

## **I WANT TO KNOW WHAT YOU WANT: HOW EFFORT PERCEPTION FACILITATES THE MOTIVATION TO INFER ANOTHER'S GOAL**

Giel Dik and Henk Aarts  
*University of Utrecht*

Three experiments investigated whether inferring goals from another agent's behavior is a motivational process and, more specifically, whether the motivation to infer a goal is enhanced by the amount of behavioral effort that is perceived. Participants were exposed to behavior that varied in intensity to induce different perceived amounts of effort, after which the motivation to infer the goal of the actor's behavior was measured. Experiment 1 employed a text comprehension task, whereas Experiment 2 used an animated film task. Subjective experiences were used to measure the motivation to infer the goal. A third experiment assessed motivation with a behavioral measure. Results showed that an increase in perceived effort enhances the motivation to infer the goal of an actor, and that this effect was specific for situations in which goal content was unknown. Implications for the literature on goal inferences are discussed.

People have a strong tendency to perceive the behaviors of others in terms of the goals that cause these behaviors. Without awareness, effort or intention (i.e. spontaneously; Uleman, Newman, & Moskowitz, 1996) we infer the goal that another being tries to attain when we are merely exposed to her actions. In the psychological literature, these Spontaneous Goal Inferences (SGI's) have been demonstrated by exposing participants to written behavioral descriptions that imply the goal a protagonist wants to reach, after which the mental accessibility of the goal concept is measured (Aarts, Gollwitzer, & Hassin, 2004; Hassin, Aarts, & Ferguson, 2005; Long & Golding, 1993; Poynor & Morris, 2003). Researchers have designed these behavioral descriptions to imply that a goal is being pursued, and to demonstrate that participants spontaneously include this goal in their encoding of the behavioral information even though the goal is not explicitly mentioned.

---

The work in this paper was supported by the Dutch Organization for Scientific Research (NWO VIDI-grant 452-02-047). Correspondence concerning this article should be addressed to Giel Dik or Henk Aarts, Utrecht University, Department of Social and Organizational Psychology, PO Box 80140, 3508 TC, Utrecht, The Netherlands. E-mail: [gieldik@zonnet.nl](mailto:gieldik@zonnet.nl) or [H.Aarts@uu.nl](mailto:H.Aarts@uu.nl).

Whereas the evidence for SGI's is mounting (Aarts, Dijksterhuis, & Dik, 2007) most research so far has mainly used stimulus materials that (as pre-testing has shown) strongly imply a specific goal or could easily be recognized in terms of the goal. However, an examination as to which circumstances favor the occurrence of SGI's, and especially why they occur, still remains a fairly unstudied issue. Recently though, we started to explore this topic and established that systematically increasing the amount of behavioral effort that observers may perceive in an agent's actions performed in a given situation, led these observers to make SGI's (Dik & Aarts, 2007). Consistent with theories proposing that people possess cognitive schema's or scripts about how goal pursuit typically emerges (Graesser, Singer, & Trabasso, 1994, Malle, 2005, Read, 1987, Schank & Abelson, 1977), these findings suggest that encoding another person's actions in terms of effort provides a more 'typical' instance of motivational goal pursuit. Therefore, people recognize high effort behavior more easily as being aimed at a goal that, in turn, leads to a higher probability of inferring the underlying goal of the behavior in the situation at hand.

However, whereas the role of scripts may reveal an understanding of how behavioral characteristics (such as effort) cause people to discover the goals of another agent, other, more functional perspectives (Kruglanski, 1990; Tomasello, Carpenter, Call, Behne, & Moll, 2005), take a different route and suggest that a person's epistemic motivation determines the search for meaning in the environment, and increases causal inferences (see also, Berscheid, Graziano, Monson, & Dermer, 1976; Pyszczynski & Greenberg, 1981). This perspective suggests that the occurrence of goal inferences follows from the strength of a person's epistemic motivation. Surprisingly, the role of motivation in making goal inferences has been neglected so far by empirical research. Following the functional perspective on causal inferences, we reason here that SGI's also depend on whether or not observed behavior carries certain characteristics that can trigger epistemic motivation to discover the goal that causes the behavior. This motivation, we assume, derives from our desire to understand the goals of other individuals to the extent that they provide us with valuable information about our environment, which can greatly benefit our well-being. Therefore, it is likely that we become more motivated to infer those goals, and especially when another person's behavior signals to us that she is pursuing a goal that is worthwhile.

Based on research that demonstrated that behavioral effort is used as a cue to determine (goal) value (Kassin & Lowe, 1979; Kruger, Wirtz, Van Boven, & Atermatt, 2004), we propose that perceptions of effort trigger the motivation to make goal inferences. In other words, perceiving another person intensifying her behavior when aiming to attain a (yet unknown) goal triggers our epistemic motivation to find out what that goal is. Three experiments were set out to test some key hypotheses derived from this conceptualization.

## GOAL INFERENCES

Social behavior is commonly understood by identifying its cause. Important mental constructs that people often consider to be the causes of behaviors are goals. For instance, when we see a person walking to the refrigerator, people tend to describe

this behavior in terms of its goal, that is, by stating that the person wants to get a snack (McClure, 2002). Inferring a goal from behavior as a way of understanding it seems to be deeply rooted in humans when they observe their social world. Goal inferences can even occur without effort, intention or awareness (i.e. spontaneous), that is, mere exposure to intentional behavior can be sufficient to start up the goal inference process (see Malle, 1999; for an in-depth analysis on the differences between the manner in which people explain intentional vs. unintentional behavior).

In the literature on text comprehension and semantic processing it has been demonstrated that goals are inferred spontaneously when people read descriptions of intentional behavior (Aarts et al., 2004; Hassin et al., 2005; Long & Golding, 1993; Poynor & Morris, 2003; see for a review Aarts et al., 2007). Hassin et al. (2005) exposed participants to sentences that described behavior clearly implying the achievement of a specific goal (e.g., "The man with the suitcases goes to the airport," implying the goal to travel). The emergence of SGI's was assessed with the use of several different implicit accessibility measures, for instance by measuring enhanced mental accessibility of the goal representation with a lexical decision task after each sentence was read (Study 4). It was revealed that participants responded faster to a goal related word after a sentence that implied the pursuit of this goal, compared to sentences that contained the same words, but that did not imply the goal (i.e., "The man sells the suitcases at the airport"). Participants did not require explicit instructions to infer goals, nor were they aware of the fact that they did. Thus, the mere exposure to intentional behavior leads people to spontaneously infer the underlying (implied) goal of that behavior.

