

## Accessibility from active and fulfilled goals <sup>☆</sup>

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Received 10 February 2004; revised 28 June 2004

### Abstract

In six studies participants searched for a target stimulus among other stimuli. Lexical decision and Stroop measures of accessibility showed that accessibility of target-related words was enhanced prior to finding the target and reduced after finding it, relative to both a preceding stage, relative to a control, no-goal condition and relative to a condition in which the goal was not fulfilled. In addition, Studies 4, 5, and 6 showed that goal-related accessibility and post-fulfillment inhibition were proportional to the goal's expectancy, the goal's value, and their interaction. Together, these studies support the notion that goals enhance accessibility of the goal-related constructs, which is maintained as long as the goal is active, goal fulfillment inhibits accessibility of goal-related constructs, and these effects are proportional to the strength of the motivation.

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Theories in both cognitive and social psychology propose that motivational states, such as needs, goals, intentions, and concerns are characterized by enhanced accessibility of motivation-related constructs. For example, Bruner (1957) suggested that goals and other motivations function as sources of perceptual readiness, while Anderson's (1983) adaptive control of thought (ACT\*) model conceptualized goals as sources of activation capable of sustaining activation even without

rehearsal. In social psychology, Higgins and King (1981) discussed motivation as one determinant of construct accessibility, along with recency and frequency of prior activation. Wyer and Srull (1986, 1989) included in their bin model of social cognition a "goal specification box" which stores the objectives of the system and directs information processing accordingly.

Motivation theories of volition have converged on the notion that motivation enhances the accessibility of related constructs. These theories explicitly suggested or implicitly assumed that enhanced accessibility of goal-related concepts is conducive for effective goal pursuit. For example, Kuhl (e.g., Goschke & Kuhl, 1993; Kuhl, 1983, 1987; Kuhl & Kazén-Saad, 1988), based on former theorizing by Ach (1935), stated that for effective and efficient goal pursuit goal-relevant information must be activated in order to prepare the individual for transforming intention into action. More specifically, he argued that the intentional status of an activity is encoded as a "commitment marker," which is tagged to the representation of the activity. Such a commitment marker may then serve as an internal context cue that biases the retrieval process

<sup>☆</sup> This research was supported by a grant from the Deutsche Forschungsgemeinschaft to Jens Förster (FO244/6-1) and by a Heisenberg award from the Deutsche Forschungsgemeinschaft to Jens Förster. We thank Simon Finkeldei, Christiane Haupt, AndréLombe, Amina Özelsel, Sonja Ranzinger, Susanne Schmid, Anke Siebers, Anna Seidle, Thomas Stemmler, Sabine Wolfrath, and Anja Zimmermann for helping to collect and analyze the data. Special thanks go to Anke Siebers and Amina Özelsel for the thorough pretesting of the stimulus materials. We thank Martin Denzler, Stefanie Kuschel, Katrin Schimmel, Angie Nichols, and Amina Özelsel for invaluable discussions and Angie Nichols for editing the manuscript.

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toward intention-related memory images. Similarly, in his research on mind-sets, Gollwitzer (e.g., Gollwitzer, 1996; Gollwitzer & Moskowitz, 1996) reasoned that activation of intention-relevant memory entries prepares the individual to efficiently, and sometimes automatically, detect goal-relevant cues in the environment, thus providing him or her with a behavioral repertoire (means) that supports ultimate goal attainment (see also Bargh, 1997; Bargh & Barndollar, 1996; Kruglanski, 1996 for a similar reasoning).

The second principle that characterizes accessibility from motivational sources is that it persists as long as the motivation is active. For example, Goschke and Kuhl (1993) made participants rehearse a series of actions and then informed them that they will either perform the actions (a goal) or observe another person performing them (non-goal). Using a recognition test, they found faster and more accurate responses to the actions in the goal condition than in the no-goal condition, even when rehearsal of the actions was not possible in the intervening time. These results were interpreted as supporting the notion of persisting activation due to the formation of an intention. In a related vein, Bargh, Gollwitzer, Lee-Chai, Barndollar, and Trötschel (2001) showed that activation of an achievement goal from priming constructs related to achievement increased performance on an anagram task. Moreover, immediate performance facilitation was found to be less pronounced compared to performance after a delay, a finding that was interpreted as evidence for the operation of a motivational system. Interestingly, the relatively slow decay of accessibility from motivational sources distinguishes it from accessibility from recent semantic priming, which is known to produce decay over relatively short periods of time (Higgins, Bargh, & Lombardi, 1985; Srull & Wyer, 1979).

Persistence of accessibility from unfulfilled goals was also theorized to underlie rumination and intrusive thoughts (Martin & Tesser, 1996), and unresolved (i.e., current) concerns were theorized to underlie occurrence of concepts related to these concerns in dreams (Klinger, 1977, 1987, 1996). Such activation was thought to remain until the individual either reaches the goal or disengages from it (Lewin, 1951; Martin & Tesser, 1996). These real life phenomena of rumination, intrusive thoughts, and dreams demonstrate that unfulfilled goals may maintain the accessibility of goal-related constructs over extended periods of time—for months and even years.

As noted before, the persistence of activation of goal-related constructs until fulfillment is consistent with a functional view of accessibility. It is reasonable to assume that heightened accessibility of goal-related constructs helps to detect stimuli in the environment that are necessary for efficient goal pursuit and thus contributes to the likelihood of goal achievement (see Ach, 1935; Gollwitzer, 1999; Kuhl, 1983). For example, while

searching for an object (e.g., your reading glasses), it would be useful to activate concepts that are related to the target of search, such as its likely locations (e.g., case, bag, bedroom) or typical activities for which the target is used (reading, watching TV), because the target of search is likely to be in proximity to the associated object or the activity (e.g., the glasses are likely to be near the TV).

The third principle of accessibility from motivational sources is that it is inhibited (i.e., actively reduced) upon fulfillment of the motivation (Lieberman & Förster, 2000; Marsh, Hicks, & Bink, 1998; Marsh, Hicks, & Bryan, 1999; Zeigarnik, 1927). In line with other theories, we think that this is the case because upon goal fulfillment, the accessibility of goal-related constructs loses its functionality and could potentially interfere with other, more necessary tasks that the individual faces. In cybernetic models of goal hierarchies (Carver & Scheier, 1999; Vallacher & Wegner, 1987), for example, goal attainment (e.g., buying groceries) is followed by a reinstatement of a higher-order, superordinate goal (e.g., cooking dinner) that constituted the reason for pursuing the original (i.e., subordinated) goal. In this view, constructs that are related to the fulfilled goal (e.g., money, supermarket) are clearly irrelevant and could potentially interfere with successful performance of the next task at hand. “Clearing up” the mental system from such constructs becomes highly functional (see also Gollwitzer, 1999; Kuhl, 1983; Mayr & Keele, 2000). In the example above, both “supermarket” and “cook” could be strong associates of “food” and thus interfere with each other’s retrieval from long term memory (Anderson & Spellman, 1995). Inhibiting “supermarket” after shopping might be helpful for performing the next task (cooking) by allowing cognitive resources to be used for the more relevant task.

Interestingly, fulfilling a motivation usually involves processing constructs related to the motivation, and according to the findings with recent semantic priming, is supposed to increase accessibility (Higgins, 1996; Wyer & Srull, 1986, 1989). Thus, post-fulfillment inhibition, like persistence of accessibility may distinguish accessibility from a motivational source from accessibility that is due to semantic priming. For example, if a person has a goal to find her glasses, then the construct of glasses should become accessible and remain accessible until the glasses are found. By the logic of post-fulfillment inhibition, finding the glasses should fulfill the goal and reduce the accessibility of glasses. Contrary to this, if a person notes to herself “my neighbor’s glasses look just like mine” (i.e., a non-motivational processing of the construct “glasses”), then the accessibility of glasses would initially increase and gradually decay over time. In this case, the logic of accessibility from construct use suggests that seeing the glasses would reactivate the construct and enhance its accessibility.

What is the empirical evidence for post-fulfillment inhibition? Within Lewin's field theory (1951), the Zeigarnik effect was demonstrated whereby people remembered interrupted tasks better than completed tasks (Zeigarnik, 1927; for reviews see Butterfield, 1964; Heckhausen, 1991; Wicklund & Gollwitzer, 1982). Presumably, this occurs because interruption preserved the goal to complete the task and maintained the goal-related tension, whereas task completion released the tension and reduced memory for the task. Although Lewin and Zeigarnik did not formulate their findings in terms of accessibility, the free recall measure they applied could be interpreted in those terms (Tulving & Patterson, 1968). The Zeigarnik effect could suggest, then, that goals enhance the accessibility of goal-related constructs, and goal fulfillment reduces this accessibility.

Lieberman and Förster (2000) examined the effect of expressing a construct after suppressing it on the construct's accessibility. They reasoned that suppressing a construct enhances the motivation to use it, thereby also enhancing its accessibility, and that expressing a construct after suppressing it would fulfill this motivation. Based on the idea of post-fulfillment inhibition, they hypothesized and found that after participants express a previously suppressed construct, accessibility of this construct was reduced both relative to suppression alone (a state in which an active goal continues to exist) and relative to expression alone (a state in which accessibility due to construct use exists). This paradigm thus provides an indirect support for the notion of post-fulfillment inhibition.

The most direct evidence for post-fulfillment inhibition comes from Marsh et al. (1998, 1999), who extended the paradigm of Goschke and Kuhl (1993) mentioned above and used a lexical decision task to examine the accessibility of intended actions both prior to and after completion. Replicating Goschke and Kuhl (1993), they found that before completion, accessibility of intended actions was enhanced relative to non-intended (i.e., to-be observed) actions. It was found also that after performing the action, accessibility of the performed action was inhibited and decreased more than that of observed actions, a result that is in line with the notion of post-fulfillment inhibition. Marsh and his colleagues (1998) conducted their studies within the framework of prospective memory, and the goals they examined placed a considerable burden on working memory—they involved memorizing (and, in the goal condition, also executing) a series of actions (e.g., “distribute the cutlery, sharpen the pencil, pour the water, spray the aerosol, stack the articles”). The question still remains whether similar results would be obtained with less memory-taxing goals. We believe that the answer is positive, meaning that goal-related accessibility and post-fulfillment inhibition may be viewed not only from the perspective of prospective memory but also from a

broader theoretical perspective, that of general models of motivation and cognition. Our studies examine this prediction.

