

Autism, kinematics and social cognition

Jennifer L. Cook^{1*}

1 School of Psychology, University of Birmingham, Edgbaston, Birmingham, United Kingdom

Autism¹ is a neurodevelopmental condition associated with social and communication difficulties, repetitive behaviours and restricted routines (American Psychiatric Association, 2013). Decades of autism research have focused on social and language abilities. This literature has made claims, for example, that autistic individuals have difficulties with socio-cognitive abilities such as imitation, perceiving and recognising human movement (biological motion perception), and recognition of facial expressions. A parallel literature highlights differences in the way that autistic individuals move their bodies to express themselves. This paper draws together these parallel literatures. I argue that when we interact with other people we read their body movements (i.e. their “body language”) in order to infer what they are thinking and feeling inside. However, because autistic and non-autistic people move differently, their bodies may be speaking a different language. The implications of this are two-fold. First, the conclusion drawn from the existing literature, that autistic individuals have “difficulties” with socio-cognitive abilities (e.g. imitation, emotion recognition) is flawed because these abilities are often tested using stimuli based on non-autistic body movements and facial expressions. It is likely that autistic individuals are able to “read” body movements and facial expressions if the movements are similar to their own. Second, differences in body language can create barriers to achieving optimal education, life and social skills outcomes, for example, by inhibiting communication in a mentor-mentee relationship. Future work should assess the extent to which communication can be improved if interaction partners take time to learn the language of each other’s body movements.

1. Social cognition and autism

Many studies have demonstrated differences between autistic and non-autistic participants in various domains of social cognition. For example, we (Cook et al., 2009), and others (Kaiser et al., 2010), have reported differences in classifying movement stimuli as representing ‘human’ / ‘non-human’, or ‘natural’ / ‘unnatural’ movement (though see Edey et al (2018)). A number of studies have also reported differences in interpreting emotion from facial expressions (Braverman et al., 1989; Brewer et al., 2015; Capps et al., 1992; Davies et al., 1994), posture (Hadjikhani et al., 2009) and body movement (Atkinson, 2009; Hubert et al., 2007; Nackaerts et al., 2012). However, there are inconsistencies in the literature. For example, in our own work, we have seen differences between autistic and non-autistic adults in imitating dynamic sweeping arm movements (Cook et al., 2014), but no differences in imitating snapshots of finger tapping (Cook and Bird, 2012). There are many factors that might contribute to the inconsistencies in the literature. In the next section I focus on the role of body movements.

2. Autistic body movements and their role in social cognition

Our work has shown differences between autistic and non-autistic adults in the kinematics of body movements (Cook et al., 2013; Edey et al., 2016). Using motion-tracking technology, we found that autistic arm movements are characterised by more jerky, less smooth, patterns of motion. Accounting for movement differences may explain some of the inconsistencies in the social cognition literature. For example, I note above that we have seen differences between autistic and non-autistic adults in imitating sweeping arm movements (Cook et al., 2014), but not finger tapping

¹ ‘Disability-first’ terminology is used throughout in line with the majority preference expressed in a survey of the autistic community (Kenny et al., 2016)

(Cook and Bird, 2012). Importantly we have also seen differences between autistic and non-autistic adults in executing sweeping arm movements, whereas autistic finger tapping movements are not atypical (Gowen and Miall, 2007). Thus, autistic adults do not exhibit atypical imitation when the movement is within their normal motor repertoire (i.e. finger tapping). The atypical imitation reported in Cook et al. (2014) is therefore likely to be related to the fact that the imitative stimulus comprises an unusual movement (i.e. sweeping arm movements with non-autistic kinematics). It is unlikely that this result reflects a difficulty with imitation *per se*.

Indeed, body movement kinematics are not only important for a range of everyday tasks (from handwriting to ball throwing) but are central to social cognition. Consequently, differences between autistic and non-autistic movements may comprise a double-sided social barrier. When we interact with other people we use body movements to help infer thoughts and feelings. To a large extent, we do this using our own patterns of body movement as ‘templates’ (Cook, 2016; Edey et al., 2017). Autistic people may have different movement templates which do not ‘fit’ non-autistic movements, thus making inferences from non-autistic body movements difficult (Cook et al., 2014, 2013, 2009; Edey et al., 2016). However, importantly, we found that the converse is also true: most non-autistic people are unlikely to have accurate templates of autistic movement, thus making it difficult for non-autistic people to interpret the thoughts and feelings that underlie autistic body movements (Cook, 2016; Edey et al., 2016).

To illustrate: We asked autistic and non-autistic participants to use their arm movements to animate two cardboard triangles in a way that suggests the triangles are coaxing, mocking, surprising, or seducing each other (Edey et al., 2016). We videoed the results and asked other participants to judge the extent to which each video depicted these four mental states (coaxing, mocking, seducing or surprising). We found that non-autistic participants produced highly accurate ratings for videos created by other non-autistic participants. However, their accuracy significantly dropped when making judgements about videos produced by autistic participants. Thus, non-autistic participants had difficulties with “reading” the mental states depicted in the movements generated by autistic participants.

3. Conclusion

Body movements are an important non-verbal cue which help us infer others’ thoughts and feelings. However, because autistic and non-autistic people move differently, their bodies may be speaking a different language. Empirical work should recognize this and endeavor to use stimuli based on autistic movements and facial expressions. Future work should also aim to remove barriers to achieving optimal education, life and social skills outcomes by investigating the potential benefits of body language learning. For example, a professional working closely with an autistic person might benefit from additional time/training to allow them to better identify how that particular individual uses their body to express themselves.

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