

Intention & Intentionality
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Developing Intentional Understandings

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We assume that adults largely understand people in intentional terms, and ask: How do children come to these intentional understandings? Any answer to this question must be multi-level and developmental, because the notion of intention has several senses and children's construals of people demonstrably develop from infancy to older childhood. Our focus is intentional understandings in the first few years of life, and especially two informative developmental ages: the infant and the 2-3-year-old preschooler. By the time of their third birthday, children reveal an impressive, yet intermediate, understanding of intention useful for thinking about earlier and also later developments. Infants, we argue, reveal key competencies that lead to preschoolers' more developed conceptions.

Understanding Intentions

In everyday conception, people act intentionally, they have intentions, and they are intentional beings. This intentional construal of ourselves and others pervades our judgments about, talk about, and interactions with people. Intentionality matters: whether someone did something intentionally or accidentally matters; if intentional, whether the intention was good or bad matters. Sin, guilt, responsibility, and motives are all intentional constructs used by individuals and societies to understand, evaluate, and react to human behaviors. As is evident in these examples, intentional understandings and construals represent a collection of beliefs and distinctions rather than a single concept. Within this system of conceptions we emphasize three features that are central to an everyday understanding of people in intentional terms. We do not aim to advance a comprehensive definition but to

provide a conceptual starting place for thinking about early yet genuine intentional understandings.

First, consider the everyday sense of intentional as doing something on purpose—because you meant to, or because you *wanted* to. Intentional actions are directed toward satisfying some desire or goal; an understanding of people in terms of their desires, including broad-based desires (e.g., wanting ice cream) and more specific goals (e.g., wanting to taste *that* ice cream cone) is thus crucial to characterizing intentional understanding. Of course, strictly speaking, intentions are different from and separable from desires (as discussed in the chapters in part I). Nonetheless, when we say that someone did something intentionally, we mean, at the least, that she meant to or wanted to.

A more important distinction than that between desires and intentions, for our purposes, is that between desires (or intentions) and actions. People act intentionally, but intentions are not actions, they are mental states. Of course, intentions and actions are linked in intimate ways. Actions (as opposed to movements) are typically intentional; certainly people's intentions are often expressed in their actions. We will consider intentional action more fully when we discuss infants. For now, however, note that in our everyday conception two persons could engage in the exact same behaviors, but from an intentional point of view we can construe those acts quite differently: for example, in one case as intended and in the other as accidental. Persons also can intend to do things but then fail to do so (unfulfilled intentions), and there are nonintentional human behaviors (such as reflexes). In short, critical differences exist between intention and actions, wanting versus doing. Our second emphasis, therefore, concerns when and how children understand desires as mental states that lie behind action but are not actions themselves.

A focus on mental states leads to our third emphasis. Intentions or desires take their place within a network of other related mental-state constructs, such as the actor's beliefs, emotions, and perceptions. On traditional philosophical accounts, it is the connection between desires and beliefs that is most important for intentional understanding. Certainly children's intentional understandings are reshaped as their conceptions of beliefs develop (Moses, this volume; Wellman 1990). But we argue that young children understand persons as intentional, as sensibly having desires for things and for actions,

while understanding little if anything about beliefs. (See also Bartsch and Wellman 1995a.) Even this early intentional understanding, however, if genuine, must encompass some necessary connections between desires and other states and experiences. In particular, desires and intentions seem intricately related to emotional and to perceptual experiences. If Jill wants to do X, and then fails, she'll be displeased, unhappy, even angry. If Bill wants a candy, but does not see one (even if one is there), he won't reach for it.

The connectedness of mental states is powerfully related to philosophers' characterization of all mental states as intentional in the broad sense of this term. In this sense, mental states are similarly intentional (Brentano 1874) in their "aboutness": a belief *about* candy, a desire *for* candy, and happiness *about* candy are all similarly about some object, proposition, or state of affairs. Importantly, when connected together in intentional understandings, various mental states are about or directed toward the *same* objects and goals. We ordinarily attribute to Jane, who is looking for candy in the cupboard, a desire for candy and a belief that candy is in the cupboard. We do not see Jane's intentional action in terms of a desire about dogs and a belief about Washington, DC. Similarly, we would not reason that any old desire explains Jane's happiness about finding candy, it is her desire for *candy* that provides this explanatory understanding. In reasoning about people, Jane's various states are connected by being "about" a focal object, event, or state of affairs, and this object is spotlighted by her desires or goals. In this way too, desires and intentions, as we consider them in this chapter, are focal for intentional understandings even in the broader sense.

In sum, we concentrate on an intentional construal of persons in terms of (1) desires or goals that are (2) internal psychological states that underlie and are separate from overt movements or from objective features of the world, and that (3) connect with other mental states and experiences.

Young Children's Intentional Understandings

Even 2-year-olds and 3-year-olds understand persons intentionally in these three senses. Consider a study with 2½-year-olds by Wellman and Woolley (1990). As shown on the left of figure 1, children made judgments about story characters in three situations. In the Finds-Wanted situation, a character wants something that might be in one of two locations; the character

