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Review article

What are reaction time indices of automatic imitation measuring?

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ABSTRACT

Humans unintentionally copy other people's gestures, postures and speech patterns. This behaviour has been termed 'automatic imitation', and is thought to play a crucial role in the development of social relationships by building affiliation and rapport between interaction partners. The current paper critically evaluates reaction time measures of automatic imitation and demonstrates that it is currently unclear what reaction time indices measure, due to a lack of research assessing dimensions of validity and domain-specificity. Based on this assessment of the literature, three suggestions are made for future research. First, studies that assess the validity of reaction time paradigms as an index of automatic imitation are required. That is, the extent that processes involved in reaction time measures of automatic imitation also operate in real-world copying behaviours needs firmly establishing. Second, the extent that component processes of automatic imitation rely on domain-specific, domain-general or a combination of both types of cognitive system needs establishing. Moreover, theories of imitation that move beyond neat divisions between domain-specific and domain-general systems should be prioritised. Third, a case is made for why methodological rigour requires far more emphasis in order to support the development of a cumulative science of automatic imitation. In sum, by providing a critical review of the current literature, as well as suggesting new directions for research questions, theories and methods, this paper aims to stimulate discussion regarding optimal approaches to studying automatic imitation. Moreover, the analysis and recommendations presented here generalise to other domains of social cognition, such as gaze perception and perspective taking, which also rely on similar reaction time paradigms.

1. Introduction

During social interactions, we unintentionally copy other people's actions. For example, we may copy an interaction partner's body posture, gestures or speech patterns without intending to do so. Such automatic imitation behaviour has been argued to serve a central social function by building affiliation, rapport and liking between individuals (Chartrand & Lakin, 2013).

Given the ubiquitous influence of imitation on our daily lives, it is not surprising that researchers in diverse sub-disciplines of psychology and neuroscience have studied imitation as a means to better understand human social behaviour. Across these research domains, a variety of methods have been adopted to study imitation, which vary in ecological validity (Fig. 1). In developmental and social psychology, for example, methods typically involve observing live interactions and recording overt copying behaviours (Chartrand & Lakin, 2013; Ray & Heyes, 2011). The advantage of observing live social interactions is the relatively straightforward sense in which copying behaviours relate to real-life imitation behaviour. By contrast, in cognitive psychology, reaction time measures of automatic imitation have been designed based on stimulus-response compatibility (SRC) paradigms (Brass, Bekkering, Wohlschlagler, & Prinz, 2000; Stürmer, Aschersleben, & Prinz, 2000). SRC paradigms have the advantage of being amenable to study

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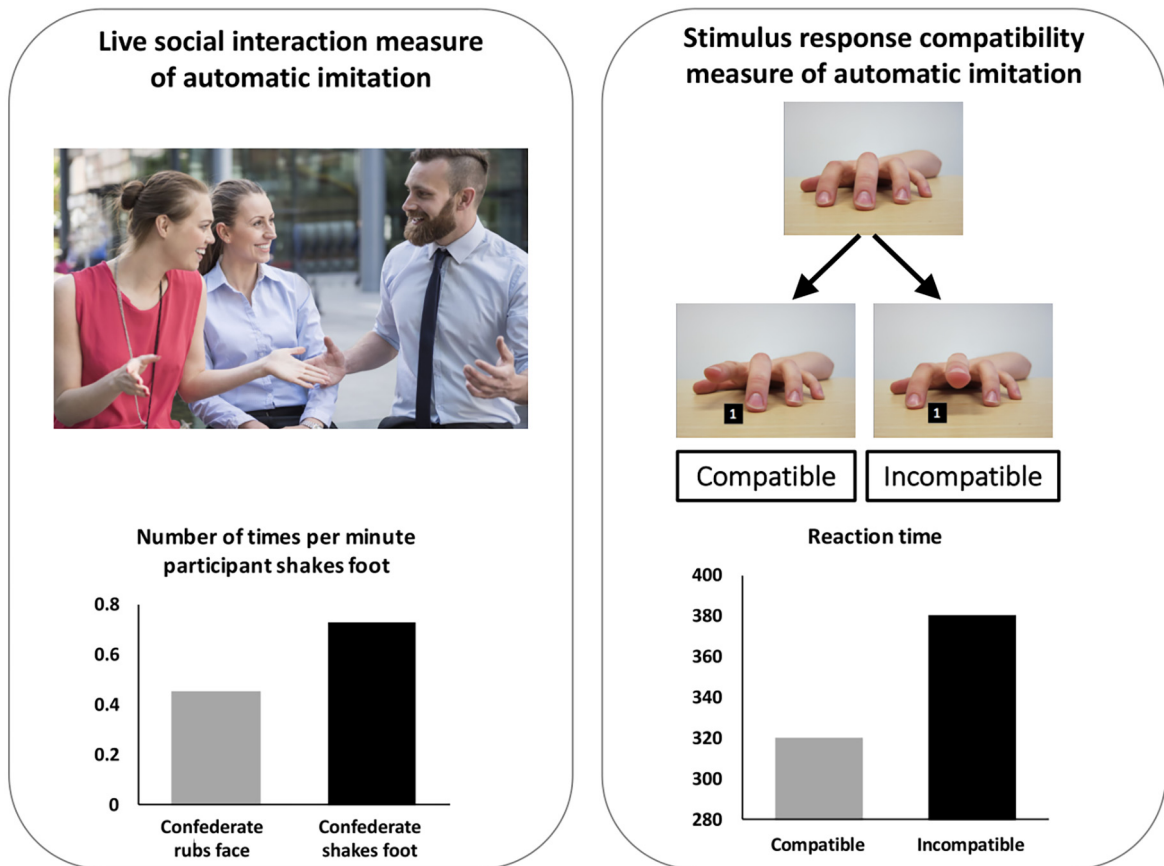


