



The relationship between attention and deferred imitation in 12-month-old infants



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ABSTRACT

Imitation is a frequent behavior in the first years of life, and serves both a social function (e.g., to interact with others) and a cognitive function (e.g., to learn a new skill). Infants differ in their temperament, and temperament might be related to the dominance of one function of imitation. In this study, we investigated whether temperament and deferred imitation are related in 12-month-old infants. Temperament was measured via the Infant Behavior Questionnaire Revised (IBQ-R) and parts of the Laboratory Temperament Assessment Battery (Lab-TAB). Deferred imitation was measured via the Frankfurt Imitation Test for 12-month-olds (FIT-12). Regression analyses revealed that the duration of orienting (IBQ-R) and the latency of the first look away in the Task Orientation task (Lab-TAB) predicted the infants' imitation score. These results suggest that attention-related processes may play a major role when infants start to imitate.

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1. Introduction

Imitation plays an important role in a human life because it allows for the acquisition of cultural practices (Tomaseello, 1999). Previous debates on imitation have predominantly focused on the age at which humans are able to imitate (e.g., Carpenter, Nagell, & Tomasello, 1998; Jones, 2007; Meltzoff & Moore, 1997) or on which external factors (e.g., rationality of the action or model characteristics, Wood, Kendal, & Flynn, 2013; Zmyj & Seehagen, 2013) influence imitation. In contrast, internal factors such as infants' temperament have received less attention in the investigation of imitation, even though the concept of temperament entails elements that might relate to imitative behavior. Infants' temperament is defined by a physiological reactivity and the regulation thereof (Rothbart & Derryberry, 1981) as well as the regulation of social processes (Goldsmith & Campos, 1982). Accordingly, infants' temperament becomes apparent in different domains such as extraversion (e.g., smiling or laughter during play), negative emotionality (e.g., sadness), and orienting/regulation (e.g., duration of orienting, Gartstein & Rothbart, 2003). Infants' attention capacities are usually conceived of as a part of the domain of orienting/regulation (e.g., Dixon & Smith, 2000). This study is therefore designed to test the relationship between infants' temperament and their performance in deferred imitation.

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Theories about imitation focus on two functions of imitation (Nielsen, 2009; Over & Carpenter, 2013; Uğziris, 1981). On the one hand, imitation serves a social function, such as communicating non-verbally, identifying with the model via imitation, or conforming with the model. On the other hand, it serves a cognitive function: The imitator learns actions from the imitatee that solve a given problem, without the costs associated with trial-and-error learning. Since imitation is intricately embedded in a social context, imitation research should not focus merely on the cognitive function of imitation. Accordingly, in terms of the relationship between temperament and imitation, it is essential to investigate not only aspects of the temperament that might promote the cognitive function of imitation such as attentional capacities, but also aspects of the temperament that might promote the social function of imitation such as infants' tendency to laugh and to cuddle.

A typical imitation task consists of a demonstration and an imitation phase. Importantly, the delay between demonstration and imitation varies substantially between studies. Accordingly, imitation is typically divided into immediate imitation and deferred imitation. Immediate imitation is often designed to test the impact of social influences on infants' behavior (e.g., a model's group membership, Buttelmann, Zmyj, Daum, & Carpenter, 2013) or infants' cognitive processes during imitation (Asendorpf, Warkentin, & Baudonniere, 1996). Deferred imitation is often designed to test infants' declarative memory (Barr, Dowden, & Hayne, 1996), which has already been demonstrated in 6-month-old infants (Barr, 1996). However, deferred imitation has also been used to test cognitive processes during imitation (Gergely, Bekkering, & Király, 2002). In deferred imitation tasks, it is assumed that infants must have encoded the demonstrated action and stored it in the long-term memory when they reproduce this action after a given latency. However, there is no empirical evidence that social influences are less pronounced in deferred imitation than in immediate imitation. While there is no test available with good performance criteria tapping into infants' immediate imitation there is such a test for infants' deferred imitation (Goertz, Knopf, Kolling, Frahsek, & Kressley, 2006; Kolling & Knopf, 2015).