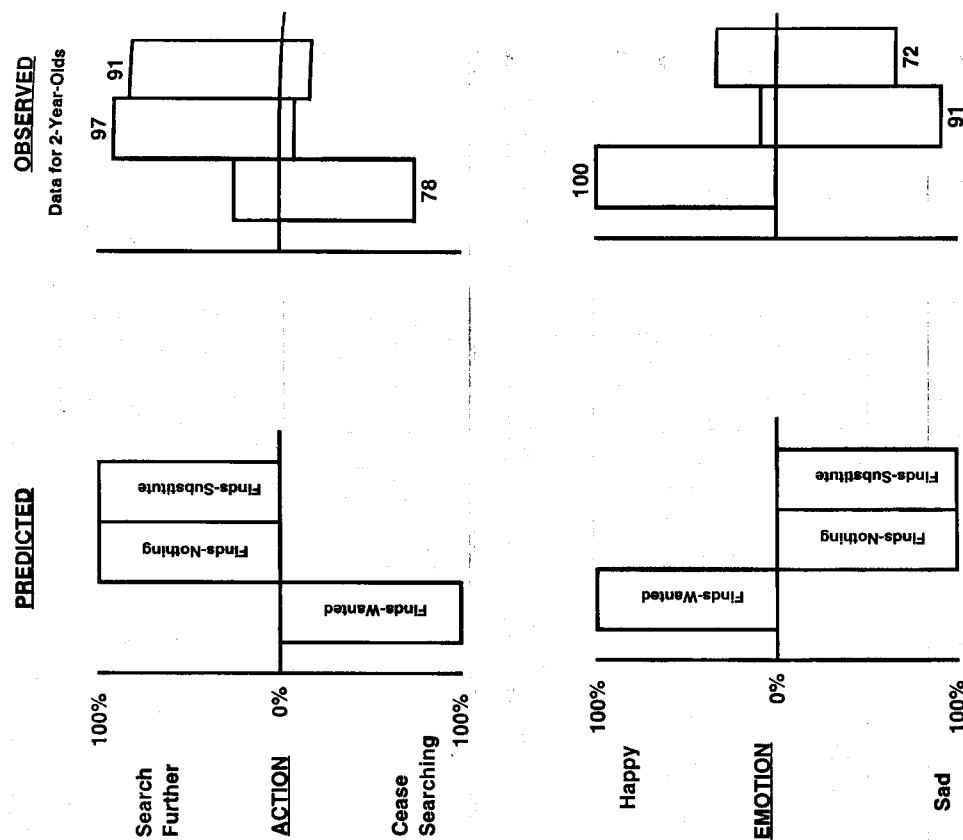


Figure 1

Left: A depiction of the predicted responses in the study by Wellman and Woolley (1990) if children understand persons in terms of their subjective desires. Right: Observed data from from 2-year-olds.

searches in one location and gets the object. The Finds-Nothing situation was identical to Finds-Wanted *except* that upon searching in the first location the character found that nothing was there. The Finds-Substitute situation was also identical to Finds-Wanted, except that upon searching in the first location the character found an attractive object but not the one said to be wanted.

In making Action judgments, children had to predict the character's subsequent action, that is whether he would go on to search in the second location or would stop searching after the first location. Suppose that children understand the character's desire, and thus understand the character's actions as intentional in the sense of attempting to fulfill his goal or desire. Then, to reiterate, the very same overt behavior could have very different construals. In this research, therefore, we carefully matched the Finds-Wanted and Finds-Substitute situations. In Finds-Wanted, Joe wants a bunny and finds it. In Finds-Substitute, Bill wants a dog but finds something else—in fact he finds the exact same bunny that Joe found. If we consider behavior at the level of movement and resulting objective outcome, Joe and Bill engage in the same behaviors. But at the level of intentions, these are very different actions because Joe got what he wanted and Bill did not. Intentional understanding should lead to a prediction of cessation of search in the case of Finds-Wanted, but continued searching in the very similar Finds-Substitute. Indeed, on an intentional understanding of these actions, the Finds-Substitute situation should be comparable to the Finds-Nothing situation instead. Consistent with these predictions, and as shown at the top right of figure 1, 2-year-olds' action judgments show an intentional understanding of these situations, that is, an understanding in terms of the actor's desires.

As shown at the bottom of this figure, children were also asked to make Emotion judgments, that is, to state whether the character would be happy or sad after opening the first door. As can be seen, 2-year-olds appropriately predict happiness for the Finds-Wanted situation but sadness for Finds-Nothing and Finds-Substitute characters. These judgments show that young children understand some of the connections between desires and other related mental states, in this case emotional states. (See also Wellman, Phillips, and Rodriguez 2000.) These emotion judgments also show ways in which 2-year-olds appreciate desires and intentions as internal mental

states. Within an intentional understanding, whether some state of affairs is desirable is not an objective quality of the object or situation but is a *subjective* aspect of the person, determined by what he or she wants or likes. Consider again Joe (who wants a bunny and finds one) versus Bill (who wants a dog but finds the same cute, cuddly bunny that Joe found). Two-year-olds understood that this outcome was not objectively desirable and thus inevitably happy-making; happiness instead depended on the character's desires, consistent with a subjective understanding of desires.

The action and emotion judgments 2-year-olds made in this study are straightforward. But these judgments are straightforward only on the basis of the understanding that Joe's and Bill's actions and emotional reactions were shaped by their desires and that Joe and Bill had different desires or goals in spite of executing objectively identical actions.

These key aspects of young children's intentional understandings are also apparent in their everyday conversations. Children do not use such terms as *intend to*, *on purpose*, or *mean to* until about 3, 4, or 5 years, but as early as 1½ years they talk about persons' goals and desires, primarily with the term *want*. Bartsch and Wellman (1995a) examined talk about desires for 10 English-speaking children studied longitudinally from about 2 years to 5 years. Careful examination of more than 200,000 child utterances yielded more than 5000 instances that were judged to be genuine references to desire. By genuine references to desire we meant use of a term like *want* to refer to a person's internal state of wanting or longing to obtain an object, engage in action, or experience a state of affairs. Consider the first example in table 1. Ross's initial question might just have been a simple behavioral request: "Take it off." However, his follow-up question ("You want it on?") suggests more than just a behavioral request, because Ross did not simply take the button off or insist that his father do so. Instead, he continues to try to characterize his father's goal, his desire, in the absence, or in advance of, instrumental actions. Genuine references to desire, like those in table 1, were frequent in children's conversations and were evident as early as the transcripts began, at right about the second birthday.

