

Goal contagion:

Inferring goals from others' actions – and what it leads to

Henk Aarts

Utrecht University

Ap Dijksterhuis

University of Amsterdam

Giel Dik

Utrecht University

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As social beings, humans attribute goals to other people's behaviors. Thinking about behaviors in terms of the goals they serve allows an understanding of how the same behaviors, conducted in different circumstances, may serve divergent intentions. Think, for example, about being offered a beer from a colleague in the hotel bar after a long sit at the conference diner table. Such an offer may serve the goal of collaborating, socializing, or seeking casual sex. For social animals like ourselves, it is important to know what *caused* the agent's behavior, and which one of the end states he views as *desired*. Importantly, in some circumstances answers to both questions – i.e., what causes the behavior and what are its desired states or outcomes – are based on an understanding of an agent's goals (e.g., Heider, 1958; Meltzoff & Moore, 1996). Comprehending other's goals may prevent mistakes that could be embarrassing or even harmful.

Furthermore, perceiving other people's behavior in terms of goals may have important implications for one's own behavior. For instance, it has been argued that humans and great apes can use others' goals to represent, organize and guide their own courses of goal-directed actions (Byrne & Russon, 1998; Tomasello, Kruger, & Ratner, 1993). Specifically, an appreciation of the goals motivating other people allows one to entertain similar goals and to try to attain them oneself. Knowing, for example, that someone's goal is to seek collaboration or casual sex may cause one to readily adopt these goals, provided collaboration with others or seeking casual sex is a desired goal state for oneself. Inferring these goals as potential causes of behavior, then, is not only important for a direct understanding of the intentions of people we interact with, but also for the successful pursuit of one's own needs and goals.

In this chapter, we present a framework for the comprehension and examination of goal pursuit resulting from the perception of other people's actions. Specifically, we aim to advance the idea that individuals are capable of taking on the goals implied by other people's

actions without conscious intent. The framework consists of two key components. First, we propose that people can automatically infer other people's goals from behavioral information. Second, we posit that these inferred goals can be automatically acted on by the perceiver. Thus, we suggest that the perception of goal-implying behaviors may facilitate the achievement of one's own goals without the need for conscious assistance, an instance we recently labeled goal contagion (Aarts, Gollwitzer, & Hassin, 2004; Aarts & Hassin, 2005).

Our framework builds on two major developments in social psychology research over the last fifteen years or so. The first is rooted in the observation that people often go beyond the behavioral information given automatically, and recognizes that, under certain circumstances, social (causal) inferences occur without conscious intent (e.g., Gilbert, 1989; Hassin, Bargh, & Uleman, 2002; Uleman, Newman, & Moskowitz, 1996). Such an ability would allow a deeper understanding of the social world without the costs that are associated with conscious processes. The other development is the diversion from the traditional views that goal setting and adoption is accompanied by a conscious decision, and that goal striving (i.e., the initiation and maintenance of goal-directed action) is characterized by conscious intent (e.g., Ajzen, 1991; Bandura, 1986; Deci & Ryan, 1985; Locke & Latham, 1990). Instead, it has been proposed that the mere activation of representations of goals can also cause behavior directly, and that motivated social behavior can operate outside of conscious awareness (e.g., Aarts & Dijksterhuis, 2000; Bargh, 1990; Moskowitz, Li, & Kirk, 2004; see also the chapters in this volume by Chartrand; Ferguson, Hassin, and Bargh).

Remarkably, in these last 15 years these two developments have led relatively separate lives. Accordingly, the question of whether, and how social (goal) inferences affect behavior have hitherto received little theoretical analysis and empirical attention. The present chapter contributes to closing this gap and provides a perspective within which the automatic emergence of needs, desires and goals in the presence of others in everyday life can be

understood. We now turn to a review of research, partly based on our own recent work, that have addressed and empirically examined the issue of automatic social inferences, and in particular automatic goal inferences, and their direct motivational implications for social behavior.

Automatic social inferences

Originally, automatic processes were thought of as unintentional, nonconscious, ballistic and effortless. This monolithic approach, however, gave way to a more flexible view, according to which these characteristics do not always co-occur, and some automatic processes may exhibit only a subset of them (e.g., Bargh, 1994; Gilbert, 1989). A large body of social psychological research on the automaticity of social inferences has examined a specific collection of these features, namely – spontaneity. An inference is said to be spontaneous if (1) it does not require explicit instructions, (2) people are unaware of their intentions to make it and; (3) people are usually unaware of the inference itself. Basically, this means that inferences can occur without conscious intent (Uleman, 1999).

Trait inferences. The empirical work on spontaneous inferences has mainly focused on examining trait inferences. Uleman and his colleagues (e.g., Uleman, Newman, & Moskowitz, 1996; Winter & Uleman, 1984) have convincingly argued and showed that trait inferences may sometimes be spontaneous. Thus, upon reading the sentence “While dancing the salsa, Jackson slapped his girlfriend in the face” readers may spontaneously infer the trait “clumsy”. These inferences do not require a conscious impression-formation goal: They occur when participants are instructed to memorize sentences, as well as when they are just asked to familiarize themselves with them, or judge how interesting they are. Recently, it has been demonstrated that spontaneous trait inferences are linked in memory to the actor (Todorov & Uleman, 2002; Van Overwalle, Drenth, & Marsman, 1999), suggesting that, in line with Gilbert and his colleagues’ model (e.g., Gilbert, Pelham & Krull, 1988), dispositional

attributions can occur automatically as well (e.g., we automatically conclude that Jackson is a clumsy person).

