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The Culture-Fair Common Region Test (CRT)

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The Common Region Test (CRT) is a useful spatial categorization test that assesses spatial binding of individual objects to places, or pairs of matching objects to a region. Our aim was to test whether ethnic differences exist in the CRT of typically developing children and those with special needs (N = 117). Typically developing children were more likely to show objects-region binding, independently of ethnicity. Likewise, children with ASD and ADHD showed mainly unsystematic coding, independently of ethnicity. Thus, it is demonstrated that the CRT is a useful culture-fair assessment of spatial categorization.

In culture-fair test developments, it is important that the same constructs are measured across different cultures. Professionals in mental health weigh socio-economic factors as more important than race (Cuccaro et al., 1996). Moreover, epidemiological studies suggest that children with special needs have more underlying medical conditions than typically developing children even after controlling for factors such as race/ethnicity/national minority status (Dizitzer et al., 2020; Schieve et al., 2012; Turygin et al., 2013).

The Common Region Test (CRT) uses a Wertheimer array with three rows of dots (Wertheimer, 1923), see **Figure 1**, upper left figure. In the first row, dots were equal insofar as they were of the same appearance and distance, in the second row, pairs of dots were closer together which tests the Gestalt principle of proximity, and in the third row, pairs of dots were of different colour which resembled the Gestalt principle of similarity.

When asked to draw a circle around those dots which they think belong together, young children allocate small individual places to each dot in this array (object-place binding), but

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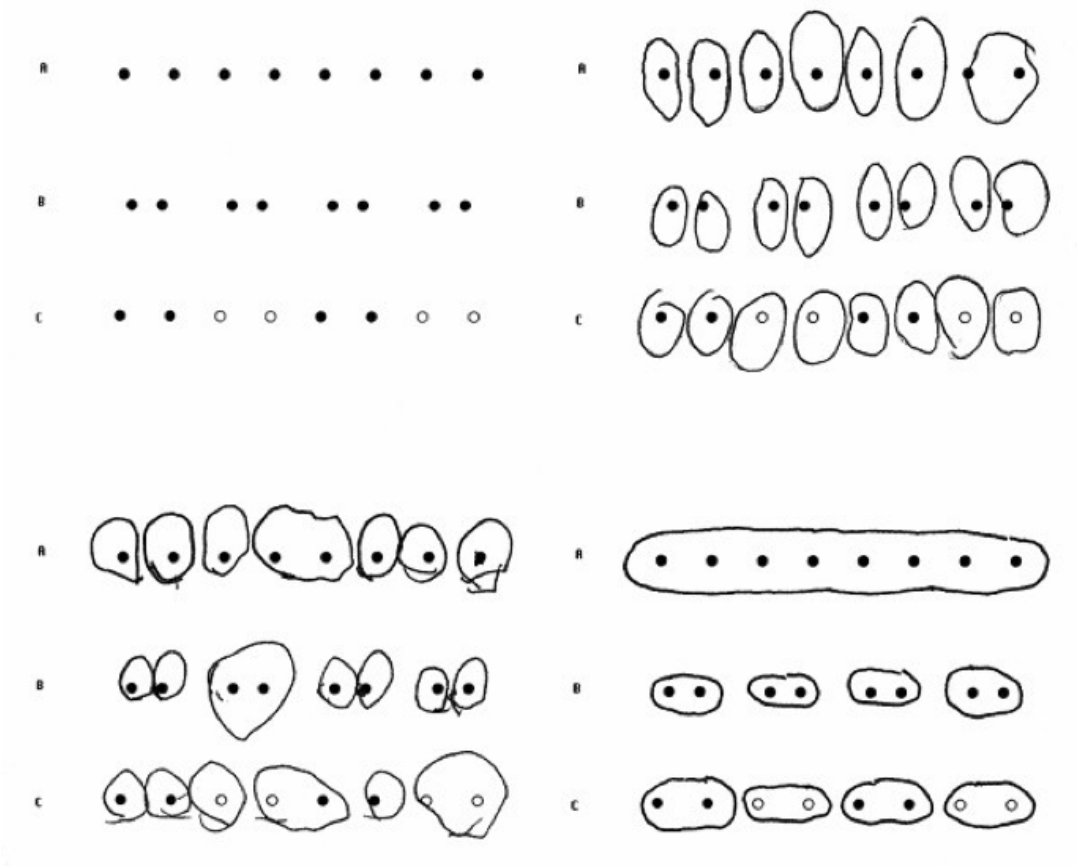