Beyond this general coding we looked for more exacting and precise uses that would further confirm children's understanding. Consider the distinction between desires in contrast to behavior or action. In their comments on *unfulfilled desires* (table 1) children often distinguished goals and desires

from the behaviors that would enact those desires or the outcomes that would satisfy those desires. Equally intriguing, children often commented on their *future desires* (desires that would only be enacted later), thereby acknowledging that desires are separable from behavior (in this case, one as in the present and the other as in the future). Finally, young children revealed a subjective understanding of desire by explicitly contrasting two individuals' different desires for the very same thing (table 1). Taken together, everyday conversational references to people's desires illuminate an early intentional understanding of persons as having internal goals and wants that differ from person to person subjectively, that underlie intentional action, but that are also different from behavior in important ways.

If very young children are indeed understanding people intentionally, this might be especially revealed in their explanations of human activities and occurrences. Why do people do things? The most basic intentional explanation is "because they want to." Broader intentional explanations would also mention related mental states, such as the actor's beliefs, emotions, and perceptions. In an early series of studies, Bartsch and Wellman (1989) asked young children to explain everyday acts—for example: "Jane is looking for her kitten under the piano. Why is Jane doing that?" Overwhelmingly young 3-year-olds, as well as older children and adults, provided explanations that referred to the actors' mental states: "She thinks her kitty is there." "She saw her kitty under the piano." "She misses her kitty." And, they explained behavior in the narrower intentional sense of specifically citing the character's desires: "She wants her kitty." "She wants to find him." Desire explanations were the most frequent and typically the first explanation offered for an action.

Consider as well children's explanations of emotions. Wellman and Banerjee (1991) presented 3-year-olds and 4-year-olds with scenarios such as this: "Jane went to preschool and saw they were having apple juice for snack. She was very happy. Why was she so happy?" Notice that it would be extremely easy to resort to situational rather than mentalistic-intentional explanations for these sorts of stories and questions—"Apple juice is good." The stories themselves mention obvious external eliciting situations, and the child could respond just by citing those situations. In contrast, the stories themselves never mentioned the character's desires or beliefs. However, even 3-year-olds went beyond situationist explanations to provide mentalistic,

Table 1

References to desires in everyday conversation of 2-3-year-old children.

Genuine references to desires

Ross (2;6): You want it [a button] off?

Adult: No thank you.

Ross: You want it on?

Adam (2;7): Want spoon?

Adult: No thank you.

Adam: OK. You don't want spoon. Don't want a spoon.

Sarah (2;11): Eat; you eat water?

Adult: No, I don't want any water.

Sarah: I want some.

Ross (3;4): I wanted it to be a Sunday but it didn't.

Adult: What? Sunday. You wanted it to be a Sunday, but it wasn't.

Ross: No, no. I wanted it to be a sun day, 'cause the sun didn't come out.

Adult: Oh you wanted it to be a sunny day.

Ross: I wanted to be sun.

Unfulfilled desires

Ross (3;2): Daddy I want to go to McDonald's and you didn't let me.

Peter (2;8): I wanna come out. I can't come out.

Sarah (3;10): Turtle. Turtle. I want a turtle, but I can't have one.

Future desires

Abe (2;6): Get a circle one for me [a kind of telephone].

Adult: No I won't get you a [telephone].

Abe: I want one. When I grow big I get one.

Ross (3;6): Are you going to die?

Adult: Not until you get to be an old man.

Ross: If you die, I want mommy to get another you.

Adult: Another me?

Ross: Yes, another Brian.

Sarah (2;9): I want to have one of those.

Adult: Tell Daddy.

Sarah: I want have one of those . . . for my birthday (several weeks away).

Subjective contrastives for desires

Adam (3;0): I don't like shaving cream. Daddy like shaving cream.

Abe (2;10): No.

Adult: You don't like it?

Abe: You like it?

Adult: Yes I do.

Abe: But I don't like it.

Sarah (3;11): You wanna take that off?

Adult: No, I don't want to take that one off.

Sarah: I did wanta take this one off.

Ross (2;9): That's kind of scary.

Adult: Well, but its neat. I like it.

Ross: But I don't like it.

intentional explanations: "She wants apple juice." "She thought there'd be apple juice." Some of the youngest 3-year-olds never mentioned beliefs, but all children frequently explained the character's emotions in terms of her desires, preferences, and goals.

Young children's judgments and explanations, thus, straightforwardly suggest that they see people in internal-state, intentional terms. However, young children's intentional understandings cannot be fully understood without also examining their judgments and explanations of *nonintentional* behavior. For example, do young children understand that some human behaviors are *not* intentional?

Consider the types of actions and movements presented in table 2. Voluntary actions that actors perform because they want to are prototypic intentional actions (for example, a person pours milk on his cereal). As just noted, young children and adults alike typically explain such actions in intentional-psychological ways citing mental states generally ("He thinks cereal is tasty with milk") and citing desire-goal explanations specifically ("He wanted milk on his cereal"). Mistakes, biological movement, and physical object-like movements contrast with such straightforward intended actions. In one sense mistakes are unintended actions—something happens that is not a result of or encompassed by the subject's desires. However, for adults mistakes are still to be explained psychologically and intentionally: "He didn't know the pitcher had juice." "He thought it had milk." Or consider the explanation "He wanted to pour that pitcher, but he didn't want to pour juice." As Anscombe (1957) insists, actions are intentional "under a description." Mistaken actions are intentional under some description (pouring the pitcher) if not under others (pouring the juice rather than the milk).

Physical object-like movements, such as being drawn to the ground by gravity, however, require *nonintentional* construal and explanation. The

Table 2

Example items for eliciting explanations from preschoolers (from Schult and Wellman 1997).

