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THE PERCEPTION–BEHAVIOR EXPRESSWAY: AUTOMATIC EFFECTS OF SOCIAL PERCEPTION ON SOCIAL BEHAVIOR

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Each of us is in fact what he is almost exclusively by virtue of his imitativeness
—William James (1890, p. 741)

I. Introduction

Some years ago, one of the authors was driving on a highway at a speed of about 85 miles an hour. Not surprisingly, after a while a police car turned up and the driver was summoned to stop. One of the officers approached the car and asked, "What do you think you're doing? Have you just been watching the Formula One Grand Prix on TV?" The driver pondered this question for a while and said, somewhat hesitantly, "Well, yes, as a matter of fact I was." The officer, presumably a Formula One fan himself, nodded, smiled sympathetically, and gave the driver a steep fine.

As William James noted in our opening quote, we have an innate tendency to imitate. We whisper to someone who is whispering; we start to speak much louder when others do so. We scratch our head upon seeing someone else scratch his or her head. We walk slower in the presence of the elderly, we cycle faster after we have seen a cycling race on TV, and, yes indeed, we get a fine for driving too fast after we have been watching a Formula One Grand Prix.

In this chapter, we argue that this tendency to imitate is the consequence of the way we—or, rather, our brains—are shaped. We argue that social perception, defined here as the activation of a perceptual representation, has a direct effect on social behavior. Perceptual inputs are translated automatically into corresponding behavioral outputs. As a result, we often do what we see others doing.

We must at the outset distinguish the present notion of a direct effect of perception on behavior from two major historical positions that are superficially similar. The first, the behaviorists' thesis that responses follow directly from perceived stimuli, or S-R bonds, also holds that perception directly leads to action (e.g., Skinner, 1938; Watson, 1913). However, the mechanism proposed is quite different because these responses are not imitations of the perceived event but are stamped-in responses to stimuli based on one's past reinforcement history. The second apparently similar theoretical position is Gibson's (e.g., 1979; McArthur & Baron, 1983) notion of *affordances*. In this view, environmental stimuli directly suggest the appropriate behavioral response to them: the grilled lobster says "eat me" and the cold glass of beer says "drink me." Both the behaviorist and the Gibsonian theorist would argue, as we do here, that behavioral tendencies are put into motion directly by perceptual activity, but unlike the present theme, they also argue (more or less) that these tendencies are learned responses over time based on one's history of reward and punishment with those stimuli.

The perception–behavior link argued for here, on the other hand, is the human (and basic animal) tendency to act in the same way as we see others act. We contend that this phenomenon flows directly from a fact of mental representation and organization—that perceptual and behavioral representations for the same action overlap. Thus the effect is a natural consequence of the automatic activation of the behavioral response by the perception of someone else doing the same thing. It is not necessary that the behavioral response be stamped in as a habit through reinforcement and it is not necessary for the response to be intended and strategic.

The chapter is structured in the following manner: First, we start with a broad discussion on the functional relation between perception and behavior. This section is not restricted to imitation; instead, we present a more general perspective on perception and action. Second, we elaborate in more depth on the direct relation between perception and behavior and specifically on one consequence of this relation: imitation. Third, we define the core concepts of social perception. A distinction is drawn between observable behavior (such as gestures), inferences we make on the basis of the observed behaviors of others, and representations that become activated because of the social group membership of others. In the fourth section, evidence is discussed that indicates that all three of these forms of social perception lead directly to corresponding overt behavioral tendencies. We next review evidence concerning the mediators of the perception–behavior relation, as well as evidence regarding various moderators that are relevant for understanding the circumstances under which people do versus do not imitate. We close the chapter by discussing the perception–behavior link from a functional perspective.

II. The Relation between Perception and Behavior

The cognitive approach that has dominated psychology for over 30 years has changed psychology's perspective on perception. When asked what the most important function of perception is, most—if not all—people would presumably answer that perception provides us with an understanding of the world. We perceive because we want to know what is going on around us. Although this answer is compelling, it is also largely incomplete and to some extent plainly wrong. Certainly, perception is essential for us to comprehend our environment but that does not mean that this understanding is an end in itself. Rather, understanding is a means by which we act effectively. Adaptive perception is ultimately in the service of functional behavioral responding to the environment, and comprehension and understanding are only important means to that end.

Another way to look at this is by taking an evolutionary perspective. In the course of our development as a species, perceptual abilities and functions developed because we started to behave, not because we started to understand. Humans and squirrels are able to perceive and to behave, while oak trees and stinging nettles are not able to perceive and not able to behave. Plants that are fixed in position and do not motorically navigate their environment did not develop mechanisms of perception, whereas animals that are able to move around in their world did. As Milner and Goodale (1995) noted: "Natural selection operates on the level of overt behavior; it cares little about how well an animal 'sees' the world, but a great deal about how well the animals forages for food, avoid predators, finds mates, and moves efficiently from one place in the environment to another" (p. 11). We are able to see, in other words, simply because we descend from individuals who could see and who were better at mating or better at avoiding falling trees or hungry lions than other, nonseeing individuals. In sum, perception is for doing. It is our best action guidance and control device.

Especially in nonprimate animals there is often a one-to-one relation between a specific perceptual process and a specific form of action. Frogs, for instance, have two different perceptual systems. One system is responsible for detecting and hunting small prey objects, whereas the other is responsible for avoiding large objects. These systems function independent of each other and, importantly, were developed independent of each other. Evidence shows that destroying the system responsible for detecting prey objects has no detrimental effects whatsoever on the capacity to avoid larger objects and vice versa (Ingle, 1973). Another case in point is the small sea creature belonging to the order Balanomorpha. This creature leads a curious life. For a while, it does nothing but float with the currents. When it eventually reaches a solid surface, it performs the only action of its life—it attaches itself to this surface. Once the perceptual system has performed its function (detecting a solid surface), it ceases to function and dies. Action is not called for anymore, so perception is thrown overboard (in fact, the creature devours its own brain at this point).

A. PERCEIVING LEADS TO DOING

Among these more simple creatures, the same perceptual process always has the same behavioral consequence. For a frog, a large object above the surface means "flight," while a small, irregularly moving object on the surface means "go for it." There are no exceptions. The perception of a small object on the surface always prompts hunting behavior. Perception races right through the brain to evoke behavioral output. It does not stop somewhere, does not alter its course.

Further animal evidence for the direct relation between perception and action comes from studies of the behavior of fish in shoals (e.g., Breder, 1976; Pitcher, 1979). Everyone has witnessed the impressive synchrony of movement that fish in shoals can display. They all move in the same direction, and then change direction, at the same time. This behavior is in harmony with the hypothesis of a direct link between perception and action. If a fish perceives the fellow fish in front of it change direction, it can do nothing but the same.

Admittedly, or rather, fortunately, many species have a behavioral repertoire that is more flexible than that of fish, frogs, or Balanomorpha. Humans also prey (or at least recognize food), mate, and avoid large objects, but in humans a specific perceptual process does not always lead to the same specific act. Although certain stimuli possess strong affordances (McArthur & Baron, 1983), we are all able to look at a grilled buttery lobster without starting to eat it or look at a cold glass of beer without starting to drink it, though this may be harder for some than for others (e.g., Metcalfe & Mischel, 1999). And although perceiving a person behave in a certain way creates that same tendency in oneself, the doctor in the examining room does not undress along with his or her patient. The conclusion from this state of affairs is that whereas in some species perception always leads to action, in others (such as humans) it does not. As Buytendijk (1922) put it long ago, "In ourselves we notice that perceptual processes can occur independently of specific actions. However, with animals this is not the case. With animals, perception is always related to specific actions or, more precisely, perception always include the impetus to actions" (p. 24).

B. TWO POSSIBLE ROADS TO FLEXIBILITY

How can we reconcile the fact that perception appears specifically designed for and directly leads to action tendencies with the fact that in humans (and only a limited number of other species) these action tendencies are not obligatory? In other words, how can there be such rigid relations between perceptual processes and action tendencies and at the same time such flexibility?

Although there are surely numerous possibilities, two more general "classes" of possibilities loom largest. The first possibility is that perception in itself is insufficient to elicit action and that an additional process is needed. In the absence of this additional facilitating mechanism, perception does not directly affect overt behavior. For example, it is possible that perception must be accompanied by a consciously made decision, some form of "express fiat" to be translated into overt behavior. Alternatively, it is possible that motivation functions as such a critical facilitator. A system shaped like this can certainly explain flexibility in behavior. Sometimes the facilitator is present, and sometimes it is absent; hence, sometimes perception leads to action, whereas on other occasions it does not. This possibility (which can be termed the facilitator option) is regarded by many as the most likely candidate.

The second possibility is that perceptual activity is sufficient to create action but that it is sometimes inhibited. That is, the default option is that perception does lead to action (as in fish or frogs) but under some circumstances a "stop sign" is given in order to block the impulse from resulting in overt behavior (see Logan & Cowan, 1984). In concrete terms, we would see an aggressive act (for example) and the impulse or urge would be to act aggressively ourselves (see Berkowitz, 1984) but then control or inhibit this impulse from reaching behavioral fruition, for some reason. (We discuss what these reasons might be in a further section, but they mainly have to do with a conflict between the automatically suggested behavior and one's current or chronic goals.) And if no inhibitors are present, we will indeed act on the perceptually instigated impulse. Of course, such a system can account for flexibility. Perception leads to action, but inhibitors (or acts of control) are able to block or prevent this from occurring. This possibility (which we call the "inhibitor option") is not regarded by many as the most likely candidate, but as we see it, it is way ahead on points.