However, behaviors differ to the extent that they embody goal pursuit. Some behaviors are more easily recognizable for an observer as being instigated by a goal than others. For instance, goal-directedness is usually characterized by motivational behavior, which can be revealed through the effort that is perceived in the behavior. According to Schank and Abelson (1977), incoming information is organized following existing mental categories that describe how social events typically proceed. For example, a restaurant-script contains information like receiving the menu from the waiter, ordering drinks, etc. In addition, Schank and Abelson (1977) also describe knowledge structures that are not as specific as scripts but contain, for instance, knowledge about how goals are pursued across different situations. People have mental schemas about how goal-directed behavior is performed. That is, motivational action is employed as a mean to attain a desirable end-state (Dik & Aarts, 2007; Kruglanski, 1996; Read, 1987).

The research alluded to above suggests that the more strongly observed behavior resembles a stored representation of typical goal-pursuit, the more easily an observer can identify an actor's goal-pursuit, and the goal she pursues. Hence, the more effort (as an indicator for motivation) is perceived in an actor's behavior in the situation at hand, the more likely that an SGI will occur. As a first demonstration of this idea, Dik and Aarts (2007) examined whether the strength of SGI's was dependent on the amount of behavioral effort that was observed. In their studies, they asked participants to watch a specific-designed animated movie that featured movements of a ball implying the goal of helping a smaller ball to get its kite out of a tree. However, the ball 'pursued' this goal by using various amounts of per-

ceived effort (i.e., trying various numbers of doors to enter a room that contained a ladder). To assess SGI's, after the film the mental accessibility of the concept of helping was measured using a word completion task (Experiment 1) and a lexical decision task (Experiment 2). Results demonstrated a linear relationship between effort and goal inferences; stronger SGI's occurred when the perception of effort was higher.

As the cognitive components of these causal inferences have been well documented in the literature (Graesser, et al., 1994; Hastie, 1983; Uleman et al., 1996), motivational underpinnings of the inference process have been stressed as well (Kruglanski, 1990; Tomasello, et al., 2005). For instance, recently Tomasello and colleagues (2005) have argued that humans possess the unique motivation to read and share intentions with other individuals, allowing them to work together to reach a joint goal. The cognitive ability to 'read' the goals of others serves human cultural learning and engagement. Accordingly, humans employ their cognitive ability to infer goals when they want to, that is when it serves their needs and motives. Considering this functional perspective on goal inferences, here we argue that the occurrence of these inferences is greatly influenced by our motivation to make them. Moreover, our motivation to make SGI's is enhanced when we assume that finding out a goal is going to be valuable.

#### PERCEIVED BEHAVIORAL EFFORT AND THE MOTIVATION TO INFER GOALS

Understanding the goals of others can serve our needs and motives and be of great importance for our well being. For instance, understanding that other individuals are fleeing from danger or seeking out water and food can greatly benefit our own survival. Presumably, humans can be strongly motivated to find out the goals of others in our social surroundings, depending on the situation. People are especially motivated to infer a goal from another's behavior if they assume that finding out the goal's content provides them with useful information or valuable outcomes. Thus, another person's behavior should comprise certain characteristics that signal to an observer that the goal underlying the behavior is something worth finding out. Hence, we propose here that the perception of behavioral effort serves as such a signal. Perceived effort is used as a heuristic for perceptions of value (Kruger et al., 2004) and goal desirability (Kassin & Lowe, 1974). When encountering various behaviors around them, people prefer to infer those goals that seem valuable to the actor, because goals that are valuable to another person might be valuable to know and to attain ourselves (Aarts et al., 2004). This line of reasoning is consistent with the general notion that knowing the value of others' goals facilitates a more accurate picture of social reality and fosters interpersonal and group relationships by means of sharing and striving for socially important behaviors and end-states (Aarts et al., 2007; Cialdini & Trost, 1998; Tomasello et al., 2005). All else being equal then, people are more eager to discover the goal causing another person's behavior as a result of perceiving more effort, because the effort renders the potential goal of the actor to be perceived as valuable or important.

## THE PRESENT RESEARCH

Three experiments are reported that test the hypothesis that people become more motivated to infer an agent's goal when they perceive his or her behavior to be more effortful. In all three experiments, participants were exposed to an agent that behaved in a specific context suggesting either low, medium, or high effort, while the agent's goal remained unrevealed to them. Next, motivation to infer the goal was assessed. Following previous work on goal inferences, the first experiment exposed participants to descriptions of intentional behavior with the use of a text comprehension task (Hassin et al., 2005), after which participants were explicitly asked to report their motivation to find out the agent's goal causing her behavior. The second experiment aimed to replicate and extend our basic hypothesis by employing an animated film to show an agent's behavior. Finally, Experiment 3 explored effects on motivation by means of a behavioral measure, and tested whether the enhanced motivation to infer goals is conditional on knowing the goal in advance or not.

## EXPERIMENT 1

Experiment 1 served as an initial test to demonstrate that people's motivation to find out another person's goal increases as a function of the effort that they perceive in the person's goal pursuit. We designed a short story in which a protagonist attends to a goal in the environment, while the pace by which she moved in the direction of the goal was varied. In order to create differences in perceived effort, participants read that the protagonist moves with either a slow, moderate, or strong pace. Thus, we assume that in the course of directing at a goal stronger walking pace is encoded as more effortful. However, the content of her goal is not revealed in the story. Afterwards, participants rated their motivation to find out what the protagonist's goal was. It was expected that participants' experienced motivation would increase proportionately to the pace of walking, and that this effect is mediated by the amount of effort that they perceived to be present in the protagonist's behavior.

## METHOD

### Participants and Design

Eighty-two Dutch undergraduates participated in the experiment, receiving € in return. They were randomly assigned to the low, moderate, or high pace condition.

