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Case Report: Selective Deficit in the Production of Intransitive Gestures in an Individual with Autism

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SELECTIVE DEFICIT IN THE PRODUCTION OF INTRANSITIVE GESTURES IN AN INDIVIDUAL WITH AUTISM

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Left-hemisphere brain damage may result in limb apraxia, a deficit in the processing of gestures (Rothi et al., 1991; Cubelli et al., 2000) which may be transitive (i.e., actual object use), intransitive (i.e., communicative), pantomime (i.e., a gestures that describe the object use), or meaningless gestures (i.e., arbitrary gestures that have no semantics). Previously identified patterns of impaired praxis processing include selective deficits in the production of transitive gestures (Motomura and Yamadori, 1994), object-related gestures (transitive gestures and pantomimes, Dumont et al., 1999), and pantomimes (Bartolo et al, 2003). Cubelli et al. (2000) reported an aphasic patient (Case 19) showing a deficit in intransitive but not transitive gesture production, but pantomimes were not tested. In summary, given the absence of any report distinguishing pantomimes and intransitive gestures, to date it is not possible to conclude that pantomimes and intransitive gestures are processed by different mechanisms (Carmo and Rumiati, in press). Mozaz and colleagues (2002) and Carmo and Rumiati (in press) suggest that the difference between gestures depends on the complexity of the movements to be executed.

However, intransitive gestures differ from pantomimes as well as from transitive gestures in that they include socio-communicative content: “waving hello” puts two people in communication with each other, and a gesture like “I’m cold” communicates an internal state. It is well established that individuals with autism show impaired social communication skills (Dziuk et al., 2007), as well as a demonstrated visual preference for objects in social contexts (Klin et al., 2002). Thus, it is reasonable to expect that individuals with autism may be more affected in the production of intransitive gestures than in the production of object-related gestures. This pattern has not been observed in this population probably because most studies in autism often group intransitive gestures and pantomimes together (Dewey et al., 2007; Mostofsky et al., 2006).

In the course of a group study aimed at evaluating individuals with autism using different gestures, we came across the case of an individual (JK) who showed a clear pattern of selective deficit in the production of intransitive actions.

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Case Report

JK (11 year old male) was diagnosed with autism spectrum disorder (ASD) according to *DSM-I V* (American Psychiatry Association, 1994) criteria. He also achieved scores out of normal range in two tasks assessing social cognitive abilities, the ADOS (Autism Diagnostic Observation Schedule, Lord et al., 1999; pathologic score = above 10, JK score = 15) and the SCQ (Social Communication Questionnaire, Rutter et al., 2003; pathologic score = 15 or above, JK score = 19). Twenty-three typically developing participants (TD, range age 7.3-15.8; mean age 12.0, SD 2.1) served as controls. All participants were administered a series of cognitive tests evaluating their general neuropsychological profile: the Beery Test of Visual Motor Integration (VMI, Beery and Beery, 2004); the Beery Test of Visual Perception (VP, Beery and Beery, 2004); three working memory tasks (Pickering and Gathercole, 2001): Digit recall (DR); Word list matching (WLM); and Listening recall (LR), and IQ (Wechsler, 1999). To avoid false positive diagnoses, we determined the cutoffs as the worst score achieved by the TDs minus two further points (see Bartolo et al., 2001; 2003).

Gesture processing was evaluated by means of twelve tasks assessing gesture comprehension and production. The stimuli were designed for US children. Each task included 20 items (the transitive gestures task included 18). Gesture comprehension was assessed using three gesture/object-or-situation matching tasks testing transitive, intransitive gestures and pantomimes. Gesture production was assessed by means of five tasks assessing transitive gestures (spontaneous object use) and the production of pantomimes and intransitive gestures in verbal and visual modality. Intransitive gestures were elicited after the participant listened to (verbal modality) or watched (visual modality) a social scenario. Imitation was assessed by means of four tasks taxing the reproduction of transitive, intransitive, meaningless gestures and pantomimes.

For every item, each participant was given a score of 1 for correct, 0 for failure, for a maximum score in each task of 20 (18 for production of transitive

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gestures). Failures were determined according to the criteria set out in Bartolo et al, 2008.

Results

JK performed above cutoff in both gesture comprehension and imitation (see Table 1). Pantomimes and transitive gestures production were also performed above cutoff. JK scored below cutoff only in the production of intransitive gestures in both verbal and visual modalities, showing for the first time a dissociation between intransitive gestures (impaired) and pantomimes (well executed). This dissociation is confirmed by Crawford and Garthwaite's (2005) statistical method: JK's pantomime production statistically dissociated from that of intransitive gestures in both the verbal and visual modalities. For verbal modality, there were deficits in intransitive gestures [$t(22) = 6.18$, $p < .001$] and pantomimes [$t(22) = 1.78$, $p = .044$], with a strong dissociation [$r = 0.46$; $t(22) = 4.20$, $p < .001$]; for visual modality, there was a deficit in intransitive gestures [$t(22) = 6.96$, $p < .001$] but not in pantomimes [$t(22) = 0.00$, $p < 1$], with a classical dissociation [$r = 0.37$, $t(22) = 14.37$, $p < .001$]. From a qualitative viewpoint, JK's performance was characterized by "I don't know" answers or by providing the correct verbal response without generating a gesture.

Discussion

Whereas consistent findings show an advantage in the production of intransitive gestures over pantomimes (Bartolo et al, 2003; Dumont et al., 1999; Mozaz et al., 2002; Carmo and Rumiati, in press), JK is the first report of a selective deficit in the production of intransitive gestures. This deficit cannot be due to gesture complexity, since JK's performance was above cutoff in gesture imitation, thus improving when a model was provided. It also cannot be explained by arguing that intransitive gestures based on a story telling task may be too complex for an autistic participant. Indeed, JK had an intact cognitive profile, in particular his language comprehension skills were adequate for following verbal

instructions, participating in functional conversation, and completing a test of listening recall above cutoff. Moreover, his verbal IQ score was well above cutoff. These finding weaken the plausibility of attributing the impairment of gestural performance to a pure language comprehension deficit . Finally, JK was also able to comprehend the visual social scenario, since he could match a gesture to the correct situation.

Overall, this finding contradicts the hypothesis that any deficit is complexity-driven (Mozaz zt al., 2002; Carmo and Rumiati, in press). To understand the nature of JK's pattern, it is worth noticing that during conversational speech, JK demonstrated a reduced capacity to integrate gestures into social communication, and although his "I don't know" responses in the production of intransitive gesture task predominated; at times he also expressed correct knowledge of the gesture to be executed, further confirming this difficulty in integrating the appropriate gesture in the specific social context. Recently, Dziuk et al. (2007) found a correlation between praxis and social impairments suggesting that dyspraxia may be a 'core feature of autism' (p. 734). JK performed out of the normal range in tasks assessing socio-cognitive abilities (ADOS and SCQ) as well as in tasks of intransitive gesture production. Therefore, given that the only tasks JK failed were those assessing social abilities and the production of intransitive gestures, we claim that a more convincing explanation is that the ability to produce intransitive gestures relies on socio-cognitive skills.

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