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The perception of social and mechanical causality in young children with ASD

Elizabeth Ray *, Anne Schlottmann *

Department of Psychology, University College London, Gower Street, London WC1E 6BT, United Kingdom

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Abstract

This study investigated perceptual causality in launch and reaction events in children with ASD (CA = 8.4, VMA = 5.1) and mental age matched controls with typical development and learning difficulties. This is of interest because difficulties with global processing in autism suggest that individuals with ASD may not 'see' causal Gestalts in general, and specific difficulties with reaction perception could be related to difficulties with TOM. Participants matched pictures depicting mechanical and psychological cause and non-causality to computer animated launch and reaction events and delayed control events. Children with ASD showed the typical response to reaction events, matching them with the picture for psychological cause, but they were impaired in launch perception compared to control participants. We discuss the possibility that event duration may be the critical difference between the causal events. The information allowing identification of a reaction is conveyed over a longer time frame (600 ms here) than in launching (21 ms here). This may allow for the deployment of global processes and/or attentional shifts in reaction, but not launch perception.

Keywords: Autism; Perceptual causality; ASD

Adults, talking-age children, and 6-month-old babies show perceptual causality (PC) responses to at least two motion displays: launching and reaction (Fig. 1a and b). When adults (Michotte, 1963; Schlottmann & Anderson, 1993) see one shape, A, approach a stationary shape, B, if B moves immediately upon contact, they see an illusory causal Gestalt. They report, for example, that A hit B into motion—a launch event. A brief pause on impact destroys the causal impression. Even 3-year-olds reliably match launching with a picture showing mechanical causality, rather than psychological causality or independent motion. They choose

* Corresponding authors. Tel.: +44 20 7679 5351; fax: +44 20 7436 4276.
E-mail addresses: e.ray@ucl.ac.uk (E. Ray), a.schlottmann@ucl.ac.uk (A. Schlottmann).

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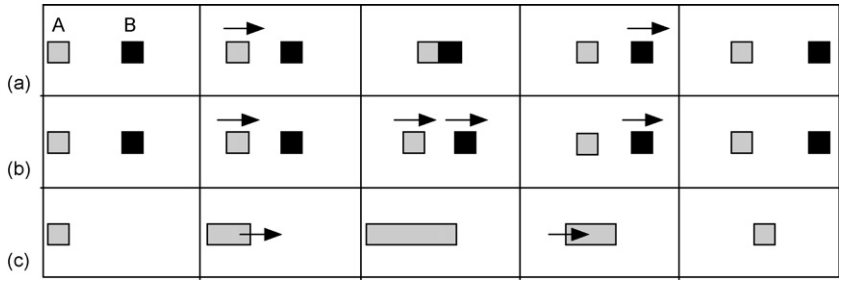

Fig. 1. (a) Schematic launch event, (b) reaction event and (c) non-rigid caterpillar stimulus. (In (a), shape A moves towards B which is stationary. After contact, A is stationary and B moves away. This appears as A launching or pushing B. In (b), B begins to move before contact, slightly before A has reached its final position. This appears as A chasing B and B trying to running away. In (c), a square shape first elongates from the right edge, then contracts from the left edge. The resulting translation appears self-produced and animal-like.)

this picture less often for delayed control events (Schlottmann, Allen, Linderoth, & Hesketh, 2002).

In reaction events, A moves towards B, B moves off before contact, then both move simultaneously until A stops and B continues. Adults (Kanizsa & Vicario, 1968) see this as a goal-directed interaction, e.g., as B running away because A chased it. Three-year-olds (Schlottmann et al., 2002) match the reaction event with a picture showing goal-directed, psychological cause. If A stops before reaching B and B moves after a delay, they report that the objects moved independently.

To assess PC in infants, they are habituated to motion in one direction before the events are reversed around their mid-point. Infants dishabituate more to reversal of launch (Leslie & Keeble, 1987) and reaction events (Schlottmann & Surian, 1999; Schlottmann, Surian, & Ray, in press) than delayed control events. This suggests they are surprised to see the objects swap causal roles, because spatio-temporal changes are equivalent in experimental and control events. Oakes (1994) and Cohen and Amsel (1998) also confirmed 6-months-olds' sensitivity to causal structure in launching.

While origin and nature of PC remain controversial (see special issue of Acta Psychologica, Wagemans, Van Lier, & Scholl, 2006; Schlottmann, Ray, Mitchell, & Demetriou, 2006), its early onset is clear. Thus, PC could support development: it could identify events for causal analysis without prior understanding and bootstrap inferential mechanisms of causal understanding (Leslie, 1988; Schlottmann, 1999). Launching could underpin much knowledge of object physics apparent in the first year (Baillargeon, Kotovsky, & Needham, 1995), while reaction templates could support early social understanding.

1. PC and autism

PC is relevant to theories emphasizing either the social or perceptual/information processing deficits in autism. In the first class fall the theory of mind (TOM) approach (Baron-Cohen, Leslie, & Frith, 1985), and recent proposals about deficits in social orienting (Dawson et al., 2004) or face processing (Shultz, 2005). In the second class fall the weak central coherence account (Frith & Happé, 1994; Happé & Frith, 2006), and enhanced local functioning theories (Mottron, Dawson, Soulieres, Hubert, & Burack, 2006). We outline below reasons why investigating PC in autism is of interest from both perspectives.