

How do children infer intentions from tracking individuals? A developmental account grounded in mental files

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In this paper we study how young children develop the cognitive ability to access and classify agents' intentions from the tracking of individuals, i.e., agents and objects involved in goal-directed actions. While perceiving an action involving an agent and an object, the child infers the agent's intentions from the end state of the action and/or from salient action effects related to the object. We account for the recognition of intentions through the coordination of object and agent files within an overarching event file. While in the object file, the target object is bound to a particular goal state – when the action's end state and/or a salient action effect occur – a corresponding intention will be bound to the agent file. Intentions are understood as variables – abstractions from types of object-related action-effects and types of agent-related movement features. Through the coordination of object and agent file an interface is built up where states in the environment (end states of actions/action effects) correspond to intentional states internal to an agent: the agent intends the end state/the action effect.

In conclusion, we propose a comprehensive theory of tracking of objects and agents and a mechanism for coordinating the external, perceptual domain with the internal, intentional domain. In this interdisciplinary approach, we bring developmental cognitive science to bear on one of philosophy's most important concepts: intentionality.

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In this paper we study how young children develop the cognitive ability to access and classify agents' intentions from the perceptual tracking of individuals – agents and objects involved in goal-directed actions. Young children between 14-18 months of age can discriminate an actor's intentional action from an accidental act (Carpenter, Akhtar, & Tomasello, 1998; Meltzoff, 1995). A precursor of the understanding of intentions is the understanding of goal-directed actions. As early as 6-months of age, infants are sensitive to goal objects in familiar actions such as grasping (Woodward, 1998). Even unfamiliar actions such as lowering the back of the hand in front of an object can be understood as goal-directed at that age if a salient action effect is present, e.g., a displacement of the object (Király, Jovanovic, Prinz, Aschersleben, & Gergely, 2003).

We hypothesize that in such transitive actions young children infer the intentions of an agent through the tracking of the target objects and the salient action effects related to them. We propose to account for this ability in terms of a theory of object, agent and event files (Bullo & Rysiew, 2007; Hommel, Müsseler, Aschersleben, & Prinz, 2001). According to our argument, the final state of the target object and (if any) the action effect are represented in the object file. Goal-directed movements are tracked by an agent file. These two files are coordinated by means of an overarching event file (Hommel et al., 2001). Children can identify the type of the present action through access to the event file (Baillargeon & Wang, 2002; Wang and Baillargeon, 2007). Given this knowledge they may anticipate possible

outcomes – action goals – from memory. If they do not have such knowledge yet, they may construe them *via* perceptual tracking of the object(s) involved in the action. Crucial for the recognition of intentions is the linking of object and agent files within the event file. While the target object is bound to a particular goal state – when the action's end state and/or a salient action effect occur – in the object file, a corresponding intention is bound to the agent file. This coordination of the object file with the agent file provides the child with a way to use perceptual tracking of individuals to parse and classify intentions. Intentions are understood as variables – abstractions from types of object-related action-effects and types of agent-related movement features. They can be tracked *via* the combination of perceptual features in the object and agent files. Through the coordination of these features an interface is built up where states in the environment (end states of actions/action effects) correspond to intentional states internal to an agent: the agent intends the end state/the action effect. The child thus bootstraps herself from the physical domain into the cognitive-intentional domain by means of perceptual tracking.

In conclusion, we propose a comprehensive theory of tracking of objects and agents and a mechanism of coordinating the external, perceptual domain with the internal, intentional domain. In taking an interdisciplinary approach, we bring developmental cognitive science to bear on one of philosophy's most important concepts: intentionality.

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