher for the global trials than for the local trials, following the convergent pattern as the RT data (see Table 1). Altogether, this pattern of results suggested that the manipulation was effective in producing the intended changes in attentional breadth.

The next and crucial step was to determine whether there was any asymmetry in contracting versus expanding attention. A repeated-measures *t*-test revealed that the cost to contracting attention (contraction cost RT = 107.87ms) was equivalent to the cost for expanding attention (expansion cost RT = 101.92ms), $t(66) = .48$, $p = .635$. In other words, there was no asymmetry between contraction and expansion efficiency.

Finally, an aspect of the results worth commenting on is that the RTs in the Even Block, where the target was equally likely to appear at either the local or global levels, had much slower RTs than the biased blocks. For example, RTs to the global trials in the Even Block were significantly slower than RTs to the global trials in the Mostly Global block ($p < .001$). Even though these both entail RTs to global stimuli, there was a clear advantage when these were part of a majority-global block. In contrast, RTs to the global trials in the Even Block were not significantly different to RTs to the minority global trials in the Mostly Local block ($p = .300$). While at face value this might seem surprising, it is actually consistent with the processes theorised to occur here. Switching attention between levels is sluggish and slows responses compared to maintaining attention at the same level (as evidenced by the ~100ms switch costs between the majority and minority levels in the biased blocks). Therefore, it is logical that a block that requires more frequent attentional switches will slow responses compared to one that has less frequent switches. Since the group-level analysis indicated no greater salience for the global versus the local level in the Even Block, presumably half of participants adopted a broader (global) attentional breadth and half a narrower (local) attentional breadth here. If so, then there would have been far more frequent switches (50% of trials) in this block compared to the biased blocks, where it appears that participants adopted the attentional breadth that favoured task performance on the majority trials, and therefore switches would have occurred on ~20% of trials. This difference in the frequency of switches could account for the overall difference in RT between the Even and biased blocks. Note that this explanation for these results is supported by the results of Experiment 2 (see main manuscript).

Ethnicity Analyses for Experiment 1 from the main manuscript:

Previous research has found cross-cultural differences in attentional breadth, such that individuals with East Asian individuals tend to have a broader attentional breadth than Caucasians or those from Western cultures (Boduroglu, Shah, & Nisbett, 2009; McKone et al., 2010). This was the reason that we recorded participants' self-identified ethnicity. Participants provided a range of responses to this question. There were four categories that had a minimum of five participants reports them: Australian (N = 16), Caucasian (N= 15), Chinese (N = 11), Asian (N = 8), All other self-reported ethnicities (e.g., Indian, African, Sri Lankan) were reported by fewer than five participants, and were therefore not included in the following analyses with the Ethnicity variable (N = 18). To maximise the number of participants in each group, those who identified as Chinese were combined with those who identified with the broader category of Asian (N = 19). This meant that there were three groups to compare in the following analyses: Asian, Australian, and Caucasian.

First, we examined whether default attentional breadth varied as a function of participants' self-reported ethnicity, as is predicted by this previous literature. A one-way ANOVA with Global Preference RT from the Even Block as the dependent variable revealed a significant main effect of Ethnicity, $F(2, 47) = 4.55$, $p = .016$, $\eta_p^2 = .162$. (For all independent-groups t-tests, values are reported with equal variances assumed unless the Levene's Test for Equality of Variances test was significant, in which case values are reported with equal variances not assumed). An independent-groups then revealed that mean Global Preference score was significantly larger for the Asian Group (M = 50.3ms, SD = 55.5) than for either the Caucasian (M = 8.7ms, SD = 36.8), $t(31.2) = 2.62$, $p = .014$, or the Australian group (M = 8.0, SD = 46.7), $t(33) = 2.45$, $p = .020$, which did not significantly differ from one another (t<1). It is striking that even though we did not explicitly seek to recruit participants of particular ethnicities but instead let this vary and measured it, our results still strongly showed the pattern consistent with previous literature (McKone et al., 2010): Asian individuals tended to have a much larger attentional breadth than the other groups. In fact, it was 5-6 times the magnitude of that of the other groups (50 versus 8-9ms).

Second, we repeated the main analysis on the flexibility (biased) blocks including Ethnicity as a variable. This revealed no significant main effect of Condition (F<1), and Condition did not interact with Ethnicity, $F(2, 47) = 1.79$, $p = .178$, $\eta_p^2 = .071$. There was no main effect of Level (F<1), however, Level interacted with Ethnicity, $F(2, 47) = 4.18$, $p = .021$, $\eta_p^2 = .151$. There was once again a significant interaction between Condition and Level, $F(1, 47) = 228.39$, $p < .001$, $\eta_p^2 = .829$. Furthermore, there was also a significant three-way interaction among Condition, Level, and Ethnicity, $F(2, 47) = 12.47$, $p < .001$, $\eta_p^2 = .347$.

