As mentioned in the Methods section of the main text, participants were involved in a battery of tests on a variety of topics. Among these were tasks irrelevant to the present context, such as racism scales, perception of painful expressions, personality questionnaires, etc. Some tasks on the other hand were pertinent to the present experiment as the basis for statistical control of other processing abilities (below). Unfortunately however, because not all subjects completed all tasks, the following analyses could only be carried for 35 out of 37 participants.

Sensitivity to horizontal gratings

Among the battery of tests was a gratings detection task (600 trials), consisting in the presentation of two stimuli, on either side of a central fixation cross, that remained visible until participants entered a response. One stimulus was the target (a horizontal [300 trials] or vertical [300 trials] grating filtered with orientation bubbles and embedded in white noise) while the other was a distractor (white noise only), and participants indicated which stimulus contained the target. In order to maintain a performance of 75% correct responses within orientation, the signal-to-noise ratio (SNR) was modulated independently for horizontal and vertical gratings using QUEST (Watson & Pelli, 1983), which determined the proportion p, comprised between 0 and 1, of the target grating i needed to maintain the target performance. To this, a proportion of white noise w was added. Thus, the target can be expressed as $ip + w(1 - p)$, and SNR can be expressed as $p/(1 - p)$. Both the target and the distractor noise had equal energy. Participants were adequately prepared for this task by first completing noiseless and noisy practice blocks of the task.

Object processing and horizontal tuning for cars

Object processing tasks were a car recognition task with horizontal bubbles, and the Horse Memory Test (HMT; Duchaine & Nakayama, 2005).

The car recognition task was a 2ABX match-to-sample (600 trials total), consisting in the presentation of a noiseless unfiltered cue car (500 ms), followed by a white noise mask (100 ms), and then followed by a pair (target + distractor) of noisy orientation-filtered stimuli that remained visible until a response was entered. Both the target and distractor were filtered with the exact same orientation bubbles filter. In order to maintain a performance of 75% correct responses, the signal-to-noise ratio (SNR) was modulated using QUEST (Watson & Pelli, 1983), which determined the proportion *p*, comprised between 0 and 1, of the target/distractor *i* needed to maintain the target performance. To this, a proportion of white noise *w* was added. Thus, the target/distractor can be expressed as $ip + w(1 - p)$, and SNR can be expressed as $p/(1 - p)$. Participants were adequately prepared for this task by first completing noiseless and noisy practice blocks of the task.

Analyses and Results

For the gratings detection task, we extracted the SNR for horizontal grating trials, averaged over the last 50 trials ($M = 3.33$, $SD = 1.65$). For the Horse Memory Test, the variable of interest was percent correct responses ($M = 86.8\%$, $SD = 9.2\%$). For the car recognition task, SNR data and orientation bubbles were analyzed; the former was averaged over the last 100 trials ($M = 3.03$; $SD = 0.35$), and the latter was analyzed using the same classification image procedures as the one outlined in the main text. At the group level, horizontal information positively correlated with car recognition ($Zmax = 12.78$, $p < 0.001$; see Figure S1). For this reason, we extracted horizontal tuning scores

for cars using the same procedure as for horizontal tuning scores for faces, but with a FWHM = 37 degrees, as this distribution width was best fitted to the group data for cars.

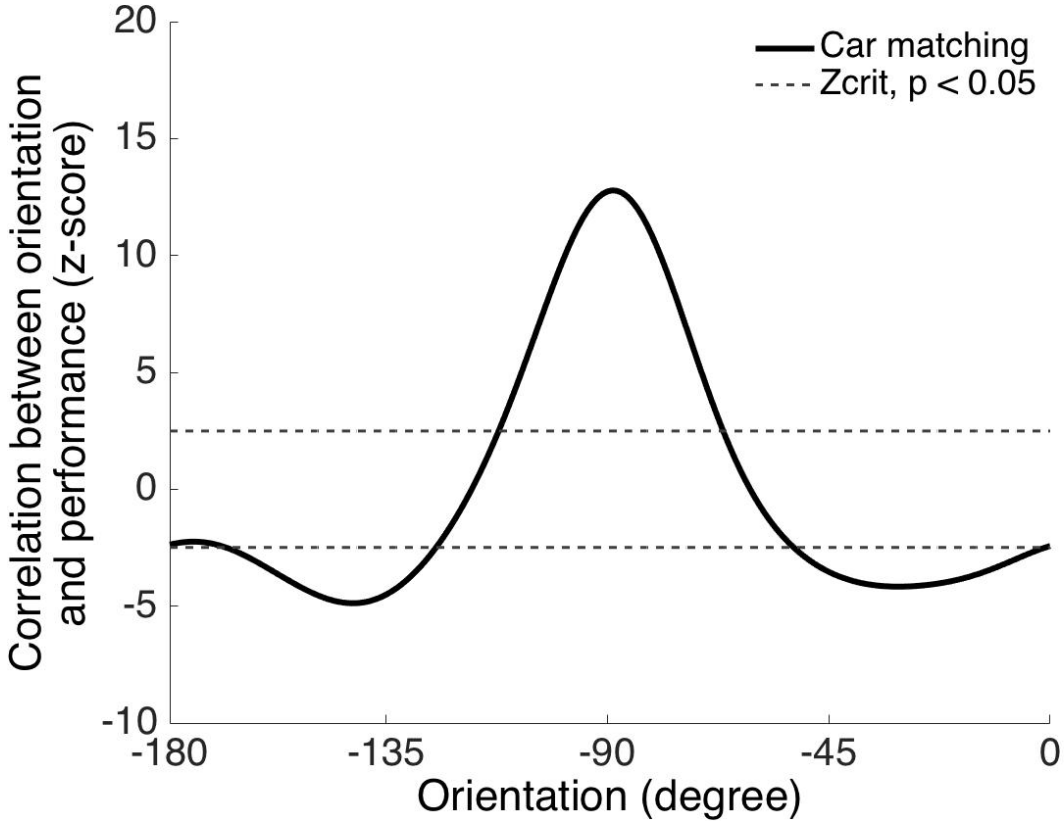

Figure S1. Group classification vector from the orientation bubbles car matching task. Illustrates the correlation (*z*-score) between orientations and accuracy for car recognition. Gray dotted lines plot the two-tailed significance threshold.

We then proceeded to re-test the correlation between face processing ability and horizontal tuning for faces, this time controlling for the possible confounding effects of horizontal tuning for objects ($Tuning_{Cars}$), sensitivity to horizontal gratings ($SNR_{Gratings}$), and object processing ability ($HMT_{\%Correct}$, SNR_{Cars}). The correlation was almost unchanged, $r_{Partial}$ = 0.39, 95% CI = [0.08, 0.64], $p < 0.05$.