Causal inferences. Lately, it has been suggested that various types of spontaneous inferences described in the literature fit under the same conceptual umbrella, that of automatic causal inferences (the ACI framework; Hassin, Bargh, & Uleman, 2002; see also Hassin, Aarts & Ferguson, in press). That is, spontaneous inferences of traits (Winter & Uleman, 1984), and predictable events (McKoon & Ratcliff, 1986) can be conceived of as instances of causal inferences -- the former in terms of possible *reasons* for behavior, and the latter in terms of its expected *results*.

An interesting implication of the ACI framework suggested by Hassin and colleagues is that people should be able to automatically infer other social constructs that are perceived as serving a prominent role in the causal chain of behaviors. One such type of construct are goals: the representations of desired states that people aim to attain. The ability to infer goals offers an important extension to the understanding of others in terms of their traits because unlike traits - that are relatively stable characteristics - goals are more flexible and context-dependent. As such, goals may help us understand why a person performs a variety of behaviors that may be less explicable in terms of traits (e.g., when we see someone running after a cab with a suitcase in her hand, it is usually not because the person is athletic).

It should be noted, though, that work on dispositional attribution of behavior suggests that goal and trait inferences can be interrelated. Specifically, contemporary stage models of attribution propose that trait inferences are usually preceded by an identification or categorization stage of the observed behavior (e.g., Gilbert et al., 1988; Trope, 1986). This stage is required to make sense of, and to assign meaning to the perceived body movements that people orchestrate and exhibit in a given context or environment. This stage of information processing is so obvious that we usually forget that we do it. In their analysis of

behavior identification, Jones and Davis (1965) emphasized that action is often identified by making an inference about another person's intention. Others have argued that humans have a natural tendency to represent and perceive overt behaviors in terms of the goals they serve (e.g., Heider, 1958; Vallacher & Wegner, 1987). Because observable action is often identified by ascribing goals or intentions to it, the behavioral categorization stage often involves making goal inferences. Thus, to the extent that the causes inferred from others' behavior (e.g., running after a cab) pertain to the accomplishment of desired states or outcomes (e.g., wanting to be on time), exposure to such behavior may affect the individual to categorize it in terms of the goal or motive causing the action (McClure, 2002)¹.

Furthermore, trait inferences (e.g., she is a punctual person) sometimes require behaviors to be identified in terms of goals or motives. Accordingly, goal inferences can precede (and can be necessary for) the emergence of trait inferences. In line with this reasoning is work that has demonstrated that the extent to which a behavior is rated as typical of a certain trait is strongly predicted by its relatedness to the goal associated with that trait (Read & Miller, 1989; Read, Jones, & Miller, 1990). As Read and colleagues suggest "inferring the goal for which an individual is striving is a central part of the trait inference process" (Read, et al., 1990, p. 1056). In short, goal inferences ("What is the person trying to do?") seem to occur first when dispositional trait inferences ("What is the person like?") cannot be drawn directly. Important for the present argument is the idea that when goals are perceived as causes for behavior, people should be able to automatically infer them.

Automatic goal inferences

Classic social theories on consciousness propose that conscious awareness or intent allows social animals to understand each other's goals through insight in the motivational causes of each others' behaviors (see e.g., Humphrey, 1978). Although conscious intent may

aid the comprehension of goal-directed behavior, it may not be a prerequisite to encode others' goals. The idea that social animals naturally and automatically infer the goals that guide others' behaviors has interested researchers in several areas in psychology. In general, two areas of research have empirically focused on the question whether goal inferences can occur automatically: (a) research on animated movements of physical objects that conceive of goal inferences as a perceptual process, and examines the attribution of mental states to moving objects by adults, babies and even chimps; and (b) research on text comprehension that attests to the occurrence of goal inferences in making sense of other people's actions expressed through language.

Animated movements and automatic goal inferences

Research on adults. One of the first demonstrations of the emergence of goal inferences is Heider and Simmel's (1944) animated movie study on causality and social perception. In a nutshell, Heider and Simmel showed that adults readily attribute mental properties (such as goals) to geometric shapes, as long as they move in a particular interactive "social" way. As an illustrative sample of the movie, participants saw a scene in which a small triangle and small ball left a rectangle by opening a door, but were directly and hastily followed by a larger triangle that was also inside that rectangle. When participants were asked to report their thoughts as to what they believe the larger triangle was trying to do, they came up with answers such as "he wants to separate the small triangle from the ball" or "he chases the small triangle and ball"; answers that clearly refer to goal-directedness and specific social aims. These findings point to the human tendency to perceive functional properties in simple displays that are found objectively in neither the actual event themselves nor in one's retinal projections (see also Michotte, 1963).