First, the inhibitor option is the more likely candidate from an evolutionary perspective. When new species develop, this is done by adding new brain parts to existing old ones (see, e.g., Dennett, 1995; Milner & Goodale, 1995). Old modules do not suddenly cease to exist; it is rather that some new function is added. The frog and fish, in other words, are still in us. The advantage that humans have is that we also possess new inhibiting or moderating systems to the automatic perception–behavior effect.

The inhibitor option is consistent with this principle of evolution. Direct perception–behavior links still exist, but can be moderated by newer systems that can exercise a certain degree of control over older ones. The facilitator option, on the other hand, is inconsistent with this truism. The assumption of some sort of facilitator itself is not problematic. It can simply be seen as a new system added somewhere along the way. However, requiring a facilitator (whether motivated or not) would mean that the direct link between perception and behavior has somehow ceased to exist. The facilitator option, then, depends on the unlikely assumption that old modules are thrown away and fully replaced by new ones. In concrete terms, the frog or fish would have turned out to be useless, and the development of a new species would have to start from scratch. But this is not how evolution works.

Other evidence in favor of the inhibitor option comes from studies of people with various disorders. Stronger than normal effects of perception on behavior can be observed in aphasia, apraxia, low-rate mental deficiency, epilepsy, and catatonic states (Prinz, 1990; Stengel, Vienna, & Edin, 1947), conditions in which the ability to control or inhibit thought and action is impaired. Frontal lobe damage is also associated with diminished inhibitory functioning (e.g., Passingham, 1993; Smith & Jonides, 1999) and, indeed, frontal lobe patients are characterized by relatively direct and uncontrolled effects of perception on behavior (Lhermitte, 1983). When they see water, they drink. When they see a grilled lobster, they eat, even when this is obviously inappropriate. In other words, removing the capacity for inhibition increases the effect of perception on behavior. These findings contradict the facilitator option because explaining them in terms of facilitation would require the absurd assumption that the effects are due to better facilitatory capacities among frontal lobe patients.

III. The Direct Effect of Perception on Behavior Produces Imitation

As can be concluded from the above, there is an express connection between perceptual input and behavioral output. However, such a direct link between perception and action does not yet explain imitative behavior. That is, the assumption of such a link does not necessarily imply that perception leads to behavior that corresponds with perception, or *that which resembles that what has just been perceived*. The reason that this happens is that perception and action share neurological systems. This means that the translation of perception into corresponding action is a consequence of the way we are wired. In what follows, we review both neurological evidence and research on the "common-coding" hypothesis that support the view of shared neurological systems or shared mental representations.

A. NEUROPHYSIOLOGICAL EVIDENCE

There is plenty of evidence for a direct relation between perception and behavior in animals other than fish or frogs. Various neurological studies with monkeys show that the same area of the premotor cortex becomes activated when the monkey

witnesses an action (the experimenter reaching for something) as when the monkey performs the same action (Di Pellegrino, Fadiga, Fogassi, Gallese, & Rizzolatti, 1992; Rizzolatti & Arbib, 1998). Thus in primates there is an overlap between the mental representations used in perceiving an action and those used to perform the same action. Thus, perception primes or activates the behavioral tendency itself.

Such strong support for a direct relation between perception and action has also been obtained with human participants. Zajonc, Pietromonaco, and Bargh (1982) showed that participants instructed to try to remember each of a series of faces taken from a college yearbook spontaneously (and subtly) mimicked the facial expressions while they viewed each photograph; interfering with these slight muscle movements by having some participants chew gum while viewing the photographs interfered with later memory for the faces. Similarly, Fadiga et al. (1995) showed that watching an experimenter grasping an object leads to muscular responses that are (more or less) the same as the muscular responses participants displayed while grasping the object themselves.

Long ago, Carpenter (1874) and James (1890) proposed the notion of *ideomotor action*—that merely thinking about doing something automatically makes it more likely that you will perform the action. James defined this principle as "every representation of a movement awakens in some degree the actual movement which is its object" (p. 396). James also emphasized the passive nature of the effect: he argued that an act of will was not necessary for the action impulse instigated by the thought to emerge in actual behavior. Recent neurophysiological evidence, as well as experimental evidence reviewed below, is in harmony with the principle of ideomotor action. Paus, Petrides, Evans, and Meyer (1993) found that thinking about a word or a gesture leads to the same activation in the anterior cingulate cortex as actually uttering the word or making the gesture. Jeannerod (e.g., 1994; see also 1997) showed that mentally simulating an action leads to activation of the same neurons in the premotor cortex as performing this action and concluded that "simulating a movement is the same thing as performing it, except that the execution is somehow blocked" (p. 1422). In their studies, Jeannerod and colleagues demonstrated that imagining complex actions (such as running, rowing, or weightlifting) has neurophysiological consequences that are largely comparable to those of actually engaging in those actions. In both cases, motor programs are active (Decety, Jeannerod, Germain, & Pastene, 1991; Jeannerod, 1994, 1997).

The principle of ideomotor action, or "thinking is for doing" in James's well-known phrase, is consistent with the notion of a direct and unmediated effect of perception on behavior if it is assumed that perceptual activity is another source of behavior-relevant thought (see Berkowitz, 1984; Chartrand & Bargh, 1999). As we argue below, the key mediator of perception–behavior effects is the activation of the mental representation of the behavior, and this can occur through perceiving that behavior as well as thinking about it actively.

B. THE COMMON-CODING HYPOTHESIS

There is other evidence for shared representational systems for perception and action. Prinz (1990) claimed that language comprehension and language production depend on the same representational systems. More generally, he proposed the idea of common-coding, that is, shared representational systems for perception and action. An interesting corrolary of this hypothesis is that performing an action at the same time as perceiving that action should be difficult if both activities require the same representation.

Müsseler and Hommel (1997) tested this idea. They presented participants with series of four left or right arrows (e.g., "<<><"). Participants were asked to read these series and to reproduce them by pressing on the corresponding arrow buttons on a computer keyboard. Later, participants were presented with a fifth arrow that was always presented exactly when the participant was pressing the key corresponding to the second arrow presented. Participants were asked to press the key corresponding to the fifth arrow immediately upon reponding to the first four. Of interest was the number of mistakes participants made with their responses to the fifth arrow. According to the logic of common coding, participants should make more mistakes in their reponses to the fifth arrow if this arrow was the same as the second (i.e., both were right arrows or both were left arrows), that is the one they were responding to while the fifth arrow was being presented. And this is indeed what happened. While pressing a certain arrow key, participants had more trouble perceiving this same arrow than the opposite arrow, as shown by greater error rates in reporting after the fact which arrow had been presented.

The implications of the fact that activation of the mental representation of an action leads to actual engagement in this behavior is that people have a natural tendency to imitate (see also Greenwald, 1970; Wheeler, 1966). *Perceiving an action activates the mental representation of this action, which in turn leads to performance of the action.* In other words, our tendency to imitate others is a consequence of the way that behavior is represented mentally. It is not motivated (necessarily) or requiring of a choice to occur, but rather is a natural consequence of the way we are wired.

IV. The Three Musketeers of Social Perception

The conclusion of the previous section is that we have a tendency to imitate others because perception automatically elicits corresponding behavior. If one wants to know what sort of behavior we tend to imitate, an easy way out would

be to say that—because perception leads to corresponding behavior—we imitate everything we can perceive. This is true, but then the need arises to first discuss what we can perceive.

So what does a social perceiver perceive? First, social perceivers perceive what we may call *observables*. This class of behavior is easy to define. It involves behavior that we can literally perceive. We perceive gestures and movements of others. We can see someone wave, scratch her head, or wiggle his foot. Furthermore, we can perceive various facial expressions. We see people smile or frown, for instance. Also, we hear people speak. Not only do we listen to the contents of speech, we also perceive other variables such as accents or tone of voice.

Second, we generate *trait inferences* on the basis of the behaviors of others. These inferences (e.g., honest, intelligent) are themselves not literally perceived, but are made upon the perception of behavior that is present and observed in the current environment. Such inferences are made spontaneously—that is, unintentionally and immediately—upon perception of the observable act (e.g., Gilbert, 1989; Winter & Uleman, 1984). If we learn that "Pam brought flowers when she picked up her boyfriend from the airport," we spontaneously translate this concrete behavior into an abstract personality trait. Without being aware of it, we draw the conclusion that Pam is a nice and considerate person. We make trait inferences spontaneously, unconsciously, and constantly, and they are an integral part of everyday social perception (Higgins, 1989; Higgins & Bargh, 1987).

Third, social perceivers also go beyond the information actually present in the current environment through the activation of *social stereotypes* based on easily detectable identifying features of social groups (Brewer, 1988). Stereotypes are integrated collections of trait concepts purportedly descriptive of the social group in question. Unlike trait inferences, however, stereotypes represent mental activation that does not have a one-to-one correspondence with current events being perceived.

