



Full length article

Outcome producing potential influences twelve-month-olds' interpretation of a novel action as goal-directed



Szilvia Biro^{a,b,*}, Stephan Verschoor^b, Esther Coalter^b, Alan M. Leslie^c

^a Centre for Child and Family Studies, Leiden University, Wassenaarseweg 52, 2333 AK Leiden, The Netherlands

^b Institute of Psychology, Leiden University and Leiden Institute for Brain and Cognition, Wassenaarseweg 52, 2333 AK Leiden, The Netherlands

^c Department of Psychology and Center for Cognitive Science, Rutgers University, 152 Frelinghuysen Road, Piscataway, NJ 08854, USA

ARTICLE INFO

Article history:

Received 13 March 2014

Received in revised form 31 July 2014

Accepted 29 September 2014

Keywords:

Action interpretation

Goal attribution

Cognitive development

ABSTRACT

Learning about a novel, goal-directed action is a complex process. It requires identifying the outcome of the action and linking the action to its outcome for later use in new situations to predict the action or to anticipate its outcome. We investigated the hypothesis that linking a novel action to a *salient change in the environment* is critical for infants to assign a goal to the novel action. We report a study in which we show that 12-month-old infants, who were provided with prior experience with a novel action accompanied with a salient visible outcome in one context, can interpret the same action as goal-directed even in the absence of the outcome in another context. Our control condition shows that prior experience with the action, but without the salient effect, does not lead to goal-directed interpretation of the novel action. We also found that, for the case of 9-month-olds infants, prior experience with the outcome producing potential of the novel action does not facilitate a goal-directed interpretation of the action. However, this failure was possibly due to difficulties with generalizing the learnt association to another context rather than with linking the action to its outcome.

© 2014 Elsevier Inc. All rights reserved.

1. Introduction

As adults, we habitually see actions of social agents as bent toward particular ends. However, learning about a novel, goal-directed action is not a straightforward process, it involves multiple steps (Csibra & Gergely, 2007). When one observes a novel action for the first time, one has to be able to identify the outcome of the observed action and figure out which aspects of the action are essential for achieving the outcome. A second necessary step is to store the link between the observed novel action and its outcome for future use. Finally, one has to be able to retrieve the stored link and to use it in an entirely new context. For example, observation of the novel action in a new situation can lead to the anticipation of the outcome without having witnessed the attainment of the associated outcome. This last step of appreciating that the novel action has

* Corresponding author at: Centre for Child and Family Studies, Leiden University, Wassenaarseweg 52, Leiden, 2333 AK Leiden, The Netherlands. Tel.: +31 0 71 527 4815.

E-mail address: sbiro@fsw.leidenuniv.nl (S. Biro).

the potential to produce a particular outcome, enables us to engage in fast on-line processes of intertwined goal anticipation and action prediction¹.

A number of mechanisms have been suggested for the above steps in the process of learning about a novel goal-directed action. Teleological reasoning (Gergely & Csibra, 2003) and simulation procedures (e.g., Meltzoff, 2002; Tomasello, 1999) have been suggested to solve the inferential problem of action and goal selection, and a bi-directional action-effect association mechanism (Hommel, Musseler, Aschersleben, & Prinz, 2001) has been proposed to take care of the linking and retrieval of stored means-end relations. While there is debate about the relations between these mechanisms and the role they play in the emergence and development of goal-directed action interpretation in infancy (e.g., Woodward, 2009; Biro & Leslie, 2007; Biro, Verschoor, & Coenen, 2011; Shimizu & Johnson, 2004; Johnson, 2000), most of these mechanisms seem to share an assumption about an important precondition in infancy for interpreting novel actions as goal-directed. For infants to be able to successfully identify the outcome, and to link it to the action, the outcome of the novel action needs to involve a *salient and easily detectable change* in the environment (e.g., Király, Jovanovic, Prinz, Aschersleben, & Gergely, 2003; Elsner, 2007; Biro & Leslie, 2007; Meltzoff, 1988; Verschoor, Weidema, Biro, & Hommel, 2010).