In order to understand this three-way interaction, two ANOVAs were conducted, one with Contraction Cost RT as the dependent variable and the other with Expansion Cost RT, both with Ethnicity as the Independent Variable. Ethnicity had a significant effect on Contraction Cost RT, $F(2, 47) = 11.80$, $p < .001$, $\eta_p^2 = .334$, but not on Expansion Cost RT, $F(2, 47) = 2.47$, $p = .095$, $\eta_p^2 = .095$. Independent-groups t-tests then revealed that Asian participants demonstrated a much larger Contraction Cost (M = 163.3ms, SD = 76.1) than did the Caucasian (M = 65.2ms, SD = 50.6), $t(32) = 4.29$, $p < .001$, or Australian groups (M = 59.9, SD = 81.2), $t(33) = 3.88$, $p < .001$, who did not differ from one another (t<1). In other words, Asian participants showed evidence of broader scale of attention under neutral conditions, and correspondingly had greater difficulty contracting their scale of attention when the demands of the task predominately favoured being broad but required infrequent attentional contraction. There were no differences among the different groups of self-identified ethnicities in their attentional expansion efficiency.

The increased Contraction Cost for the Asian participants could have stemmed from their overall slower RTs (e.g., 441ms average for biased blocks versus 362ms for Caucasians,

$t(32) = 2.37$, $p = .024$). This pattern of generalised slower responses for Asian participants has been observed in previous literature (Boduroglu & Shah, 2017). It is conceivable that RT costs (which are RT difference scores) would be greater where there are overall larger RTs. However, inconsistent with this notion, if we follow the approach adopted in previous research where this has been an issue (Lawrence, Edwards, & Goodhew, 2018) and control for baseline differences in RT by entering mean RT from across the two biased blocks as a covariate in the ANOVA, then there was still a significant three-way interaction among Condition, Level, and Ethnicity, $F(2, 46) = 4.68$, $p = .014$, $\eta_p^2 = .169$. Furthermore, we calculated Contraction Cost RT normalised to participants' average RT, by dividing the Contraction Cost RT difference score by mean RT in the Mostly Global block. Using this measure, there was still a significant difference in normalised Contraction Cost RT between Asian (352ms) and Caucasian participants (170ms), $t(32) = 4.09$, $p < .001$, and between Asian (352ms) and Australian participants (150ms), $t(25.23) = 3.34$, $p = .003$, but not between Caucasian and Australia participants ($t < 1$). This confirms that the differences between individuals with different self-identified ethnicities were not merely a product of differences in mean RT.

Ethnicity Analyses for Experiment 2 from the main manuscript:

We sought to analyse participants' data as a function of their country of birth. Here, with the acknowledgement that this involves some imperfect but necessary generalisation to ensure a sufficient sample size in each group, participants were classified into the following four groups: (1) East Asian country of birth (China and South Korea [N = 19]), (2) Australia as country of birth (N = 18), (3) South Asian country of birth (Malaysia, Singapore, Philippines, Indonesia, [N= 14]), or (4) West Asian country of birth (India, Pakistan, and Bangladesh [N = 11]). Participants who did not fall into any of these categories (e.g., Nigeria), were not included in the following country-of-birth analyses. These four groups did not differ with respect to Global Preference RT ($F < 1$). This was true even when just the first two larger groups were compared ($t < 1$).

This Country of Birth variable was then included as a between-subjects factor in the main ANOVA. This revealed that Country of Birth did not interact with either the Condition or Level main effects (*F*s < 1), but it did interact with the Condition by Level interaction, $F(4, 62) = 4.10$, $p = .005$, $\eta_p^2 = .209$. Differential RT costs could have stemmed from overall differences in RTs (e.g., 525ms average for biased blocks for those born in East Asia versus 420 for those born in Australia, $t(35) = 2.70$, $p = .011$). This pattern of generalised slower responses for individuals from East Asia has been observed in previous literature (Boduroglu & Shah, 2017) and could reflect a tendency to focus on accuracy rather than speed. Indeed, consistent with this notion, individuals born in East Asia had higher overall accuracy in the biased blocks (98%) than individuals born in Australia (95%), $t(22.98) = 2.95$, $p = .007$. When we controlled for baseline differences in RT by entering it as a covariate in the ANOVA, there was no longer a three-way interaction among Condition, Level, and Country of Birth, $F(4, 61) = 1.50$, $p = .214$, $\eta_p^2 = .089$. This indicates that once baseline differences in RT are accounted for, there were no differences in attentional re-sizing flexibility amongst the participants born in different countries.