Upon seeing a person, we automatically categorize that person as a member of his or her group based on these characteristics, and also, often if not usually the stereotype associated with that group becomes active as well (Bargh, 1999; Devine, 1989; Greenwald & Banaji, 1995; Lepore & Brown, 1997). Merely seeing an African American face (even subliminally) is sufficient to cause the activation of the stereotype of African Americans in randomly selected White U.S. college students (Bargh, Chen, & Burrows, 1996; Chen & Bargh, 1997). Stereotype activation, like trait inferences, occurs as a natural and automatic part of the process of everyday social perception.

In sum, we perceive more than is literally present. Apart from perceiving observables, we make trait inferences and activate social stereotypes. As is demonstrated in the next section, all three forms of social perception elicit the tendency to imitate in the social perceiver.

V. Social Perception Elicits Corresponding Behavior

A. OBSERVABLES

In the following paragraphs, evidence of imitation of observable behavior is reviewed. The research on imitation of observables can be divided into three domains. First, there is a large literature on imitation of facial expressions. In addition, others have investigated imitation of gestures and movements. Finally, there is evidence of imitation of various speech-related variables. The major findings of all three domains are discussed, starting with facial expressions.

1. Facial Expressions

The evidence for imitation of facial expressions is abundant (e.g., Dimberg, 1982; Vaughan & Lanzetta, 1980; Zajonc et al., 1982). An example of a very contagious facial expression that is familiar to all of us is yawning. If, after a long car or train ride, a person starts to yawn, usually his or her travel companions start to yawn within a few minutes. This tendency to imitate yawning has also been demonstrated empirically. Provine (1986) asked participants to watch a 5-min videotape. In one condition, participants watched a video with yawning people, whereas in a control condition participants watched a video with smiling people. As expected, 55% of the participants in the experimental (i.e., yawn) condition started to yawn while watching the video, as opposed to only 21% in the control (i.e., smile) condition. Interestingly, Provine also obtained evidence supporting our claim that activation of the mental representation of an action (which can be the result of perception but also of, for instance, thought) is crucial in eliciting corresponding behavior. That is, one does not have to literally perceive a yawn to engage in yawning. Provine found that reading about yawning or thinking about yawning also caused participants to yawn. Finally, the fact that one of the authors of this chapter is yawning right now can be taken as anecdotal evidence that writing about yawning does the trick as well.

Although no consensus emerged among researchers on the exact cause of the phenomenon, various investigators have studied imitation of facial expressions among newborns (Anisfield, 1979; Field, Woodson, Greenberg, & Cohen, 1982; Jacobsen & Kagan, 1979; Meltzoff & Moore, 1977, 1979, 1983). Meltzoff and Moore (1977, 1979) showed that even 1-month-old babies imitate facial expressions. If you look at a baby and open your mouth, the baby will open her mouth. If you stick out your tongue, the baby will often do the same.

An interesting early demonstration of imitation of facial expression among adults can be found in an experiment by O'Toole and Dubin (1968). Their experiment was aimed at investigating mother–child interactions during feeding.

They had observed that a mother would usually open her mouth just prior to feeding her infant a spoonful of food. Their intuitive explanation for this finding was that a mother would open her mouth in the hope that her child would do the same and—most importantly—that the food would end up where it is supposed to end up. They put their ideas to a test by watching various mother–infant interactions and observed indeed that both mothers and infants open their mouths. Surprisingly however, in almost 80% of the cases, a mother opens her mouth only *after* the child does so. In other words, it is the mother who is imitating the child, not vice versa. The child is merely opening his or her mouth upon perceiving the food on its way.

Another example of adult imitation of facial expressions comes from experiments carried out by Bavelas and colleagues (Bavelas, Black, Lemery, & Mullett, 1986, 1987). In their experiments, a confederate was the victim of a painful injury that occurred in the presence of the participants. As expected, the participants imitated the expressions of the confederate, which can best be described as a big wince. Interestingly, they also manipulated the visibility of the expression of the confederate. In one condition, the expression of the confederate was easier to see than in a second condition. As a result, the degree to which participants imitated the expression varied as well. More visible expression led to more imitation; that is, the easier it was to perceive the expression, the greater the effect on one's own behavior.

Zajonc and colleagues (Zajonc, Adelmann, Murphy, & Niedenthal, 1987) reasoned that couples who have lived together for a period of time should have often experienced the same emotions at the same times, and because frequent facial expressions eventually lead to changes in facial lines, they hypothesized that partners should start to look more like each other the longer they are together. In their experiment, they gave participants 24 photographs. These photographs were those of the partners of 12 married couples. Some photographs were made at the wedding, whereas others were made 25 years later. The task of the participants was to assess the degree of resemblance of various pairs of photographs. As predicted, partners who were together for 25 years resembled each other more than random pairs of the same age and than newlywed couples. Although Zajonc et al. (1987) interpreted these findings in terms of shared emotional experience, these findings are also consistent with the present hypothesis of a direct effect of perception on behavior; that is, it may be that frequent perception of the partner's expression leads one to adopt that same expression repeatedly oneself, producing over time the similarity in facial lines between the two partners (see Bargh, 2000).

Imitation of facial expressions has also been studied in the context of emotional contagion (see, e.g., Hatfield, Cacioppo, & Berntson, 1994). Our facial expressions affect our emotions through a process of feedback elicited by facial muscles (Strack, Martin, & Stepper, 1988). Imitation of facial expression therefore leads to shared emotions. In concrete terms, the perception of a sad face evokes a sad expression in the perceiver and the perceiver will actually begin to feel sad as well.

In the Zajonc et al. (1987) research, the relation between shared facial expressions and shared emotions was obtained in a follow-up study. They had observed variations in the degree of resemblance of life partners. This led to the intriguing hypothesis that partners who have grown to look like each other more may actually be happier together than those who have not because their resemblance is due to a greater history of shared emotions. And, in general at least, shared emotions lead to a stronger bond between partners. A questionnaire study indeed confirmed this hypothesis, with effects being impressive in size (with a correlation of .49 between resemblance and self-reported happiness).

2. Behavior Matching

The evidence concerning the imitation of movements and gestures is less abundant than the evidence on imitation of facial expressions. Although theorists have always treated the automatic imitation of postures, gestures, and movements as a given (e.g., Allport, 1968; Köhler, 1927), early "evidence" was almost entirely anecdotal (see Bavelas et al., 1986; for reviews, see Capella, 1981; Chartrand & Bargh, 1999; Dijksterhuis, 2001; LaFrance, 1979). Later reports, in which posture imitation (or posture mirroring, as it is more often called) was investigated experimentally, suffered from methodological weaknesses (Charney, 1966; Kendon, 1970). Finally, research in the 1970s and early 1980s was concerned not so much with the occurrence of posture imitation per se, but with the relation between imitation and rapport. These studies (e.g., Bernieri, 1988; LaFrance, 1979; LaFrance & Ickes, 1981) speak to the possible function of posture and gesture mirroring in that some experiments clearly show a strong correlation between posture imitation and rapport. However, they do not shed light on how often people spontaneously engage in posture imitation.

The only early investigation we could identify that exceeds the level of mere anecdotal evidence was reported by Eidelberg (1929). In his experiment, participants were instructed to point at their nose upon hearing the word "nose" and to point at a lamp upon hearing the word "lamp." The experimenter, who was clearly visible to the participants, also pointed at his or her nose or at the lamp upon hearing the corresponding instruction. After a while, the experimenter started to make "mistakes" in that he or she pointed at the lamp upon hearing the word nose and vice versa. Interestingly, participants started to make the same mistakes as well. They spontaneously imitated the gestures made by the experimenter, despite the instruction to follow the verbal cues (i.e., the words "nose" and "lamp") and not the behavior of the experimenter.

Bernieri (1988; see also Bernieri, Reznick, & Rosenthal, 1988) was the first to provide truly solid evidence for posture imitation. In his studies, a somewhat complicated but nonetheless ingenious paradigm was used. First, two participants (A and B) were asked to interact. While they interacted, they were videotaped. A little later, both participants A and B were asked to engage in another interaction with a different participant, such that A interacted with C and B would interact with D. Again, both interactions were videotaped. Subsequently, two tapes were constructed on which the gestures and postures of both participants A and B were displayed. One concerned the actual interaction between A and B. The other tape pictured A while interacting with C and B while interacting with D. Subsequently, judges—who were unaware of which tape displayed the actual interaction between A and B—estimated the degree of posture similarity. If the degree of matching is greater on the first tape (the actual interaction) than on the second, there is evidence for posture matching. Bernieri (1988) indeed obtained this evidence. People do spontaneously mirror the postures of individuals they interact with.

Chartrand and Bargh (1999) replicated and extended these effects. Instead of investigating posture mirroring, they focused on actions such as foot shaking or nose rubbing. In their first experiment, a confederate was instructed to either rub her nose or shake her foot while working with a participant on a task. Importantly, the two were strangers and had only a minimal interaction, greatly reducing the probability that any imitation was motivational in nature—such as part of an attempt to ingratiate the other person. Their hypothesis, that participants would mimic the behavior of the confederate, was confirmed. Under conditions where the confederate rubbed her nose, participants engaged more in nose rubbing than in foot shaking, whereas the opposite was true when participants interacted with the confederate who shook her foot. Chartrand and Bargh (1999) replicated and extended this finding in a second study, in which the confederate purposefully mimicked the body posture of the participant. This study obtained clear evidence that mimicry leads to increased liking of interaction partners. The lack of a motivational basis for these findings supports our thesis of an automatic link between social perception and one's own behavior in a naturalistic interaction context.