Fig. 1. Two approaches to measuring automatic imitation. In the left panel, unintentional copying behaviours are recorded during live social interactions (e.g., Chartrand & Bargh, 1999). A confederate may rub her face or shake her foot during a conversation, and the number of matching actions performed by the participant are recorded. The number of times per minute that a participant shakes her foot is greater when the confederate shakes her foot than rubs her face. As such, even though there is no instruction to copy actions, participants appear to unintentionally imitate the actions of their interaction partners. In the right panel, reaction times are recorded during a stimulus response compatibility paradigm (e.g., Brass et al., 2000). In one example paradigm, participants are instructed to lift their index finger if a number 1 is presented and lift their middle finger if a number 2 is presented. Concurrent with this instruction, participants also observe a finger lift that can either be compatible or incompatible with the participant's finger lift. Reaction times are longer in the incompatible than compatible conditions and this difference is thought to index the additional cognitive resources required to suppress the urge to imitate the incompatible action and enforce one's own intended action.

in controlled laboratory environments, but the disadvantage of reduced ecological validity to real-life copying behaviour. Drawing links between reaction time measures and real-world imitation behaviour is therefore less direct than observational approaches and requires further validation.

The validity of a measure, along with its reliability, are important concerns for any scientific method of measurement: Are the tools used to study a particular phenomenon consistent across time (are they reliable?) and do they measure what they intend to measure (are they valid?)? Here, I address these questions with regard to automatic imitation research with a particular focus on reaction time measurements. In addition, I also review evidence that speaks to the specificity or generality of the component processes that make up automatic imitation. Like many complex cognitive processes, assessing evidence for domain-specificity is important when interpreting SRC measures of automatic imitation. For example, SRC measures could be a valid measure of real-world copying tendencies but operate on domain-general cognitive and neural architectures for prioritising and guiding behaviour. As such, in addition to reliability and validity, I outline how it is also important to concurrently consider domain-specificity when interpreting component processes of SRC measures of automatic imitation.

The paper is structured in four parts. First, I provide a short review of reaction time tasks that are typically employed in cognitive psychology to study imitation (for a detailed review, see Heyes, 2011). Second, I review evidence that assesses the reliability and validity of these reaction time measures. I show that we currently know very little about the reliability or validity of reaction time measures of automatic imitation and this presents a major obstacle to promoting a progressive research programme (Lakatos, 1970; Meehl, 1990). Third, I consider the extent to which component processes of automatic imitation rely on domain-specific and domain-general cognitive and neural mechanisms. I show that there is evidence for a strong domain-general contribution to component processes that involve the control of automatic imitation, which is contrary to a dominant view in the literature. In the final part of

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