This country-of-birth analysis diverged from the results of Experiment 1. Namely, in Experiment 1, individuals who self-identified their ethnicity as Asian had a more global default attentional preference in the unbiased block, which corresponded to increased Contraction Cost in the biased blocks. Here, in Experiment 2, there appeared to be no meaningful differences in performance as a function of participants' country of birth. This could have stemmed from the different variable recorded – self-identified ethnicity versus country of birth. It is conceivable that self-identified ethnicity might more closely resemble an individual's cultural experience, however, most previous studies use country-of-birth to operationalise cultural differences (Boduroglu & Shah, 2017; McKone et al., 2010). Regardless of which is the superior method, it is possible that this difference in measurement was responsible for the different pattern of results. However, we also suspect that the experimental design played an important role. Specifically, we propose that the intermixed block in Experiment 1 is more sensitive to individual differences in default preference than the 100% global/local blocks in Experiment 2, since in the latter there is a clear incentive to adopt a particular attentional breadth. In other words, there was a clear difference in preferred attentional breadth between different ethnicities in Experiment 1 when the conditions did not require participants to adopt a global or local breadth of attention, whereas these differences were eliminated when the task demands did compel this. That is, there can be greater individual variability in *preference* than ability (Goodhew & Edwards, 2019; Koldewyn, Jiang, Weigelt, & Kanwisher, 2013). This, of course, only explains why there were no cultural differences in Global Preference RT, it does not account for why there were also none for the attentional resizing measures once differences in RT were controlled for. This could be a consequence of the different means of measuring ethnicity (identification versus country of birth), or, alternatively, it could reflect the fact that in Experiment 2 on average *all* individuals showed greater expansion than contraction efficiency: these conditions may have been less sensitive to revealing a subset of participants having more difficulty with contraction than expansion.

References

Baumann, N., & Kuhl, J. (2005). Positive Affect and Flexibility: Overcoming the Precedence of Global over Local Processing of Visual Information. *Motivation and Emotion, 29*(2), 123-134. doi:10.1007/s11031-005-7957-1

Boduroglu, A., & Shah, P. (2017). Cultural differences in attentional breadth and resolution. *Culture and Brain, 5*(2), 169-181. doi:10.1007/s40167-017-0056-9

Boduroglu, A., Shah, P., & Nisbett, R. E. (2009). Cultural Differences in Allocation of Attention in Visual Information Processing. *Journal of cross-cultural psychology, 40*(3), 349-360. doi:10.1177/0022022108331005

Calcott, R. D., & Berkman, E. T. (2014). Attentional Flexibility During Approach and Avoidance Motivational States: The Role of Context in Shifts of Attentional Breadth. *Journal of Experimental Psychology: General, 143*(3), 1393-1408. doi:10.1037/a0035060

Gable, P. A., & Harmon-Jones, E. (2008). Approach-motivated positive affect reduces breadth of attention. *Psychological Science, 19*(5), 476-482. doi:10.1111/j.1467-9280.2008.02112.x

Goodhew, S. C., & Edwards, M. (2019). Translating experimental paradigms into individual-differences research: Contributions, challenges, and practical recommendations. *Consciousness and Cognition, 69*, 14-25. doi:10.1016/j.concog.2019.01.008

Kimchi, R., & Palmer, S. E. (1982). Form and texture in hierarchically constructed patterns. *Journal of Experimental Psychology: Human Perception and Performance, 8*(4), 521-535.

Koldewyn, K., Jiang, Y., Weigelt, S., & Kanwisher, N. (2013). Global/Local Processing in Autism: Not a Disability, but a Disinclination. *Journal of autism and developmental disorders, 43*(10), 2329-2340. doi:10.1007/s10803-013-1777-z

Lawrence, R. K., Edwards, M., & Goodhew, S. C. (2018). Changes in the spatial spread of attention with ageing. *Acta Psychologica, 188*, 188-199. doi:10.1016/j.actpsy.2018.06.009

McKone, E., Davies, A. A., Fernando, D., Aalders, R., Leung, H., Wickramariyaratne, T., & Platow, M. J. (2010). Asia has the global advantage: Race and visual attention. *Vision Research, 50*(16), 1540-1549. doi:10.1016/j.visres.2010.05.010

Navon, D. (1977). Forest before trees: The precedence of global features in visual perception. *Cognitive Psychology, 9*(3), 353-383. doi:10.1016/0010-0285%2877%2990012-3

Yovel, G., Levy, J., & Yovel, I. (2001). Hemispheric asymmetries for global and local visual perception: effects of stimulus and task factors. *Journal of Experimental Psychology: Human Perception and Performance, 27*(6), 1369-1385.