3. Speech-Related Variables

Finally, there is evidence of automatic imitation of various speech-related variables. One phenomenon that is investigated by several researchers is *syntactic persistence*, that is, the tendency to use a certain syntax when this syntax is made cognitively accessible. This phenomenon supports the common-coding approach to language comprehension and language production postulated by Prinz (1990). Prinz argues that we use the same mental representations for both comprehension and production of speech. According to Prinz (see also Studdert-Kennedy, 1987), language comprehension and production develop at the same time during ontogeny: ". . .the ability to produce language is of no use when there is no one to listen, and the ability to understand language is of no use when there is no one to produce it" (p. 177).

Bock (1986, 1989) reported evidence of syntactic persistence. In one experiment, participants would hear and repeat a sentence such as "The corrupt inspector offered a deal to the bar owner." Later, participants would see a picture of, for instance, a boy handing a valentine to a girl. This picture can be described as "The boy is handing a valentine to a girl" or as "The boy is handing the girl a valentine." As the first sentence has a syntactic form similar to that of the priming sentence, this is the description participants most often gave. Syntactic structures appear to carry over from one sentence to another.

Whereas in the studies conducted by Bock (1986) participants activated a particular syntax themselve, Levelt and Kelter (1982; see also Schenkein, 1980) investigated syntactic persistence in a social context. In one of their experiments, the experimenter called various shops and asked either "What time does your shop close?" or "At what time does your shop close?" If the former question was asked, shopkeepers more often answered with "Five o'clock," whereas the answer to the latter question was "At five o'clock" in the majority of cases. Importantly, Levelt and Kelter as well as Schenkein obtained such effects of speech imitation for single words and clauses as well as for the structural format of entire sentences. Finally, Levelt and Kelter showed that cognitive load did not increase these speech imitation effects (which were already very substantial under normal conditions), suggesting that these effects were automatic in nature.

Recently, Neumann and Strack (2000) obtained evidence for imitation of tone of voice between interaction partners. In one of their experiments, participants listened to an audiotaped speech given by a stranger. While they were listening, participants were asked to repeat what they heard and were audiotaped themselves. It was found that participants adopted the tone of voice of the person on the tape they listened to. A sad tone of voice on the tape elicited a sad tone of voice in the participant, whereas a happy voice led to a happy voice in the participant. These findings are particularly important, as they rule out the possibility that participants imitated tone of voice for strategic reasons (e.g., to increase cohesion). They did not see the person who delivered the speech, they did not even know who this person was, and no participant was aware of the actual goal of the experiment. Instead, they were successfully led to believe that the experimenters were interested in the reproduction of speech content.

4. Are Emotion and Behavior Matching Strategic?

Bavelas and colleagues (Bavelas et al., 1986, 1987) accounted for their findings with a motivational communicative perspective. They argue that participants imitate in order to show the confederates that they are empathizing with them, that they are "feeling their pain." And if there is more eye contact between the confederates and the participants, the participants imitate more because they know

that the confederates are better able to see their expression. In other words, they interpret the imitation as a motivated, strategic behavior to create an empathic bond with the other person. This model of imitation (which is, according to the division we made earlier between "facilitator option" and "inhibitor option, an example of a facilitator option) is the standard account in the field not only of facial mimicry, but of the related phenomena reviewed above of "behavior matching" (La France, 1979, 1982) and "rhythmic synchrony" (Bernieri, 1988; Condon & Ogston, 1966; Condon & Sander, 1974). Most of this research has sought to link behavioral coordination effects with the establishment of rapport and liking between the parties involved, with some researchers viewing empathy as the cause of mimicry and others considering mimicry to be the cause of empathy (see Bernieri & Rosenthal, 1991; Chartrand & Bargh, 1999, for reviews).

Although it is true that there tends to be greater mimicry when the two individuals like each other than when they do not (e.g., Charney, 1966; LaFrance & Broadbent, 1976), so that rapport between the parties is an important moderator of the effect (see Moderators of the Perception–Behavior Link below), this does not mean that the perception–behavior effect requires for its occurrence a motivation or strategy or even positive affect toward the other person as a necessary condition.

After all, the evidence reviewed above shows that the only real precondition of imitation of observable behavior is the perception of the behavior. We emphasize that our explanation of an innate express route between perception and action is supported by this evidence, as our explanation would lead one to predict all the reviewed effects to be automatic and nonstrategic as opposed to other explanations that claim these effects to be strategic and intentional. There is no evidence at all for the strategic nature of the imitation effects reviewed above, whereas the support for the automatic and unintentional nature of imitation is evident. Meltzoff and Moore (1977) demonstrated a tendency to imitate among newborns. O'Toole and Dubin (1968) showed that mothers tend to imitate their children and there really is no strategic reason to do so. Although Bernieri (1988) showed imitation among people who engaged in an extended interaction (potentially allowing the interactants to engage in motivated imitation), Chartrand and Bargh (1999) showed that even minimal interaction with a complete stranger led to imitation. Finally, Neumann and Strack (2000) obtained evidence for imitation of tone of voice when the person being imitated was not even present.

In sum, there is considerable evidence showing that people automatically imitate observed behavior—ranging from facial expression and postures to speech patterns. There is no evidence for the strategic nature of the imitation effects, whereas the support for the automatic and unintentional nature of imitation is evident. That is, in the experiments reviewed above, people did not imitate because they wanted to imitate. Instead, they imitated for no other reason than that they are designed to do so.

B. TRAIT INFERENCES

As alluded to earlier, social perception entails much more than the encoding of observable behavior. We tend to automatically encode a person's social behavior in terms of the trait concepts relevant to it (e.g., Bargh, 1994; Gilbert, 1989; Higgins, 1989; Winter & Uleman, 1984; Uleman, Newman, & Moskowitz, 1996). In this section, we review the evidence demonstrating that the automatic activation of personality trait constructs in the course of social perception leads to behavior corresponding to these constructs. It leads, in other words, to imitation. If we see a person walk very slowly, we automatically infer the trait "slow," and we automatically tend to become slow.

The evidence for trait-induced social or interpersonal behavior is abundant. In a seminal study, Carver, Ganellen, Froming, and Chambers (1983) primed the concept of hostility among half of their participants by incidentally exposing them to words related to this concept. The remaining half of the participants were not primed with hostility. Subsequently, participants played the role of a teacher in a learning task based on the classic experiment of Milgram (1963). Participants had to administer electrical shocks to a second participant (actually a confederate) whenever this second participant gave an incorrect answer to a question. The participants, however, were free to choose the intensity of the shocks. The results showed that participants primed with hostility delivered more intense shocks than did control participants. In other words, priming hostility indeed led to more hostile behavior.

Various other social behaviors have been shown to be affected by activated traits and stereotypes as well. Bargh, Chen, and Burrows (1996, Experiment 1) presented their participants with a scrambled sentence task in which they were to construct grammatically correct sentences out of a random ordering of words (see Srull & Wyer, 1979) as a purported test of language ability. In one condition, the scrambled sentences contained some words related to rudeness (e.g., aggressively, bold, rude), whereas in a second condition the scrambled sentences contained some words related to politeness (e.g., respect, patiently, polite). In a third condition, the scrambled sentence task did not contain words related to either rudeness or politeness. The experimenter left the room after the participants had been given the instruction necessary to complete the scrambled sentence task. Participants were requested to meet the experimenter in a different office upon finishing the scrambled sentence task. When participants approached the experimenter, the experimenter was talking to a confederate. The confederate surreptitiously measured the time it took for participants to interrupt the conversation. Participants who were primed with rudeness were more likely (63%) than control participants (38%) to interrupt whereas participants primed with politeness were least likely to interrupt (17%).

In experiments reported by Macrae and Johnson (1998), consequences of activation of the trait helpful were investigated. In their experiments, half of the

participants were primed with the concept of helpfulness through the use of a scrambled sentence task, whereas the remaining participants were not primed. Upon finishing the task, the experimenter picked up her possessions from a desk (books, a paper, a bag, pens) and asked the participants to follow her to another experimenter. As she approached the door, she "accidently" dropped some of the items she was carrying. As expected, participants primed with helpfulness picked up more items from the floor (i.e., behaved in a more helpful way) than did control participants.

Epley and Gilovich (1999) primed participants with stimuli related to either conformity or nonconformity. A third group of participants was not primed. Later, participants were asked to evaluate various aspects of the experiment in the presence of a number of confederates, who expressed their favorable evaluations before the participants were given the opportunity to do so. Participants primed with conformity conformed more to the confederates (i.e., evaluated the experiment more positively) than no-prime controls and than participants who were primed with nonconformity. Participants primed with nonconformity, however, did not conform less than no-prime controls. There are various explanations for this asymmetric finding (see Epley & Gilovich, 1999); in our view the most likely being that the social pressure on participants to conform in the experimental situation was rather strong, leaving less room for the nonconformity prime to be effective.

To summarize, activation of trait concepts elicits corresponding behavior. Activation of the trait rude makes us rude and activation of the trait helpful makes us helpful. It is also evident that the effects are not restricted to a particular behavioral domain. Our tendency to imitate or to match behavior of our social environment seems to affect many forms of overt social behavior.

