



Strategies and biases in location memory in Williams syndrome

Emily K. Farran*

Department of Psychology, University of Reading, UK

Received 11 July 2007; received in revised form 23 July 2007; accepted 30 July 2007

Abstract

Individuals with Williams syndrome (WS) demonstrate impaired visuo-spatial abilities in comparison to their level of verbal ability. In particular, visuo-spatial construction is an area of relative weakness. It has been hypothesised that poor or atypical location coding abilities contribute strongly to the impaired abilities observed on construction and drawing tasks [Farran, E. K., & Jarrold, C. (2005). Evidence for unusual spatial location coding in Williams syndrome: An explanation for the local bias in visuo-spatial construction tasks? *Brain and Cognition*, 59, 159–172; Hoffman, J. E., Landau, B., & Pagani, B. (2003). Spatial breakdown in spatial construction: Evidence from eye fixations in children with Williams syndrome. *Cognitive Psychology*, 46, 260–301]. The current experiment investigated location memory in WS. Specifically, the precision of remembered locations was measured as well as the biases and strategies that were involved in remembering those locations. A developmental trajectory approach was employed; WS performance was assessed relative to the performance of typically developing (TD) children ranging from 4- to 8-year-old. Results showed differential strategy use in the WS and TD groups. WS performance was most similar to the level of a TD 4-year-old and was additionally impaired by the addition of physical category boundaries. Despite their low level of ability, the WS group produced a pattern of biases in performance which pointed towards evidence of a subdivision effect, as observed in TD older children and adults. In contrast, the TD children showed a different pattern of biases, which appears to be explained by a normalisation strategy. In summary, individuals with WS do not process locations in a typical manner. This may have a negative impact on their visuo-spatial construction and drawing abilities.

© 2007 Elsevier Ltd. All rights reserved.

Keywords: Williams syndrome; Visuo-spatial cognition

* Department of Psychology, School of Psychology and Clinical Language Sciences, University of Reading, Earley Gate, Reading RG6 6AL, UK. Tel.: +44 118 378 7531; fax: +44 118 931 6715.

E-mail address: E.K.Farran@reading.ac.uk.

1. Introduction

Williams syndrome (WS), a rare genetic disorder, occurs in approximately 1 in 20,000 live births (Morris & Mervis, 1999). Individuals with WS show an unusual cognitive profile in which verbal abilities are superior to visuo-spatial abilities (e.g. Udwin & Yule, 1991). Furthermore, an atypical pattern of strengths and weaknesses can be observed within each domain (Farran & Jarrold, 2003; Karmiloff-Smith et al., 1997). The visuo-spatial domain is characterised by relative strengths in face processing and perceptual identification, and weaknesses in drawing and on construction tasks (Farran, Jarrold, & Gathercole, 2003; Karmiloff-Smith, 1997).

The ability to represent an object's location appears to be a relative weakness in WS. Hoffman, Landau, and Pagani (2003) suggest that poor performance on block construction tasks, a hallmark of WS (Mervis, 1999), can be explained by deficits in coding the identity and location of each component part. Hoffman et al. (2003) isolated these two task demands; in an identity task and a location task, participants were shown a model image with one block cued. In the identity task, they then chose an identity match from a set of 2D block faces. In the location task, participants were shown a single block, and a copy space of possible block locations, and asked to place the block in the correct location in the copy area. WS performance was significantly poorer than control participants on both tasks (comparisons across tasks were not made). Paul, Stiles, Passarotti, Bavar, and Bellugi (2002) also employed a location matching task, and similarly report poor abilities in WS. However, in both studies, controls were matched by overall mental age, which necessarily assumes a group difference in visuo-spatial cognition. Further investigation is required to determine how performance on such tasks relates to the visuo-spatial profile in WS.

Farran and Jarrold (2005) present further evidence for atypical location coding in WS. They investigated two types of spatial relations, using tasks adapted from Koenig, Reiss, and Kosslyn (1990). Coordinate spatial relations refer to the encoding of fine grain information, e.g. precise locations, specific distances. In this task participants judged whether a ball was 'in' or 'out' (within or beyond a certain distance from a bat). Categorical spatial relations are regions of space that cover a range of values (see Kosslyn & Koenig, 1992). In this task, individuals classified a ball as 'above' or 'below' a bat. The WS group performed at a comparable level to TD children matched by visuo-spatial ability. However, on both tasks, the WS group unexpectedly showed response biases in the opposite direction to TD children and adults. This suggests that individuals with WS categorise spatial locations in an atypical manner. Although these alternative coding strategies did not negatively affect level of performance on the spatial relations tasks, the tasks were perceptual. It is therefore possible that poor performance on production tasks relates to a negative impact from such strategies.

Object location processing is thought to be a function of the dorsal visual stream (Ungerleider & Mishkin, 1982). Thus, impaired location coding in WS could inform the 'dorsal stream vulnerability' hypothesis, which explains that visuo-spatial cognition in WS can be accounted for by weaker dorsal than ventral stream functioning (e.g. Atkinson et al., 1997). Indeed, in support of this, studies of short term and long term memory have demonstrated a dissociation between impaired memory for spatial location, relative to visual identity in WS (e.g. Vicari et al., 2004; Vicari, Bellucci, & Carlesimo, 2006; Vicari, Bellucci, Santa Marinella, & Carlesimo, 2003). However, on account of mixed support (Atkinson et al., 2006; Jordan, Reiss, Hoffman, & Landau, 2002), current thinking points towards a fractionation of dorsal functions in WS (see Meyer-Lindenberg et al., 2004). Location coding in WS is related to current hypotheses of visuo-spatial processing in WS in the present experiment. Before introducing this Experiment, spatial location coding strategies in typical development are discussed.

متن کامل مقاله

دریافت فوری ←

ISIArticles

مرجع مقالات تخصصی ایران

- ✓ امکان دانلود نسخه تمام متن مقالات انگلیسی
- ✓ امکان دانلود نسخه ترجمه شده مقالات
- ✓ پذیرش سفارش ترجمه تخصصی
- ✓ امکان جستجو در آرشیو جامعی از صدها موضوع و هزاران مقاله
- ✓ امکان دانلود رایگان ۲ صفحه اول هر مقاله
- ✓ امکان پرداخت اینترنتی با کلیه کارت های عضو شتاب
- ✓ دانلود فوری مقاله پس از پرداخت آنلاین
- ✓ پشتیبانی کامل خرید با بهره مندی از سیستم هوشمند رهگیری سفارشات