Figure 1 Common Region Test, CRT. Wertheimer array (upper left). 4- to 6-year-old children show object-place binding (upper right). With increasing age, object-region binding of matching objects dominates (lower right). Unsystematic coders (lower left) show both types of spatial binding (Lange-Küttner, 2006, with permission of the British Psychological Society).

older children draw common regions around matching dots (objects-region binding) (Lange-Küttner, 2006, 2010, 2013). Moreover, there are children who show unsystematic coding as they follow neither a clear system of object-place binding nor of objects-region binding. Such unsystematic binding is most often a temporary transitional pattern in the development from object-place to objects-region binding.

We have recently published an article on spatial categorization in children with special needs using the CRT and revealed that children with autistic spectrum disorder (ASD) show unsystematic and under-inclusive allocation of objects to places independently of their age,

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while those with attention-deficit hyperactivity disorder (ADHD) show unsystematic and over-inclusive allocation of non-matching objects to regions. The spatial categorization was dependent on the level of fine motor skills, with children with ASD having poorer fine motor skills than those with ADHD who in turn showed less well-developed fine motor skills than typically developing children.

While fine motor skills development appears to be a quasi-biological variable, social science commentators were asking, though, whether there would be ethnic differences in this cross-cultural urban London-based UK sample. We are thus testing whether there could be a racial factor involved in the CRT because spatial categorization in geographical terms could also imply ethnic segregation (Mask, 2020; McDoom & Gisselquist, 2016). People who have something in common can choose or be obliged to settle in the same area. But because we were aware of the motor component, we were expecting children with ASD and ADHD to show unsystematic response patterns in the CRT independently of ethnicity. The alternative hypothesis is that because ethnically diverse children may be more likely to experience isolation or segregation, they would be constructing fewer common spatial regions.

Methods

Participants

A sample of $N = 117$ school children from various schools in South-West London, UK, took part in the study. About half the sample were White children ($n = 66, 56.4\%$). The other half of the sample consisted of Asian ($n = 44, 37.6\%$), Black ($n = 5, 4.3\%$), Arab ($n = 1, .90\%$) and Albanian ($n = 1, .90\%$) children. More details on the sample and the diagnostic assessments can be found in the recently published paper on spatial categorization and fine motor skills (Lange-Küttner & Kochhar, 2020).

Apparatus and Procedure

Common Region Test (CRT). This test was given on one sheet of paper, with three rows of dots: row A, B and C, see **Figure 1**. Row A consisted of equidistant dots, row B where pairs of dots were closer together (proximity) and row C where dots were equidistant but pairwise colored (black/white) (similarity) (Lange-Küttner, 2006). Children were given the following instruction: "Please draw a circle around those dots which you think belong together". They were tested individually by the second author. Scoring of the CRT was based on whether children had drawn a circle around individual dots (object-place binding) (score 1), matching dots (objects-region binding) (score 3) or whether there was a combination of approaches

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(unsystematic binding) (score 2). The final interrater reliability for the 117 drawings was 99.1%. One disagreement was settled in a discussion.

Results

Typically Developing Children. Object-place binding was the least common approach, with unsystematic and objects-region binding at about the same level in either group of white and ethnic minority children. Chi-square analysis showed that there were no significantly different distributions between the two groups, $\chi^2(2, 78) = .16$, $p = .925$, eta $= .04$, see **Figure 2A**, which was confirmed with a Bayes test for independent samples, Rouder $t(76) = -.362$, $p = .718$, BF 5.39. The quoted eta is ethnicity-dependent in this and all chi-square tests that follow.

Children with Special Needs. The same analysis for just children with a clinical diagnosis showed that unsystematic coding was the most common approach. Chi-square analysis showed that there were no significantly different distributions between white and ethnic minority children, $\chi^2(2, 39) = 2.39$, $p = .302$, eta $= .25$, see **Figure 2B**. This was confirmed with a Bayes test for independent samples, Rouder $t(37) = -.318, p = .752$, BF4.06.