Finally, a fourth principle of accessibility from motivational sources is that it should be proportional to the strength of the motivation. Classic theories of motivation state that motivation increases with the expectancy of reaching a goal and with the goal's value—this basic premise underlies expected utility theory in economics and decision making, the theory of achievement motivation (e.g., Atkinson, 1964), the theory of reasoned action (Fishbein & Ajzen, 1974), and the theory of motivation in organizational psychology (Vroom, 1966). For example, according to all these models, an applicant's motivation to apply for a job position increases with the job's attractiveness and the estimated chances to get the position. Furthermore, the expectancy-value models specify that expectancy and value combine in a multiplicative way to determine motivation. Thus, if the job is not attractive, then motivation to apply would be low no matter how likely is one to get the job. In a similar way, if there are virtually no chances of getting the job, motivation to apply would remain low even if the job is rather attractive. Based on expectancy-value models of motivation, we could predict that accessibility of goal-related constructs should increase with the goal's expectancy and value. To the best of our knowledge, this effect has never been shown in the literature, although it is clearly in line with the social cognitive notion of goals as sources of accessibility.

We propose the reason for this effect can be explained in terms of functionality. A high motivation to fulfill a goal means that the individual is ready to invest a lot of energy in goal pursuit, and, probably, gives it a high priority over other goals. Enhancing the accessibility of goal-related constructs could help to achieve the focal goal, but at the same time, it could interfere with achieving other goals (Shah, Friedman, & Kruglanski, 2002). For example, enhanced accessibility of “glasses” and its associates could help to find glasses, but it would most likely also detract attention from simultaneously pursuing other goals (pre-existing or newly introduced) that require simultaneous attention (e.g., engaging in a conversation). Thus, because of its potential costs, enhanced accessibility of goal-related constructs should be proportional to the emphasis one is ready to assign to the pursuit of this particular goal (i.e., to the motivation to pursue the goal). To consider another example, suppose that a person sets a goal to oppose the next sexist remark by a colleague. To efficiently pursue that goal, that person needs to be sensitive to sexist issues, which can effectively be achieved if the accessibility of constructs related to sexism is increased (see Gollwitzer, 1999; Goschke & Kuhl, 1993). Such enhanced accessibility, however, would detract

from the person's ability to engage in other simultaneous tasks (e.g., impression management) and thus should be employed only when there is a strong motivation to oppose sexist remarks.

If accessibility could be increased with higher motivation, would the extent of post-fulfillment inhibition be proportional to the strength of the motivation to achieve the goal? In other words, would more inhibition follow the fulfillment of more motivating goals? Of course, if higher motivation should produce higher pre-fulfillment activation, and if inhibition is measured against a pre-fulfillment stage then more inhibition is expected for higher levels of motivation. However, if inhibition is measured as a reduced accessibility compared to a control, no-goal condition (rather than being compared to a previous stage within the goal condition), would less accessibility of goal-related constructs follow the achievement of more motivating goals? It is possible the achievement of highly motivating goals is more salient and therefore inhibition is more likely to follow fulfillment of such goals than fulfillment of less motivating goals. A similar prediction also follows from the functional reasoning we introduced before. Specifically, it is reasonable to assume that highly motivating goals are more likely than less motivating goals to suppress (or put "on hold") even important alternative goals. For example, a high motivation to respond to sexist remarks may suppress the important goal of self presentation, but a weak motivation would not suffice to produce such suppression. Therefore, as a rule, the importance of the next pressing goal is likely to be greater after fulfillment of a highly motivating goal than after fulfillment of a less motivating goal. Transferring attention and resources to this important goal is facilitated by strong inhibition of the constructs related to the previous goal. Thus, the more motivating the initial goal is, the more functional it is to inhibit its related constructs after goal fulfillment in order to turn back to the important alternative goal that was suppressed.

In sum, we are proposing four principles that characterize accessibility from motivational sources: (1) motivation increases the accessibility of related constructs; (2) this accessibility persists as long as the motivation is active; (3) motivation-related constructs are inhibited upon fulfillment of the motivation; (4) motivation-related accessibility and post-fulfillment inhibition are proportional to the strength of the motivation. The first principle is widely documented, the second and the third principles were demonstrated in a number of studies but generally received less support in the social cognitive literature, and finally, to the best of our knowledge the fourth principle has never been demonstrated. The present paper demonstrates these four principles with accessibility from goals. Studies 1–3 establish a paradigm of examining goal-related accessibility and post-fulfillment inhibition. Studies 4–6 use the same paradigm to exam-

ine all four principles by varying expectancy and value of the goal.

### **Study 1: Speed of lexical decisions before and after goal fulfillment**

Participants looked through a series of pictures with the goal of finding a picture of glasses that is followed by a picture of scissors in order to report it to the experimenter. Participants in the control, no-goal condition looked through the same pictures without being instructed to find a target. Four blocks of pictures were presented with the target combination, in the third block. After each block of pictures, participants performed a lexical decision task in which they had to indicate as fast and as accurately as possible whether a string of letters was a word or a non-word. Faster lexical decisions on semantic associates of a construct indicate a greater accessibility of the construct (Neely, 1991). Words related to glasses, words unrelated to glasses, and non-words were presented randomly. In this way, we examined the accessibility of goal-related and goal-unrelated constructs both before and after goal fulfillment and compared those to the accessibility of the same constructs in a control, no-goal condition.

#### *Method*

##### *Participants*

Thirty-five University of Würzburg students (23 women and 12 men) from different disciplines participated in a battery study and received DM 12 (at the time US \$5.5) as compensation. Gender had no effect on our results.

##### *Procedure*

Participants first performed tasks unrelated to the present experiment for about 20 min. The present study was introduced as a pretest, ostensibly conducted for a colleague researcher, who needed pictures for a future experiment and had to obtain pre-experimental ratings of the pictures. We told participants that they have to watch the picture and then answer a few questions about them. Participants in the goal condition were told that in order to make sure that they carefully watched all the pictures, when they see a picture of glasses that is immediately followed by a picture of scissors, they have to get up, approach the experimenter and notify her about finding the target combination. They were told that there is one and only one such combination in the entire set of pictures. Participants in the no-goal condition were told that the pictures represent different everyday life objects, like, for example, glasses and scissors. In this way, in both conditions scissors and glasses were

mentioned in the instructions, but only in the goal condition they constituted the target of a search.

The pictures were color icons of bells, flags, flowers, animals, etc. from the Word graphic library (for example: 🍁 ✂️ 📧 🌸 🐻 📞 🚩, etc.) The pictures, approximately 40 × 40 cm in size (screen size was 1 × 2 m and the pictures were presented in the center of the screen), were projected on the wall. Each picture was presented for 10 s. There were a total of 31 images, repeatedly presented in random order through the experiment. Participants watched four sets with 30 pictures in each set. After each set, participants answered four questions about how much they liked the sequence of images they saw. The questions were “How much did you like the composition of the series?,” “In your opinion, how much would others like the composition of the series?,” “How boring was the series?,” and “How interesting was the series?.” Each question was followed by a 9-point scale. These questions were intended to lend credibility to the cover story, and were not analyzed.

Glasses and scissors appeared repeatedly among the pictures. Specifically, in the first set, glasses appeared in positions 8, 20, and 25 and scissors appeared in position 29. In the second set of pictures glasses appeared in positions 4, 12, 19, 24, and 28 and scissors appeared in position 8. In the third set of pictures glasses appeared in positions 3, 20, and 29 and scissors appeared in position 4 (i.e., immediately after a picture of glasses, thus constituting the search target). In the fourth set of pictures glasses appeared in positions 2, 8, 11, and 24 and scissors appeared in position 20. Thus, in the goal condition the target was found (i.e., the goal was fulfilled) in the third set of pictures.

We told participants that in order to provide them with a break from watching the pictures and to better distinguish among the series, they would perform an unrelated filler task after each session of the picture-evaluation task. The filler was introduced as an unrelated experiment on speed of word recognition. The filler was a lexical decision task designed to measure the accessibility of words related to glasses and words unrelated to glasses. Participants were told that letter strings would appear on the screen and were instructed to press the left (right) key if the string is a word and the right (left) key if it is not a word. Whether the right key or the left key was to be pressed for words was counterbalanced across participants and had no effect on the results. Participants were instructed to respond as quickly and as accurately as they could. On each trial, an upper-case letter string (font size 22 in Times New Roman) was presented in the middle of the computer screen and remained until a response was made. Five seconds after the response, the next letter string appeared. No masks or fixation points were used.

Each block of lexical decision presented, in random order, 7 or 8 words related to glasses (e.g., read, profes-

sor, sun), 17 or 18 words unrelated to glasses, and 15 non-words.<sup>1</sup> The first five words in each block were always unrelated to glasses. They served as practice trials that were not included in the analyses. The non-words were obtained from words (that were not used in the task) by altering one letter. The words that were unrelated to glasses were not related to any of the other pictures in the experiment. Each (word or non-word) stimulus was used only once in the lexical decision task. In the goal condition of this and all the subsequent studies, all the participants noticed the combination in the third set and complied with the instruction to report it.<sup>2</sup>

After proceeding through the experiment participants performed a series of unrelated tasks for another 20 min. After that, they were paid, probed for suspicions, and thanked for taking part. None of the participants suspected a relation between the picture task and the lexical decision task.

### *Stimulus material*

To select words related to glasses, 40 University of Würzburg undergraduate students generated 10 associations for the word glasses. All the words generated by this sample were ranked by another sample of 50 University of Würzburg participants and the 30 highest ranked items were rated by another sample of 30 University of Würzburg undergraduate students on how much they were associated to glasses on 9-point scales ranging from 1 (not at all related to glasses) to 9 (very related to glasses). The word “glasses” itself was not

<sup>1</sup> The proportion of 15 non-words to 25 words was unintended and might seem problematic. However, this asymmetry could have only led to a bias towards a decision for words compared to non-words. Since we were not interested in differences between non-words and words, we think that our material is not problematic. Moreover, such a bias cannot explain any of the predicted interactions. Study 3 has an equal proportion of words and non-words and led to similar results.

<sup>2</sup> One might wonder why our dependent measure consisting of words related to glasses rather than the word “glasses” itself. This was done to prevent repeated exposure to the same word, which could have produced a floor effect due to learning and, in addition, raised suspicion about some relation between the lexical decision and the picture-evaluation parts of the study, especially in the goal condition. Another potential question about our dependent measure could be why we did not examine words related to scissors in addition to or instead of words related to glasses. We decided against examining associates of scissors because we reasoned that in order to perform the task, our participants do not have to be vigilant to pictures of scissors all the time, but only after seeing a picture of glasses. Contrary to this, they have to be vigilant to detect pictures of glasses during the entire experiment. Furthermore, upon encountering a picture of glasses, participants have to store the entry “glasses” in their memory until the appearance of the next picture. We believe that for that reason, the goal-related activation of “glasses” should have been stronger than that of scissors. Because we were interested in demonstrating the properties of goal-related accessibility, we set to examine the former rather than the latter. Obviously, future research, which will examine the boundary condition of the phenomena described in this paper, should also examine these procedural variations.

used, nor were any combinations with “glasses” like “sun glasses.” The mean rating of the selected words,  $M = 6.21$ , was significantly greater than the scale’s midpoint  $t(29) = 15.26, p < .0001$ .