C. SOCIAL STEREOTYPES

The automatic activation of social stereotypes in the course of perceiving another person produces the same effects on behavior as does the activation of single-trait concepts, because stereotypes are to some extent schematic knowledge structures composed of several different trait concepts, ostensibly descriptive of the stereotyped group. However, the trait concept becomes activated in perception either because of trait-relevant behavior by the other person or because it participates in a cultural stereotype relevant to the perceived person; it will have the same effect on one's own behavior. For example, if we meet an elderly person, the category elderly becomes activated as well as associated traits such as slow. In both cases, the activation of the trait construct slow will guide one's behavior irrespective of why or how the trait was activated. In what follows, we review evidence of stereotype activation on motor behavior, on various forms of interpersonal behavior, and on intellectual performance.

Bargh et al. (1996, Experiment 2) were the first to report effect of stereotype activation on motor behavior. In their experiment, some participants were primed with the stereotype of the elderly, whereas others were not. The participants in the experimental condition were primed by exposing them to words related to the elderly (i.e., gray, bingo, Florida) in the context of a scrambled sentence language task, whereas participants in the control condition were not exposed to these words. After participants finished the priming task, they were told that the experiment was over. A confederate, however, recorded the time it took participants to walk from the experimental room to the nearest elevator. The data clearly showed that participants primed with the elderly stereotype walked significantly slower than control participants. In other words, people displayed behavior corresponding to the activated stereotype. Elderly are associated with slowness, and activating the stereotype of the elderly indeed led to slowness among the participants.

A conceptual replication of these findings was reported by Kawakami, Young, and Dovidio (2000). In their experiments, some participants were presented with various photographs of elderly people, whereas others were presented with photographs of university students. The photographs were primes in a lexical decision task. Each photograph was accompanied by a personality trait and the task of the participant was to decide whether the presented traits were descriptive of the social category displayed on the photograph (elderly vs student). As would be expected from the present thesis, reaction latencies on the words were longer when the words were preceded by a photograph of an elderly person than when the words were preceded by photographs of younger people.

Dijksterhuis, Spears, and Lepinasse (2001) obtained comparable results in a different paradigm. In their study, some participants were instructed to form an impression of various elderly individuals while looking at the photographs of these individuals. The second task, which was ostensibly unrelated to the first task, was a lexical decision task in which participants were asked to decide as fast as possible whether words presented on the screen were existing words (car, shop) or random letter strings (ikn, geru). Participants primed with the elderly stereotype showed reaction times that were considerably slower than participants who were not primed. In sum, activation of the elderly stereotype makes one slow, whether it pertains to one's walking speed or one's reaction time.

As noted above, crucial in the onset of behavioral changes are trait constructs. We can infer the trait slow from seeing someone walking slowly or we can activate the trait slow because it is part of an activated stereotype. But of course, there are other ways. We can, for instance, activate the trait slow by presenting participants with very slow animals. Theoretically, this should lead to slowness as the relevant concept is activated. There is no reason to assume that our brain makes a difference between whether slowness is activated because of exposure to animals or to members of a stereotyped group.

Aarts and Dijksterhuis (2001) investigated this possibility. They obtained evidence demonstrating that priming participants with names of animals also affects motor behavior. In their study, participants were either primed with animals associated with speed (cheetah, antelope) or with animals (snail, turtle). Subsequently, participants were asked to pick up a questionnaire in an adjacent room. The time it took participants to collect the questionnaire was assessed. In line with predictions, participants primed with fast animals were considerably faster than participants primed with slow animals. This study shows that we can also automatically imitate animals and not just fellow human beings.

Bargh et al. (1996, Experiment 3) also demonstrated effects of stereotype activation on interpersonal behavior. In their experiment, participants were seated behind a computer and were asked to engage in a very laborious task. While engaging in this task, some participants were subliminally primed with photographs of male African Americans, whereas others were subliminally presented with male Caucasian faces. After participants had been performing the laborious task for a while, the computer program beeped and displayed an error message stating "F11 error: Failure saving data." Subsequently, the experimenter pressed a button upon which the message "You must start the program over again" appeared. The participants were videotaped during these moments and the dependent variable was the level of hostility participants displayed upon hearing that they had to start all over again. As expected, both the experimenter (who was blind to conditions) and several independent coders rated the reaction of the participants primed with the stereotype of African Americans as more hostile than the reaction of the participants primed with Caucasian faces. This finding was replicated and extended to the domain of self-fulfilling prophecy effects by Chen and Bargh (1997).

Dijksterhuis and van Knippenberg (2000) demonstrated behavioral effects of activation of the stereotype of politicians. In earlier work, they had established that politicians are associated with longwindedness. That is, people believe that politicians talk a lot without saying much. In an experiment, Dijksterhuis and van Knippenberg activated the stereotype of politicians with the use of a scrambled sentence procedure for half of their participants. Subsequently, participants were asked to write an essay in which they argued against the French nuclear testing program in the Pacific (this experiment was carried out in 1996). As expected, participants primed with politician-related stimuli wrote essays that were considerably longer those of control participants.

A third domain in which it has been demonstrated that stereotypes and traits lead to corresponding behavior concerns the domain of intellectual (or mental) performance. Dijksterhuis and van Knippenberg (1998) improved people's intellectual performance in a series of experiments. In their first experiment, they requested half of their participants to think about college professors and to write down everything that came to mind regarding the typical attributes of professors. The remaining half of the participants were not given this task. In an ostensibly unrelated second experiment, participants were asked to answer 42 general knowledge questions that were taken from the game "Trivial Pursuit" [such as "What is the capital of Bangla Desh?" (a) Dhaka, (b) Bangkok, (c) Hanoi, or (d) Delhi]. In line with the prevailing stereotype of professors as being intelligent, primed participants answered more questions correctly than did no-prime control participants. In their set of studies, it was also shown that the magnitude of the change in intellectual performance was a linear function of the strength of the priming manipulation. Participants primed for longer durations outperformed participants primed for shorter durations, who in turn outperformed participants who were not primed. In another experiment conducted by Dijksterhuis and van Knippenberg (1998), it was shown that participants could also be led to perform worse on a general knowledge task by having them think previously about soccer hooligans, a social group that is associated with stupidity.

It has also been shown that activation of the stereotype of the elderly affects memory performance (Dijksterhuis, Aarts, Bargh, & van Knippenberg, 2000; Dijksterhuis, Bargh, & Miedema, 2000; Levy, 1996). In an experiment conducted by Levy, elderly participants were primed with either positive (e.g., wise, experienced) or negative (e.g., senile, dementia) terms associated with the elderly. Subsequently, participants were asked to perform various memory tasks. As she predicted, priming positive words led to improved memory performance, whereas priming negative words led to deteriorated performance.

Indeed, Dijksterhuis, Bargh, and Miedema (2000) did obtain evidence showing that activation of the "elderly" stereotype affects memory performance among college students (i.e., participants for whom the stereotype is not self-relevant). In their experiment, participants were seated behind a desk on which 15 objects were placed (a book, a pencil, a bag, etc.). Some participants were asked to answer questions about elderly people ("How often do you meet elderly people?" "Do you think elderly people are conservative?"), and others were asked to answer questions about college students. After answering questions for 3 min, participants were placed in a different experimental room and asked to recall as many objects present in the previous room as possible. As expected, participants primed with the elderly stereotype recalled fewer objects than other participants. The deteriorating effects of activation of the elderly stereotype on memory have been replicated and extended by Dijksterhuis, Aarts, Bargh, and van Knippenberg (2000), who used subliminal priming procedures and different memory paradigms.

1. Relation to Stereotype Threat

Stereotype priming effects on behavior bear a close relation to the well-known phenomenon of "stereotype threat" (e.g., Aronson, Quinn, & Spencer, 1998; Levy, 1996; Shih, Pittinsky, & Ambady, 1999; Steele, 1997; Steele & Aronson, 1995). When aspects of one's identity related to task performance are made salient,

performance is affected in the direction of that aspect of identity. Asian American children as young as 5 years old do better on math tests if their Asian aspect of identity has just been made salient; if their female identity is made salient, girls do worse on the same math test; African Americans do worse on academic tests in general if their racial group membership is subtly made salient (through a standard first questionnaire on which one checks off one's racial and ethnic group identity); women do worse on math tests if their gender identity is made salient; and elderly participants do worse on memory tests if their age was just made salient. All of these effects are attributable to the trait concepts activated or primed by the identity salience manipulation—of being poor in math, having poor memory, and so on. But the conclusion generally drawn from these studies is that activation of stereotypes only affects the behavior of members of those stereotyped groups. For example, Levy (1996) reported that elderly participants performed better on a memory task when primed with positive aspects of the elderly stereotype but worse when primed with negative aspects, and she reported no such effects of the elderly stereotype priming on college-age participants. She concluded that activated stereotypes only exert behavioral effects when these stereotypes are self-relevant.

However, as reviewed above, there are now many studies showing stereotype priming effects among nongroup members. In the case of the elderly stereotype in particular, Bargh et al. (1996, Experiment 2) found college students to walk more slowly leaving the experimental session after priming with the elderly stereotype, and Dijksterhuis et al. (2000) found poorer incidental memory performance for elderly-primed college students. In a study related to a different case of stereotype threat, Dijksterhuis and Corneille (2001) examined the cultural sterotype of women as being poor at mathematics. They demonstrated that subliminally priming participants with the female stereotype by exposing them to words related to this sterotype reduced performance (of both male and female participants) on a calculus task relative to participants who were not primed. This finding was replicated in several experiments.

