



A variation of the social context in the warm-up period influences 18-month-olds' imitation

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ABSTRACT

The present study aimed to investigate how the prior social disposition of a model in a warm-up period influences 18-month-old infants' subsequent imitation. Infants were randomly assigned to an interactive and social warm-up period ($n = 19$) or a non-interactive and non-social warm-up period ($n = 19$) with the model prior to the imitation task. They then participated in an imitation task with different types of actions: novel means actions, arbitrary vs. functional actions and necessary vs. unnecessary actions. An additional social warm-up control group ($n = 14$) and a non-social warm-up control group ($n = 14$) were recruited to assess the spontaneous production of the target actions in the absence of the demonstration. The results showed that infants in the experimental groups performed significantly more target actions than infants in the control groups, showing an imitation effect. Furthermore, the results of the experimental groups showed that the overall imitation performance of the target actions was higher in the social condition than in the non-social condition. This imitation enhancing effect of the social warm-up period held true for the novel means actions and functional vs. arbitrary actions, however not for the necessary vs. unnecessary actions. Implications of the results for theory and future studies are discussed in terms of infants' social motivation and its relation to infants' imitative behavior.

1. Introduction

Imitation refers to social learning in a broad sense, while following a much more strict terminology it means copying means and goals in a high fidelity manner. Imitation enables the acquirement of knowledge and skills in a relatively short time by avoiding time consuming trial-and-error learning (Bekkering, Wohlschlaeger, & Gattis, 2000) and is therefore an important learning mechanism especially during infancy and childhood. Accordingly, for the last decades, the study of imitative development during infancy has received a tremendous amount of attention (Nadel, 2014). Most studies have been conducted with a standardized imitation paradigm (Meltzoff, 1985). In this experimental procedure, the infant observes a model performing target actions on one or a series of unfamiliar objects. After that, the objects are handed to the infant and imitative behavior is observed – either immediately, assessing action perception and action understanding, or after a delay, assessing long-term memory processes (Abravanel & Gingold, 1985).

As most studies on infants' imitation involve an unfamiliar human model, the vast majority of studies conduct a warm-up period prior to the demonstration phase to make the infants familiar with the testing environment and the model. So far, however, the model's sociability and the type of interaction during a warm-up period have not been systematically studied; a short warm-up period itself has been considered sufficient to elicit a high level of imitation and studies have freely chosen the form and content of it

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(Devouche, 1998).

There is some limited evidence in previous work, however, that a variation in the warm-up period could affect infants' imitation performance. For example, Somogyi and Esseily (2014) reported that when the experimenter mimicked 16-month-old infants' actions before a tool-use task, infants imitated the target actions with a higher rate than after a neutral warm-up period. Also, playing with the infants without mimicking them led to a better performance than when infants played on their own. Zmyj, Schneider and Seehagen (2017) showed that an extended warm-up phase led to a decrease of infants' cortisol level. The authors pointed out that an elevated stress level due to a short or non-existing warm-up period might impair infants' cognitive abilities during the test period. Furthermore, Nielsen (2006) investigated more specifically the influence of a variation of the model's prior sociability. In this study, 18-month-old infants were assigned to one of two warm-up conditions. In the "social" condition, the model was sitting during the warm-up period at a table and engaged in a social interaction with the child (e.g., smiling, eye contact) while an assistant was playing with the child and familiarized him/her with the room. In the "aloof" condition, the model was absent during the warm-up period and met the child for the first time in the test room. In the demonstration phase, infants watched the model retrieve a toy from a closed box by disengaging a switch located on the front of the box. Although the box could be easily opened by hand, the model opened the box by using an object. During demonstration, the model's actions were either accompanied by social-communicative cues (social condition) or the model remained focused on the toy and avoided eye contact (aloof condition). The results showed that 18-month-old infants' imitative behavior was influenced by the social disposition of the model. Infants imitated more exactly the specific object-use when the model acted socially, but imitated selectively only the end-state of the action when the model acted aloof.