Intended action	Biological
It's time for breakfast, so Jimmy gets the cereal out of the cupboard. Now Jimmy has an idea. He wants to pour milk on his cereal. Jimmy takes a pitcher out of the refrigerator and pours it on his cereal. He pours milk on his cereal.	Robin is climbing a tree in her backyard. She's hanging from a branch, not touching the ground. Now she has an idea. She wants to hang on that branch forever, and never let go. Robin drops to the ground.
Mistake	Physical
It's time for breakfast, so Jimmy gets the cereal out of the cupboard. Now Jimmy has an idea. He wants to pour milk on his cereal. Jimmy takes a pitcher out of the refrigerator and pours it on his cereal. He pours orange juice on his cereal.	Bobby is playing in his bedroom. He climbs on top of this stool. Now he has an idea. He wants to step off the stool, and float in the air, up off the floor. Bobby steps off the stool, and comes right down to the floor.

explanations for object-like movements lie in the domain of physical understandings rather than intentional understandings. Similarly, the explanations for biological movements—such as fevers and muscle fatigue—lie in the domain of biological forces rather than intentions and reasons.

In several studies, Schult and Wellman (1997) presented 3-year-olds and 4-year-olds with scenarios of the sort depicted in table 2 and asked them to explain what happened—e.g., “Why did Jimmy pour orange juice on his cereal?” Far from regarding all human movements and acts as being due to the actors’ desires, beliefs, and intentions, even 3-year-olds were appropriately selective as to the kinds of actions that deserved intentional explanation. The clearest contrast concerns Mistakes versus Object-like movements. Voluntary acts, but Mistakes as well, received psychological, intentional explanation. *Psychological explanations* referred to the character’s mental states, such as desires, preferences, beliefs, and emotions: “He wanted to get down.” “He just didn’t know it was ketchup.” “She thought it was milk.” Unlike simple intended actions children rarely said that a character engaged in mistakes “because he wanted to.” But, still, they explained these acts in terms of the character’s psychological and inten-

tional states—their knowledge and beliefs, as well as desires to do *some* things if not others: “He wanted to pour milk, but it was orange juice.” In contrast, physical movements were explained quite differently; children gave them predominantly physical explanations. *Physical explanations* appealed to or implied physical forces, such as gravity or the wind, or declared the need for some other physical mechanism for the action to be carried out: “He’s too heavy to float in the sky.” “Gravity pulls him down.”

“Planes can fly and people can’t, ‘cause they don’t have wings.” In short, young children see much human behavior as intentional—caused by the actor’s subjective desires—but they also appropriately understand other human behavior as nonintentional.

Examination of children’s everyday conversations—in this case the explanations they offer and request in everyday situations with parents and peers—confirms these conclusions and extends them to 2-year-olds (Hickling and Wellman 2000; Wellman, Hickling, and Schult 1997). Thus, laboratory studies and natural language ones as well, and children’s predictions and their explanations as well, converge to reveal an impressive intentional understanding that is apparent in children as young as 2 years. In this understanding, young children construe persons as having internal subjective desires that interconnect with other mental states, especially emotions, and that cause actors to do things. Intentional actions are desire-driven actions; people are desiring, acting beings. Even young children understand that desires are separate from actions, however, in that desires may never be enacted, may only be intended for future enactment, and may result in mistaken instead of intended outcomes. Furthermore, young children’s intentional construals are appropriately limited in that they understand that some movements—e.g., object-like movements—can be unintended altogether.

Intentional understandings are not complete, or even largely developed, at the age of 2 or 3 years. As still older children come to understand more about person’s beliefs, their larger psychological understanding of behavior changes (e.g., Gopnik and Wellman 1994); their understanding of intention itself also changes (Moses, this volume). And preschool children come to understand more clearly how desires can be distinguished from intentions (Astington and Lee 1991; Feinfield, Lee, Flavell, Green, and Flavell 1999; Schult 1999). Still, it is worth emphasizing how much 2-year-olds

have come to understand. Their basic understanding, similar to our adult one, is that persons do things because they want to, that such wants are linked to related states such as emotion, that wants or goals differ from person to person, and that wants and actions are (crucially) separable. This understanding, apparent in 2-year-olds, is an impressive achievement that represents the culmination of earlier developments.

Infants

When infants first show genuine intentional understanding is not clear, but several recent studies demonstrate that by 18 months toddlers have achieved some important appreciations. For example, Repacholi and Gopnik (1997) had 18-month-old children taste two snacks: broccoli from one small bowl and goldfish crackers from another. Almost all children clearly preferred the crackers. Then an adult, facing the child across the table, tasted each snack, going "Mm" and smiling to one snack and "Eww" and displaying disgust to the other. In a Match condition, the adult liked the crackers and disliked the broccoli, matching the child's preference. In a Mismatch condition, she liked the broccoli instead. After displaying her reaction to each bowl, the adult held her hand halfway between the two bowls and said "I want some more, can you give me some more?" In *both* conditions 18-month-olds overwhelmingly gave the adult more of what the adult had liked. In the Mismatch condition, therefore, the children seemed to interpret the adult's unspecific request ("Give me some more") intentionally and subjectively, in terms of her previously displayed desires.

In Meltzoff's research (1995), 18-month-olds who watched an adult engage in an unsuccessful action imitated the model's actions, but in doing so they produced the intended, successful action—an action they had never actually observed—rather than the failed action that they had observed (Meltzoff and Brooks, this volume). Carpenter, Akhtar, and Tomasello (1998) similarly had 18-month-olds watch and imitate actions. When the adult performed one act, she emphatically said "Oops!" as if it were accidental; when performing another action, she emphatically said "There!" as if this was what she intended to do. Infants differentially produced the intentional action.

All three of these studies focused on older infants' understanding of behavior: their interpretation of an actor's behavioral request in terms of the actor's desires or goal; their imitation of a demonstrated behavior in its unobserved, intended form; their imitation of intentional not accidental actions although both were identical in form. Thus, by 18 months infants seem to understand human actions in some intriguingly intentional ways. What ways? And what understandings may appear still earlier? To address these questions requires characterizing intentional actions more clearly.

Intentional Actions

Philosophers (e.g., Dretske 1988) distinguish between movement (motion of the body regardless of intent) and intentional acts. In this sense, (1) below is a behavioral, movement description and (2) is an intentional action description.