Thus, when considered in the context of the now-abundant research showing stereotype activation effects on behavior of randomly selected participants (reviewed above)—that is, for those who are not members of the stereotyped group—the following synthesis between stereotype threat research and perception–behavior research can be made. Stereotype priming effects on the behavior of a member of the stereotyped group (i.e., stereotype threat) are likely to be larger (and easier to obtain) because for group members there are two routes, not just one, to the representation of that kind of behavior. The first is the activated stereotype, but the second is the person's self-representation or social identity, which constitutes a second and strong source of activation of the particular trait concept representation. Nongroup members have just the one route, through the activated stereotype (or perceived behavior). In other words, as argued above, stereotype threat and perception–behavior effects share the same common mechanism (the perceptually activated stereotype or stereotype-relevant trait representation) but for stereotyped group members this representation is, in effect, activated twice, producing still stronger effects on behavior.

Wheeler, Jarvis, and Petty (2001) received some support for this idea. They primed their participants with the stereotype of African Americans, after which these participants performed worse on a math test than control participants. The participants were all non-African Americans, but Wheeler et al. (2001) reported an interesting moderator. Their priming procedure consisted of the instruction to write about a day in the life of a certain individual (a person with either a typical African American name or a typical Caucasian American name). Some participants wrote their short stories in the first person (thereby adopting the perspective of the target), while others wrote their stories in the third person. The participants who wrote their stories in the first person showed stronger priming effects than participants who wrote in third person. One way to explain the findings is to assume that participants who wrote in the first person identified more with the target person and, because of this identification, activated their stereotype to a greater extent.

On the other hand, Dijksterhuis and Corneille (2001) did not obtain stronger effects of stereotype activation for group members than for nongroup members. In their research, performance on a calculus task of male and female participants deteriorated to the same extent after activation of the female stereotype. Even a manipulation of task diagnosticity (known to increase the salience of task-related identity and hence to enhance stereotype threat) did not lead to further deterioration of performance of female participants when this manipulation was combined with a priming manipulation. That is, performance on a subsequent calculus task showed that the effects of the two manipulations were not additive. However, it is possible that the priming procedure used by Dijksterhuis and Corneille (2001) activated the stereotype to such an extreme degree that additional activation, and therefore further deterioration of performance, was prevented.

VI. Mediators of the Perception–Behavior Link

A. THE ROLE OF BEHAVIOR REPRESENTATIONS

In the next section, mediational evidence is presented that sheds light on the process by which perception affects overt behavior. How, in other words, can perception of a smile or activation of an abstract construct such as a stereotype lead to behavioral changes such as decreased walking speed or altered intellectual performance? Let us first discuss the relation between behavior representations and actual behavior.

We discussed the idea of so-called ideomotor action under "Neurophysiological Evidence". The principle of ideomotor action, introduced long ago (Carpenter, 1874; James, 1890; Jastrow, 1908), states that merely thinking about an action leads automatically to the tendency to engage in this action. As James (1890, p. 522) defined it, "Whenever movement follows unhesitatingly and immediately the notion of it in mind, we have ideo-motor action." If we translate this line of thinking in the psychological language we use today, ideomotor action implies that the activation of a behavioral representation elicits the tendency to engage in this same behavior. In concrete terms, the activation of the mental representation of "walking" should lead to the tendency to walk. This in itself is not surprising. It is hard to see how we can be able to walk without first activating some neural correlate of this behavior in the brain. What was important for the theorists cited earlier was not only that such behavior representations were activated after conscious decisions ("let's walk") but also that a fleeting notion of the behavior was enough to evoke the behavior itself.

As alluded to earlier, recent techniques developed in the neuropsychological domain allow a test of these old ideas. Paus, Petrides, Evans, and Meyer (1993), for instance, have shown that thinking about a word or a gesture leads to the same activation in the anterior cingulate cortex as actually uttering the word or making the gesture. Jeannerod and colleagues have conducted a series of experiments in which they demonstrated that imagining somewhat more complex actions (such as running, rowing, or weightlifting) has neurophysiological consequences that are largely comparable to the neurological consequences of actually engaging in an action (Decety, Jeannerod, Germain, & Pastene, 1991; Jeannerod, 1994, 1997). Crucial in their research program are so-called motor programs, as these programs are ultimately reponsible for overt behavior. As Jeannerod and others have shown, imagining an action leads to activation of exactly the same motor programs as does performing the action.

To conclude, what is needed for behavioral changes are activated motor programs and what is needed for activated motor programs are activated behavior representations. And this, we argue, is what happened in the experiments reviewed in this chapter. In all these studies behavior representations were activated. The important difference between the various experiments is the process leading to activation of behavior representations. Imitations of facial expressions, speech-related variables, and gestures and postures are the consequences of the mere perception of these behaviors in others. It is easy to see how relevant behavior representations are activated in these cases. One perceives a smile, and this is enough to activate the representation of a smile, which in turn is enough to activate the programs controlling facial muscles. In the same vein, perceiving a gesture (as, e.g., in Chartrand & Bargh, 1999) activates the representation of this gesture, presumably in the same way as thinking about a gesture does (as in Paus et al., 1993).

B. FROM STEREOTYPES TO IMITATION

However, the research on imitation mediated by activated stereotypes or trait concepts is different in that activation of behavior representations is mediated by activation of intermediate representations. Research shows that upon activation of a social category (e.g., elderly), associated stereotypic traits (e.g., slow, forgetful) are also activated (Blair & Banaji, 1996; Devine, 1989; Dijksterhuis & van Knippenberg, 1996; Dovidio, Evans, & Tyler, 1986; Macrae, Stangor, & Milne, 1994). As one would expect, effects of stereotype activation on behavior are mediated by trait activation. Dijksterhuis, Aarts, Bargh, and van Knippenberg (2000) showed that activation of the stereotype of the elderly led to forgetfulness, but only among participants who indeed associated elderly with forgetfulness. That is, only participants who indeed activated the trait forgetfulness after being primed with the category elderly display actual forgetfulness. Hence, the effects of stereotype activation on behavior are mediated by activation of traits. These effects were replicated by Dijksterhuis and Corneille (2001), who showed that only participants who associated women with poor math performance suffered from poor performance after being primed with the female stereotype.

Trait concepts, in turn, can activate behavior representations. Activating the trait slow leads to activation of more concrete behavior representations such as linger or dawdle, whereas the trait intelligent leads to activation of behavior representations such as concentrate and think. In a recent study, Dijksterhuis and Marchand (2000) showed that activation of the stereotype of professors leads to activation of such concrete behavior representations as think and concentrate. Furthermore, these effects were mediated by activation of the trait intelligent. Behavioral representations on the level of abstractness of think or dawdle activate motor programs, as Jeannerod and others have shown for comparable behavior representations such as run or row. In sum, stereotypes can automatically affect behavior because they activate—via the activation of traits and behavior representations—motor programs.

To recapitulate, the effects of stereotype activation on changes in overt behavior can be explained by a series of steps. First, stereotypes activate associated traits. These traits, in turn, activate more concrete behavior representations. Finally, these behavior representations activate the motor programs responsible for actual behavior.

VII. Behavioral Contrast

The findings reviewed in the previous section demonstrate that primed traits and stereotypes elicit corresponding behavior in the perceiver. These behavioral

effects can be characterized as manifestations of *behavioral assimilation* and are reminiscent of findings from the social judgment domain in which it has been demonstrated that primed constructs—such as traits—lead to judgmental assimilation (e.g., Higgins, Rholes, & Jones, 1977; Srull & Wyer, 1979, 1980). In Higgins et al.'s (1977) seminal demonstration, participants were surreptitiously primed with either the positive or the negative version of traits that could both be used to describe the same type of behavior (e.g., adventurous vs reckless, independent vs aloof). Later, they were asked to form an impression of a person named Donald who performed ambiguous behaviors that could each be interpreted in either a positive or a negative way. These impressions showed that the primed traits indeed led to assimilation: Participants primed with the positive set of traits formed more positive impressions of Donald, whereas those primed with negative traits formed more negative impressions. Importantly, priming with positive and negative traits that were unrelated to the later behaviors had no such effects on impressions. Trait primes, it has often been argued, lead to assimilation because they work as interpretation frames, causing perceptual input to be interpreted in line with this trait construct (Higgins, 1996; Schwarz & Bless, 1992; Stapel, Koomen, & van der Pligt, 1996). The effects of primed traits on judgments are comparable to those on behavior. In one case traits guide perceptual input, while in the other case traits guide behavioral output. However, in both cases accessible traits constructs direct ongoing processes in an assimilative fashion.

The social judgment literature has, however, demonstrated a second effect. Under some conditions, primes do not elicit judgmental assimilation; instead, they elicit jugdmental contrast (e.g., Stapel, Koomen, & van der Pligt, 1996, 1997). That is, the prime led to a biasing effect in the direction opposite to what was implied by the prime. Crucial in causing such contrast effects are comparisons. Priming Adolf Hitler still activates the concept of hostility but it also renders a more likely comparison between Hitler and the stimulus person to be judged. These comparisons, in turn, elicit contrast effects. If one is primed with Hitler and asked to judge a somewhat hostile person named Donald, a comparison between Donald and Hitler will lead to a less hostile assessment of Donald ("Well, Donald isn't that hostile"). In recent years, judgmental contrast effects after exemplar priming have been documented extensively. It is now known that comparisons—and hence contrast effects—are more likely to occur if the exemplar is extreme rather than moderate and sufficiently concrete and when the comparison is relevant under the circumstances at hand (e.g., Herr, 1986; Herr, Sherman, & Fazio, 1983; Manis, Nelson, & Shedler, 1988; Schwarz & Bless, 1992; Stapel, Koomen, & van der Pligt, 1996, 1997).