Infants' ability to imitate is part of their social-cognitive abilities. It has been studied how temperament is related to infants' social-cognitive abilities in general and their imitative abilities in particular. These studies suggest that temperament is related to social-cognitive abilities. For instance, infants' soothability and attention were found to predict their language abilities as toddlers (Dixon & Shore, 1997). Likewise, positive emotionality and attention were correlated with toddlers' language abilities (Usai, Garellò, & Viterbori, 2009). The relationship between attention and language acquisition is causal: Toddlers who were distracted during a word learning task showed a poorer performance than toddlers who were not distracted (Dixon & Salley, 2007). Temperament in terms of low executive control and high negative affect was also related to joint attention (Salley & Dixon, 2007; Todd & Dixon, 2010; Vaughan et al., 2003).

Moreover, temperament is also related to imitation. Toddlers with a high attentional focus were more likely to imitate than toddlers with a low attentional focus (Dixon, Salley, & Clements, 2006). Likewise, infants' attentiveness correlated with their imitative behavior in the first year of life (Heimann, 2002). The role of attention in imitation was emphasized in a study in which a model performed an action that could possibly distract the infants (i.e., wrapping the upper body in a blanket) before showing the target action to be imitated (i.e., illuminating a touch light by contacting it with one's head). This distraction then resulted in a decrease in the imitation rate compared to a baseline condition in which the infants were not distracted. In contrast, when the infants were habituated to this unusual view of the model being wrapped up in a blanket, their imitation rate did not differ from the baseline. In fact, they imitated more target actions than in a condition without the habituation phase (Beisert et al., 2012). In a longitudinal study, infants' extraversion and negative affect predicted their imitative performance when they became toddlers (Dixon et al., 2012). The results have been interpreted causally: Temperament aspects such as attentional focus are necessary for learning. Only if the infants attend will they process the information that is provided by the model, either verbally in the case of language acquisition or non-verbally in the case of imitation (Bloom, 1993; Dixon et al., 2012). This interpretation, however, could not be supported by a recent imitation study that used eye-tracking to analyze 12-month-old infants' looking behavior during the demonstration phase of an imitation test. Infants' looking behavior while observing the model's behavior was not predictive of their later imitative behavior (Kolling, Óturai, & Knopf, 2014).

Several issues remain unresolved regarding the relationship between imitation and temperament. First, information about reliability and validity of the tests used to assess imitation in previous studies is mostly lacking. In the present study, we used the Frankfurt Imitation Test for 12-month-olds (FIT-12, Goertz et al., 2006; Kolling & Knopf, 2015), which shows good performance criteria and tests deferred imitation. Second, in previous studies, children's temperament was analyzed only with questionnaires. In the present study, we assessed the infants' temperament not only via questionnaire (Infant Behavior Questionnaire – Revised, IBQ-R, Gartstein & Rothbart, 2003) but also via two tasks to directly observe infants' temperament interactions (Laboratory Temperament Assessment Battery, Locomotor Version, Lab-TAB, Goldsmith & Rothbart, 1999). The Lab-TAB provides a total of 20 tasks to test infants' temperament. However, it also allows for the use of a subsample of the full battery. To avoid exhausting the infants' stamina and to ensure their participation in the test phase of the FIT-12, we decided to use only two subtests. We chose the Task Orientation Task (TOT) as a proxy for infants' duration of orienting. In this task, infants' interest in non-social objects is tested in terms of their persistence (i.e., looking time). Higher attentional capacities are mirrored in longer looking times to objects and longer latency until a first look away from them. We chose the Puppet Game (PG) as a proxy for infants' social orientation. Here, infants' response to social stimulation is tested when interacting with hand puppets. Higher social orientation should be mirrored in infants' smiling or laughter. Third, to the best of our knowledge, so far, no study has investigated the relationship between temperament and deferred imitation in the first year of life. In the present study, we thus tested infants at 12 months of age.

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