ASD/ADHD. Children with special needs were further split into two sub-samples of children with ASD vs. ADHD. In children with ASD, there was no significant difference between white and ethnic minority children with regards to the CRT, $\chi^2(2, 19) = 4.54, p = .103$, eta $= .49$, and this was confirmed with a Bayes test for independent samples, Rouder $t(17) = -.36, p = .720$, BF2.98. In children with ADHD, there was absolutely no difference between white and ethnic minority children, $\chi^2(2, 20) = .10, p = .995$, eta $= .02$, see also the Bayes test for independent samples, Rouder $t(18) = .000, p = 1.0$, BF3.12.

Conclusion

We could find the same response pattern of children coming from different ethnicities in the CRT, both in typically developing children and in those with special needs. Typically developing children showed allocation of regions to matching dots, while this was rare in children with special needs, whether ASD or ADHD, who mainly used unsystematic strategies, but both groups did so independently of their ethnic/national minority status. Thus, this clearly demonstrated that the Common Region Test (CRT) is a culture-fair test that allows to assess children's systematic attention and spatial categorization according to Gestalt features of similarity and proximity.

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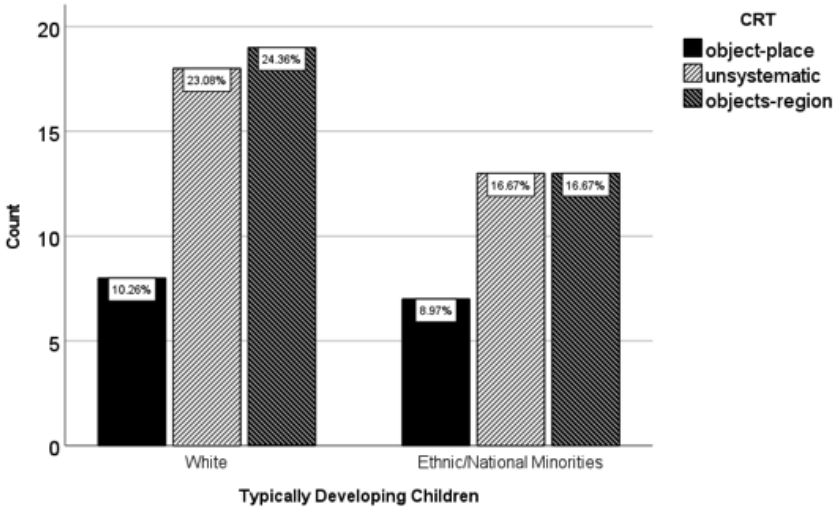
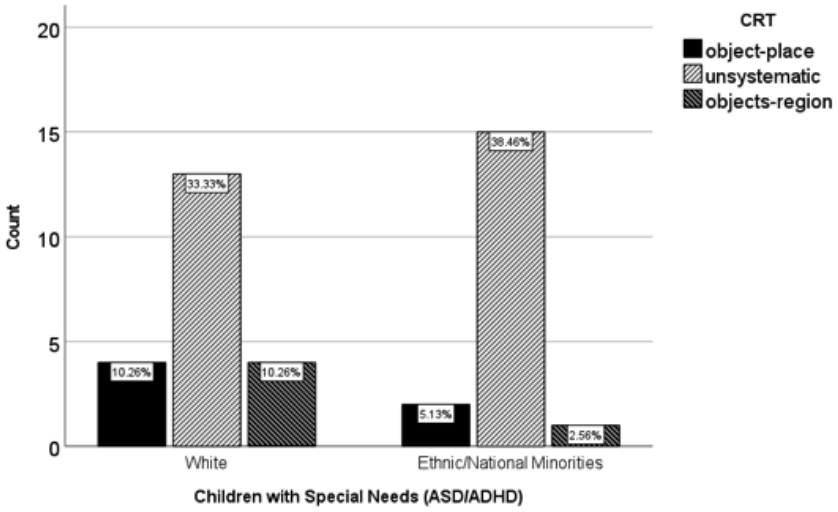


(2A)



(2B)

Figure 2 Response patterns in the Common-Region-Test (CRT). The number of children (count) is plotted on the y-axes with percentages available in each column.

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