One theory that was suggested to explain these differences is the social affiliation account which explains that infants' exact versus selective imitation varies to the extent to which they are motivated primarily by cognitive or social motivation (Carpenter, 2006; Over & Carpenter, 2012; see also Užgiris, 1981). That is, in situations in which cognitive motivation predominates, infants focus much of their attention on the functions of the objects in order to learn a new skill and are accordingly mainly interested in attaining a particular result. Consequently, they selectively imitate the elements of the demonstrated target actions that are relevant for achieving that result. In contrast, in situations in which social motivation predominates, infants seek to affiliate with the model and are interested in sustaining the interaction. As a function of this social motivation to imitate, infants are more likely to match their own behavior with the models' behavior. Accordingly, the modeled target actions are imitated more exactly by the infants, even if the actions are irrelevant to achieve a certain outcome or to manipulate an object. Hence, it has been suggested that infants' exact imitation can be used as an indicator of social motivation (e.g., Carpenter, 2006; Van Etten & Carver, 2015). In contrast, alternative theories explain infants' variation in imitative behavior according to what infants interpret as the models' intentions or goals to be: infants imitate the modeled actions more exactly when no other end-state of an action could be perceived as a goal. However, when a clear final end-state is present, infants selectively imitate only the relevant actions in order to achieve the goal (Bekkering et al., 2000; Carpenter, Call, & Tomasello, 2005). Since this account cannot explain why infants in the social condition imitated also the unnecessary actions although the end-state was clear to distinguish (Yu, 2015), support for the social affiliation account seems to be more plausible.

There are, however, some important limitations in previous studies that preclude a precise understanding of how the prior social disposition of the model in a warm-up period influences infants' subsequent imitation. First, in Nielsen's (2006) study, the assistant and not the model had a warm-up period with the infant in the social condition. Hence, no active interaction between the model and the infant took place. Furthermore, in the aloof condition, the model did not meet the infant before the demonstration phase and was, accordingly, an unfamiliar person for the infants. Second, as the use of social-communicative cues was varied between the social vs. aloof condition in the demonstration phase as well, it is not clear whether the disposition of the model in the warm-up period was the only factor that could have had an impact on infants' imitation.

Third, infants' exact imitation was investigated with only one action type, whereas in other previous studies, exact imitation was also measured with different action types. For example, the first type of imitation task measures the acquisition of novel means actions, which are unusual novel actions to produce an interesting effect on novel objects even though the same effect could be easily achieved by more familiar means (e.g., using one's forehead instead of one's hand to turn on a light, see Meltzoff, 1988; Herold & Akhtar, 2008). A list of studies showed that the social-communicative context had an effect on infants' exact imitation of novel means actions (e.g. Király, Csibra, & Gergely, 2013; Shimpi, Akhtar, & Moore, 2013).

The second type of imitation task varies the functionality of target actions (see Óturai, Kolling, Rubio Hall, & Knopf, 2012). Functional actions are those that require specific object properties and are thus strongly connected to the objects, whereas arbitrary actions do not require specific object properties and thus could be performed on a wide range of objects. Óturai et al. (2012) showed that 12-month-old infants only imitated the functional actions, whereas 18-month-olds imitated both kinds of actions. The authors pointed out that the imitation of arbitrary actions observed in older infants may serve social functions.

The third type of imitation task is a two-action sequence on an object in two different causal contexts. In the necessary condition, the first action is causally necessary in order to execute the second action that yields the effect (e.g., producing a sound by pressing a button on the object). In the unnecessary condition, the first action is causally unnecessary in order to execute the second action. Hence, in former studies, exact imitation as evidenced by imitation of first action in the unnecessary condition was used as an indicator for the social motivation to imitate (e.g., Hilbrink, Sakkalou, Ellis-Davies, Fowler, & Gattis, 2013).

In the present study, then, we investigated whether 18-month-old infants' imitative behavior differs upon a social warm-up period versus a non-social warm-up period with the model prior to the imitation task. Importantly, to ensure that any differences found in imitation across conditions were due to the different prior social conditions, the model used social-communicative cues during the demonstration phase in both conditions. Furthermore, in order to assess if infants' imitation rate in the experimental groups is above

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