### Results and discussion

Faster decisions on semantic associates of glasses indicate greater accessibility of the concept of glasses (see Neely, 1991 for a review). The response times were log-transformed (natural logarithm function) to achieve homogeneity of error variance, but, for the sake of clarity, we present non-transformed means. We excluded from the analysis incorrect responses (1.6% of the responses) and response latencies that were three standard deviations greater or less than the mean for each stimulus in each experimental condition (0.82% of the responses). A 2 (Goal: goal vs. no-goal)  $\times$  2 (Word Type: related to glasses, not related to glasses)  $\times$  4 (Blocks 1 to 4) ANOVA on the mean of the transformed response latencies was conducted, with goal as a between-subjects variable and word type and block as within-subjects variables. The analysis yielded a significant three-way interaction,  $F(3, 99) = 34.80, p < .0001$ , a Goal  $\times$  Word Type interaction,  $F(1, 33) = 4.69, p = .04$ , a Goal  $\times$  Block interaction,  $F(3, 99) = 30.35, p < .0001$ , a Word Type  $\times$  Block interaction,  $F(3, 99) = 11.72, p < .0001$ , and a main effect for Block,  $F(3, 99) = 17.46, p < .0001$ . There were no main effects for Goal,  $F < 1$  or for Word Type,  $F < 1$ . The results are presented in Table 1.

We computed, for each block, an index of the relative accessibility of goal-related words as a difference between the response latency for words unrelated to glasses and response latency for words related to glasses (see Table 1). A higher score on that index indicates that words related to glasses were more accessible relative to words unrelated to glasses. A series of analyses used this index as a dependent measure to separately examine our hypotheses. Remember that Blocks 1 and 2 measure accessibility before goal fulfillment, whereas Blocks 3 and 4 measure accessibility post-fulfillment. We thus

examine Blocks 1 and 2 to test the prediction that goal-related constructs would be more accessible in the goal condition than in the no-goal condition. We compare Blocks 2 and 3 to examine the prediction that accessibility of goal-related constructs would drop after fulfillment (i.e., from Block 2 to Block 3) in the goal condition but not in the no-goal condition. We examine Blocks 3 and 4 to look at the dynamics of post-fulfillment inhibition over time. In each case, we conducted an ANOVA on the advantage of goal-related words in the relevant blocks with goal condition and blocks as the independent variables. We used Scheffé post hoc comparisons to detect significant differences between means, controlling for an inflated type I error.

### Accessibility from active goals

A 2 (Block 1 vs. 2)  $\times$  2 (Goal vs. No Goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of Block,  $F(1, 33) = 4.62, p = .03$ , a main effect of Goal,  $F(1, 33) = 18.32, p = .0002$ , and a Block  $\times$  Goal interaction,  $F(1, 33) = 23.11, p < .0001$ . Post hoc analyses revealed goal-related accessibility in Block 2, namely, the relative advantage of glasses-related words was greater in the goal condition ( $M = 133$ ) than in the no-goal condition ( $M = -26$ ). In Block 1, however, there was no such effect—there were no differences between the goal and the no-goal conditions in the relative advantage of glasses-related words ( $M = 16$  vs.  $M = 34$ , respectively). Thus, the goal enhanced the accessibility of goal-related constructs, but this effect developed over time and was not evident immediately. This finding is consistent with previous findings on the gradual increase in goal-related accessibility prior to fulfillment (Bargh et al., 2001), and will be examined in further studies and discussed in General discussion.

### Post-fulfillment inhibition

A 2 (Block 2 vs. 3)  $\times$  2 (Goal vs. No Goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of Block,  $F(1, 33) = 25.86, p < .0001$ , no main effect of Goal,  $F(1, 33) = 2.02$ ,

Table 1  
Response latencies on a lexical decision task by Goal, Word Type, and Block (Study 1,  $N = 35$ . Standard deviations in parentheses)

	Block 1	Block 2	Block 3	Block 4	Mean
<i>Goal</i>					
Words related to glasses	737 (151)	562 (75)	981 (130)	717 (70)	749 (78)
Words unrelated to glasses	753 (134)	695 (130)	707 (136)	706 (125)	715 (121)
Advantage of words related to glasses	16 (87)	133 (120)	-275 (173)	-11 (82)	-34 (86)
<i>No-goal</i>					
Words related to glasses	816 (183)	782 (164)	694 (99)	652 (58)	736 (87)
Words unrelated to glasses	849 (179)	756 (122)	735 (120)	719 (147)	765 (130)
Advantage of words related to glasses	34 (64)	-26 (112)	41 (165)	66 (122)	29 (58)

Note. The advantage of words related to glasses is the difference in response latencies between words unrelated to glasses and words related to glasses. A larger value represents greater accessibility of words related to glasses relative to words unrelated to glasses.

$p = .16$ , and a Block  $\times$  Goal interaction,  $F(1,33) = 79.32, p < .0001$ . The interaction showed post-fulfillment inhibition, namely, after goal fulfillment, in Block 3, accessibility of goal-related constructs was reduced in the goal condition more than the no-goal condition relative to Block 2. Post hoc analyses revealed that before fulfillment, in Block 2, the advantage of goal-related constructs was greater in the goal condition ( $M = 133$ ) than in the no-goal condition ( $M = -26$ ), but immediately after fulfillment, in Block 3, this relation was reversed, and the advantage of goal-related constructs was less in the goal condition ( $M = -275$ ) than in the no-goal condition ( $M = 41$ ). In other words, immediately after goal fulfillment, the accessibility of goal-related words was reduced below the baseline provided by the no-goal condition.

#### *The dynamics over time of post-fulfillment inhibition*

A 2 (Block 3 vs. 4)  $\times$  2 (goal vs. no-goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of Block,  $F(1,33) = 17.27, p = .0002$ , a main effect of Goal,  $F(1,33) = 23.66, p < .0001$ , and a Block  $\times$  Goal interaction,  $F(1,33) = 21.27, p < .0001$ . The interaction showed that post-fulfillment inhibition (i.e., the relative disadvantage of goal-related words in the goal condition) was stronger in Block 3 than in Block 4, although post hoc tests showed that post-fulfillment inhibition was evident both in Block 3 ( $M_{\text{goal}} = -275$  vs.  $M_{\text{no-goal}} = 41$ ) and in Block 4 ( $M_{\text{goal}} = -11$  vs.  $M_{\text{no-goal}} = 66$ ). This result could be interpreted as a partial release from post-fulfillment inhibition of goal-related constructs. We are not aware of any report of a similar effect in the literature, as previous studies that demonstrated post-fulfillment inhibition did not examine its dynamics over time. We will investigate this effect further in the following studies.

In sum, Study 1 demonstrated that active goals enhanced the accessibility of goal-related constructs and that goal fulfillment inhibited these constructs, rendering them less accessible than before fulfillment and less accessible than the same constructs in a control, no-goal condition. The results also showed a release of post-fulfillment inhibition. This latter effect, which was never demonstrated in the literature, will be examined in further studies.

#### **Study 2: Speed of performing a Stroop task before and after goal fulfillment**

We conducted a conceptual replication of Study 1 with a Stroop task, in which words related to the goal and words unrelated to the goal are presented in color. Participants have to indicate the color of the word as quickly and as accurately as possible. The more accessible a word is, the more its semantic associates interfere

with the color-naming task, and therefore the amount of interference could serve as a measure of accessibility (for a similar use of the Stroop paradigm in social cognition see, for example, Anderson, Anderson, & Deuser, 1996; Kawakami, Dovidio, Moll, Hermsen, & Russin, 2000; Lane & Wegner, 1995; Pratto & John, 1991; Wegner, Erber, & Zanakos, 1993; Wentura, Rothermund, & Bak, 2000). Thus, in the present study slower response latencies indicate greater accessibility.

#### *Method*

##### *Participants*

Thirty-one University of Würzburg students (20 women and 11 men) from different disciplines participated in an experiment on different psychological tests and received DM 12 (at the time US \$5.5) as compensation. There were no gender differences in any of the results reported below.

##### *Procedure*

The procedure and the materials were identical to Study 1, except that a Stroop task was used instead of the lexical decision task. In the Stroop task, we presented to participants words in either a blue or a yellow font on the computer screen and instructed them to press the left (right) key if the word is printed in yellow and the right (left) key if it is printed in blue. Whether the right key or the left key was to be pressed for blue words was counterbalanced across participants and had no effect on the results. We used the same stimuli as in Study 1, including the words and the non-words. Thus, each block of the Stroop task had randomly ordered 7 or 8 trials with words related to glasses, 17 or 18 trials with words unrelated to glasses, and 15 non-word trials. Note that in this study, unlike in Study 1, larger values (i.e., slower response latencies) reflect greater accessibility. As in Study 1, we computed an index of the relative advantage of goal-related words so that larger values would represent a greater advantage. This was achieved by subtracting, in each block, the mean response latency for words unrelated to glasses from the mean response latency for words related to glasses.

#### *Results and discussion*

Slower decisions on semantic associates of glasses indicate greater accessibility of the concept of glasses (see Neely, 1991 for a review). The response times were log-transformed (natural logarithm function) to achieve homogeneity of error variance but, for the sake of clarity, we present non-transformed means. We excluded from the analysis incorrect responses (1.6% of the responses) and response latencies that were three standard deviations greater or less than the mean for each stimulus in each experimental condition (0.48% of the responses). A 2

(Goal: goal vs. no goal)  $\times$  2 (Word Type: related to glasses, not related to glasses)  $\times$  4 (Blocks 1 to 4) ANOVA on the mean of the transformed response latencies was conducted, with Goal as a between-subjects variable and Word Type and Block as within-subjects variables. The analysis yielded a significant three-way interaction,  $F(3,87) = 18.73$ ,  $p < .0001$ , no Goal  $\times$  Word Type interaction,  $F < 1$ , a Goal  $\times$  Block interaction,  $F(3,87) = 14.67$ ,  $p < .0001$ , a Word Type  $\times$  Block interaction,  $F(3,87) = 57.52$ ,  $p < .0001$ , no main effect for Goal,  $F < 1$ , a main effect for Word Type,  $F(1,29) = 123.35$ ,  $p < .0001$ , and a main effect for Block,  $F(3,87) = 112.48$ ,  $p < .0001$ . The results are presented in Table 2.