### Procedure

Participants sat behind a PC in a cubicle and worked on the task individually. The instructions on the computer screen informed participants that they participated

in an experiment about story reading and text comprehension. They read a short story about which they had to answer a number of questions. Nothing was mentioned about the content of these questions.

*Manipulation of Walking Pace.* The computer then displayed the written story about a woman (Susan) who walked across the street. The weather was fine and, while walking, Susan had a thought and looked around. Ahead she saw something and she decided to go there. Depending on pace condition, the story then ended as follows: Susan moved towards it at an easy pace, a moderate pace, or a high pace. After the reading task, participants answered several questions, provided to them in random order.

*Perceived Effort.* Participants were asked to indicate how much effort Susan had put in her behavior. This question was rated on a 9-point scale (*no effort at all*—1 to *a lot of effort*—9) and served to check whether we have succeeded in increasing the perceived amount of effort proportional to our walking pace conditions.

*Reported Motivation.* Furthermore, participants had to indicate how motivated they were to find out the goal of the protagonist. Specifically, it was asked how much participants wanted to know what Susan wanted to do. This item was rated on a 9 point scale (*not at all*—1 to *very much*—9).

*Control Questions.* To examine the specificity of our hypothesis, that is, an increase in effort enhances the motivation to infer the goal of the agent and not the motivation to acquire or seek out new information in general (i.e. diversive curiosity; Berlyne, 1960), two control question were included that were unrelated to information about Susan's goal. These items were how much participants wanted to know the weather conditions of that day, and what color Susan's hair was (*not at all*—1 to *very much*—9).

At the end of the experiment, participants were debriefed, paid and thanked.

## RESULTS AND DISCUSSION

### Perceived Effort

To assess whether the perception of effort corresponded proportionally to the increase in walking pace that we manipulated, the perceived effort ratings were subjected to an ANOVA with perceived effort as the dependent variable and the pace conditions as the independent (between-participants) variable. This analysis yielded a strong linear effect,  $F(1, 80) = 47.44, p < .01, \eta^2 = .37$ . Averages for the low, moderate, and high pace conditions were: 4.4 ( $SD = 1.8$ ), 6.0 ( $SD = 2.0$ ), and 7.7 ( $SD = 1.6$ ) respectively, supporting the notion that the perceived effort increased linearly with the manipulated increase in pace.

### Reported Motivation

To investigate our hypothesis as to the effect of pace on the motivation to find out another person's goal, the reported motivation scores were subjected to an ANOVA with pace as the independent variable. As the perception of effort showed a strong linear increase, we examined whether the reported motivation followed



a similar trend. Analysis revealed that this was indeed the case:  $F(1, 80) = 8.59, p < .01, \eta^2 = .10$ . The average motivation ratings were: 6.1 ( $SD = 1.5$ ), 6.9 ( $SD = 2.0$ ), and 7.5 ( $SD = 1.4$ ) for the low, moderate, and high pace conditions respectively. This pattern thus confirms our hypothesis: perceiving more effort in another person's behavior motivated participants to find out the goal causing the behavior.

### Mediation of Perceived Effort

To examine whether the effect described above was due to participants perceiving more effort, we conducted a mediational analysis (Baron & Kenny, 1986). As we reported above, the first two steps of mediation had been met (an effect of the IV on the mediator and an effect of the IV on the DV), so next we analyzed the effect of walking pace on reported motivation again, this time controlling for the scores on the perceived effort ratings. An ANCOVA, using the pace and motivation measure as the independent and dependent variables and the perceived effort ratings as a covariate (mediating variable), revealed that the effect of perceived effort on the motivation measure was significant after controlling for pace,  $\beta = .38, t(80) = 2.99, p < .01$ , hereby meeting our third requirement for mediation. Furthermore, this analysis revealed that the effect of our pace conditions on reported motivation had completely vanished when controlling for perceived effort,  $F(1, 79) = .38, p = .54$ . A Sobel test showed that this decrease of our effect was significant,  $z = 2.95, p = .01$ . Importantly, a test of the opposite model was unreliable: An ANCOVA examining the effect of manipulated pace on perceived effort while controlling for reported motivation did not cancel out the original effect,  $F(1, 79) = 35.18, p < .01, \eta^2 = .31$ . This indicates that the effect of manipulated pace on reported motivation was completely mediated by perceived effort, suggesting that participants became more motivated to infer the protagonist's goal because they perceived her to invest more effort into her behavior.

### Control Questions

The two control questions revealed no effect of pace conditions (both  $F$ 's  $< 1$ , ns.), thereby showing that effort did not boost the motivation to acquire new information in general, but was specific to information concerning the goal of the pursuer.

## EXPERIMENT 2

The previous experiment obtained initial evidence for the idea that increased perceived effort enhances the motivation to infer the goal of another's behavior. This effect was established in a text comprehension task that described walking speed to indicate effort as part of an agent's everyday activity. The purpose of Experiment 2 was to replicate and extend the results from Experiment 1 in three ways. First, we used the animated film technique—a paradigm that utilizes functional properties of objects to convey behavioral information, and therefore allows for an examination of the role of effort in motivating people to infer goals from a more basic and content-free perceptual process view (see Kassin, 1982; for a discussion

on this matter). In Experiment 2, participants watched a short film in which a ball 'walks' down a road and encounters a house that contains several doors. The alleged goal of the ball was to enter the house, and differences in perceived effort were experimentally induced by showing how the ball 'tries' to open either one or more doors (see also Dik & Aarts, 2007). Thus, instead of variations in speed, we used the number of different actions to attain a goal to induce differences in perceived effort. After the film, participants reported their experienced motivation to find out the ball's goal to enter the house.

The second purpose of Experiment 2 was to provide an empirical test of the possible mechanism underlying the effect of perceptions of effort on the motivation to infer goals. SGI's do not necessarily happen upon the mere perception of every behavior, but they are more likely to occur upon the actualization of our epistemic motivation. The motivation to find out others' goals is not equal for every behavior, and as we reasoned, is high for those behaviors that carry features that something worthwhile is being strived for. After all, some goals are more valuable for us to know than other goals. Following the social informational value perspective on knowing and sharing goals of other people on the basis of the value of others' goals (Aarts et al., 2004; Cialdini & Trost, 1998; Tomassello et al., 2005), we proposed that people become more motivated to know another person's goal as a function of perceptions of effort because they perceive the goal as being more valuable and important to the other person (and hence, may be valuable to them as well). Therefore, to test this proposition more directly, in the second experiment perceived value as to the agent's goal was measured and its relation with manipulated number of different actions and reported motivation was examined.