For a long time, Heider and Simmel's work enjoyed an anecdotal status, and their evidence for goal inferences was mostly taken for granted. Fortunately, subsequent studies

conducted by other research groups replicated their findings with a wide range of different stimuli and movements, which corroborated the notion that people uncover the causal and social structures of the world by inferring properties such as agency, intentionality, desires or goals (for an overview, see Kassin, 1982; Scholl & Tremoulet, 2000). Most of the research in this area seems to assume that goal inferences occur immediately and effortlessly, and that goal inferences are default responses of our mental system. However, it should be noted that participants in these kinds of studies are usually *explicitly* asked to think in terms of goals, to retrospectively reflect on the observed movements or to provide goal ratings. Evidence gathered in these studies is thus not conclusive with regard to the automaticity of goal inference upon exposure to animated movements of physical objects.

Research on babies and chimps. Stronger evidence that pertains to the automaticity of goal inferences comes from studies on the ability to encode animated movements of physical objects in terms of goals by very young infants and chimpanzees (Csibra, Gergely, Biro, Koos, Brockbank, 1999; Gergely, Nadasdy, Csibra, & Biro, 1995; Hauser, 1999; Premack, 1990; Uller & Nichols, 2000). For example, there is research to suggest that babies use different aspects of biological motion, such as self-propelled movement, to assign a sense of agency to inanimate objects (Premack, 1990; Premack & Premack, 1997).

Furthermore, toddlers seem to employ principles of rationality at very young age to infer desires or goals from animated movements of objects. For instance, in one study (Csibra et al., 1999), 6 and 9-month-old babies were habituated to a computerized scene in which a ball “tries to meet” another ball. Since the balls are separated by a barrier, one of the balls “jumps” over it in order to meet the other ball. In the subsequent test phase, the babies are shown one of two scenarios in which there is no barrier. In one such scenario the ball, in his “attempt to meet” the other ball, still “jumps” over the now non-existent barrier. In the other scenario the ball simply moves in a straight line. Despite the fact that the motion in the second

condition is novel, and that babies generally look longer at novel events, the 9 month olds looked longer at the first event than at the second (this was not the case with the 6 month olds). The results from a control group showed that the effects with the 9 months olds are attributable neither to novelty per-se, nor to the illogical nature of jumping over a non-existent barrier. These data suggest that very young children use an efficiency principle in understanding the intention of the moving object. In other words, they perceived the ball's behavior as goal-oriented – it simply “wanted” to meet the other ball, and babies somehow realized that it does not make sense to accomplish this by jumping over a barrier that does not exist. Similar findings have been reported for chimpanzees.

These findings are interpreted as indicating that primates, humans included, have an early-developed system for ascribing unobservable mental states to an agent (a desire or goal to produce a state) on the basis of contextual information of actions or movements performed by this agent (see, Frith & Frith, 2003; for a possible neuro-scientific account of this system). More importantly, they suggest that goal inferences can occur in the absence of fully developed capacity for higher cognitive reasoning and processing, hence, in the absence of full-blown human conscious processes (Gergely, 1994; MacPhail, 1998; Zeman, 2001). Thus, they support the suggestion that goal inferences, at least under certain circumstances, could be automatic.

Text comprehension and automatic goal inferences

Goal inferences have also been extensively studied in research on text comprehension. Most researchers in this field consider the understanding of protagonists' goals as central to narrative comprehension. Accordingly, the consensus seems to be that readers make goal-relevant inferences when they are actively trying to understand information about scripted behavior (e.g., Graesser, Singer, & Trabasso, 1994; McClure, 2002; McKoon & Ratcliff, 1992; Trabasso & van den Broek, 1985). However, for many text-comprehension researchers

the distinction between automatic and controlled inferences is less important than that between on-line and off-line inferences – that is, inferences that occur during initial comprehension of text or after it, respectively. There are a few exceptions though.

In proposing their logic of the minimalist hypothesis, McKoon and Ratcliff (e.g., 1992) suggest that under certain circumstances goal inferences may occur automatically. Specifically, they posit that inferences automatically emerge during reading to the extent that they are necessary for local coherence (e.g., understanding the connection between two successive sentences in a text), or can be based on easily available general knowledge (e.g., typical or clear inferences). To date, however, they did not examine the full implication of their theory.

Furthermore, Long and Golding (1993; see also Long, Golding, & Graesser, 1992) examined automaticity of on-line inferences of goals. In their study, participants were asked to read a short story including all kind of actions that could be identified in terms of superordinate goals or subordinate goals (the “why” and “how” of the action, respectively; cf. the action identification framework proposed by Vallacher & Wegner, 1987). For example, participants read a story about “The Czar and his daughters” that included sentences such as “One day the daughters went walking in the woods” (superordinate goal of “exercising”, and subordinate goal of “strolling”) and “A dragon kidnapped the three daughters” (superordinate goal of “eating”, and subordinate goal of “grasping”). A lexical decision task was used to assess the accessibility of these two types of goals to determine which inference participants made from each action while trying to comprehend the story. They showed that superordinate goal words were more accessible than subordinate goal words, suggesting that goals were indeed automatically inferred from the text. There are several concerns, however, that cast doubt on the conclusiveness of these studies. Critically, the researchers did not examine

whether these processes meet various criteria of automaticity (i.e., they did not check whether subjects intended to infer goals and whether they were aware of such inferences).