We computed, for each block, an index of the relative accessibility of goal-related words as a difference between the response latency for words related to glasses and response latency for words unrelated to glasses (see Table 2). A higher score on that index indicates that words related to glasses were more accessible relative to words unrelated to glasses. As in Study 1, we analyze this index to examine our hypotheses about the accessibility of active goals, post-fulfillment inhibition and its dynamics over time. As in Study 1 we conduct ANOVA's on the advantage of goal-related words in the relevant blocks and use Scheffe post hoc comparisons to detect significant differences between means.

#### Accessibility from active goals

A 2 (Block 1 vs. 2)  $\times$  2 (Goal vs. No Goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of Block,  $F(1,29) = 5.45$ ,  $p = .03$ , a main effect of Goal,  $F(1,29) = 3.87$ ,  $p = .06$ , and a Block  $\times$  Goal interaction,  $F(1,29) = 41.76$ ,  $p < .0001$ . Post hoc analyses revealed goal-related accessibility in Block 2, namely, the relative advantage of glasses-related words was greater in the goal condition ( $M = 491$ ) than in the no-goal condition ( $M = 166$ ). In Block 1, however, there was no such effect—there was no difference between the goal and the no-goal conditions in the relative advantage of glasses-related words ( $M = 237$  vs.  $M = 309$ ). Thus, the goal enhanced the

accessibility of goal-related constructs, but this effect developed over time and was not evident immediately. This finding replicates Study 1.

#### Post-fulfillment inhibition

A 2 (Block 2 vs. 3)  $\times$  2 (Goal vs. No Goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of Block,  $F(1,29) = 105.25$ ,  $p < .0001$ , a main effect of Goal,  $F(1,29) = 4.65$ ,  $p = .04$ , and a Block  $\times$  Goal interaction,  $F(1,29) = 53.66$ ,  $p < .0001$ . The interaction showed post-fulfillment inhibition, namely, after goal fulfillment, in Block 3, accessibility of goal-related constructs was reduced in the goal condition more than in the no-goal condition relative to Block 2. Post hoc analyses revealed that before fulfillment, in Block 2, the advantage of goal-related constructs was greater in the goal condition ( $M = 491$ ) than in the no-goal condition ( $M = 166$ ), but immediately after fulfillment, in Block 3, this relation was reversed, and the advantage of goal-related constructs was less in the goal condition ( $M = 9$ ) than in the no-goal condition ( $M = 96$ ). In other words, immediately after goal fulfillment, the accessibility of goal-related words was reduced below the baseline provided by the no-goal condition.

#### The dynamics over time of post-fulfillment inhibition

A 2 (Block 3 vs. 4)  $\times$  2 (Goal vs. No Goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of Block,  $F(1,29) = 4.35$ ,  $p = .05$ , a main effect of Goal,  $F(1,29) = 8.92$ ,  $p = .006$ , and a Block  $\times$  Goal interaction,  $F(1,29) = 8.09$ ,  $p = .008$ . The interaction showed post-fulfillment inhibition (i.e., the relative disadvantage of goal-related words in the goal condition) in Block 3 ( $M_{\text{goal}} = 9$  vs.  $M_{\text{no-goal}} = 96$ ) but not in Block 4 ( $M_{\text{goal}} = 13$  vs.  $M_{\text{no-goal}} = 27$ ). Thus, a complete release of post-fulfillment inhibition occurred in Block 4, in contrast to the partial release in Study 1.

#### Additional results

In the no-goal condition, the relative advantage of glasses-related words diminished across the four blocks,

Table 2  
Response latencies on a stroop task by Goal, Word Type, and Block (Study 2,  $N = 31$ . Standard deviations in parentheses)

	Block 1	Block 2	Block 3	Block 4	Mean
<i>Goal</i>					
Words related go glasses	858 (166)	975 (110)	488 (107)	461 (86)	696 (61)
Words unrelated to glasses	621 (183)	484 (83)	479 (92)	449 (78)	508 (88)
Advantage of words related to glasses	237 (208)	491 (157)	9 (64)	13 (44)	187 (80)
<i>No-goal</i>					
Words related to glasses	876 (90)	640 (87)	604 (142)	466 (86)	646 (64)
Words unrelated to glasses	567 (144)	474 (96)	508 (119)	441 (75)	498 (98)
Advantage of words related to glasses	309 (164)	166 (127)	96 (122)	25 (44)	149 (79)

Note. The advantage of words related to glasses is the difference in response latencies between words related to glasses and words unrelated to glasses. A larger value represents greater accessibility of words related to glasses relative to words unrelated to glasses.

$F(3,45) = 16.05, p < .0001$ . Possibly, with practice, performance in the color-naming task approached optimal efficiency, and differences between word types were diminished due to a floor effect. This effect was not replicated in any of the other studies, all of which examined lexical decisions rather than a Stroop task.

In sum, Study 2 replicated Study 1 in demonstrating that active goals enhance the accessibility of goal-related constructs and that goal fulfillment is followed by an inhibition of these constructs, which renders them less accessible than either before fulfillment or in a control, no-goal condition. Studies 1 and 2 also revealed that goal-related accessibility was not evident immediately but emerged over time (i.e., in Block 2 but not in Block 1), and post-fulfillment inhibition was evident immediately after fulfillment and was released afterwards (i.e., inhibition was stronger in Block 3 and weaker or non-existent in Block 4). Although the basic results of Study 1 were replicated, it seems that the Stroop paradigm used in Study 2 produces, in the control condition, a decrease over blocks in the relative accessibility of goal-related words, an effect that may potentially complicate the comparison between the control and the experimental conditions. Therefore, in further studies we return to the lexical decision paradigm.

In Studies 1 and 2 participants that were endowed with a goal always fulfilled it. This procedure did not enable to compare a fulfilled goal to an active, unfulfilled goal. Study 3 was designed to address this issue by including a third condition, in which the goal is never fulfilled. In addition, in Studies 1 and 2 the target of search was a combination of stimuli (a picture of glasses that is followed by a picture of scissors) rather than a single stimulus and the first stimulus of the compound appeared a number of times through the set of stimuli (but, of course, was followed by the second target stimulus only once). Possibly, this aspect of the paradigm helped to create an especially strong activation of the first construct of the compound, because each time participants encountered the first stimulus (glasses) they had to keep it in mind until they saw the following stimulus in order to decide whether this was or was not the target combination. Study 3 examines a single-stimulus target in order to extend our predictions to this, potentially weaker, situation of goal activation.

### **Study 3: The effect of fulfilled vs. unfulfilled goals**

The present study examines the effect of fulfilled vs. unfulfilled goals by introducing two goal conditions: one in which, as in the previous studies, the goal is fulfilled and another goal condition, in which the goal is not fulfilled but rather continues to exist through the experiment. We expected that in the unfulfilled goal condition, no inhibition of the goal-related construct would

occur, and therefore goal-related constructs would remain accessible and possibly even increase in accessibility through the experimental sessions. In addition, the present study also extends previous findings to other content. Specifically, instead of searching for a combination of visual stimuli, we asked participants to find the word “aggression” in a series of words.

### *Method*

#### *Participants*

One hundred and ten undergraduates (55 men, 55 women), majoring in different disciplines at the University of Würzburg were asked to participate in a psychology study. Two participants were excluded from the analyses because of data loss.

#### *Procedure*

The procedure is based on that of Study 1 with a few important changes: First, we added a new, unfulfilled goal condition, in which participants searched for a target stimulus that was never presented. To better distinguish the two goal conditions, we term them “fulfilled goal condition” and “unfulfilled goal condition,” although the former is identical to the goal condition in Studies 1 and 2. Second, participants searched for the word “aggression” among other words, instead of searching for a combination of visual stimuli. Third, we used only three blocks of stimuli instead of four blocks (this was done because we had only 21 words that were associated with aggression to a sufficient degree, see below). As in previous studies, the goal was fulfilled (in the fulfilled goal condition) in Block 3.

Participants in all the experimental conditions were asked to read words presented at a rate of one word every 4s on the computer screen, with an inter-stimulus interval of 2s. They were told that questions would be asked about these words afterwards. Each block contained 40 words which were, according to our pretest (see later), unrelated to aggression. Each block was followed by a lexical decision task, which was introduced as a part of an unrelated perception task and was designed to measure the accessibility of aggression-related words. We explained that alternating between these tasks would help attention and concentration. After each block, participants had to answer the question “How positive were the words presented overall?” on a scale anchored at 1 (very negative) and 9 (very positive). This question was introduced to make the cover story believable and was not analyzed.

Each lexical decision task presented, in random order, seven words related to aggression (e.g., brutal [brutal], Hass [hatred], bedrohen [to threaten]), seven words unrelated to aggression (e.g., global [global], Herd [oven], befestigen [to fix]), and 14 non-words. The non-words were obtained from words (unrelated to aggres-

sion and not used in the word-search task) by altering one letter. Each (word or non-word) stimulus was used only once in the lexical decision task. Some of these words were taken from [Mussweiler and Förster \(2000\)](#). More words were added based on a pretest with 20 participants (10 male and 10 female) who rated 225 words on a scale from 1 (not at all associated to aggression) to 9 (strongly associated to aggression). We chose those with a mean rating above 6 as aggression-related words, and those with a mean rating below 3 as aggression-unrelated words.

In the unfulfilled goal and the fulfilled goal conditions, participants were told that in order to make sure that they read all the words, they should tell the experimenter if the word “aggression” appears on the screen. They were told that this word will appear once and only once in the sequence of words. Participants in the fulfilled goal condition found the word in the third block, and all of them reported finding it to the experimenter, as required. Participants in the unfulfilled goal condition never found the target word.

After the word searching task and the lexical decision tasks, participants worked on some unrelated tasks and at the end of the session they were probed about any possible suspicions regarding the relation between the lexical decision task and the search task. Four participants mentioned that in the lexical decision task some words were related to aggression. These participants were excluded from the analyses (although including them did not change the results in any significant way). All the other participants did not report any suspicion.

