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Letters

Only half right: comment on Regier and Kay

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We accept Regier and Kay's argument that linguistic terms affect color categorization in the right but not the left visual field (LVF) [1]. We also agree that left and right hemispheres might contain qualitatively different color processing systems. We disagree, however, with the suggestion that the right hemisphere contains a set of prelinguistic color categories that influence perception when stimuli are presented in the LVF. Their argument rests on studies [2,3] that seem to show categorical perception of color by prelinguistic infants. The key finding was that infants showed faster eye-movements from a borderline green background to a blue target than to a more central green. Unfortunately, infants in these studies were tested on only two pairs of stimuli. Consequently, the results might have reflected simple color preference [4] by the infants for the blue rather than the green target. Such a conclusion is supported by results from recent studies [5,6] in which infants showed a significant negative bias for looking times to a green hue compared to the average time spent looking at other hues. (Earlier studies of infant categorical perception (CP) either had major methodological flaws or have not been replicated, as discussed in [7], so we do not consider them here.) No explanation in terms of color categories in the right hemisphere is required if infants shift their gaze faster towards blue than to central green on the basis of simple color preference. More varied investigations of infant behavior using a variety of different color categories with participants from different linguistic communities are required before we can conclude that prelinguistic infants demonstrate CP for color that mirrors the effects found in language users.

Humans can make fine perceptual discriminations between approximately two million different shades of color. Our recent findings indicate that discriminations are *no* more sensitive at category boundaries than within categories [8]. We therefore believe there to be a *non-categorical* color processing system (possibly, but not necessarily, restricted to the right hemisphere) that

can make extremely fine discriminations between colors and assess whether two colors are identical. We do not believe that this system 'knows' precise information concerning similarities and differences between two shades of color (e.g. that one is brighter or more saturated than another, or that two different shades share the same name). A non-categorical system might work better at making fine perceptual discriminations *because* it is not categorical. CP in language users probably arises from the concurrent operation of the perceptual and categorical systems. When judging, for example, whether two different shades of blue are identical, information from the left-hemisphere categorical system indicating that they share the same name conflicts with information from the perceptual system that they differ. Decisions for items from different color categories are made more quickly not because of increased sensitivity to perceptual change at category boundaries, but because both categorical and perceptual systems indicate that they differ. At slower response times, CP occurs for stimuli in both visual fields [9,10] because information presented to the LVF has had time to access the categorical system in the left hemisphere. CP for color can therefore be readily explained if one processing system is language-based and categorical and the other system is perceptual but not categorical.

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Letters Response

On the status of prelinguistic color categories: Response to Roberson and Hanley

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Roberson and Hanley [1] argue that further research is needed before one can conclude that the right hemisphere contains representations of prelinguistic color categories. We agree with that assertion. In fact, in our recent review [2], we state explicitly that the existence of prelinguistic categorical perception of color has recently been disputed and that, '[i]f confirmed', it raises important questions that we then proceed to discuss, drawing on Hanley and Roberson's earlier discussion of the same questions [3]. Our treatment of this issue reflects the current mix of contention and interesting new ideas present in the literature, Roberson and Hanley's present comment notwithstanding.

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Letters Response

Pre-linguistic categorical perception of colour cannot be explained by colour preference: Response to Roberson and Hanley

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Here, I challenge Roberson and Hanley's claim [1] that apparent pre-linguistic categorical perception (CP) of colour could be due to infant colour preference. The authors focus their argument on two infant colour CP studies [2,3] that found that infants detected a coloured target on a coloured background faster when the target and background were from different categories (blue1 and green1) than when they were from the same category (green1 and green2). Roberson and Hanley suggest that these apparent category effects could be due to 'simple color preferen-

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ce...for the blue rather than the green target'. However, their argument is based on a misunderstanding of the methods. For instance, in Ref. [2], there was no blue target; the target for both different- and same-category conditions was green (green1) and the background varied. Target preference cannot explain the category effect as the target was constant across conditions.

Moreover, it is not clear that infants would prefer the blue in these studies over the green. Roberson and Hanley cite a preference study [4] in which infants looked less at green than at the other colours, yet the other colours did not include a good blue. The other study cited [5] used very

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