Thirdly, previous work has demonstrated that moving geometrical figures tend to be perceived as living, intentional beings (starting with a classic study from Heider & Simmel, 1944), as long as they exhibit specific motion features. Two important features that have been investigated in the literature are self-propulsion (i.e., the object can start and stop on its own) suggesting that the object is an animate (living) being (Premack, 1990), and the principle of rationality (i.e., the object moves toward its goal along the most direct trajectory), implying goal-directed movement (Gergely, Nadasy, Csibra, & Biro, 1995). Although we constructed our display in a way that the different effort conditions would all carry these features, we wanted to make sure that the perceptions of intentionality would not differ between conditions and so we also measured perceived intentionality.

## METHOD

### Participants and Design

Forty-eight Dutch undergraduates participated in the experiment, receiving €2,- in return. They were randomly assigned to the one, two, or four doors condition.

### Procedure

Participants sat behind a PC in a cubicle and worked on the task individually. They were told that they were participating in research about how people process information that is exposed in animated displays. They were going to watch a short animated film, followed by a number of questions.



*Stimulus Material.* After a key press the film began and showed a ball that was moving down a road that had some trees next to it (see Figure 1). The road led upwards from the bottom of the screen and ended on a horizon. The road was broadest below, narrowing down towards the horizon. The ball was actually bouncing up and down in the center of the screen, while the trees moved towards the participants point of view, increasing in size. This created an image of the ball walking towards the horizon past the trees. Furthermore, the ball came across a house that was also located next to the road. In the beginning of the film, the house was shown as a small spot near the horizon, but as the ball 'got closer' the house increased in size and the details of it became visible. After a few seconds it became apparent that the house had four doors and a sign on it that could not be read at first, but as soon as the ball walked even further participants were able to read the word *theater* on it. The ball then passed the house and it disappeared below the screen. Then a second house appeared in the distance and as the ball walked closer, it was shown that the sign on this house said *café*. The ball passed this house too, and it also disappeared below the screen.

*Manipulation of Number of Actions.* Then a third house appeared and as soon as the ball reached it, the ball, the house, and the trees stopped moving. The ball walked off the road to the house and touched (depending on condition) one, two, or all four doors, creating the suggestion that the ball tried to enter the house. Each door was touched for a second. Note that at this point it was not possible to read the sign on the house yet, and thus the ball's possible reason or goal to enter the house was not revealed. After these attempts the ball returned to the road and resumed its path. The ball moved on and just as the sign on the house was about to become readable, the film stopped. Accordingly, participants saw that the ball tried to open one or more doors in order to enter the house, but just as they were going to discover the goal of the ball to enter the house, the film stopped and the questions were administered (in random order).

*Perceived Effort.* To test whether we succeeded in inducing differences in the amount of perceived effort by showing an increase in number of attempted doors, we asked participants how much effort they thought that the ball had put in entering the last house. Responses were collected on a nine point scale (none—1 to a lot—9).

*Reported Motivation.* To assess how motivated participants were to find out the goal of the ball, they were asked how much they wanted to know what the ball wanted to do in the house (not at all—1 to very much—9).

*Perceived Goal Value.* To assess the perceived value of the ball's goal, two questions were posed that measured participants' perceptions as to how valuable and important it was for the ball to enter the house (not at all—1 to very much—9). These two ratings were averaged ( $r = .60$ ) into an index of perceived goal value.

*Perceived Intentionality.* To check whether differences in perceived intentionality of the agent (i.e., the ball) could explain the effect on participants' motivation to find out the agent's goal, we included an additional item. This item asked participants to what extent the ball behaved in an intentional manner (not at all—1 to very much—9).

At the end of the experiment, participants were debriefed, paid and thanked.

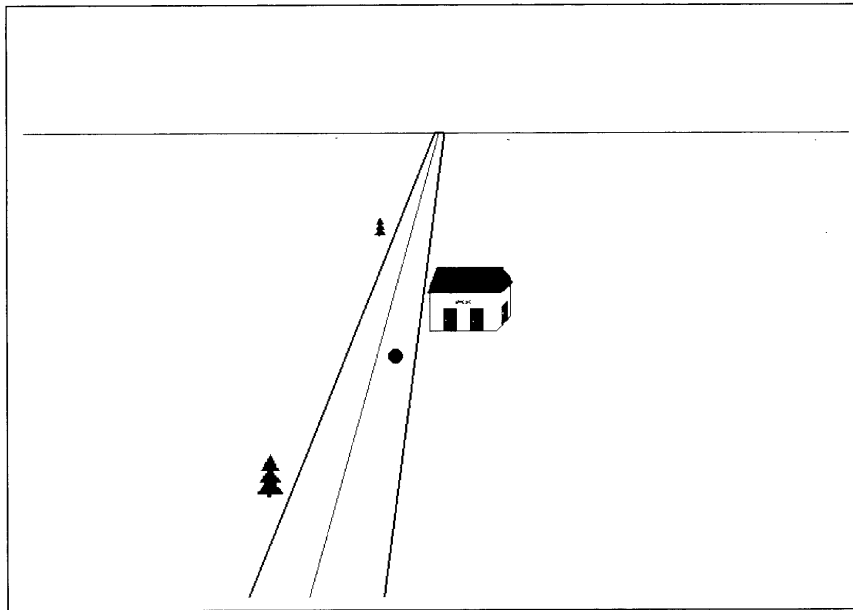


Figure 1. Fragment of the animated film (Experiments 2 and 3).

## RESULTS AND DISCUSSION

### Perceived Effort

To test whether the manipulation was successful and participants had indeed perceived the ball to put more effort into going into the house when it tried to open more doors, the manipulation check was subjected to an ANOVA with the number of attempted doors as the independent variable,  $F(1, 46) = 33.99$ ,  $p < .01$ ,  $\eta^2 = .43$ . Average scores were: 4.4 ( $SD = 2.2$ ), 6.0 ( $SD = 1.6$ ), and 7.8 ( $SD = 1.0$ ) for the one, two, or four doors conditions respectively. It turned out that the increase in attempted doors showed a linear relation with the manner in which participants perceived effort.