To further explore this issue in a more systematic way, Hassin, Aarts, and Ferguson (2005) conducted a series of studies that include off- as well as on-line measurement for the examination of automatic goal inferences. In a first study, they used a surprise cued-recall paradigm to demonstrate off-line inferences. Participants read short pilot-tested sentences under instructions to rate “how interesting they are”. The sentences described a behavior performed to attain a specific goal (e.g., “the student is cycling to the campus as fast as he can” implies the goal of attending a lecture), or a similar behavior that does not imply this goal (e.g., “the student is cycling away from the campus as fast as he can”). After completing a filler task for 5 minutes, they were presented with a surprise cued-recall task for the sentences. The cues were either the implied goals (goal cue condition) or a word taken from the sentences (repetition cue condition). Results showed that only goal cues (and not repetition cues) helped retrieving goal-implying sentences more than control sentences, even though the two types of sentences shared all the words that were semantically related to the cue. In a second study, goal cues facilitated the retrieval of goal-implying sentences even when the road to successful achievement of the goal was blocked and the expected goal attainment thus should not occur (e.g., the front wheel of the bicycle rolled flat on a stray nail), suggesting that goals are inferred from actions even when they do not predict future events (cf. the concept of predictive inferences, McKoon & Ratcliff, 1986, 1992).

The inferences obtained in the surprise cued-recall paradigm result from retrieval processes, and thus tell us something about the long-term representations of inferred goals. However, do people rely on these representations to infer goals during perception of actions? That is, do goal inferences also occur automatically on-line, at encoding? In two further studies, Hassin and colleagues (2005; Studies 3 and 4) examined this issue by employing a

probe recognition task and a lexical decision task. As in the previous studies, participants read goal-implying sentences and control sentences within a very short amount of time, which was immediately followed by the goal word. To disguise the critical trials, the goal-implying and control trials (i.e., sentence and corresponding goal word) were embedded in a large number of fillers. In the probe recognition study, participants' task was to decide whether the word had appeared in the previous sentence or not (requiring a no-response which should take longer if the goal-implying sentences would enhance the accessibility of the goal). In the lexical decision study, they had to indicate whether the string of letters following the sentences was an existing word or not (requiring a yes-response which should go faster in the case of enhanced accessibility of the goal). Both studies established that goal-implying sentences did enhance the accessibility of the goal representation, showing that goals were inferred on-line. All together, then, these findings provide strong evidence for the notion that people automatically infer other people's goals from descriptions of behaviors.

The role of perceived effort in automatic goal inferences

The research on automatic goal inferences discussed so far suggests that the human mental system is well-tuned towards inferring goals from observed specific pattern of actions performed by inanimate objects in a movie or by a person described in a short script. Recently, we began to more closely examine the operation of this system to better understand the basic features that signals the pursuit of goals in a given behavioral context and affect the strength of goal inferences. Specifically, in a series of studies we investigated the role of behavioral effort exerted by an actor as a cue to the incentive value or goal of motivating the actor's behavior (Dik & Aarts, in press). Effort is one of the hallmarks of motivation and goal pursuit -- it tells an organism that the (different) actions performed by someone else in response to the situation at hand may serve a goal (Geen, 1995; Pervin, 1989; Toates, 1986). In addition, recent research suggests that perceptions of effort are readily used to infer the

incentive value or goal of a produced item or behavior (Kruger, Wirtz, Van Boven, & Altermatt, 2004). Thus, the more an agent reinitiates his behavior, using different but related actions, the more strongly that agent's behavior is perceived in terms of the desired goal driven the behavior in the given context (Heider, 1958; Jones, 2001). In other words, the representation of a goal may increase in accessibility (because of inferring the goal) when more behavioral effort is perceived.

To investigate this idea we exploited the animated movie technology, that enabled us to experimentally test the effects of the amount of effort displayed by a physical object on the occurrence of inferences as to the goal of helping (Dik & Aarts, in press, Studies 1 and 2). Participants were asked to watch a computerized movie that allegedly served as a pilot for future research. The scene consisted of houses and trees, and in one of the trees a kite that "belonged" to a small ball was stuck in the twigs. The small ball was waiting under the tree until it would fall out (thereby indicating the need for help). Subsequently, a large ball appeared on the scene, moving in the direction of a house that had four different doors and contained a ladder. The ladder could serve as a mean to help the small ball getting the kite out of the tree. To manipulate the perceived effort, the large ball "tried to open" no doors, one door, two different doors or all four doors. The moving-speed of the large ball was fixed, and the whole movie took about 10 s. The rationale here, then, is that "trying to open" more different doors more strongly implies the desire or goal to help.

To assess whether automatic goal inferences had occurred, in one study a lexical decision task was used to unobtrusively measure the accessibility of the goal of helping after exposure to the movie (faster lexical decisions to help-related words indicate higher accessibility of the helping goal). In another study, the accessibility measure consisted of a word completion task, in which participants had to provide as many words as possible with the letter H (higher accessibility of the helping goal is thus shown when participants provide

the word “helping” more often or earlier in the list of words). As predicted, the results of both studies showed a linear effect of the perceived amount of effort on the accessibility of the goal of helping. Awareness ratings further showed that participants were unaware of these effects.