- (1) A hand moves out from a body and ends up in contact with a ball.
- (2) A person reaches for and grasps a ball.

At the level of observation of behavior alone, (1) and (2) might look the same. At the level of intention, however, they can be quite different; an analysis of behavioral movements does not necessarily yield an analysis of intentional action. (See also Baird and Baldwin, this volume.)

However, the relation between behavior (at least intentional behavior) and intention is deep, intimate, and diagnostic. In fact, the relation between observable intentional actions and underlying intentions, we argue, parallels a relation familiar to cognitive scientists in the discussion of categorization, namely the relation between a concept's identifying features and its essential features. Figure 2 shows these parallel relations. In the case of categories, striped, meat-eating, ferocious, feline, and quadrupedal are all perceptual features of our everyday category of tigers. But these are not essential features of the category—even an albino (not striped), three-legged (not quadrupedal), infant (not ferocious), milk-drinking (not meat-eating) tiger cub is still a tiger. Yet stripes, meat eating, ferociousness, and quadrupedality remain typical manifestations of being a tiger. As typical manifestations of tigerhood, these perceptual features are critical to our

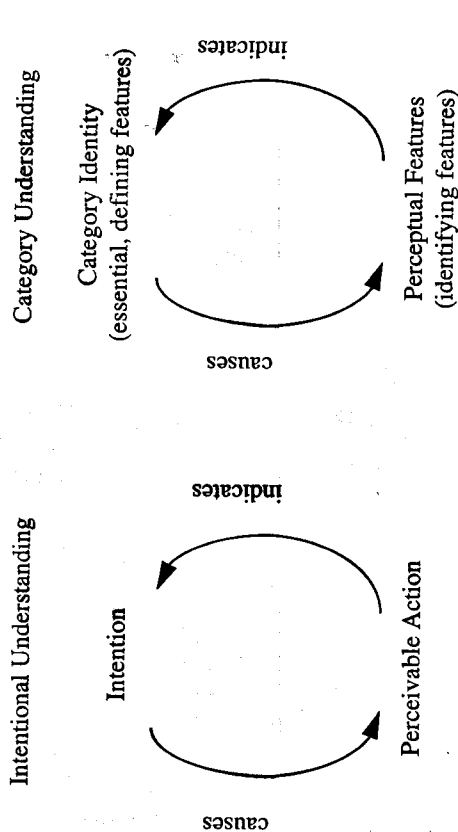


Figure 2

The parallel relationship between (right) essential versus identifying features of a category and (left) intentions versus behavioral features of intentional action.

everyday identification of tigers—recognizing a tiger in the wild depends on these identifying features, not on unobservable tiger essences. Thus, as captured in the figure, perceptual features allow one to identify tigers (sometimes erroneously) because these are the sorts of features that typically (though certainly not always) result when an item has the essential features of tigerhood (has underlying tiger DNA, perhaps).

A similar relationship exists, we argue, between perceptual features of intentional behavior and underlying intentions. Behaviors are not intentions, and behaviors may be mistakenly identified as intentional when they are not or mistakenly identified as unintentional when they are. But often certain perceivable features identify a behavior as intentional, we propose. These features signal a behavior's underlying intentionality—that this behavior is an intentional action—and they can work to identify intentions, because intentions, when enacted, often (though not always) yield behaviors of a certain form.

This analysis assumes that there are some detectable, telltale, perceivable features of intentional behavior. It could be argued instead that there are no such features and that we humans only impose an intentional reading of behavior in our "minds' eyes." In defense, our assumption is a limited one: sometimes behavior observably manifests intention (sometimes it does not).

At the same time, we do not assume that intention is directly and necessarily perceivable in behavior, although others (e.g., Asch 1952; Premack 1990) have argued that humans are simply hard wired from birth to perceive self-caused behaviors as intentional. We assume, instead, a process of identification via perceivable features; intentionality is sometimes (not always) *identifiable* from behavior.

What features of perceivable behavior might plausibly indicate and manifest intentionality? We believe there are several candidates,¹ but we concentrate on two: *object directedness* and *action connectedness*.

Mandler (1992) suggests, using image-schema depictions, that infants can distinguish mechanical movements from biological self-propelled movements because of their differences on a number of perceivable movement features. Specifically, the mechanical movements of a physical object encompass contact with and transmission of force from one object to another and result in regular, linear trajectories of movement. Self-propelled motions, in contrast, arise on their own, without earlier contact, and result in irregular bio-mechanical movements and trajectories. These two movement types thus have different correlated perceptual features.

Intentional actions, we contend, require yet another image-schematic depiction and evidence yet other correlated perceptual features. Importantly, an intentional action is not merely self-propelled; it is oriented toward and moves toward an object or goal. The movement dynamics in this case thus encompass an orientation and a directedness. In simple action situations at least, the goal directedness of intentions can result in perceptually identifiable *object directedness* that is manifest in behavioral movements themselves as toward certain things and not others: a finger dialing a phone, a hand inserted into a glove, a person reaching for an ice cream cone, a hand pulling a cup toward a body.

Beyond directedness, intentional behaviors can manifest characteristic connections to other behaviors, expressions, and postures. Consider a reach for candy. Typically, such object-directed reaching requires perceptual guidance—manifest in head and eye orientations and trajectories. Furthermore, actually obtaining the goal object can result in distinctive facial expressions—those associated with happiness at success, or surprise at an unexpected result. Launching the reach and guiding it correctly might be manifest in a furrowed brow of concentration that is then relaxed as the target is

grasped. Vocal accompaniments ("Oops," "There," "Yes," "Damn") are also typical. Intentional behaviors, therefore, also often manifest, and thus can be identified by, telltale *action connections*; the target action is connected to other behaviors and displays, especially to perceivable emotional displays and perceivable eye, head, and body orientations.