### Reported Motivation

The reported motivation measure was subjected to an ANOVA with attempted doors as the independent variable,  $F(1, 46) = 7.68$ ,  $p = .01$ ,  $\eta^2 = .14$ , which revealed a linear effect. Average scores were: 5.5 ( $SD = 2.0$ ), 6.4 ( $SD = 1.5$ ), and 7.2 ( $SD = 1.6$ ) for the one, two, and four attempted doors conditions respectively. Again, this confirms our hypothesis. People become more motivated to infer the goal of an agent when this agent behaves more in an effortful manner.

### Mediation of Perceived Goal Value

With the perceived goal value index we wanted to explore the mechanism that turned exhibited effort into more motivation to infer the goal. Specifically, we argued that more behavioral effort signals the mental system that the goal causing the behavior is socially more valuable, which in turn, motivates participants to infer the goal. To test this notion, we conducted a mediational analysis and first examined whether participants perceived the goal of the ball to be more valuable as a function of the number of attempted doors. An ANOVA, testing the linear trend, showed that this was the case:  $F(1, 46) = 19.87, p < .001, \eta^2 = .30$ . Average scores were: 4.7 ( $SD = 1.7$ ), 5.8 ( $SD = 1.5$ ), and 7.0 ( $SD = 1.3$ ) for the one, two, and four doors conditions respectively. Furthermore, an ANCOVA, testing the effect of manipulated number of doors on reported motivation again, but now with the perceived goal value rating as a covariate, revealed that there was a separate effect of the mediating variable (perceived goal value) on the dependent variable (reported motivation) as well,  $\beta = .40, t(45) = 2.60, p = .013$ . Importantly, this analysis also demonstrated that the original effect of manipulated number of doors on reported motivation had completely disappeared when controlling for perceived goal value,  $F(1, 45) = 1.06, p = .31$ . A Sobel test demonstrated that this decrease of the original effect was significant,  $z = 2.25, p = .02$ . An ANCOVA testing the opposite effect (number of doors on goal value with motivation as a covariate) did not cancel out the original effect,  $F(1, 45) = 11.52, p = .001, \eta^2 = .20$ . Together, these analyses indicate that an increase in displayed effort caused participants to become more motivated to infer the goal of the other agent as a result of an enhancement of perceived value of the agent's goal.<sup>1</sup>

### Perceived Intentionality

An ANOVA testing the effects of the manipulated number of doors on the intentionality rating, revealed a nonsignificant (linear) effect,  $F(1, 46) < 1, ns$ . (overall mean being: 5.7,  $SD = 2.2$ ). This finding shows that participants' perception of intentional movement did not differ across conditions, and thus, that differences in reported motivation did not arise due to differences in intentionality perceptions.

## EXPERIMENT 3

So far we demonstrated that people are more motivated to infer the goal of another individual when they perceive the other to behave more in an effortful manner. Also, it became apparent that this enhanced motivation emerged because people perceived the goal to be valuable to the other agent. These findings were obtained by using a self-reported measure of motivation. Obviously, such measure taps people's explicit and reflective thoughts about their motivation to infer goals. This

---

1. A more stringent test of our theoretical idea would be to examine whether the effect of perceived effort (instead of to be perceived effort in terms of number of doors) on reported motivation is mediated by goal value. However, this mediation effect could not be established, which is due to the strong correlation between perceived effort and goal value, and the relatively small sample size. Therefore, the results of Experiment 2 suggest that the amount of effort that is to be perceived (instead of perceived as such) from the actor's behavior is *likely to* influence motivation through perceived goal value.

leaves open the possibility that participants did not become motivated by themselves, but only reported to be so because they were asked about it. According to our line of reasoning, however, the motivation to infer goals as a function of perceived effort may also affect actual behavior in a spontaneous fashion. Therefore, in this experiment we did not ask participants about their motivation, but we unobtrusively tapped it with a behavioral measure.

In this experiment, we again used the animated film which was interrupted just before the goal of the ball became known to participants. During the interruption, a mouse click task had to be performed before the film continued. It is known that motivational behavior (in the present case, to find out an agent's goal) may become manifest by a speed-up of performance on a task that enables one to act on the given motivational goal state (Freedman & Edwards, 1988; Latham & Locke, 1975; Payne, Bettman, & Luce, 1996). In the present experiment we made use of this rationale. Specifically, participants learned that after completing the mouse click task they could uncover the goal of the ball because then the sign on the house became readable. Working time on this interruption task thus served as the independent variable; we assumed that the faster participants completed this task, the more motivated they were to find out what the ball wanted to do (see e.g., Aarts et al., 2004; for a similar procedure to use working-speed as an implicit behavioral measure of motivation).

Experiment 3 also served another important purpose. In this experiment we manipulated the disclosure of the goal by either giving the sign on the house before participants worked on the interruption (mouse click) task, or after. First, manipulating the disclosure of the goal enabled us to demonstrate that the motivation to infer the goal of another agent is only enhanced by perceived effort if the goal is unknown. If the goal is known perceived effort is not expected to trigger epistemic motivation. Participants are not bothered to find out the goal and hence, they can easily turn to working on the interruption task. Second, it allowed us to rule out a behavioral priming account for the effects, in the sense that participants put more effort into the interruption task because they were primed with the concept of effort as a result of having seen the ball displaying more effort (see Dijksterhuis & Bargh, 2001). If behavior priming of effort drives the effects, then participants should increase their speed on the interruption task irrespective of whether the goal is known or not. However, if perceived behavioral effort facilitates the motivation to infer the possible goal causing the observed behavior, as we hypothesized, then participants should speed-up the interruption task as a function of perceived effort, but only in the condition where the goal (that is, the sign of the house) was not given.