These findings demonstrate that individuals more strongly impute unobservable social motivational causes (in this case, the goal to help) to a moving inanimate object when that object displays more effort in the movement. These findings extend previous work on automatic goal inferences, which demonstrated that people infer the content of goals from behavior performed by inanimate objects or human actors without explicit instructions or conscious intent to do so, by showing that perceived effort may play a key role in the inference process. Thus, goal inferences result from a rather sophisticated system that allows us to easily detect, assess and combine behavioral information into a goal representation to grasp the goals of others – a magnificent piece of “mind work” that can be handled by, and delegated to the unconsciousness (Nørretranders, 1998; Wilson, 2002).

Goal contagion: Automatic goal pursuit upon inferring goals

As we argued in the opening paragraphs, automatic goal inferences do not only provide a direct understanding of the intentions of other people. In addition, they may also directly promote the successful pursuit of one’s own needs and goals without the need for conscious guidance. Indeed, human beings are capable of initiating and pursuing the goals they infer from other people’s actions automatically, and hence exhibit goal contagion. Before we discuss the evidence supporting the goal contagion hypothesis, however, we will briefly address some general issues pertaining to the conceptualization of automatic goal pursuit, and the recent interest in the activation of goals to understand the direct behavioral effects of inferred goals on one’s own goal-directed behavior.

Automatic goal pursuit

A growing number of studies show that goal pursuit can be elicited by mental processes that are put into motion by features of the social environment, and that goal pursuit can subsequently operate outside of conscious awareness (for an overview, see Custers & Aarts, 2005a; ; Chartrand, this volume; Ferguson et al., this volume; Moskowitz, Li, & Kirk, 2004). Central to the idea of automatic goal pursuit is the assumption that goals are mentally represented as desired states that may pertain to behavior (e.g., performing well, helping other people) or to an outcome (e.g., owning money, being proud of oneself; see also the distinction between “do” and “be” goals, Carver & Scheier, 1998). Although often implicitly assumed, conceptualizing goals as representations of desired states suggests the operation of two informational features (Custers & Aarts, 2005a; 2005b): (a) a cognitive one that provides the knowledge of the state that has to be met; and (b) an affective-motivational one that signals the individual that the state has incentive value, and is worth to pursuing. Thus, activation of the goal representation directs as well as energizes activity that is instrumental in attaining the goal (Geen, 1995; Hyland, 1988; Pervin, 1989; Wright, 1996).

Furthermore, goals are assumed to be part of mental structures including situations, the goal itself, and actions that may aid goal pursuit. This implies that goals can be primed by situational cues (Aarts & Dijksterhuis, 2000; Bargh & Gollwitzer, 1994; Kruglanski, Shah, Fishbach, Friedman, Chun, Sleeth-Keppler, 2002). Importantly, goal priming effects are more pronounced when there is a current need or desire making it more pertinent to attain the goal. For instance, priming people with the goal of drinking and quenching thirst only enhances the accessibility and selection of thirst-reducing items if participants are indeed already thirsty (Aarts, Dijksterhuis, & De Vries, 2001; Strahan, Spencer, & Zanna, 2002). Nonconsciously activated goals, then, are likely to operate if the goal already exists as a desired state in the

mind of the individual (Fitzsimons & Bargh, 2004; see also Lewin, 1951). In other words, one can only prime goals when they are there.

Previous empirical work used conceptual priming procedures to test whether goals can be activated and pursued automatically (Bargh, Gollwitzer, Lee Chai, Barndollar, & Trötschel, 2001; Chartrand & Bargh, 1996; Hassin, 2004). This research has established that direct priming of goals via exposure to words that are closely related to them exerts an unconscious influence on action in a subsequent goal-relevant situation. For instance, Bargh and colleagues (2001) unobtrusively exposed participants to words such as “strive” and “succeed” to prime the achievement goal (a goal held by most students, although not always in operation), and then gave them the opportunity to perform well (finding as many words as possible in an anagram puzzle task). Results indicated that participants primed with the achievement goal outperformed those who were not primed with the goal. In a recent line of experimentation, we replicated these goal priming effects in the realm of social stereotypes, showing that people automatically pursue the goals associated with social groups after mere exposure to these groups, such as the goal of helping or making money that are stereotypical for nurses or stockbrokers, respectively (Aarts, Chartrand, et al., in press). Moreover, it has been demonstrated that this goal priming leads to qualities associated with motivational states or “goal-directedness”, such as persistence, flexibility, and increased effort in working for the goal, especially in the face of obstacles and the road to successful goal attainment is hampered.

Goal imitation of simple action movements on objects

The research described above provides evidence that motivational, goal-directed behavior can be automatically put into motion if the representation of the goal is primed. Accordingly, inferring the goal motivating others' actions may directly affect one's own goal-directed behavior. Recently, researchers in developmental psychology have started to examine

this topic to broaden the perspective on behavioral imitation. Specifically, they analyze the adoption of action goals on objects that young children perceive in a model's behavior. The common view about the mechanism underlying behavioral imitation is that observing an action performed by another person activates a matching motor program by direct perceptual-motor mapping. This way, people do what they see other people do. This view has stimulated a tremendous amount of research in different fields of psychology to investigate the neurological and perceptual-motor processes involved in basic action imitation (see reviews by Dijksterhuis, Chartrand & Aarts, in press; Meltzoff & Prinz, 2002).