The notion of judgmental contrast prompted the question of whether it would also be possible to demonstrate *behavioral contrast*. Is it possible, in other words, that exemplar priming leads to behavioral contrast by evoking a comparison between the primed exemplar and the self? Dijksterhuis, Spears, et al. (1998)

tackled this question. In their first experiment, they primed participants with either stereotypes or exemplars. Both the stereotypes and the exemplars could designate intelligence or lack of intelligence. Concretely, participants were primed with stimuli related to professors, to supermodels, or to specific exemplars such as Albert Einstein or Claudia Schiffer. After the priming procedure, participants were asked to answer a number of general knowledge questions. As expected, priming stereotypes led to behavioral assimilation. Participants primed with professors outperformed those primed with supermodels (as in Dijksterhuis & van Knippenberg, 1998). However, priming exemplars led to behavioral contrast. Participants primed with Einstein performed worse than participants primed with Claudia Schiffer. These effects of behavioral contrast were also demonstrated in the paradigm first used by Bargh, Chen, and Burrows (1996). Whereas they had shown that priming the elderly stereotype led participants to walk slower, Dijksterhuis, Spears, et al. (1998) showed that priming an elderly exemplar (the 88-year-old Dutch Queen Mother) prompted participants to walk faster.

In a third experiment, evidence was obtained indicating that a comparison between the primed exemplar and the self is indeed crucial for contrast to occur. It was shown that priming professor only led to a heightened accessibility of the construct of intelligence, whereas priming Einstein led to the formation of an association between the self-concept and the construct of stupidity. In other words, after priming Einstein—but not after priming professor—participants draw the conclusion "I am stupid," reflecting the comparison they made between Einstein and themselves.

In a second series of studies (Dijksterhuis, Spears, & Lepinasse, 2001), behavioral assimilation and behavioral contrast were related to regular impression formation processes. The fact that exemplars lead to contrast whereas traits (and also stereotypes) lead to assimilation led to the more general assumption that concrete stimuli lead to contrast whereas more abstract stimuli lead to assimilation. From the impression formation literature it has been known that person perceivers usually from rather abstract, stereotypical impressions of people, whereas on some occasions they form more concrete, individuated impressions (see, e.g., Bodenhausen, Macrae, & Sherman, 1999; Brewer, 1988; Fiske & Neuberg, 1990). Dijksterhuis, Spears, and Lepinasse (2001) applied this knowledge to the domain of behavioral contrast. In various experiments, they asked participants to form impressions of an elderly person or of elderly people, while manipulating various moderators that are known to affect the stereotypicality of impressions people form. In the first study, participants formed an impression of either one elderly person or five elderly people. In a subsequent reaction time task, participants who formed an impression of five elderly people showed assimilation (they became slower), whereas participants who formed an impression of a single elderly person showed contrast (they became faster). In a second study, it was demonstrated that whereas an impression of a single elderly person under normal circumstances led to contrast, an impression made under conditions of cognitive load—known to lead to more stereotypical impressions (Bodenhausen & Lichtenstein, 1987; Dijksterhuis & van Knippenberg, 1995; Macrae, Hewstone, & Griffiths, 1993)—led to assimilation. Finally, although an impression of five elderly people was demonstrated to lead to assimilation, an instruction to form an impression as accurately as possible—known to lead to less stereotypical impressions (Erber & Fiske, 1984; Tetlock, 1992)—led to behavioral contrast. In sum, more stereotypical impressions led to behavioral assimilation, whereas individuated impressions led to behavioral contrast. In general, more concrete stimuli can lead to behavioral contrast, whereas more abstract stimuli lead to behavioral assimilation.

There are exceptions to this rule, however. It has already been mentioned that for an exemplar to lead to behavioral contrast, this exemplar has to evoke a comparison. Such comparisons only lead to contrast if the comparison is made on a dimension relevant for the behavior at hand (see, e.g., Biernat, Manis, & Nelson, 1991; Stapel, Koomen, & van der Pligt, 1997). In concrete terms, a comparison with Einstein will lead me to conclude that I am not that intelligent after all, and this leads to contrast on a task measuring intelligence. However, it will not lead to effects on tasks that are unrelated to intelligence. Macrae et al. (1998) demonstrated that such comparisons have to be rather specific in order to elicit contrast. They primed participants with the former Formula One world champion Michael Schumacher. Later, participants were requested to perform a counting task during which their speed was measured. One might have predicted that Schumacher would lead to a comparison and that this comparison would lead to the conclusion among participants that they are slow. Such a comparison should in turn lead to contrast; that is, participants should become slow. However, Macrae et al. (1998) found an assimilation effect. Participants primed with Schumacher became faster. It is probably the case that Schumacher made the construct of speed accessible, thereby causing assimilation, while the comparison was not relevant enough for the task to cause contrast. It is likely that a comparison with Schumacher does not lead to the conclusion "I am slow," but that it leads to the more narrow conclusion "I am a slow driver." Given that the task was a counting task that had nothing to do with driving, the comparison was not relevant enough to cause contrast (see also Aarts & Dijksterhuis, 2001, for a more elaborate discussion of this explanation).

Aarts and Dijksterhuis (2001) also obtained evidence for the important role of comparison processes in causing behavioral contrast. They primed participants with either slow (snail, turtle) or fast (cheetah, antelope) animals. Later, participants were asked to pick up a questionnaire in a different experimental room. Unbeknown to the participants, the time it took the participants to collect this questionnaire was measured. Importantly, Aarts and Dijksterhuis (2001) manipulated the perceived comparability of the animals. In one condition, they emphasized the similarities between humans and other animals, whereas in a second condition they emphasized the difference between humans and animals. This perceived comparability proved to be an important moderator. Participants who were led to believe humans and other animals are comparable showed behavioral contrast (that is, participants primed with fast animals became slow and people primed with slow animals became fast), whereas participants who were led to believe humans and animals to be completely different showed assimilation.

To summarize, social perception does not always lead to assimilation or imitation. The behavioral contrast findings parallel the judgmental findings: Whereas abstract constructs lead to assimilation, concrete stimuli such as exemplars may led to contrast provided they are extreme enough and the comparison being made is relevant for the behavior under consideration.

VIII. Moderation of the Perception–Behavior Link

Earlier, we argued that unconscious imitation is a consequence of the way we have been "built." Perception is linked to behavior and the activation of a perceptual representation evokes the corresponding action. However, we also argued that these effects could sometimes be inhibited or moderated. Without the possibility to moderate direct effects of perception on behavior, we would indeed behave like the fish or frogs discussed earlier. Our action would always directly follow from our perception without any flexibility whatsoever.

We know that this is not the case, of course. Humans are flexible and they can override direct effects of perception on behavior. We do possess a set of moderating modules clearly separating us from fish and frogs. In the next section, we review the findings on moderators of the perception–behavior link.

A. DISINCENTIVES

There may be clear costs associated with the perceived behavior based on one's prior experience that prevent one from engaging in the perceptually suggested behavior. Unlike lemmings, who follow their mates right over the cliff, humans have some knowledge and experience with the painful consequences of falling substantial distances. Disincentive values of stimuli can produce counterforces on behavior that override the perceptual effect on behavior (Bargh & Ferguson, 2001), as shown in a study by Macrae and Johnston (1998). In their first experiment, participants were primed with stimuli either related to helpfulness or not, after which a confederate accidently dropped a number of pens. Under usual circumstances, primed participants indeed displayed more helpfulness—they picked up more items. However, when the pens were leaky—with a clear disincentive

or cost to the act of picking them up—participants were hesitant to help both under priming conditions and under no-prime control conditions. (This finding is reminiscent of an earlier one by Langer, Blank, & Chanowitz, 1978, in which participants were likely to allow a person to cut in front of them in line for clearly bogus reasons except when the cost of doing so was high—as when the requestor was going to make a lot of copies.)

B. CONFLICT WITH CURRENT GOALS AND PURPOSES

Macrae and Johnston (1998) used a similar experimental setup to show the moderating role of goals. Again, some participants were primed with helpfulness, whereas other participants were not. And again, after participants were primed a confederate dropped a number of objects. In this experiment, however, some participants were told that they were running late and they had to hurry to the next experimental session. As it turned out, the goal to hurry overruled the effects of priming. Primed participants were more helpful than their no-prime counterparts only under normal circumstances. They were not more helpful when the conflicting goal to hurry was active.

These findings suggest that passive effects of perception on behavior are dominated by currently operating goals, when the behaviors required for goal attainment are in conflict with those suggested perceptually. Such a model of action control, with operating goal pursuits inhibiting or overruling automatic access to the motorium, has been proposed by Shallice and his colleagues for many years (1988; Norman & Shallice, 1986). This model is also in harmony with the substantial literature on flexible working memory processes in which task goals can override automatically suggested responses if given enough time and attention (Fazio, Sanbonmatsu, Powell, & Kardes, 1986; Neely, 1977). A well-known example of this ability is the Stroop color–word task, in which people are generally able to make the correct response (e.g., name the color in which the word is presented) even though the word itself (e.g., "red") may automatically suggest a different response (e.g., Cohen, Dunbar, & McClelland, 1990; Logan, 1980).