Lastly, we tried to control for another alternative explanation for the effects of perceiving effort on the motivation to find out the goal to which the effort is aimed at. A few studies have shown that unexpected events can instigate causal search, that is when people encounter an event that violates their expectations, they tend to become motivated to identify the cause of the event (Pyszczynski & Greenberg, 1981; Wong & Weiner, 1981). It may be possible that effortful behavior (in our case, a higher number of door attempts by the ball to enter the house) is more unexpected than less effortful behavior, and this may explain the differences in motivation that we found. In order to rule out this possibility, in the current experiment we pre-exposed participants to all the different "number of doors" films that we

designed before the actual task started in order to familiarize them with the films. This way, participants knew on beforehand the different types of behaviors the ball could exhibit, thus rendering these behaviors less likely to violate their expectations.

## METHOD

### Participants and Design

Eighty-two Dutch undergraduates participated in the experiment, receiving €2 in return. They were randomly assigned to one of the cells from the 2 (goal disclosure: yes vs. no) × 3 (number of doors: one vs. two vs. four) between participants design.

### Procedure

Participants sat behind a PC in a cubicle and worked on the task individually. The same film as in the previous experiment was used, with an important modification. Again, the instructions on the computer screen told participants that they were participating in research about how people process information that is exposed in animated displays. In addition, they were told that the researchers wanted to study the influence of interruption on this processing. Participants were going to watch an animated film that, from time to time, would be interrupted by a mouse click task. This mouse click task consisted of five squares on the computer screen that formed a path. Each of these squares had to be clicked on, starting with the first and ending with the fifth. To familiarize participants with the experimental task, they watched an example of the interruption task, and also all the different number of doors conditions of the film without interruption. Then the experiment started and participants were first exposed to an exercise trial. In the *no goal disclosure condition* the ball passed a house that had a sign on it that was about to become readable when the film stopped and the mouse click task began. After they finished this task, the film continued and participants were able to read the sign as the ball continued on its path. In the *goal disclosure condition*, the sign became visible earlier and was already readable before the interruption and continued to be so after the interruption task was completed.

*Motivational Behavior.* Next, the experimental trial began and participants saw the ball trying to enter a house using either one, two, or all four doors. Then the ball walked back to the road and continued on its way. As the house came closer to the viewpoint of the participants and they were just about to see what the sign said (in the no goal disclosure condition), the interruption task began and participants first had to finish it before the film continued (and thus could find out what the agent's goal was to enter the house). In the goal disclosure condition the goal was readable before the interruption (and hence, participants could more rapidly move to the interruption task as they were not triggered with the motivational state of discovering the goal). The main dependent variable was the time participants took to work on the interruption (mouse click) task.

## RESULTS AND DISCUSSION

### Motivational Behavior

The time that participants took to finish the mouse click task was subjected to an ANOVA analysis with number of doors and goal disclosure conditions as the independent variables. The analysis revealed a main effect for goal disclosure,  $F(1, 76) = 8.21, p = .01, \eta^2 = .10$ , and a nonsignificant effect for number of doors,  $F(2, 76) = 1.60, p = .21$ . The main effect of goal disclosure showed that participants were overall faster on the interruption task when the goal of the ball was known ( $M = 2.56$  s;  $SD = .36$ ) in comparison to when the goal was unknown ( $M = 2.80$  s;  $SD = .40$ ). A possible explanation for this effect could be that participants in the goal disclosure condition were not distracted by trying to read the unreadable sign, thus more easily facilitated the switch to the (mouse click) interruption task.

More importantly, the interaction between number of doors and goal disclosure was significant,  $F(1, 80) = 4.66, p = .03, \eta^2 = .06$ . Contrast analysis showed a linear increase in the speed of working on the interruption task as a function of the number of doors for participants who did not know the ball's goal during the interruption,  $F(1, 80) = 7.75, p < .01, \eta^2 = .09$ , while for participants who did know the goal this effect was absent,  $F(1, 80) = .07, p = .79$ . For the no goal disclosure condition, the mean working times on this task were: 2.99 s ( $SD = 0.40$ ), 2.80 s ( $SD = 0.41$ ), and 2.61 s ( $SD = 0.31$ ) for the one, two, and four doors conditions respectively. For the goal disclosure condition these averages were: 2.54 s ( $SD = 0.36$ ), 2.58 s ( $SD = 0.39$ ), and 2.57 s ( $SD = 0.34$ ). This pattern of means supports our hypothesis that participants speeded up their performance on the interruption task to discover the ball's goal if the ball was perceived to put more effort in his pursuit. Moreover, this motivational effect only emerged when the goal of the ball was unknown to participants; when the goal was already known, no motivational effects of perceptions of effort were established.

To conclude, the results from Experiment 3 replicate the effects from the previous two experiments by showing that the motivation to find out an agent's goal increases as a function of the effort that the agent displays. Moreover, the results from the first two experiments are extended by demonstrating that people not only report to be motivated, but also show motivational behavior directed at information concerning the agent's goal. Importantly, this does not happen when people are already familiar with the desired information, demonstrating the functional operation of epistemic motivation and cancelling out a behavioral (effort) priming explanation.

## GENERAL DISCUSSION

In three experiments it was demonstrated that people become more motivated to find out the goal of an actor's behavior whenever this behavior is characterized by more effort. Experiment 1 found higher experienced motivation ratings to know



the goal of a protagonist as this protagonist moved with a higher pace toward her goal. Experiment 2 extended these findings to effortful behavior that was exhibited using an animated film, when effort was manipulated by increasing the number of attempted means to attain the goal. Finally in a third experiment, an increase in motivation to find out an actor's goal as a function of perceiving effort was established using a behavioral measure. Participants behaved more in a motivational manner in order to acquire information about an agent's goal when this agent put more effort into her behavior. Importantly, no effects on behavior occurred when participants already knew the goal. These findings provide new and important evidence that inferring goals from behavior can be a motivational process. Moreover, our studies show that this motivation is influenced by the effort that is perceived in the behavior performed by others in the situation at hand.