*Results and discussion*

As in previous studies, response times were log-transformed (natural logarithm function) to achieve homogeneity of error variance, but, for the sake of clarity, we present non-transformed means. We excluded from the analysis incorrect responses (1.6% of the responses) and response latencies that were three standard deviations greater or less than the mean for the stimulus in the experimental condition (0.69% of the responses). A 3 (Goal: fulfilled goal, unfulfilled goal, no-goal) × 2 (Word Type: related to glasses, not related to glasses) × 3 (Blocks 1 to 3) ANOVA on the mean of the transformed response latencies was conducted, with Goal as a between-subjects variable and Word Type and Block as within-subjects variables. The analysis yielded a significant three-way interaction,  $F(4,202) = 24.07, p < .0001$ , a Goal × Word Type interaction,  $F(2,101) = 37.79, p < .0001$ , a Goal × Block interaction,  $F(4,202) = 5.08, p = .06$ , a Word Type × Block interaction,  $F(2,202) = 22.25, p < .0001$ , a main effect for Goal,  $F(2,101) = 2.97, p = .06$ , a main effect for Word Type,  $F(1,101) = 112.36, p < .0001$ , and a main effect for Block,  $F(2,202) = 24.16, p < .0001$ . The results are presented in [Table 3](#). As in previous studies, we computed, for each block, an index of the relative accessibility of goal-related words. A series of analyses used this index as a dependent measure to examine our hypotheses about the accessibility of active goals and post-fulfillment inhibition.

*Accessibility from active goals*

A 2 (Block 1 vs. 2) × 3 (Goal: fulfilled goal, unfulfilled goal, no-goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of Block,  $F(1,101) = 12.93, p = .0005$ , a main effect of Goal,  $F(2,101) = 27.54, p < .0001$ , and a marginal Block × Goal interaction,  $F(2,101) = 2.36, p = .10$ . Post hoc analyses revealed goal-related accessibility in both Blocks 1 and 2. Specifically, in Block 1, the relative advantage of glasses-related words was less in the no-goal condition ( $M = 5$ ) than in the two goal conditions,

Table 3  
Response latencies on a lexical decision task by Goal, Word Type, and Block (Study 3,  $N = 104$ . Standard deviations in parentheses)

	Block 1	Block 2	Block 3	Mean
<i>Fulfilled goal</i>				
Words related to aggression	669 (102)	600 (69)	734 (112)	668 (76)
Words unrelated to aggression	753 (142)	731 (103)	668 (92)	717 (90)
Advantage of words related to aggression	83 (80)	131 (86)	-66 (88)	49 (46)
<i>Unfulfilled goal</i>				
Words related to aggression	663 (100)	596 (63)	548 (58)	602 (52)
Words unrelated to aggression	740 (142)	710 (92)	676 (68)	709 (80)
Advantage of words related to aggression	77 (78)	114 (79)	129 (77)	106 (54)
<i>No-goal</i>				
Words related to aggression	717 (67)	667 (49)	667 (76)	684 (49)
Words unrelated to aggression	722 (96)	678 (76)	657 (61)	686 (67)
Advantage of words related to aggression	5 (99)	11 (66)	-9 (50)	2 (49)

*Note.* The advantage of words related to glasses is the difference in response latencies between words unrelated to glasses and words related to glasses. A larger value represents greater accessibility of words related to glasses relative to words unrelated to glasses.

which did not differ from each other ( $M_{\text{fulfilled goal}} = 83$ ,  $M_{\text{unfulfilled goal}} = 77$ ). In Block 2, the same pattern was repeated ( $M_{\text{no-goal}} = 11$ ,  $M_{\text{fulfilled goal}} = 131$ ,  $M_{\text{unfulfilled goal}} = 114$ ). The marginal interaction indicated that the goal accessibility effect was somewhat stronger in Block 2 than in Block 1, replicating the findings of Studies 1 and 2 (in which this interaction was stronger, and goal-related accessibility showed in Block 2 but not in Block 1).

#### *Post-fulfillment inhibition*

A 2 (Block 2 vs. 3)  $\times$  3 (goal: fulfilled goal, unfulfilled goal, no-goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of Block,  $F(1, 101) = 36.40$ ,  $p < .0001$ , a main effect of Goal,  $F(2, 101) = 51.65$ ,  $p < .0001$ , and a Block  $\times$  Goal interaction,  $F(2, 101) = 41.90$ ,  $p < .0001$ . Post hoc analyses revealed that before fulfillment, in Block 2, both goal conditions showed the same amount of goal-related accessibility, i.e., less advantage to goal-related constructs in the no-goal condition,  $M = 11$ , than in either of the goal conditions, which did not differ from each other ( $M_{\text{fulfilled goal}} = 131$ ,  $M_{\text{unfulfilled goal}} = 114$ ). In Block 3, the predicted post-fulfillment inhibition occurred in the fulfilled goal condition (less advantage for goal-related words in the fulfilled goal condition,  $M = -66$  than in the no-goal condition,  $M = -9$ ) whereas goal-related accessibility continued to persist in the unfulfilled goal condition (i.e., greater advantage for goal-related words in the unfulfilled goal condition,  $M = 129$ , than in the no-goal condition,  $M = -9$ ).

In sum, Study 3 demonstrated that active goals enhanced the accessibility of goal-related constructs and that goal fulfillment inhibited these constructs, rendering them less accessible compared to accessibility before fulfillment and accessibility of the same constructs in a control, no-goal condition. Contrary to this, lack of fulfillment resulted in a maintained heightened accessibility of goal-related constructs.

The next three studies examine the effect of goal expectancy and goal value on accessibility from active and fulfilled goals. We predict that both the effect of goal-related accessibility and the effect of post-fulfillment inhibition would be proportional to the strength of the motivation to achieve the goal in question and hence should vary also as a function of the goal's expectancy and value.

#### **Study 4: The effect of goal expectancy on goal-related activation and post-fulfillment inhibition**

This study examined how the expectancy of reaching the goal affects the accessibility of goal-related constructs. We reasoned that because expectancy affects motivation (Atkinson, 1964), it should also affect acces-

sibility from motivational sources, and thus the accessibility of goal-related constructs and post-fulfillment inhibition would be greater when the expectancy of reaching the goal is high compared to when it is low. Such a strategy would be highly efficient if an organism gives higher priority to reachable rather than unattainable goals, by increasing sensitivity for goal-related constructs (e.g., objects, opportunities, means) in proportion to the goal's attainability (Ach, 1935; Gollwitzer, 1999; Klinger, 1996; Kuhl, 1983).

#### *Method*

##### *Participants*

Forty-seven University of Würzburg students (27 women and 20 men) from different disciplines participated in an experiment on different psychological tests and received € 8 (at the time US \$8) as compensation. There were no gender differences in any of the results reported below.

##### *Procedure*

The procedure and the materials were identical to Study 1, except that a manipulation of goal expectancy was added. Specifically, we told participants in the high expectancy condition that the target combination (i.e., a picture of glasses that is followed by a picture of scissors) is present in 90% of the experimental sessions. We told participants in the low expectancy condition that the target combination is present in only 5% of the experimental sessions. The control, no-goal condition was similar to Studies 1 and 2. We should note that in all the goal conditions of this study and subsequent studies, all the participants found the target combination and complied with the instruction to report it to the experimenter.

##### *Results and discussion*

As before, we log-transformed the response latencies, and excluded incorrect responses (0.9% of the responses) and response latencies that were three standard deviations greater or less than the mean response latency for each stimulus in each condition (0.47% of the responses). A 3 (Goal: high expectancy, low expectancy, no-goal)  $\times$  2 (Word Type: related to glasses, not related to glasses)  $\times$  4 (Blocks 1 to 4) ANOVA on the response latencies was conducted, with Goal as a between-subjects variable and Word Type and Block as within-subjects variables. The analysis yielded a three-way interaction,  $F(6, 132) = 7.15$ ,  $p < .0001$ , a marginal Goal  $\times$  Word Type interaction,  $F(2, 44) = 2.39$ ,  $p = .10$ , a Goal  $\times$  Block interaction,  $F(6, 132) = 2.59$ ,  $p = .03$ , a Word Type  $\times$  Block interaction,  $F(3, 132) = 15.064$ ,  $p < .0001$ , no main effect for Goal,  $F(2, 44) = 1.25$ ,  $p = .29$ , a main effect for Word Type,  $F(1, 44) = 30.52$ ,

$p < .0001$ , and a main effect for Block,  $F(3, 132) = 12.31$ ,  $p < .0001$ . The results are presented in Table 4. The relative advantage of goal-related words was computed in a way similar to Study 1, with greater scores indicating more advantage (faster response latencies) for goal-related constructs than to constructs unrelated to the goal. We turn now to examine the effects of goal expectancy on goal-related accessibility (Blocks 1 and 2), post-fulfillment inhibition (Block 2 and 3), and its dynamics over time (Blocks 3 and 4).

*Accessibility from active goals*

A 2 (Block 1 vs. 2) × 3 (Goal: high expectancy, low expectancy, no-goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of Block,  $F(1, 44) = 3.12$ ,  $p = .08$ , a main effect of Goal,  $F(2, 44) = 11.08$ ,  $p < .0001$ , and a Block × Goal interaction,  $F(2, 44) = 7.30$ ,  $p = .002$ . Post hoc analyses revealed goal-related accessibility in the high expectancy condition in Block 2. Namely, the relative advantage of glasses-related words was greater in the high expectancy condition ( $M = 152$ ) than in both the no-goal condition ( $M = 22$ ) and in the low expectancy condition ( $M = 63$ ). The no-goal and low expectancy conditions did not differ from each other. In Block 1, however, there were no differences between goal conditions in the relative advantage of glasses-related words ( $M_{\text{high expectancy}} = 65$ ,  $M_{\text{low expectancy}} = 63$ ,  $M_{\text{no-goal}} = 68$ ). Thus, the goal-related accessibility was obtained, as in Studies 1 and 2, in Block 2 but not in Block 1. Consistent with our predictions, accessibility was stronger with a more motivating, high expectancy goal than with a less motivating, low expectancy goal.

*Post-fulfillment inhibition*

A 2 (Block 2 vs. 3) × 3 (Goal: high expectancy, low expectancy, no-goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of

Block,  $F(1, 44) = 9.44$ ,  $p < .0001$ , no main effect of Goal,  $F(2, 44) = 2.43$ ,  $p = .10$ , and a Block × Goal interaction,  $F(2, 44) = 14.13$ ,  $p < .0001$ . The interaction showed post-fulfillment inhibition in the high expectancy condition, but not in the low expectancy condition. Namely, after goal fulfillment, in Block 3, accessibility of goal-related constructs was reduced relative to Block 2 in the high expectancy condition more than in either the no-goal condition or the low expectancy condition. Post hoc analyses revealed that before fulfillment, in Block 2, the advantage of goal-related constructs was greater in the high expectancy condition ( $M = 152$ ) than in both the no-goal condition ( $M = 22$ ) and the low expectancy condition ( $M = 69$ ). Again, the no-goal and low expectancy conditions did not differ from each other. Immediately after fulfillment, in Block 3, however, this relation was reversed, and the advantage of goal-related constructs was greater in the no-goal condition ( $M = 12$ ) than in the high expectancy goal condition ( $M = -89$ ). In other words, immediately after goal fulfillment, the accessibility of goal-related words was reduced in the high expectancy condition below the baseline provided by the no-goal condition. The low expectancy condition ( $M = -40$ ) was in between these two goal conditions, and did not significantly differ from either of them.