To be clear, the target action is not simply associated with or conjoined with other concomitant behaviors and displays. The connections are more functional. For example, intentional reaches often *require* visual guidance and hence certain visual orientations by the actor, and they *cause* certain emotional-cognitive reactions in the actor which are then, often, manifest in facial or verbal expressions. These functional connections are driven, often, by the object directedness of the action. The person reaches for *that* object and thus looks at *that* object and displays emotionally about *that* object. Thus object directedness and action connectedness are themselves linked, via the specific target object, in a particular fashion (similar to the way that mental-state connections are driven by the goal directedness of desires).

In sum, we propose that the object directedness and action connectedness of behaviors can often manifest and identify intentions. Consequently, one way to research infants' initial intentional understandings is to research infants' understanding of the object directedness and action connectedness of human action.

Infant Research

To understand actions as directed toward objects requires, at the least, appreciating certain associations between movable body parts and objects. Woodward (1998; see also Woodward, Sommerville, and Guajardo, this volume) has demonstrated that even 5-month-olds make such associations. Infants were habituated to a hand reaching to and grasping one of two toys. Then infants saw two test events, in which the locations of the objects were switched. In the *new object/old path* event, the hand reached to the old location and thus now grasped a different object. In the *old object/new path* event, the hand grasped the same object as in habituation, but it was now of course in the other location. If infants perceive or encode the habituation event simply in terms of the spatial movement of the hand, then the *new object/old path* event would seem familiar (because the arm and hand execute the same trajectory as habituation), and infants should look longer

at the *old object/new path* event because it shows a novel arm movement. However, if the infants perceived or encoded the habituation movement in terms of the hand's association with the *target object*, then they should look longer at the *new object/old path* event, because there the hand is associated with a new object. Five-month-old and 9-month-old infants looked longer at the *new object/old path* event.

Perhaps infants not only understand some behaviors as associated with certain objects but also understand them as *directed toward* objects. Gergely and colleagues (Gergely et al. 1995; Csibra et al., in press) presented infants with computerized two-dimensional displays of circles involved in intentional-like motion. Specifically, infants were habituated to a circle moving up to and then over a wall-like barrier, then back down across the barrier to join up with a second circle. Thus, the first circle took an indirect route over the barrier to get to the second one. After habituation, infants saw two test events where the barrier was removed. In the *direct* test event, the first circle moved directly in a straight line to link up with the second circle (a path quite different from the indirect habituation event). In the *indirect* event, the circle moved in the same path as in habituation (although the barrier no longer intervened). Nine-month-olds and 12-month-olds, but not 6-month-olds, looked longer at the indirect test event. Gergely and his colleagues concluded that the infants perceived the moving circle as intentional, expected it to go directly for its object, and thus were surprised to see it taking the indirect route when it was no longer needed.

We have reservations about how to understand Gergely's rich interpretation of infants' understanding in terms of rationality; his claim is that the circle's indirect path is worthy of attention because it is seen as irrational.² But at the least these results suggest a budding understanding of object directedness. Our own recent studies with human actors and live behaviors provide further evidence.

In our research (Phillips and Wellman 2000), infants see a person reach over a barrier and grasp an object, as shown in figure 3. Once the infants are habituated, the barrier is removed and they are shown two test events. One test event shows a *direct* reach for the object; the other shows an *indirect* reach. These test events contrast two different construals of the person's actions, one in terms of object directedness and one in terms of physical motions of the arm. If in habituation the infant interprets the actor's action

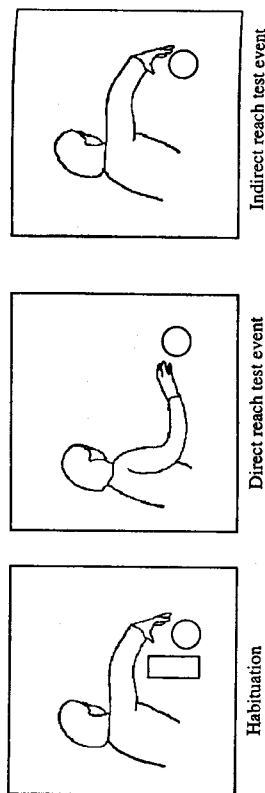


Figure 3

A depiction of the reaching events presented to infants in the study of Phillips and Wellman (2000).

as object directed (as the actor going as directly as possible to get the object), then when the barrier is removed the direct reach is the expected action and the indirect reach would be more attention-worthy. In the indirect-reach test event, although the actor's arm movement remains the same as during habituation, the actor is no longer going directly to get the object.

In fact, during tests, 12-month-olds look longer at the indirect reach. They dishabituate to the indirect reach (even though it is showing the exact same arm movement as in habituation) and do not dishabituate to the direct reach (even though it actually shows a different physical arm movement). This pattern is consistent with the hypothesis that infants construe the reach as object directed.

Perhaps, however, infants just prefer to look at a curving arm motion. A control condition tests for this possibility. For infants in the control condition, habituation and test were identical to those for infants in the experimental condition except that *no* object was ever present. In this case, since there is no object, there is no presentation of an object-directed action in habituation. And in this case, appropriately, 12-month-olds do *not* prefer the indirect-reach test event. So the experimental data do not just show a preference for looking at the curved arm motion. Instead, infant looking is sensitive to the object directedness of the action; in the context of *object-directed* reaching (as depicted in the original habituation) then the indirect test event becomes novel, unexpected, and worthy of attention. Data for 12-month-olds in the experimental and control conditions are shown in figure 4.