The present research advances our understanding about the social cognitive process underlying the inferences of goals from behavior. So far, research mainly focused on demonstrating (spontaneous) goal inferences by exhibiting behavioral information using text comprehension tasks (Hassin et al., 2005; Long & Golding, 1993; Poynor & Morris, 2003) or animated displays (for an overview see Scholl & Tremoulet, 2000). Furthermore, this research approaches goal inferences from a cognitive perspective, in which knowledge structures (such as scripts) are assumed to drive SGI effects. Building on and extending this work, we aimed to acquire a better understanding of why some behaviors may lead to stronger SGI's than other behaviors. For instance, recently, it was shown that the effort that is perceived in behavior influences the likelihood that the goal causing the behavior in the given context is inferred (Dik & Aarts, 2007). What may be expected on the basis of knowledge structure approaches that try to explain social (goal) inferences (Dik & Aarts, 2007; Graesser et al., 1994; Hastie, 1981; Read, 1987, Schank & Abelson, 1977), the resemblance that observed behavior has with stored representations of goal pursuit may not reveal the whole story as to the occurrence of SGI's. Instead, we argue for a functional perspective on goal inferences, and presented findings that suggest that the probability of engaging in the goal inference process (such as searching and combining information in the environment at issue) follows from epistemic motivation. Interestingly, we show that perceiving effort in another's behavior triggers this motivation, because observers assume that only important or valuable goals are worth this effort, which makes it interesting for them to discover the content of these goals.

An important point that should be stressed here concerns the question of how our results may fit into the distinction between dispositional versus situational aspects proposed in attribution-process models (for an overview see, Gilbert, 1998). That is, several lines of experimentation indicate that people focus on either internal (in the agent) or external (in the situation) features to arrive at causal explanation for social events. In line with this work, it may be argued, for instance, that participants speed-up on the mouse task in Experiment 3 did not reflect their motivation to find out the goal of the ball, but merely their motivation to uncover the sign on the house. This suggests that they became more motivated to make an inference about the situation, and not necessarily about the (internal) goal of the agent. Although the desired piece of information refers to an object in the environment, and as such participants want to make a situational inference, we argue that participants are interested in the information because it pertains to the goal of the ball's effortful behavior. After all, people use the behavior of others that they

observe as a source of information about what is going on in the current situation (cf. Cialdini & Trost, 1993). This piece of information can refer to an object in the situation but at the same time, be the other person's goal that we want to infer. This point illustrates that the distinction between situational and dispositional (goal) inferences is not always clear-cut, and this especially holds when a person's (internal) goal refers to an object in the situation (external). Clearly, whether the different types of inferences should be conceptualized as separate entities, or could be treated more similarly from an overarching viewpoint, calls for further theorizing and research. Perceived effort directed at objects in the environment, we believe, may provide a useful concept in this enterprise.

We also showed that perceptions of effort lead to an increase in perceived goal value, which in turn increases the epistemic motivation to uncover the content of this goal. However, the perception of the value of the other's goal might also directly influence the perceived value of the goal to ourselves. Considering that behaviors of others can shape our interpretation of the social situation by providing us with a heuristic of "social proof" that the behavior is effective (Cialdini & Trost, 1998), the desirability of potential goals in our environment might be enhanced simply because we observe others working hard to attain them. Recent work has demonstrated that priming people with states that are desirable to them can lead to nonconscious pursuit of these goal states (Bargh & Chartrand, 1999; Custers & Aarts, 2005; Moskowitz, Li, & Kirk, 2004). Also, these effects are known to occur when, instead of priming, people infer the goals from behavior of others, a phenomenon termed goal contagion (Aarts et al., 2004, 2007). The idea that perceived effort can directly influence the desirability of a goal representation, and hence, the motivation to attain them ourselves, would be a useful extension to this work.

As the current work suggests, perceiving another person's actions in terms of effort triggers our epistemic motivation that directs attention to particular information in the environment that concerns the other's goal. This way, we are prone to acquire information that can be useful to us. However, in essence this mechanism can also backfire, considering situations where others want to deceive us. An illustration of this point would be, for instance, when an army general engages in a decoy attack. By investing much effort (and human lives) into a false attack, the general can try to focus the enemy's attention to one side of the battlefield, while launching a surprise attack to the other side. Hence, the perception of effort can be employed to trick others, by distracting their attention and motivation from true intentions (cf. work on the psychology of deception, for example, DePaulo & Morris, 2004). This example demonstrates that, like cognitive heuristics (Kruger et al., 2004; Tversky & Kahneman, 1974), perceptions of effort as an indicator for goal value and SGI can lead to suboptimal conclusions as a result of a biased motivational process.

## CONCLUDING REMARKS

Goal inferences are made under those circumstances in which they serve our needs and motives the best. For instance, in situations in which we share a common task with other individuals, the cognitive ability to "read" the goals of others is a basic prerequisite for participation in collaborative activities. Understanding others' goals has even been identified as one of the building blocks from which cultural

cognition originated (Tomassello et al., 2005). Furthermore, the goals of others are readily used as a source of information, for instance about incentives in our environment. Learning where to acquire incentives by inferring the goals of others gives us the advantage that we do not need to find out everything ourselves. In this way, the ability to infer goals forms the basis for phenomena like observational learning (Miller & Dollard, 1941) or goal contagion (Aarts et al., 2004; 2007). Humans are motivated to utilize this cognitive ability to 'see' others' goals if they consider it to be beneficial to themselves, thereby using cues (such as perceptions of effort) they observe in their environment. In principle, then, we may not be mere information processors, but instead employ our information processing capabilities in the service of our well-being.