*The dynamics over time of post-fulfillment inhibition*

A 2 (Block 3 vs. 4) × 3 (Goal: high expectancy, low expectancy, no-goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of Block,  $F(1, 44) = 9.90$ ,  $p = .003$ , a main effect of Goal,  $F(2, 44) = 2.99$ ,  $p = .06$ , and a marginal Block × Goal interaction,  $F(2, 44) = 2.49$ ,  $p = .09$ . This trend suggested that in the high expectancy condition, post-fulfillment inhibition (i.e., the relative disadvantage of goal-related words) was somewhat stronger in Block 3 than in Block 4. Post hoc tests showed in Block 3 more inhibition of goal-related constructs in the high expectancy condition

Table 4  
Response latencies on a lexical decision task by Goal Expectancy, Word Type, and Block (Study 4,  $N = 47$ . Standard deviations in parentheses)

	Block 1	Block 2	Block 3	Block 4	Mean
<i>High expectancy goal</i>					
Words related to glasses	695 (146)	558 (84)	751 (98)	638 (102)	661 (69)
Words unrelated to glasses	760 (148)	710 (95)	662 (75)	665 (87)	699 (84)
Advantage of words related to glasses	65 (57)	152 (125)	-89 (96)	27 (70)	39 (32)
<i>Low expectancy goal</i>					
Words related to glasses	674 (96)	634 (74)	687 (109)	643 (115)	660 (72)
Words unrelated to glasses	737 (112)	697 (113)	647 (88)	653 (79)	683 (81)
Advantage of words related to glasses	63 (96)	63 (79)	-40 (100)	10 (84)	24 (33)
<i>No-goal</i>					
Words related to glasses	648 (106)	629 (74)	629 (103)	587 (99)	623 (80)
Words unrelated to glasses	687 (103)	651 (103)	641 (129)	615 (99)	649 (100)
Advantage of words related to glasses	38 (82)	22 (56)	12 (98)	28 (47)	25 (45)

Note. The advantage of words related to glasses is the difference in response latencies between words unrelated to glasses and words related to glasses. A larger value represents greater accessibility of words related to glasses relative to words unrelated to glasses.

than in the no-goal condition ( $M_{\text{high expectancy}} = -89$ ,  $M_{\text{low expectancy}} = -40$ ,  $M_{\text{no-goal}} = 12$ ), but no differences between goal conditions in Block 4 ( $M_{\text{high expectancy}} = 27$ ,  $M_{\text{low expectancy}} = 10$ ,  $M_{\text{no-goal}} = 28$ ).

In sum, Study 4 showed, as predicted, that the effect of active goals and post-fulfillment inhibition were moderated by goal expectancy. This is consistent with the motivational model, according to which goal expectancy affects motivation. The next study examines the effect of another determinant of motivation, namely, goal value.

### Study 5: The effect of goal value on goal-related activation and post-fulfillment inhibition

According to classic theories of motivation, the strength of the motivation to achieve a goal is proportional to the product of the goal's expectancy and the goal's value. Study 3 examined expectancy, and the present study examines the second component of this equation, namely value. Would the effects of goal-related accessibility and post-fulfillment inhibition be proportional to the goal's value? As noted before, such an effect would be highly instrumental, because if enhanced accessibility of goal-related constructs is an effort investment that is designed to facilitate goal achievement, then it should be employed more frequently (or more strongly) with important goals than with unimportant goals (Ach, 1935; Gollwitzer, 1999; Klinger, 1996; Kuhl, 1983).

In the present study, we told some participants that they are going to receive a relatively large sum of money when they find a target combination of pictures, and we told other participants that they are going to receive only a small sum of money when they find the target combination. We predicted accessibility of goal-related constructs and post-fulfillment inhibition would be greater when the value associated with reaching a goal is high than when it is low.

#### Method

##### Participants

Forty-one University of Würzburg students (23 women and 18 men) from different disciplines participated in an experiment with different psychological tests and received € 8 (at the time US \$8) as compensation. There were no gender differences in any of the results reported below.

##### Procedure

The procedure and the materials were identical to Study 1, except that a manipulation of goal value was added. Specifically, we told participants in the high value condition that they are going to receive €1 (at the time US \$1) for finding the target combination (i.e., a picture of glasses that is followed by a picture of scis-

sors). Participants in the low value condition were told that they are going to receive € 0.05 (at the time US \$ 0.05) for finding the target combination. The control, no-goal condition was similar to Study 1.

#### Results and discussion

As before, we log-transformed the response latencies, and excluded incorrect responses (0.9% of the responses) and response latencies that were three standard deviations greater or less than the mean response latency for each stimulus in each condition (0.14% of the responses). A 3 (Goal: high value, low value, no-goal)  $\times$  2 (Word Type: related to glasses, not related to glasses)  $\times$  4 (Blocks 1 to 4) ANOVA on the response latencies was conducted, with Goal as a between-subjects variable and Word Type and Block as within-subjects variables. The analysis yielded a three-way interaction,  $F(6, 114) = 7.34$ ,  $p < .0001$ , a Goal  $\times$  Word Type interaction,  $F(2, 38) = 5.08$ ,  $p = .01$ , a Goal  $\times$  Block interaction,  $F(6, 114) = 3.38$ ,  $p = .004$ , a Word Type  $\times$  Block interaction,  $F(3, 114) = 7.54$ ,  $p = .0004$ , no main effect for Goal,  $F(2, 38) = 2.08$ ,  $p = .14$ , a main effect for Word Type,  $F(1, 38) = 5.15$ ,  $p < .0001$ , and a main effect for Block,  $F(3, 114) = 2.49$ ,  $p = .06$ . The results are presented in Table 5. The relative advantage of goal-related words was computed in a way similar to previous studies. We turn now to examine the effects of goal value on goal-related accessibility, post-fulfillment inhibition, and its dynamics over time.

##### Accessibility from active goals

A 2 (Block 1 vs. 2)  $\times$  3 (Goal: high value, low value, no-goal) ANOVA on the relative advantage of goal-related constructs revealed no main effect of Block,  $F < 1$ , a main effect of Goal,  $F(2, 38) = 5.99$ ,  $p = .005$ , and a Block  $\times$  Goal interaction,  $F(2, 38) = 8.77$ ,  $p = .0007$ . Post hoc analyses revealed goal-related accessibility in the high value condition in Block 2, namely, the relative advantage of glasses-related words, was greater in the high value condition ( $M = 110$ ) than in both the no-goal condition ( $M = 10$ ) and the low value condition ( $M = -18$ ), which did not differ from each other. In Block 1, however, there were no differences between goal conditions in the relative advantage of glasses-related words ( $M_{\text{high value}} = 38$ ,  $M_{\text{low value}} = 46$ ,  $M_{\text{no-goal}} = 56$ ). Thus, the goal-related accessibility was obtained, as in Studies 1, 2, and 4, in Block 2 but not in Block 1. Consistent with our predictions, it was stronger with a more motivating, high value goal than with a less motivating, low value goal.

##### Post-fulfillment inhibition

A 2 (Block 2 vs. 3)  $\times$  3 (Goal: high value, low value, no-goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of Block,

Table 5

Response latencies on a lexical decision task by Goal Value, Word Type, and Block (Study 5,  $N = 41$ . Standard deviations in parentheses)

	Block 1	Block 2	Block 3	Block 4	Mean
<i>High value goal</i>					
Words related to glasses	643 (86)	573 (49)	721 (96)	630 (75)	642 (50)
Words unrelated to glasses	680 (75)	683 (95)	628 (66)	635 (61)	657 (57)
Advantage of words related to glasses	38 (65)	110 (96)	−93 (62)	5 (64)	15 (31)
<i>Low value goal</i>					
Words related to glasses	692 (112)	728 (119)	758 (179)	684 (125)	716 (107)
Words unrelated to glasses	738 (127)	710 (90)	701 (107)	659 (98)	702 (100)
Advantage of words related to glasses	46 (59)	−18 (97)	−57 (141)	−25 (70)	−25 (70)
<i>No-goal</i>					
Words related to glasses	623 (91)	656 (118)	597 (64)	659 (142)	634 (88)
Words unrelated to glasses	679 (118)	666 (112)	642 (102)	656 (119)	660 (105)
Advantage of words related to glasses	56 (54)	10 (54)	45 (93)	−3 (67)	27 (39)

Note. The advantage of words related to glasses is the difference in response latencies between words unrelated to glasses and words related to glasses. A larger value represents greater accessibility of words related to glasses relative to words unrelated to glasses.

$F(1, 38) = 7.54$ ,  $p = .0009$ , a main effect of Goal,  $F(2, 38) = 4.61$ ,  $p = .02$ , and a Block  $\times$  Goal interaction,  $F(2, 38) = 12.48$ ,  $p < .0001$ . The interaction showed post-fulfillment inhibition in the high value condition, namely, after goal fulfillment, in Block 3, accessibility of goal-related constructs was reduced in the high value condition more than in either the no-goal condition or the low value condition relative to Block 2. Post hoc analyses revealed that before fulfillment, in Block 2, the advantage of goal-related constructs was greater in the high value condition ( $M = 110$ ) than in both the no-goal condition ( $M = 10$ ) and in the low value condition ( $M = -18$ ), which did not differ from each other. Immediately after fulfillment, in Block 3, however, this relation was reversed, and the advantage of goal-related constructs was less in the high value condition ( $M = -93$ ) than in the no-goal condition ( $M = 45$ ). In other words, immediately after goal fulfillment, the accessibility of goal-related words was reduced in the high value condition below the baseline provided by the no-goal condition. The low value condition ( $M = -57$ ) was in between these two goal conditions, it was significantly less than the control condition ( $M = 45$ ), but did not significantly differ from the high value condition ( $M = -93$ ). We believe that the result in the low value condition in Block 3 cannot be easily interpreted as post-fulfillment inhibition because this condition did not show evidence of pre-fulfillment activation.