Several observations of imitation, however, indicate that a direct mapping between perception and action does not fully capture the complexity of human behavior that results from the perception of other individuals' behavior. For instance, pairing positive affect with the representation of behaviors increases the probability of imitating the behaviors (De Houwer, Thomas, & Baeyens, 2001). Thus, when children observe another person displaying a positive facial expression while performing a specific action they are more likely to perform that action themselves. This suggests that observed behaviors that become attached to positive affect form an incentive or desired goal state for which one mobilizes more effort or energy in order to engage in it (Custers & Aarts, 2005b). In taking this idea one step further, Carpenter, Akhtar, and Tomasello (1998) showed that infants (between 14 and 18 month old) engaged in simple actions on an object more readily when the models' actions were marked vocally as desired and goal-directed ("There!") than when these actions were marked vocally as accidental ("Whoops!"). In short, behaviors that represent an incentive or goal are more likely to be imitated than behaviors that do not reflect a goal.

Earlier we presented evidence for the idea that great apes and humans (even very young ones) go beyond the behavioral information given to infer the goals that may guide the simple movements exhibited by physical objects or other persons. When individuals pursue

(and thus imitate) this inferred goal, they seem to be capable to effectively orchestrate and perform the relevant actions leading to this goal, even though they haven't seen the resulting goal or end-state at issue. Recent research in developmental psychology provides initial support for this thesis.

In a line of experimentation on the imitation of simple goal-directed action patterns, Meltzoff (1995; see also Bellagamba & Tomasello, 1999) investigated whether preverbal infants, who watched an adult perform a series of acts on an object, would re-enact what the adult actually did, or what she tried to do. For example, an adult experimenter first showed a hollow plastic square and a stick and then tried to put the hollow square over the stick. In one condition, the experimenter succeeded, whereas in the other she never did. The 18-month-old participants were then given the same objects, and the question was what they would do with these objects. Interestingly, the toddlers who saw the unsuccessful experimenter were as likely to complete the target action as the toddlers from the successful group. This effect was not observed in a control group (in which the model displayed random movements with the object). The interesting finding here, then, is that the infants produced a target behavior that they did not perceive. Rather than imitating the behavior, they tried to attain the goal they inferred. These findings suggest that the children adopted the goal they inferred from the model's behavior.

It should be noted, though, that several issues have been raised that may disqualify this conclusion. For instance, the infants' behavior may be attributable to an understanding of the causal structure of the task (e.g., they simply discover or know the begin and end position of the objects) rather than to an understanding of the goal guiding the observed actions. Accordingly, the behavioral effects do not necessarily require the observation of a model's actions in order to occur. Additionally, because the young participants were given exactly the same objects and means in the same setting it is not clear whether they simply relied on motor

activity available in their behavioral repertoire to directly imitate the target action or whether the inferred goal was an incentive they were motivated to strive for by themselves (e.g., Gergely, Bekkering, & Király, 2002; Heyes & Ray, 2002; Huang, Heyes, & Charman, 2002; for a discussion of these topics). In other words, the findings do not allow to firmly conclude that humans are capable of initiating and pursuing the goals they infer from other people's actions automatically, and therefore the goals of others are contagious.

On the contagion of social goals

The idea that people automatically act on the goals they infer from other individuals' actions has also been investigated recently in social psychological research. In this research, some of the concerns with the goal imitation studies addressed above are solved by using an different experimental paradigm. In this paradigm, goal inferences are assumed to be made on the basis of actions of a protagonist in a specific setting described in a written scenario. However, goal striving among the perceivers is subsequently tested in a different setting that requires different behavior than the one displayed by the protagonist. Of importance, the goals used in these studies have clear incentive value and thus should act as motivators for most people, such as the goal of ingratiating, being accurate, helping others, seeking sex, or earning money (for a taxonomy of social goals, see Chulef, Read, & Walsh, 2001).

Preliminary evidence supporting the suggestion that an individual may automatically pursue social goals (and resultant actions) he or she is currently perceiving in another person was obtained by Chaiken and colleagues (Chaiken, Giner-Sorolla, Chen, 1996; Chen, Schechter, & Chaiken, 1996). They examined whether goals that result from thinking about concrete behaviors can alter the expression of attitudes. Participants in their study were asked, for 12 minutes, to take the perspective of another person performing several behaviors related to either the goal to be accurate (e.g., a reporter seeking the objective facts) or to provide a favorable impression (e.g., being on a blind date with a close friend's cousin). Subsequently,

participants engaged in a discussion with another person. As predicted, participants who had been exposed to the ingratiation goal scenarios were more likely to express attitudes that were consistent with the discussion partner's opinion than those exposed to the accuracy goal scenarios. Suspicion probes showed that participants were not aware of these effects. These results point to the emergence of goal contagion. It should be noted, however, that this study used explicit perspective-taking instructions, and a relatively large amount of time devoted to imagining oneself in another's position. Therefore, it is unclear whether these findings occur upon the mere exposure to another's behavior, or whether they require a much more elaborated and effortful process (Albrecht, O'Brien, Mason, & Myers, 1995). Furthermore, the behavioral effects were not tested for features of goal-directedness.