## REFERENCES

- Aarts, H., Dijksterhuis, A., Dik, G. (2007). Goal contagion: Inferring goals from others' actions—and what it leads to. In J.Y. Shah & W. Gardner (Eds.), *Handbook of motivation science*. New York: Guilford.
- Aarts, H., Gollwitzer, P., & Hassin, R. R. (2004). Goal contagion: Perceiving is for pursuing. *Journal of Personality and Social Psychology, 87*, 23-27.
- Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*, 1173-1182.
- Bargh, J. A., & Chartrand, T. L. (1999). The unbearable automaticity of being. *American Psychologist, 54*, 462-479.
- Berscheid, E., Graziano, W., Monson, T., & Derman, M. (1976). Outcome dependency: Attention, attribution, and attraction. *Journal of Personality and Social Psychology, 34*, 978-989.
- Berlyne, D. E. (1960). *Conflict, arousal, and curiosity*. New York: McGraw-Hill.
- Cialdini, R. B., & Trost, M. R. (1998). Social influence: Social norms, conformity, and compliance. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (Vol. 2, pp. 151-192). New York: McGraw-Hill.
- Custers, R. & Aarts, H. (2005). Positive affect as implicit motivator: On the nonconscious operation of behavioral goals. *Journal of Personality and Social Psychology, 29*, 129-142.
- DePaulo, B. M., & Morris, W. L. (2004). Discerning lies from truths: Behavioral cues to deception and the indirect pathway of intuition. In Granhag, P. (Ed.), *The detection of deception in forensic contexts* (pp. 15-40). New York: Cambridge University Press.
- Dijksterhuis, A., & Bargh, J. A. (2001). The perception-behavior expressway: Automatic effects of social perception on social behavior. In M. P. Zanna (Ed.), *Advances in Experimental Social Psychology* (Vol. 33, pp. 1-40). San Diego: Academic Press.
- Dik, G., & Aarts, H. (2007). Behavioral cues to others' motivation and goal pursuits: The perception of effort facilitates goal inference and contagion. *Journal of Experimental Social Psychology, 43*, 727-737.
- Freedman, J. L., & Edwards, D. R. (1988). Time pressure, task performance, and enjoyment. In J. E. McGrath (Ed.), *The social psychology of time: New perspectives* (pp. 113-133). Thousand Oaks, CA: Sage Publications.
- Gergely, G., Nadasdy, Z., Csibra, G., & Biro, S. (1995). Taking the intentional stance at 12 months of age. *Cognition, 56*, 165-193.
- Gilbert, D. T. (1998). Ordinary personology. In D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology* (Vol. 2, pp. 89-150). New York: McGraw-Hill.
- Graesser, A. C., Singer, M., & Trabasso, T. (1994). Constructing inferences during narrative text comprehension. *Psychological Review, 101*, 371-395.
- Hassin, R. R., Aarts, H., & Ferguson, M. (2005). Automatic goal inferences. *Journal of Experimental Social Psychology, 41*, 129-140.
- Hastie, R. (1983). Social inference. *Annual Review of Psychology, 34*, 511-542.

- Heider, F. (1958). *The psychology of interpersonal relations*. New York: Wiley.
- Heider, F., & Simmel, M. (1944). An experimental study of apparent behavior. *American Journal of Psychology*, *57*, 243-259.
- Kassin, S. M. (1982). Heider en Simmel revisited: Causal attribution and the animated film technique. *Reviews in Personality and Social Psychology*, *3*, 145-169.
- Kassin, S. M., & Lowe, C. A. (1979). On the development of the augmentation principle: A perceptual approach. *Child Development*, *50*, 728-734.
- Kruger, J., Wirtz, D., Van Boven, L., & Altermatt, T.W. (2004). The effort heuristic. *Journal of Experimental Social Psychology*, *40*, 91-98.
- Kruglanski, A. W. (1990). Motivations for judging and knowing: Implications for causal attribution. In E. T. Higgins & R. M. Sorrentino (Eds.), *Motivation & cognition. Foundations of social behavior* (Vol. 2., pp. 333-368). New York: Guilford.
- Kruglanski, A.W. (1996). Motivated social cognition: Principles of the interface. In E.T. Higgins & A.W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles* (pp. 493-520). New York: Guilford.
- Latham, G. P., & Locke, E. A. (1975). Increasing productivity and decreasing time limits: A field replication of Parkinson's law. *Journal of Applied Psychology*, *60*, 524-526.
- Long, D. L., & Golding, J. M. (1993). Superordinate goal inferences: Are they automatically generated during comprehension? *Discourse Processes*, *16*, 55-73.
- Malle, B. F. (1999). How people explain behavior: A new theoretical framework. *Personality and Social Psychology Review*, *3*, 23-48.
- Malle, B. F. (2005). Folk theory of mind: Conceptual foundations of human social cognition. In R.R. Hassin, J.S. Uleman, & J.A. Bargh (Eds.), *The new unconscious* (pp. 225-255). New York: Oxford University Press.
- McClure, J. L. (2002). Goal-based explanations of actions and outcomes. *European Review of Social Psychology*, *12*, 201-236.
- Miller, N. E., & Dollard, J. (1941). *Social learning and imitation*. New Haven: Yale University Press.
- Moskowitz, G.B., Li, P., & Kirk, E.R. (2004). The implicit volition model: On the pre-conscious regulation of temporarily adopted goals. In M. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 36, pp. 317-413). San Diego: Elsevier Academic Press.
- Payne, J. W., Bettman, J. R., & Luce, M. F. (1996). When time is money: Decision behavior under opportunity-cost time pressure. *Organizational Behavior and Human Decision Process*, *66*, 131-152.
- Poynor, D. V., & Morris, R. K. (2003). Inferred goals in narratives: Evidence from self-paced reading, recall, and eye movements. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *29*, 3-9.
- Premack, D. (1990). The infant's theory of self-propelled objects. *Cognition*, *36*, 1-16.
- Pyszczynski, T. A., & Greenberg, J. (1981). Role of disconfirmed expectancies in the instigation of attributional processing. *Journal of Personality and Social Psychology*, *40*, 31-38.
- Read, S. J. (1987). Constructing causal scenarios: A knowledge structure approach to causal reasoning. *Journal of Personality and Social Psychology*, *52*, 288-302.
- Schank, R. C., & Abelson, R. P. (1977). *Scripts, plans, goals, and understanding: An inquiry into human knowledge structures*. Oxford, England: Lawrence Erlbaum.
- Scholl, B. J., & Tremoulet, P. D. (2000). Perceptual causality and animacy. *Trends in Cognitive Sciences*, *4*, 299-309.
- Tomasello, M., Carpenter, M., Call, J., Behne, T., & Moll, H. (2005). Understanding and sharing intentions: The origins of cultural cognition. *Behavioral and Brain Sciences*, *28*, 675-735.
- Tversky, A., & Kahneman, D. (1974). Judgments under uncertainty: Heuristics and biases. *Science*, *185*, 1124-1131.
- Uleman, J. S., Newman, L. S., & Moskowitz, G. B. (1996). People as flexible interpreters: Evidence and issues from spontaneous trait inferences. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 28, pp. 211-279). San Diego: Academic Press.
- Wong, P. T. P., & Weiner, B. (1981). When people ask "why" questions, and the heuristics of attributional search. *Journal of Personality and Social Psychology*, *40*, 650-663.