#### The dynamics over time of post-fulfillment inhibition

A 2 (Block 3 vs. 4)  $\times$  3 (Goal: high value, low value, no-goal) ANOVA on the relative advantage of goal-related constructs revealed no main effect of Block,  $F < 1$ , a main effect of Goal,  $F(2, 38) = 7.32$ ,  $p = .002$ , and a Block  $\times$  Goal interaction,  $F(2, 38) = 5.50$ ,  $p = .008$ . The interaction showed that in the high value condition, post-fulfillment inhibition (i.e., the relative disadvantage of goal-related words) was stronger in

Block 3 than in Block 4, whereas other goal conditions did not show this difference between blocks. Post hoc tests showed more inhibition in the two goal conditions (high value and low value) than in the no-goal condition in Block 3 ( $M_{\text{high value}} = -93$ ,  $M_{\text{low value}} = -57$ ,  $M_{\text{no-goal}} = 45$ ), but no differences between the goal conditions in Block 4 ( $M_{\text{high value}} = 5$ ,  $M_{\text{low value}} = -25$ ,  $M_{\text{no-goal}} = -3$ ). Thus, the high value condition showed a complete release from post-fulfillment inhibition in Block 4.

In sum, Study 5 showed, as predicted, that the effect of active goals and post-fulfillment inhibition are moderated by goal value. This is consistent with the motivational model, according to which goal value affects motivation. The next study examines the combined effect of expectancy and value on goal-related accessibility and post-fulfillment inhibition.

#### Study 6: The joint effects of goal expectancy and goal value on goal-related activation and post-fulfillment inhibition

The present study extends Studies 4 and 5 by simultaneously varying expectancy and value in an orthogonal way. According to classic theories of motivation, expectancy and value should combine multiplicatively to motivational strength (Atkinson, 1964). We predicted that the accessibility of goal-related constructs and post-fulfillment inhibition would be proportional to the interaction of expectancy and value—they will be stronger when both expectancy and value are high relative to the condition in which either expectancy or value are low.

#### Method

##### Participants

Seventy-five University of Würzburg students (39 women and 36 men) from different disciplines participated

in an experiment with different psychological tests and received € 8 (at the time US \$8) as compensation. There were no gender differences in any of the results reported below.

### Procedure

The procedure and the materials were identical to Study 1, except that manipulations of goal value and expectancy were added. We manipulated expectancy in a way similar to Study 4, and within each of the groups we manipulated value in a way similar to Study 5, thus creating four experimental groups (high value, high expectancy; high value, low expectancy; low value, high expectancy; low value, low expectancy). The control, no-goal condition was the fifth group and was similar to the previous studies.

### Results and discussion

As before, we log-transformed the response latencies, and excluded incorrect responses (0.9% of the responses) and response latencies that were three standard deviations greater or less than the mean response latency for each stimulus in each condition (0.17% of the responses). A 5 (Goal: high value, high expectancy; high value, low expectancy; low value, high expectancy; low value, low expectancy, no-goal)  $\times$  2 (Word Type: related to glasses, not related to glasses)  $\times$  4 (Blocks 1 to 4) ANOVA on the response latencies was conducted, with Goal as a between-subjects variable and Word Type

and Block as within-subjects variables. The analysis yielded a three-way interaction,  $F(12, 210) = 8.54$ ,  $p < .0001$ , no Goal  $\times$  Word Type interaction,  $F(4, 70) = 1.04$ ,  $p = .39$ , a Goal  $\times$  Block interaction,  $F(12, 210) = 3.47$ ,  $p < .0001$ , a Word Type  $\times$  Block interaction,  $F(3, 210) = 29.70$ ,  $p < .0001$ , no main effect for Goal,  $F < 1$ , a main effect for Word Type,  $F(1, 70) = 4.28$ ,  $p = .04$ , and a main effect for Block,  $F(3, 210) = 17.59$ ,  $p < .0001$ . The results are presented in Table 6. The relative advantage of goal-related words was computed in a way similar to previous studies. We turn now to examine the combined effects of goal value and goal expectancy on goal-related accessibility, post-fulfillment inhibition, and its dynamics over time.

### Accessibility from active goals

We predicted that the goal accessibility effect would be stronger in the high value, high expectancy condition compared to the control, no-goal condition and the other experimental conditions. A 2 (Block 1 vs. 2)  $\times$  5 (Goal: high value, high expectancy; high value, low expectancy; low value, high expectancy; low value, low expectancy, no-goal) ANOVA on the relative advantage of goal-related constructs revealed no main effect of Block,  $F(1, 70) = 1.90$ ,  $p = .17$ , a main effect of Goal,  $F(4, 70) = 7.93$ ,  $p < .0001$ , and a Block  $\times$  goal interaction,  $F(4, 70) = 7.99$ ,  $p < .0001$ . Post hoc analyses revealed goal-related accessibility in the high value, high expectancy condition in Block 2, namely, the relative advantage of glasses-related words was greater in

Table 6

Response latencies on a lexical decision task by Goal Expectancy and Goal Value, Word Type, and Block (Study 6,  $N = 75$ . Standard deviations in parentheses)

	Block 1	Block 2	Block 3	Block 4	Mean
<i>High value, high expectancy goal</i>					
Words related to glasses	681 (98)	549 (56)	769 (112)	683 (120)	670 (64)
Words unrelated to glasses	742 (106)	672 (64)	645 (67)	615 (70)	669 (62)
Advantage of words related to glasses	61 (74)	123 (96)	-124 (83)	-68 (95)	-2 (43)
<i>High value, low expectancy goal</i>					
Words related to glasses	653 (140)	659 (111)	690 (123)	637 (118)	660 (113)
Words unrelated to glasses	729 (133)	670 (88)	638 (103)	613 (105)	663 (98)
Advantage of words related to glasses	76 (57)	11 (49)	-53 (76)	-24 (58)	3 (39)
<i>Low value, high expectancy goal</i>					
Words related to glasses	619 (83)	650 (80)	659 (93)	620 (112)	637 (75)
Words unrelated to glasses	674 (90)	659 (84)	632 (84)	621 (94)	647 (79)
Advantage of words related to glasses	55 (42)	9 (62)	-27 (58)	1 (71)	10 (35)
<i>Low value, low expectancy goal</i>					
Words related to glasses	676 (126)	702 (123)	681 (113)	627 (111)	672 (104)
Words unrelated to glasses	703 (140)	695 (120)	664 (143)	625 (87)	672 (110)
Advantage of words related to glasses	28 (49)	-8 (69)	-17 (100)	-2 (67)	0 (38)
<i>No-goal</i>					
Words related to glasses	629 (76)	643 (104)	622 (92)	598 (101)	623 (79)
Words unrelated to glasses	681 (81)	655 (81)	632 (72)	625 (95)	648 (58)
Advantage of words related to glasses	53 (67)	12 (87)	11 (87)	26 (72)	25 (44)

Note. The advantage of words related to glasses is the difference in response latencies between words unrelated to glasses and words related to glasses. A larger value represents greater accessibility of words related to glasses relative to words unrelated to glasses.

the high value, high expectancy condition than in either of the other goal conditions, which did not differ from each other. In Block 1, however, there were no differences between goal conditions in the relative advantage of glasses-related words. Thus, goal-related accessibility emerged, as in previous studies, in Block 2 but not in Block 1. Consistent with our predictions, it was stronger with a more motivating, high value, high expectancy goal, than with a less motivating goals (i.e., those that were characterized by low value, low expectancy, or both).

#### *Post-fulfillment inhibition*

A 2 (Block 2 vs. 3)  $\times$  5 (Goal: high value, high expectancy; high value, low expectancy; low value, high expectancy; low value, low expectancy, no-goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of Block,  $F(1, 70) = 36.77$ ,  $p < .0001$ , no main effect of Goal,  $F(4, 70) = 1.86$ ,  $p = .12$ , and a Block  $\times$  Goal interaction,  $F(4, 70) = 13.77$ ,  $p < .0001$ . The interaction showed post-fulfillment inhibition in the high value, high expectancy condition, but not in any other condition. Specifically, the interaction indicated that, after goal fulfillment, in Block 3, accessibility of goal-related constructs was reduced in the high value, high expectancy condition more than in either the no-goal condition or the other goal conditions relative to Block 2. Post hoc analyses revealed that before fulfillment, in Block 2, the advantage of goal-related constructs was greater in the high value condition ( $M = 123$ ) than in the no-goal condition and in all other goal conditions ( $-8 < M < 12$ ), which did not differ from each other. Immediately after fulfillment, in Block 3, however, this relation was reversed, and the advantage of goal-related constructs was less in the high value, high expectancy condition ( $M = -124$ ) compared to the no-goal condition ( $M = 11$ ) and the low value, low expectancy condition ( $M = -17$ ). In other words, immediately after goal fulfillment, the accessibility of goal-related words was reduced in the high value, high expectancy condition below the baseline provided by the no-goal condition. The high value, low expectancy condition ( $M = -53$ ) and the low value, high expectancy condition ( $M = -27$ ) did not significantly differ from either of the goal conditions.

#### *The dynamics over time of post-fulfillment inhibition*

A 2 (Block 3 vs. 4)  $\times$  5 (Goal: high value, high expectancy; high value, low expectancy; low value, high expectancy; low value, low expectancy, no-goal) ANOVA on the relative advantage of goal-related constructs revealed a main effect of Block,  $F(1, 70) = 8.10$ ,  $p = .006$ , a main effect of Goal,  $F(4, 70) = 8.74$ ,  $p < .0001$ , and no Block  $\times$  Goal interaction,  $F < 1$ . The effect of Goal showed that in both Blocks 3 and 4, the high value high expectancy condition produced a stronger disadvantage for goal-related constructs than the no-goal condition.

The other goal conditions were in between the high value, high expectancy condition and the no-goal condition. They did not significantly differ from either of these goal conditions (with the exception of the low value, low expectancy condition,  $M = -17$ , that differed from the high value high expectancy condition,  $M = -124$ , in Block 3). Thus, the high value, high expectancy condition continued to show post-fulfillment inhibition in Block 4 that was not significantly less than that of Block 3. Although the disadvantage of the goal-related words seemed to diminish from Block 3 to Block 4 (from  $M = -124$  to  $M = -68$ ), this change was not significantly different from the other goal conditions (as indicated by the lack of an interaction effect).

In sum, Study 6 showed, as predicted, that the effect of active goals and post-fulfillment inhibition were moderated by the interaction of goal value and goal expectancy. That is, these effects were evident when both value and expectancy were high, but not when either of them was low. This is consistent with the motivational model, according to which goal value and goal expectancy affect motivation in a multiplicative, non-compensatory manner—when either the goal value or the goal expectancy are low motivation is low, and cannot be compensated by an increase in the other dimension.