Aarts, Gollwitzer and Hassin (Aarts et al., 2004) directly tested the emergence of automatic pursuit of social goals after mere (and brief) exposure to behavioral information. One of their aims was to demonstrate goal contagion by examining whether the behavioral effects of goal contagion evidence features of goal-directedness (e.g., Bargh et al., 2001; Gollwitzer & Moskowitz, 1996; Toates, 1986; Tolman, 1925). For example, in one of their studies, they investigated whether the behavioral effects of an implied goal of making money are more pronounced when a preexisting need for money feeds the desire for that goal (e.g., for students lacking income to run their daily life). Participants (undergraduate students) read a short behavioral script in which a student plans a vacation with friends. After planning the vacation the student either (a) goes to a farm to work as an assistant for a month (a pretest showed that our sample of students -- either high or low in need for money -- encode this behavior in terms of the goal of making money) or (b) goes to a community center to do volunteer work for a month (control condition). These scripts were briefly (30 s) presented on a computer screen, just long enough for participants to read it. Participants were then told that the study was almost completed, but that they had to perform a short task on the computer.

Crucially, participants were told that if enough time is left at the end of the session they would be able to engage in a lottery in which they could win money. Participants' pace of working on computer-task served as a measure of goal-directed activity: The faster they work on it, the stronger is their motivation to get to the last part of the session, where they can earn money.

Results showed that participants who were exposed to the behavior implying the goal of earning money were faster than those in the control condition. However, these behavioral differences only emerged when participants had a high need for money, suggesting that the implied goal was contagious when that goal already existed as a desired state in the perceivers' mind. Importantly, thorough debriefing and awareness ratings indicated that participants were unaware of these effects.

In two other studies, Aarts et al. replicated these goal contagion effects for the goal of seeking casual sex. In these studies, heterosexual male students in all conditions read a short story about a man who meets a former female friend at a bar and spends a few hours with her. In the casual sex goal-implying condition -- but not in the control -- the man asks the woman whether he can come with her to her apartment (see also Clark & Hatfield, 1989). Next, all participants were asked to help a female or male experimenter by providing feedback on a task they performed earlier on in the study. Previous findings showed that heterosexual men know that offering help can be instrumental in attaining (casual) sex with women, and that men behave accordingly (Buss, 1988; Canary & Emmers-Sommer, 1997). Thus, goal contagion should lead participants to be more helpful. Indeed, male participants exerted more effort in helping the female experimenter in the sex goal condition than in the control condition. These behavioral changes did not ensue if participants were asked to provide feedback to the male experimenter, indicating the quality of goal appropriateness (i.e., goals make use of good opportunities to reach the goal and shun bad ones). Furthermore, the goal

contagion effects were even manifest after a 5 minutes delay, showing some degree of persistence.

In short, then, the studies presented above indicate that humans are keen to act on the goals of other social beings that are implied in a behavioral scenario or script. However, it may be argued that goal contagion occurred because participants could identify or compare with the other agent – after all, both the actor and the participant are persons, and thus belong to the same group: Humans. There is research to suggest that subjective variables pertaining to relational aspects (such as the level of social identification and significance) may influence how individuals appreciate the goals that are implied by those other persons (e.g., Andersen, Reznik, & Manzella, 1996; Shah, 2003). For instance, people who are primed with the name of a significant other seem to adjust their perceived value of a task goal to the goal value associated with the significant other (Shah, 2003). However, these findings do not mean that the emergence of automatic goal pursuit upon perception of behavior requires for its occurrence a human actor as a necessary condition. According to the goal contagion hypothesis, it should not matter whether the target is human or not, as long as the movements of the target allow for goal inferences that are represented as desired states in the perceiver's mind².

To investigate this hypothesis, Dik and Aarts (in press, Study 3) used the animated movie described earlier. As mentioned earlier, this task was used successfully in demonstrating that people are more prone to automatically infer the goal of helping implied by the movements of a physical object when that object put more effort in its goal pursuits. As it was demonstrated that the mental representation of the goal to help rendered more accessible when more effort was perceived, we expected that this heightened accessibility would lead to more goal-directed behavior, aimed at the achievement of this very same goal. Participants were instructed to watch the computerized movie in which a large ball tried to

help a little ball getting a kite out of the tree by obtaining access to a ladder in a house. The large ball tried to open no doors, one door, two doors or four doors to enter the house, thus experimentally varying the amount of effort to help. Dik and Aarts found that the increased effort displayed by the large ball in the animated movie produced more willingness to help the experimenter by volunteering in follow-up research, showing indeed that the inferred goal of helping was contagious. These findings, then, show that people act on implied goals, even if these goals are inferred from movements of nonhuman objects. This suggests that goal contagion is a basic process that is put in motion by the enhanced accessibility of the goal one infers from movements of agents to understand the potential cause and desired outcome of the observed movements.

The ceasing of goal contagion: Perceiving goal pursuits in a negative light

It is important to note that in the studies discussed so far participants were favorable towards the implied goal in general. Goal contagion occurred as the goal already existed as a desired state in the mind of most of the perceivers upon observing the goal-implying behaviors (e.g., because of a current or chronic need). Given this general “desiredness” of the implied goal, it may be questioned whether people always take on the goals they perceive in other people’s action. In our own research, we have started to address this issue by examining whether an observed goal pursuit (e.g., seeking casual sex) that unfolds in a socially unacceptable or negative way (e.g., is associated with being unfaithful) fails to be contagious, even though the person is favorable towards the goal in general. But why would this be the case? Why should people not act on a goal representation that becomes attached to negative information?