Intriguingly, in this research 9-month-olds do not prefer the indirect reach in the experimental condition. In habituation, experimental 9-month-olds

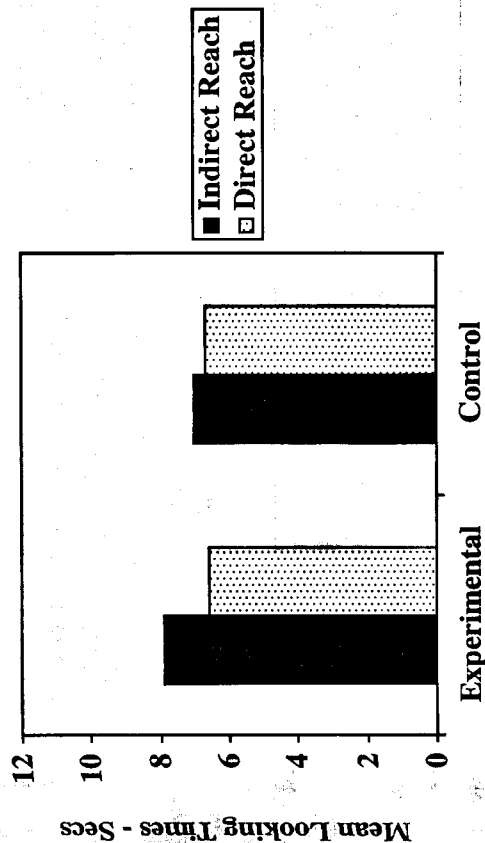


Figure 4
Twelve-month-olds' looking times to test events in the study of Phillips and Wellman (2000).

look for long times at the object-directed reach, and in test they look for long times at *both* experimental test events. Nine-month-olds look much longer at all these experimental events, where a goal-object is present, as compared to short looks at the control test events, where no object is present. An interpretation that we favor for these developmental findings is that 9-month-olds have some expectations that hands go with their target objects (as we know from Woodward's research). They are interested, therefore, in how people reach for objects, and thus they look longer at reaches directed toward objects (in our experimental condition) than they look at the exact same movements when no objects are involved (in our control condition).

If 12-month-olds, and perhaps even 9-month-olds, show a beginning awareness of object directedness, then they may also show beginning understandings of action connectedness. In other research, therefore, we are addressing infants' understanding of action connectedness.

In a series of studies, 12-month-olds and 14-month-olds saw an adult behind a table with two stuffed kittens, identical except for color (Phillips, Wellman, and Spelke 2000). During habituation trials, the infant saw a two-

part event (figure 5). First, the adult exclaimed "Look at the kitty" while turning her head and looking to one of the stuffed animals with an expression of interest and joy. Then, a curtain was drawn to conceal both the adult and the animals. Second, the curtain was opened and the adult was shown looking down at and grasping one of the kittens. During the habituation trials, the second phase of the presentation always showed the adult holding the kitten at which she had looked and emoted earlier.

After habituation, two test events were presented. One event was, like habituation, *consistent* with the principle that actors' actions (e.g., the grasp of an object) are connected to where they look and express affect. In this test event, the experimenter first looked at the second toy (the one never regarded or held during habituation); then the screen closed, and upon its opening the adult was then holding *that* kitten. In the other, *inconsistent*, test event the adult looked at the first kitten (the one she had regarded and held during habituation), the screen closed, and when it opened she was then seen holding the second kitten. This event was inconsistent with the principle that people's acts are connected to their looking and emoting, because in this test event the experimenter first looked desiringly at one object but then was grasping a different object.

Note that in both the inconsistent and the consistent test events, after the screen was opened in each case the adult was holding the same object (the kitten not held in habituation). So, physical aspects of the target act itself—grasping the same stuffed kitten—were identical for the two test events.

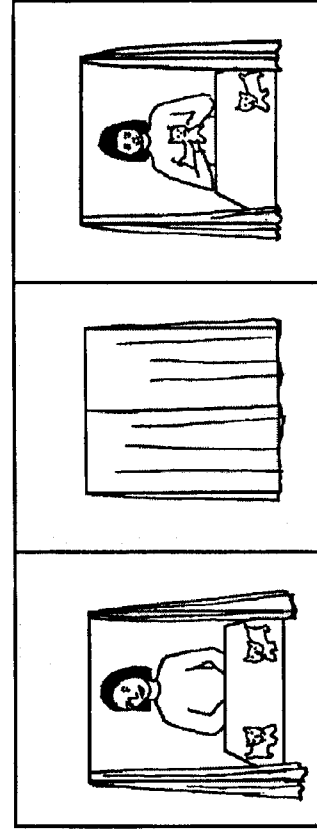


Figure 5
A depiction of the habituation events presented to infants in the study of Phillips, Wellman, and Spelke (2000).

Twelve-month-olds, as well as 14-month-olds, looked reliably longer at the inconsistent test event. Thus, they seemed sensitive to how gaze and emotion connect to and signal the actors' grasp. This leads us to believe that at about 1 year infants are sensitive to action connectedness as well as to object directedness. We are working with several other paradigms to tackle this phenomenon. In one illustrative study (Phillips and Wellman, in preparation), 11-month-olds were habituated to a display that had two people and a single object within a three-part sequence. The adults were behind a partial screen so that only their faces were visible. For the first phases of the habituation event, one adult looked directly at and displayed neutral affect toward the object; the other adult looked at the object but displayed positive affect toward it. Then an anonymous hand reached through the center of the screen and grasped the object. Note that in these habituation trials the two persons were equidistant from the object, and both looked at the object, a single hand, but neither person was seen holding the object.

After habituation, the infants saw test events parallel to those seen during habituation, except with no screen between people and object. In the initial phase of the test events, the infant observed each person express the same affect expressed during habituation, but since the screen was not present the infant was then able to witness which adult grasped the object. In one test event (the *consistent* event), the infant saw the adult who expressed positive affect grasp the object, consistent with the principle that positive perceptual/emotional regard is connected to approach-like action directedness. In the other test event (the *inconsistent* event), the infant saw the adult who expressed neutral affect grasp the object.