## **General discussion**

In our studies, participants were endowed with a goal to search for a stimulus among other stimuli. In Studies 1, 2, and 4–6 participants searched for picture of glasses that is followed by a picture of scissors among other pictures. In Study 3, participants searched for the word aggression among other words. Participants in the control condition looked through the same series of stimuli without having such goal in mind. Accessibility of goal-related words as well as of control, unrelated words was examined using the lexical decision task (Studies 1, 3, and 4–6) and a Stroop task (Study 2) both before and after the goal was fulfilled. We found that accessibility of goal-related words was enhanced prior to finding the target and was reduced after finding the target, both relative to the preceding stage and relative to the control, no-goal condition. Study 3 also demonstrated that if the goal is not fulfilled (i.e., the target is not found) then the accessibility of goal-related stimuli continues to increase and no inhibition occurs.

Studies 4, 5, and 6 manipulated the expectancy of fulfilling the goal, the payment associated with achieving the goal, and a combination of expectancy and value. In Study 4, enhanced accessibility of goal-related words prior to fulfillment and inhibition after fulfillment were found in the high expectancy condition but not in the low expectancy condition. In Study 5, enhanced accessibility of goal-related words prior to fulfillment and inhi-

bition after fulfillment was found in the high value condition but not in the low value condition. Finally, in Study 6 both expectancy and value were manipulated orthogonally, and it was found that goal-related accessibility and post-fulfillment inhibition occurred when both expectancy and value were high, but not when either of them was low.

Together, the studies demonstrate four principles of accessibility from goals: (1) goals enhance the accessibility of goal-related constructs; (2) accessibility persists until the goal is fulfilled; (3) goal fulfillment inhibits the accessibility of goal-related constructs; (4) accessibility of goal-related constructs and post-fulfillment inhibition are proportional to the strength of the motivation to achieve the goal. We believe that the demonstration of these principles and especially the introduction of the novel fourth principle are of central importance for social cognition and social psychology in general.

#### *A functional view of goal-related activation and inhibition*

As noted in the introduction, and as suggested by theories of motivation (Ach, 1935; Gollwitzer, 1999; Kuhl, 1983), we think that post-fulfillment inhibition of goal-related constructs as well as goal-related activation of these constructs is consistent with a functional view of accessibility. It has been theorized that heightened accessibility of goal-related constructs helps to detect stimuli in the environment that are instrumental for efficient goal pursuit and thus contribute to the likelihood of goal achievement. In our studies, maintaining high accessibility of the search target probably helped participants detect the target stimulus in a fast and accurate way. Upon goal fulfillment, the accessibility of goal-related constructs loses its functionality and could potentially interfere with other tasks that the individual faces. It is useful, then, at this stage, to inhibit the accessibility of constructs that are related to the fulfilled goal. Further research should more directly examine the functionality of goal-related accessibility by introducing goals that allow for different levels of achievement (e.g., “find as many targets as possible”) and by examining the prediction that the extent of goal fulfillment should be proportional to the accessibility of goal-related constructs. It is also possible to experimentally manipulate the level of goal-related accessibility and observe its effects on goal fulfillment.

Related to our notion of the functionality of inhibition is a recent finding by Shah et al. (2002) that focal goals inhibit competing goals, especially when the motivation to achieve the focal goal is strong and when the alternative goal can be substituted (rather than complement) with the focal goal. Shah and colleagues (2002) also showed that inhibition of alternative goals is instrumental for goal pursuit and goal attainment. Functional activation and inhibition of goal-related constructs was

also suggested by Aarts and Dijksterhuis (2000), who showed that goals create an association between goal-related constructs and fulfillment-relevant environmental cues. For example, people who intended to ride a bike, compared to people who intended to walk, responded faster to “bike” after being primed with a location to which they wanted to ride, but not without such priming. This research raises the possibility that goals create a “conditional accessibility” of goal-related constructs, which is triggered by an appropriate cue, rather than (or in addition to) enhancing accessibility of such constructs overall. It is possible that goals that do not require current action can be put “on hold,” a state in which goal-related accessibility is not necessarily high overall but rather can be easily enhanced by appropriate cues.

Our studies extend the functional view of goal-related accessibility and post-fulfillment inhibition by showing that both of these effects are proportional to the motivation to fulfill the goal. We suggest to explain this finding by the notion that enhancing the accessibility of goal-related constructs is more functional with more motivating goals, for which efficient fulfillment is particularly important. We also proposed a functional explanation of our finding that post-fulfillment inhibition is stronger with more motivating goals. Specifically, if, as suggested by Shah et al. (2002), goals inhibit competing goals, then more motivating goals would be capable of inhibiting stronger competing goals. Therefore, as a rule, the goals that are inhibited by a highly motivating focal goal would be stronger than the goals that are inhibited by a less motivating focal goal. If, as maintained by the functional view of post-fulfillment inhibition, post-fulfillment inhibition is conducive for fulfillment of the goals that were previously inhibited by the focal goal, then inhibition should be more important after the fulfillment of more motivating goals.

#### *Additional results in our studies*

In addition to the predicted effects of goal-related accessibility and post-fulfillment inhibition, two unpredicted effects emerged consistently in our results. First, in five of our studies, a release from post-suppression inhibition occurred. Specifically, post-fulfillment inhibition was evident immediately after fulfillment and was reduced (Studies 1 and 6) or eliminated (Studies 2, 4, and 5) later on. To the best of our knowledge, this seemingly robust and replicable effect has never been demonstrated before. Second, in five of our studies, the goal accessibility effect was not obtained immediately, but emerged at a later stage, and in another study (Study 3) the effect was evident immediately and gradually increased prior to fulfillment. This result is consistent with the view that accessibility from goals enhances gradually before goal fulfillment (e.g., Bargh et al., 2001; Martin &

Tesser, 1996) and with the notion of motivational gradients (Lewin, 1951; Miller, 1944), according to which motivation enhances closer to the goal. Notably, one explanation of goal gradients is based on expectancy (e.g., Förster, Higgins, & Idson, 1998)—in our paradigm, for example, before the target is found the probability of finding it increases as one proceeds with the experiment (e.g., the chances to find it in the first block are 1/4, but once it is not found in the first block, the chances in the second block become 1/3, etc.). Therefore, according to normative expectancy-value models of motivation, prior to finding the target, one should become increasingly motivated to find it. Our result that the accessibility of goal-related constructs increased prior to fulfillment is therefore consistent with the notion that goal-related accessibility is proportional to the goal's expectancy, or, more generally, to the motivation to achieve the goal. We should note, however, that the fact that in Studies 1, 2, and 4–6 the goal accessibility effect emerged only in Block 2 and not in Block 1 could also be an artifact of the experimental procedure. For example, it is possible that in the first block participants were still not used to the task, and thus their performance reflected more noise than in subsequent blocks.

It is worth emphasizing that in our paradigm, successive blocks not only gradually approach the goal, but they also increase exposure to goal-related constructs. Although rehearsal of goal-related constructs could be inherent to striving for a goal, it is possible to separate these two potential sources of accessibility, for example, by engaging participants in a cognitive task that prevents rehearsal (Goschke & Kuhl, 1993). It is also important to note that more extensive exposure cannot easily account for the differences between the high motivation and the low motivation conditions in Studies 4, 5, and 6. In future research it would be interesting to examine an experimental paradigm that could distinguish between motivational gradients and the effects of rehearsal.

#### *Activation and inhibition of different types of goals*

An important property of our paradigm should be noted, which could be relevant to our findings. The fact that participants knew that there is one and only one target in the entire set of stimuli designated finding the target as a clear and final case of goal fulfillment. Inhibition after fulfillment in this case is particularly strategically advantageous, because once the target is found, no additional targets are to be sought out, and information related to it cannot be useful anymore. It is possible that less inhibition would be found with goals that do not provide such a clear sense of fulfillment. More generally, it is possible that different types of goals would be associated with different patterns of activation and inhi-

bition of goal-related constructs. Thus, standards could be thought of as a subtype of goals that can be instantiated but cannot be entirely fulfilled. For example, a standard of being an egalitarian person is instantiated or met but not fulfilled by admitting a minority candidate. Contrary to this, a goal of “showing a token of egalitarian behavior” can be fulfilled. According to the functional view of goal-related accessibility, one should expect less inhibition after an instantiation of standards than after fulfillment of goals. One should, however, expect that standard-related constructs would enhance accessibility if the standard is frustrated (Moskowitz, Gollwitzer, Wasel, & Schaal, 1999; Moskowitz, Salomon, & Taylor, 2000).

#### *Implications for person perception*

Social psychological literature has particular interest in the effects of construct accessibility on person perception (e.g., Devine, 1989; Higgins, Rholes, & Jones, 1977; Srull & Wyer, 1979). What would be the implications of our findings for person perception? One would expect, for example, perception of an ambiguous social target in goal-related terms (an assimilation effect) before goal fulfillment and perception in opposite terms (a contrast effect) after goal fulfillment. For example, suppose that Sarah has a goal to aggress against Joan (e.g., to hit her). We would predict that compared to a situation in which no goals related to aggression are activated, Sarah would perceive an ambiguously aggressive behavior as more aggressive before fulfilling the goal to aggress, and will perceive the same behavior as less aggressive after fulfilling the goal to aggress. It would be interesting to examine the possibility, proposed before, that some goals, because they cannot be fulfilled but only instantiated, would not create a contrast effect at all. For example, the goal “to show a token of egalitarian behavior” can be fulfilled, but the goal “be egalitarian” cannot be fulfilled. We would expect that in the former case, more than in the latter case, a contrast effect would occur after performing an egalitarian behavior.

#### *Accessibility from motivation and accessibility from construct use*

We mentioned in the introduction that some properties of motivation-induced accessibility distinguish it from the accessibility that is produced, for example, by recent semantic priming. Specifically, the relative endurance of accessibility of motivation-related constructs is distinct from the relatively rapid decay of primed constructs (Bargh et al., 2001). Also, post-fulfillment inhibition is inconsistent with the principle that additional processing of a construct increases its accessibility, inasmuch as fulfilling a goal involves processing of goal-re-

lated constructs. Our finding about the moderation of goal-related accessibility and post-fulfillment inhibition from goal value and goal expectancy provide further evidence for the dissociation between accessibility from goals and accessibility from recent semantic priming.

It would be interesting to examine the functionality of accessibility and decay from recent semantic priming. It has been suggested that the function served by enhanced accessibility after using a construct is to facilitate perception of related constructs, which would be beneficial if redundancy is expected (Neely, 1991). For example, it is functional that processing the word “nurse” would enhance the accessibility of the construct “doctor” because these two stimuli tend to co-occur in reality. If so, one could predict that if the expectation of co-occurrence or redundancy is altered, accessibility due to construct use would change correspondingly. This could be done, for example, by changing the situation between the presentation of the two targets, or experimentally embedding a negative correlation between semantically related stimuli. Possibly, and consistently with the functional view of accessibility, inhibition would occur in the latter case.

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