It is known that humans show hypersensitivity to negative social and behavioral information (e.g., Dijksterhuis & Aarts, 2003; Pratto & John, 1991). Exposing people to negative goal-related cues can easily spoil the appreciation of a given goal (Rozin &

Royzman, 2001). Research on evaluative conditioning further suggests that goal stimuli can easily become less attractive when these stimuli are paired with negative information (De Houwer et al., 2001). In a recent empirical demonstration of this idea, Aarts, Custers and Holland (in press) used the evaluative conditioning paradigm to unobtrusively link the goal of socializing and partying (a goal most of our students perceive as a desired state, see also Sheeran, Aarts et al., 2005) to negatively valenced words, and tested effects of this affective shaping treatment on the motivation to work at the goal in a subsequent goal-relevant task (the speed of a mouse-click task that gave access to a lottery game in which one could win tickets for a popular student party). They found that participants were less motivated to strive for the goal when the goal was linked to negative information (compared to conditions in which the goal was not primed or not directly linked to negative information). These findings suggest that the incentive value of a goal decreases when the goal is co-activated with negative affect. Importantly, these effects occurred outside of participants' awareness, indicating that if activated goals become attached to negative affect, then this can lead to nonconscious cessation of motivation.

The previous findings may have important implications for the emergence of goal contagion. Specifically, they suggest that the perception of another person's goal-implying behaviors will not always lead to goal contagion: when the goal pursuit is perceived as negative, goal contagion may be less likely to occur. To examine this issue, Aarts, Gollwitzer and Hassin (2004) exposed heterosexual male students to the behavioral script implying either the goal of seeking casual sex or not. In one of the sex goal versions, it was made clear that the protagonist was already engaged in a serious relationship (this should render the goal pursuits of casual sex unacceptable and thus puts it in a negative light; Margolin, 1989). Participants were then given the opportunity to help a female experimenter, and the question was how much effort they would expend to help (as a mean for goal achievement). The

results indicated that goal contagion vanishes when the situation in the behavioral script renders the implied goal unacceptable. Further experimentation revealed that perceiving others' pursuing a goal under unacceptable conditions made the goal less desirable for the perceivers – even though it was generally favorable. Importantly, the fact that goals that were pursued improperly were not contagious did not result from a competition with other goals evoked by the situation described in the behavioral script. These data, then, support the contention that people do not automatically adopt goals that are pursued in the context of socially unacceptable, negative circumstances.

These findings further establish the important point that people do not always automatically adopt the goals of others, even though the goal is activated in the mind of the perceiver. Negative information that co-occurs with an inferred goal seems to be an important moderator of goal contagion. Such negative information may derive from the way or context in which an actor pursues the implied goal, but also from properties of the actor itself) – an issue that certainly requires further research. The bottom-line is that as soon as a goal is linked to negative affect or categorized as unattractive, that goal no longer operates as an incentive or state one desires to attain, and thus is not capable of directly shaping goal-directed activity. As the Aarts et al. (2004; in press) studies showed, however, people do not have to be aware of these behavioral effects; the reduced desire in itself may suffice to moderate goal contagion. This raises the possibility that individuals have an effortless protection or blocking mechanism that make them immune, so to speak, against taking and acting on goals that are rendered unattractive. This idea concurs well with the literature on goal assignment illustrating the difficulty to talk people into adopting new or impersonal goals if these are not presented in the most positive light possible (Locke & Latham, 1990; Oettingen & Gollwitzer, 2001).

General conclusions

In this chapter, we expanded on the progress researchers have made in two separate major developments in social psychology research – i.e., work on social causal inferences and automatic goal pursuit – to analyze the human ability to automatically infer and adopt the goals from actions performed by someone else. Our review of recent empirical research on the topic demonstrates that individuals have a natural ability to automatically infer goals from others' behaviors, and that these inferred goals can be automatically pursued by the perceiver, a phenomenon we termed *goal contagion*. These new findings show that (causal) goal inferences do not only help us to directly understand and predict the behaviors of others in the situation at hand. Goal inferences may also directly promote the successful pursuit of one's own needs, desires and goals. By adopting the goals of others people may become more similar in what they desire and strive for in the current social situation without much conscious thought. We believe that the notion of goal contagion in general, and further explorations of this process in particular, may improve our understanding of how people orchestrate their goals and behaviors in everyday life.

Footnotes

1. More recent models of behavior explanations also take unintentionality into account when making causal explanations of behavior (Malle, 1999; Malle & Knobe, 1997). However, as the present line of argument pertains to goals as causes of behavior, we only consider behavior that signals intentionality to a perceiver.
2. In fact, research on the animated movie technology has established that the attribution of goals to inanimate or nonhuman objects renders these objects animate and social. More generally, this tendency to anthropomorphize is quite common among human beings, and it may constitute the core feature that allows us to establish some sort of social bonding with nonhuman objects, such as pets, computers, cars, blow-up dolls, and so on (Mitchell, Thompson, & Miles, 1997).

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