If infants connect object directedness to the type of emotion displayed, then during habituation the infants in our study could have understood or encoded the positive adult as grasping the object, even though the identity of the person holding the object could not be seen. If so, then the inconsistent event should have seemed more novel and elicited greater recovery of looking. And indeed, sixteen 11-month-olds looked longer at the inconsistent test event, in which the neutral person grasped the object. In a contrasting control condition, 11-month-olds otherwise showed an expected preference for looking at the positive face. In view of our earlier data on infants' understanding of object directedness, we expect that in future

research 6-month-olds and 9-month-olds will have difficulty with this new task whereas 12-month-olds will succeed, just as they succeed on the "kittens" task.

Conclusions

Our chapter encompasses conceptual analyses and empirical data. For preschoolers, the data demonstrate that they appreciate three conceptually important aspects of human intentionality by the age of 2 years: an understanding of intentions or goals in terms of a person's desires for things, an understanding of desires as a mental state intimately related to but independent of action itself, and a beginning understanding of several ways in which desires coherently connect to other mental states (especially emotion and perception). For infants, we have offered a general analysis of the relation between observable behavior and underlying intentions (figure 2, left), a claim that two action features (object directedness and action connectedness) are often crucial to identifying intentions, and evidence that infants between 9 and 12 months are beginning to recognize human actions in terms of (first) object directedness and then action connectedness.

We want to emphasize that the findings with infants are consistent with two quite different interpretations. (See also Baird and Baldwin, this volume; Povinelli, this volume.) Under one interpretation, early appreciations of object directedness and action connectedness would be manifestations of an infantile intentional understanding of human action. On this account, infants expect these action regularities to obtain because they construe persons intentionally. Under an intentional construal, these action features are the expected, identifying features of people's actions, and so a failure of these intentional action features to appear is novel and thus worthy of attention. Thus, on this interpretation, infants in our studies are displaying their intentional understandings. Their appreciation of perceivable behavioral regularities is based on their construal of those behavioral regularities in a top-down way, via intentional understandings.

Alternatively, in the first year of life infants may be learning about behavior in a more bottom-up fashion. Because parents, siblings, and strangers in the child's life act in intentional fashions, the actions that infants observe

are saturated with object directedness and action connectedness. Thus infants come to expect these behavioral regularities. When they are present, behavior seems familiar; when they are not present, behavior seems unfamiliar and puzzling. On this interpretation, infants operate solely in terms of the behavioral regularity, without any intentional understanding.

These possibilities are part of a larger debate in the literature between lean and rich interpretations of infant behaviors. For example, both social referencing and gaze following (along with early words and gestures) could be seen as indexing infant intentional understandings or not (Moore and Corkum 1994; Baldwin and Moses 1996; Wellman 1993). Our data cannot decide between these two possibilities. But on either account, the sorts of action understanding we have been investigating must be central to developing intentional understandings. Suppose, on the one hand, that infants early in life construe persons as having intentional states. If so, they still must come to understand how those states manifest themselves in various human behaviors; they must come to understand intentional *action* in its various forms and connections. Thus, action understandings (and especially understandings of object directedness and action connectedness, we would claim) are needed to "flesh out" and employ intentional understanding in everyday interaction and social cognition.

Suppose, on the other hand, that infants do not at first understand humans in such intentional terms. How do they come to do so? Analyses of overt observable human behaviors would constitute an important source, perhaps the critical source, for the development of intentional understandings. On this alternative possibility, infants use observations of behavior to infer or abstract conceptions of intentions. But not just any observations of behavior would do. Only some sorts of behavioral features would be correlated with and hence informative of *intentional* understandings. Object directedness and action connectedness, we contend, are the sorts of features that could informatively help to do this job. In particular, the object directedness of behavior foreshadows the goal directedness of desires and goals. The action connectedness of actions, gazes, and emotional expressions foreshadows the intentional connections of desires, perceptions, and emotions.

On either interpretation, therefore, infants' understandings of action are crucial for developing intentional understandings. That infants as

young as 12 months display appreciations of object directedness and action connectedness reveals and helps shape their developing intentional understandings.

Acknowledgment

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Notes

1. For more on this, see Baldwin and Baird 1999 and Baird and Baldwin, this volume.
2. In addition, findings for the needed control condition were not straightforward. In the control condition of Gergely et al. (1995), infants were again habituated to a circle taking the same indirect path as in the experimental condition described in the text, but in this case even in habituation there was *no* barrier to circumvent. The control condition test events compared direct and indirect paths with *no* barriers just as in the experimental condition. In the control condition, 12-month-olds dishabituated to *both* the direct and indirect test events. Dishabituation to the indirect test event in both the experimental and control conditions raises the suspicion that the indirect test event was somehow just generally attention-eliciting.

7

How Infants Make Sense of Intentional Action

Amanda L. Woodward, Jessica A. Sommerville, and José J. Guajardo

A glance out the window reveals a scene populated by two kinds of entities: inanimate objects (such as cars, trees, and fire hydrants) and animate beings (in particular, people). Adults discriminate these two kinds of entities readily and have very different expectations about how members of each class will behave. Adults understand not only the physical regularities that govern the motions of inanimate objects but also the psychological underpinnings of human action. This "folk psychology" allows us to make sense of human behavior in terms of the goals and plans that drive it, the beliefs that inform it, and the emotions that color it, among other things. At the core of this folk theory is the idea that human action, unlike object motion, is driven by intentions. Adult understanding of intentions is embedded in rich knowledge about mental states and behavior. This enables adults to detect intentional actions on the basis of behavioral evidence and to reason about the particular intention behind an action.

One of the most enduring questions in developmental psychology is how children come to understand the distinction between inanimate objects and animate beings. A key part of this distinction is how children come to understand intentional action. How do children first detect intentional actions, and how does their understanding of intentions develop? Folk physics has roots in infancy (Baillargeon 1995; Spelke, Breinlinger, Macomber, and Jacobson 1992). In our work, we ask whether folk psychology also has roots this early in life. That is, do infants have ways of making sense of intentional action that are continuous with adult understandings?

A number of theorists have considered this question in recent years. There have been two major, and conflicting, views of the development of intentional understanding. One set of theorists has focused on the social abilities