The assumption of the necessity of a salient outcome is inherent in teleological reasoning (Gergely & Csibra, 2003), which states that an action is judged as a well-formed goal-directed action if it can be justified as an efficient action towards the outcome. Thus, when one observes a novel action, the goal of the action can be inferred by considering what change of state would be efficiently brought about by this action in the given situation. However, young infants have only limited background resources – such as knowledge about physical constraints – to make such inferences when the outcome is not immediate, not directly visible, or only one of many co-occurring outcomes (e.g., Csibra, Biro, Koós, & Gergely, 2003). The presence of a salient effect can therefore considerably ease the evaluation of an observed novel action. The role of salient changes is also central in the theoretical account proposed to explain the development of action planning and perception (Elsner & Hommel, 2001) on the basis of William James' ideomotor principle. This theory states that actions are inherently represented and linked to each other by their distal effects. Furthermore, theories that credit infants with domain specific modular systems that are sensitive to behavioral cues have also emphasized the role of salient outcomes caused by the means in infants' attribution of goal-directedness (e.g., Leslie, 1994; Gergely et al., 1995). In particular, Biro and Leslie (2007) recently proposed a cue-based bootstrapping model which claims that infants' innate sensitivity to behavioral cues (such as salient outcomes, self-propelledness, variations of the action) is coupled with a learning mechanism that can link behavioral cues to other surface features such as the appearance or type of actions. When such a link has been established, infants can anticipate goal-directed actions from actors identified by surface features without collecting direct evidence for behavioral cues.

While the influence of observed salient action effects on infants' own exploratory or imitative behavior is well-documented (e.g., Elsner, 2007; Elsner & Aschersleben, 2003; Gerson & Woodward, 2012; Hauf, Elsner, & Aschersleben, 2004; Rovee-Collier, 1987; Verschoor et al., 2010), there is much less evidence of their impact on infants' understanding of and prediction for others' observed novel actions (see Section 4 below). The aim of the current paper is to investigate the role of a salient outcome in the process of interpreting a novel action as goal-directed. Thus, we asked whether infants can appreciate the link between a novel action and its salient outcome and whether they can make use of the learnt link in a new context by interpreting the observed novel action as directed to a particular goal even in the absence of the salient outcome. In other words, we tested whether infants can assign a goal to an unfamiliar action that in a different context they had previously associated with a salient visible effect.

There is evidence that infants can already interpret a *familiar* hand action such as grasping as goal-directed as early as six months of age. In a study using a visual habituation method, infants watched a hand repeatedly grasping one of two toys on a stage (Woodward, 1998). After habituation, the positions of the toys were swapped and the hand grasped either the new toy in the old location or the old toy in the new location. Infants looked longer at the new toy test event indicating that they expected the hand to grasp the same toy. However, when 6 and 9-month-old infants were habituated in a similar setting with an unfamiliar novel action in which the back of a hand simply touched one of the target toys, the infants looked equally long in the two test events, which suggests that they did not specifically expect the hand would touch the same toy again (Woodward, 1999).

It has been suggested, however, (Király et al., 2003; Biro & Leslie, 2007) that infants' predictions in the grasping hand condition might not have been based on the grasping action per se, but rather on the strong association of the potential salient outcome that a grasping action can produce (such as the picking up of an object), a means-end relation with which infants are very familiar (Leslie, 1982, 1984). The crucial role of a salient action effect in interpreting a novel action as directed towards a particular goal-state has been demonstrated by replicating the “back of the hand touch” experiment in which the back of the hand did not only touch, but also pushed the target toy to a new location in both the habituation and test phases (Király et al., 2003; Jovanovic et al., 2007). In these experiments, infants from 6 months seemed to interpret the action as goal-directed: they expected the hand to touch and push the same object. A similar looking pattern was found when other types of unfamiliar actions with salient outcomes were used in the same experimental paradigm (Hofer, Hauf,

¹ Note that by the term “outcome” we mean the actual (causal) effect of the action, while we use the term “goal” to refer to the mental representation of this outcome. An action is thus considered goal-directed if it can be seen as performed to achieve a particular outcome, in other words, if it is a means to an end.

Download English Version:

<https://daneshyari.com/en/article/10452640>

Download Persian Version:

<https://daneshyari.com/article/10452640>

[Daneshyari.com](https://daneshyari.com)