Redundancy masking and advantages of information compression in visual perception

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Résumé

The visual environment contains too much information to be processed in parallel. To cope with excessive information, the visual system selects, discards, and compresses information. One compression mechanism is redundancy masking (RM) where redundant visual information is compressed. RM occurs with as few as three items. For example, when presented with three identical items in the visual periphery, observers often report seeing only two items. Here, we investigated to what extent features of redundancy-masked items withstand or are lost in RM. We presented 3-5 radially arranged bars with varying widths (0.1∘, 0.25∘, 0.4∘) for 150ms in the left or right hemifield (10∘ eccentricity). Observers reported the number of bars, and then adjusted probe widths and spacings to match the perceived stimulus. We computed deviation scores as the difference between perceived and actual (1) number of bars, (2) bar widths, (3) spacings between bars, and (4) overall widths of the arrays. There was strong RM: The number of bars reported was lower than the number presented. Overall, the width of thin (thick) bars tended to be overestimated (underestimated). In RM trials, the reported width was slightly larger than in non-RM trials. Importantly, except for the thinnest width condition, the reported width was more accurate in RM than in correct trials. The reported spacing between bars was larger in RM compared to correct trials, showing a lower perceived density in RM**,** while the reported overall extent of the arrays was smaller in RM trials, replicating previous results of visual space compression in RM. Our results suggest that the erroneous perception of smaller numbers of items in RM may go hand in hand with higher accuracy in reporting their features. We discuss how RM can be beneficial beyond the economical use of limited processing capacities by improving perception of individual items.

Mots-Clés: information compression, redundancy masking, peripheral vision, crowding

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