C. SELF-FOCUSED ATTENTION

Dijksterhuis and colleagues (Dijksterhuis, Bargh & Miedema, 2000; Dijksterhuis & van Knippenberg, 2000) investigated the potential moderating role of self-focus. Their analysis was based on the literature on action control (Norman & Shallice, 1986; Shallice, 1988) and on a vast body of research on self-focus. The literature on action control demonstrates that sometimes multiple action tendencies are active. Under these circumstances, these various action tendencies strive for mental dominance. The one that eventually gains dominance inhibits the other action tendencies and guides overt behavior. In the experiment carried out by Macrae and Johnston (1998), for instance, one can say that the goal to hurry and the helpfulness prime both strived for dominance but that the goal eventually won, thereby inhibiting the prime.

Increased self-focus, that is, increased attention to the self, is known to activate action tendencies (Carver & Scheier, 1981; Duval & Wicklund, 1972; Gibbons, 1990). Self-focus makes norms, behavioral standards, and important goals more salient and more accessible. This means that under conditions of self-focus, effects of perception on behavior may be overruled. After all, as the literature on action control suggests, activated norms or goals can inhibit other action tendencies, such as primed constructs. This hypothesis was tested in various experiments. In one study, participants were primed with the stereotype of politicians or they were not primed. Also, they were seated in front of a mirror (a manipulation known to enhance self-focus, see, e.g., Duval & Wicklund, 1972) or not. Later participants were asked to write a short essay about the French nuclear testing program. Based on the stereotype of politicians as longwinded, we hypothesized that primed participants would write longer essays. This was indeed the case. Importantly, and in line with the second hypothesis, this only happened among participants who were not seated in front of a mirror. Participants with heightened self-focus did not show an effect of the prime.

This finding was replicated in a second experiment. In this experiment, participants were primed with either the stereotype of professors or the stereotype of soccer hooligans. Again, they were either seated in front of a mirror or not. After being primed, participants received a general knowledge test. As expected, participants primed with professors under no-self-focus conditions outperformed participants primed with soccer hooligans, while no priming effects were apparent under self-focus conditions.

Recently, Van Baaren, de Bouter, and van Knippenberg (2001) obtained evidence showing that self-focused attention also inhibits behavioral matching of observables. In their experiment, they closely followed the procedure used by Chartrand and Bargh (1999). A participant and a confederate worked together on a task, while the confederate either engaged in foot shaking or nose rubbing. When participants worked on a task that did not alter their self-focus, the participants indeed mimicked this behavior, thereby replicating the results of Chartrand and Bargh (1999). In a different condition, however, the task the participant and the confederate engaged in was specifically designed to enhance self-focus. They were presented with a text in a foreign language (which both the confederate and the participants did not master) with omissions. The task was to guess which words were omitted and the participants could choose between I, me, or mine. This manipulation enhanced self-focus and, as predicted, no sign of behavior matching was obtained under these conditions.

In a different set of studies, additional evidence was obtained for the moderating role of self-focused attention. Dijksterhuis, Bargh, and Miedema (2000) investigated what happens when participants are told that they are primed and that the prime may influence their behavior. In their experiments, some participants were primed with the stereotype of the elderly, whereas others were not primed. Subsequently, participants were presented with a memory task. Prior to the memory task, however, some participants were told that they were primed with the elderly stereotype and that this may affect their memory performance. As may be expected on the basis of the moderating of self-focus, awareness of the potential influence of the prime eliminated the influence of the prime. That is, making people aware of the fact that their memory performance may be manipulated increases self-focus and thus overrides effects of priming.

Spencer, Steele, and Quinn (1999) obtained results that may be explained by the same mechanism, that is, enhanced self-focus. They showed, in agreement with other findings in the stereotype threat domain, that female participants underperformed on a highly diagnostic math test. It is known that diagnostic tests can lead to self-stereotyping among people for whom task-related stereotypes exist. Hence, women confronted with a math test activate the stereotype of women as being poor at math, which undermines their performance. Spencer, Steele, and Quinn (1999), however, observed that women who were explicitly told that the test at hand showed no gender differences did not underperform. In other words, the effects of stereotype activation were overridden. One way to explain this finding is to assume that focusing participants on the potential relevance of gender (or stating that gender is irrelevant for this particular test, thereby implicitly stating that on other occasions it is relevant) increases self-focus and eliminates effects of stereotype activation on performance.

D. LIKING

One important moderator, however, serves to increase perception–behavior effects. As noted above, when people like each other, they imitate and behavior match even more than usual (e.g., Bernieri & Rosenthal, 1991; Charney, 1966; LaFrance & Broadbent, 1976). As many studies have shown, feelings of empathy and liking are correlated with the amount of mimicry and imitation; Chartrand and Bargh (1999, Experiment 2) showed that postural mimicry causes greater liking, and their Experiment 3 showed that the more empathic an individual is, the more likely he or she is to mimic the interaction partner's behavior. Thus the causal effect is bidirectional; greater imitation produces greater liking and rapport, and a greater degree of liking for the other person causes one to imitate and mimic more than usual. It should be noted that although the relation between liking and imitation has often been regarded as a strategic one—people want to be liked and therefore mimic more—this does not have to be the case. It is possible that the more people like each other, the more they pay attention to each other, or, in other words, the more they look at each other. It is possible, therefore, that liking simply leads to stronger perceptual effects and to a higher activation level of the perceptual representation and therefore to more pronounced behavioral effects. This explanation is in line with findings obtained by Dijksterhuis and van Knippenberg (1998; see also Wheeler, Jarvis, & Petty, 2000), who showed that stronger priming manipulations (defined by duration of the priming manipulation) lead to stronger behavioral effects than weaker priming manipulations.

IX. Conclusions

In this chapter, we reviewed findings showing that social perception automatically results in corresponding social behavior. When we see someone yawn, we start to yawn as well. When we see someone scratch his head, we do so too. When we see elderly people, we start to walk more slowly and we become a bit forgetful. These automatic forms of imitation are the consequence of the way we are wired. Perceptual representations automatically activate corresponding behavior representations. Like other species, such as fish, we automatically imitate others.

As imitation is the consequence of "mere" perception, we do not need additional mechanisms to engage in imitation. No motivation is required, nor a conscious decision. We just do it. We start doing it soon after we are born (Meltzoff & Moore, 1977) and we apply our entire perceptual repertoire, ranging from simple gestures to abstract social stereotypes (Bargh, Chen, & Burrows, 1996; Dijksterhuis & van Knippenberg, 1998). On the other hand, unlike that of fish, human automatic imitation is not obligatory. We do it, yes, but the tendency to imitate can be inhibited, for instance, by important goals or by heightened self-focus. In a way, we can conceive of automatic imitation as "default social behavior." We naturally imitate as long as some other processes do not have a reason to intervene.

One question remains: *Why* do we do it? The fact that automatic imitation is the consequence of the way we are wired is an answer, of course, but then the question becomes why we are wired the way we are. In the Introduction of this chapter, it was already argued that natural selection works on behavior, not on perception. Selection cares not about how we perceive, but about how we behave. So somewhere along the line of our evolutionary history, imitation likely proved to be advantageous over an absence of imitation. With species such as fish and gnus, we can easily see that this is indeed the case. A fish that follows other fish or a gnu that runs away when it sees other gnus do so reduces the probability that it will be eaten by a shark or a lion.

So imitation is safe as a basic, default behavioral tendency. Although this was still true for recent ancestors of human beings as well, it is harder to defend that it is still of paramount importance for human beings today (although escaping a

building merely upon seeing others do so is still better than waiting for someone to tell you there is a fire). So are there other benefits of automatic imitation that caused human beings (and maybe other higher animals) that helped the capacity for automatic imitation to stay intact or even to develop more?

This is very well possible. Human beings have a fundamental "need to belong" (Baumeister & Leary, 1995; Caporael, Dawes, Orbell, & van der Kragt, 1989; Leary & Baumeister, 2000). They do not want to be the odd one out; instead, they need to be accepted and they need to be liked. As some of the evidence reviewed before shows, imitation certainly leads to greater cohesion and to greater liking. It makes our social interactions simply go more smoothly and without as many conflicts. So a system that allows automatic imitation, that is, a system that translates perception into corresponding behavior, helps us to fulfill an enormously important social need.

One may object to such a functional perspective by claiming that not all the individual consequences of the perception–behavior link are functional. Becoming more stupid in the presence of soccer hooligans may be helpful, but not necessarily. Driving very fast after watching a Formula One Grand Prix is certainly not functional. However, for a mechanism to be functional, all that is needed is that the vast majority of its consequences are beneficial. Or, more precisely, for a mechanism to be functional what is needed is that the consequences *in general* are beneficial compared to the consequences *in general* of not having this mechanism. It does not imply that all individual consequences are functional. Toes have a function, but everyone can recall an unfortunate encounter with a cupboard or a stone that prompted the wish to not have toes at all.

To conclude, automatic imitation is safe and it leads to social acceptance and belonging. Strange as it may sound, the author of this chapter who received a fine after driving too fast essentially did this because of a basic mechanism of mind that developed to increase safety and social acceptance. He just wanted to survive and to be liked.

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