



## Training social cognition: From imitation to Theory of Mind

Idalmis Santiesteban<sup>a</sup>, Sarah White<sup>b</sup>, Jennifer Cook<sup>b</sup>, Sam J. Gilbert<sup>b</sup>, Cecilia Heyes<sup>c</sup>, Geoffrey Bird<sup>a,b,\*</sup>

<sup>a</sup> Department of Psychological Sciences, Birkbeck, University of London, Malet Street, London WC1E 7HX, UK

<sup>b</sup> Institute of Cognitive Neuroscience, University College London, 17 Queen Square, London WC1N 3AR, UK

<sup>c</sup> All Souls College, University of Oxford, Oxford OX1 4AL, UK

### ARTICLE INFO

#### Article history:

Received 10 May 2011

Revised 4 November 2011

Accepted 11 November 2011

Available online 30 November 2011

#### Keywords:

Imitation

Mirror neurons

Theory of Mind

Training social cognition

Self-other

Perspective taking

Imitation–inhibition

### ABSTRACT

Evidence for successful socio-cognitive training in typical adults is rare. This study attempted to improve Theory of Mind (ToM) and visual perspective taking in healthy adults by training participants to either imitate or to inhibit imitation. Twenty-four hours after training, all participants completed tests of ToM and visual perspective taking. The group trained to inhibit their tendency to imitate showed improved performance on the visual perspective-taking test, but not the ToM test. Neither imitation training, nor general inhibition training, had this effect. These results support a novel theory of social cognition suggesting that the same self-other discrimination process underlies imitation inhibition and perspective taking. Imitation, perspective taking and ToM are all pro-social processes – ways in which we reach out to others. Therefore, it is striking that perspective taking can be *enhanced* by *suppressing* imitation; to understand another, sometimes we need, not to get closer, but to pull away.

© 2011 Elsevier B.V. All rights reserved.

### 1. Introduction

Sometimes we meet a stranger and the interaction is remarkably smooth; rapport builds, we quickly begin to feel close, to believe that this person can put themselves in our shoes and understand the way we think and feel. Conversely, social interactions can be awkward, and mutual understanding is never achieved. Many factors contribute to complex interactions of this kind, but one that has received much recent attention from social psychologists is imitation (also known as ‘mimicry’, e.g. Chartrand & Bargh, 1999). Imitation has been shown to contribute significantly to the development of positive social attitudes such as rapport (Lakin & Chartrand, 2003) and liking (Kühn et al., 2010) between strangers. Thus, when an individual imitates our actions we feel closer to them. We may think

that they can easily see the world from our perspective. But is this correct – does the act of imitating make the imitator better at taking the perspective of others? Conversely, if an individual inhibits imitation, does he become poorer at understanding the mental states of others?

#### 1.1. From imitation to ToM – two contrasting theoretical approaches

Two current theoretical frameworks suggest contrasting answers to these questions. The first, advanced by various researchers (e.g., Gallese & Goldman, 1998; Rizzolatti & Craighero, 2004), proposes that imitation, and its neural substrate the mirror neuron system (MNS; Catmur, Walsh, & Heyes, 2007; Heiser, Iacoboni, Maeda, Marcus, & Mazzitot, 2003), is at the core of higher-order socio-cognitive functions such as Theory of Mind (ToM) – representing the *mental states* of another – and empathy – representing the *emotions* of another. Under this hypothesis, action observation triggers motor representations that enable the reproduction of the observed action (imitation). This in turn

\* Corresponding author at: Department of Psychological Sciences, Birkbeck, University of London, Malet Street, London WC1E 7HX, UK. Tel.: +44 20 7631 6209; fax: +44 20 7631 6312.

E-mail address: [g.bird@bbk.ac.uk](mailto:g.bird@bbk.ac.uk) (G. Bird).

results in the ascription to the other of mental states associated with performance of that action (ToM). On this account, one would expect an intervention that promotes the triggering of corresponding motor representations by action observation (imitation training) to enhance the ability to represent the mental states of others.

An alternative theoretical approach suggests that it is processes mediating the *distinction and control* of representations pertaining to the self and the other, rather than the MNS, that plays a crucial role in supporting higher-order socio-cognitive abilities like ToM (Brass, Ruby, & Spengler, 2009). Crucially, this theory suggests that ToM is related not to imitation, but to the *inhibition* of imitation. When inhibiting the tendency to imitate another person's behaviour, the observer must distinguish between their own action intentions and those of the observed person (Brass & Heyes, 2005), and carry out their own motor intention rather than that of the other. The same process of distinguishing the content of one's own mental states from the representation of another's mental state is argued to be necessary for ToM, even though usually the 'control problem' in ToM is usually the converse of that encountered in imitation inhibition; one must inhibit one's own mental state and represent that of the other. Thus, this theory suggests that both ToM and imitation inhibition share the same component self-other processes. Importantly, in contrast to the MNS theory of social cognition, this theory predicts that training in imitation inhibition (rather than imitation) will result in an improvement in ToM.

The present study aimed to test these two contrasting theoretical approaches by training participants either to imitate or to inhibit imitation, and measuring transfer effects on ToM and perspective-taking tasks in healthy adults. In addition to the imitation and imitation-inhibition training groups, a third group received training in general inhibitory control using a Stroop-like paradigm. The third group was introduced in order to ensure that any effects of the imitation-inhibition training were specific to this socially relevant type of training, and not the result of a generalised improvement in inhibitory control. Twenty-four hours after training all participants performed three different tasks: an imitation-inhibition task, an advanced ToM task (Strange Stories, based on Happé, 1994) and a perspective-taking task (Director task – Keysar, Barr, Balin, & Brauner, 2000). The imitation-inhibition task requires participants to perform pre-specified responses while observing either the same or a different action. This test provides an index of the ability to inhibit the tendency to imitate; and therefore affords a method of checking whether the training manipulation was successful. Both the Strange Stories and Director tasks require the attribution of mental states to another. The Strange Stories task requires the attribution of mental states to a protagonist in a story, while the Director task requires participants to adopt the point of view of a character in order to follow his instructions to move objects. Crucially, although both require mental state attribution, successful performance in the Director task requires a high degree of self vs. other distinction, while this distinction is less necessary in the Strange Stories task. The Director task requires participants to continuously separate what they can see from what the

Director can see. However, although the Strange Stories task requires participants to represent the mental state of another, there is less demand to isolate the participant's own mental state from that of the protagonist.

This study aims to test whether imitation or imitation-inhibition training results in improved ToM and/or perspective taking. If the MNS hypothesis is correct and there is a direct link between imitation and ToM, then the imitation training group is expected to perform better in the ToM and perspective-taking tasks than the other groups. Conversely, if the imitation-inhibition training group outperforms the other groups, then this study would provide evidence in favour of the hypothesis, put forward by Brass et al. (2009), that the control of shared representations, through self-other distinction, is the 'missing link' between the MNS and ToM abilities. Finally, a lack of an effect on tests of perspective taking and ToM by either type of imitative training would suggest that imitation, perspective taking and ToM are distinct socio-cognitive processes.

## 2. Method

### 2.1. Participants

Fifty-three adults (29 females, age range 19–50 years,  $M = 26.7$ ,  $SD = 6.6$ ) participated in this study for a small monetary reward. Participants were randomly assigned to the imitation ( $N = 19$ ), imitation-inhibition ( $N = 17$ ), or inhibitory control ( $N = 17$ ) groups. Groups did not differ in terms of age ( $F(2,52) = .221$ , ns), gender ( $\chi^2 = .257$ , ns), or handedness ( $F(2,52) = .228$ , ns).

### 2.2. Procedure

All participants attended two sessions on consecutive days. On the first day they received training, and on the second day completed the imitation-inhibition, Strange Stories, and Director tasks in that order.

#### 2.2.1. Imitation and imitation-inhibition training

Participants in these two groups performed a task based on that developed by Brass, Bekkering, Wohlschläger, and Prinz (2000). Stimuli consisted of short videos showing either an index or middle finger performing a lifting movement (Fig. 1). The imitation group were asked to perform the action they observed on the screen. When the index finger of the stimulus hand lifted, participants were required to lift their own index finger. Similarly, when the middle finger lifted, participants were required to lift their middle finger. The imitation-inhibition group were instructed that when they saw an index finger lift they should lift their middle finger, and when they saw a middle finger lift they should lift their index finger. The stimulus hand was rotated around the sagittal and transverse planes with respect to the participant's hand (see Fig. 1), which rested on the computer keyboard. As response movements were spatially orthogonal to stimulus movements, imitation could be isolated from spatial compatibility.

متن کامل مقاله

دریافت فوری ←

**ISI**Articles

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