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Zur Verfügbarkeit intentionsrelevanter Informationen in Abhängigkeit von Relevanz und zeitlicher Nähe der zu erledigenden Aufgabenstellung

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1 Introduction

Our capability to perform tasks such as remembering to keep an appointment, pay bills in time, or turn off the stove after cooking is of fundamental importance in the attainment and preservation of autonomy in everyday life across the lifespan. Performing such tasks depends, to a large extent, on our ability to remember what we planned to do at a specific moment in the future. In general, the term *prospective memory* is used to describe this type of task as well as the processes by which we succeed or fail in carrying out such tasks. Because the successful completion of prospective memory tasks involves a variety of processes such as memory, attention, action control, and motivation (e.g., Dobbs & Reeves, 1996; Winograd, 1988) some authors prefer the term *realizing delayed intentions* instead of prospective memory (e.g., Ellis, 1996; Ellis & Freeman, 2008). The term delayed intention highlights two important aspects of prospective memory. First, there must be an intention, which means that a person has decided to act as a result of voluntary processes. Second, the intention cannot be executed immediately, but its execution has to be postponed until some designated moment in the future. This implies that the intended activity (e.g., to return the library book) is associated with a more or less well-defined retrieval situation (e.g., en route home after work). What distinguishes prospective memory tasks from retrospective memory tasks is "that they require identifying or recognizing cues as telltale signs of previously formed plans and intentions when they (the cues) occur as part of ongoing thoughts, actions, or situations." (Graf & Uttl, 2001, p. 442). Consequently, a question of fundamental importance is what brings a representation of intention into one's mind at the right moment given that there are no explicit prompts to initiate the retrieval.

Before turning to possible mechanisms that may contribute to successful remembering of an intended activity at an appropriate moment in the future, we will shortly present some definitions of the term intention (as used in the prospective memory literature). As McDaniel and Einstein (2007) put it in their attempt to define a prospective memory task "[t]here must be an intention" (p. 8). In other words, an intention is an inherent property of all prospective memory tasks. Like needs and goals, intentions are motivational states. Most researcher argue that what distinguishes intentions from other motivational states is that they involve the (conscious) formation of a plan. For example, Goschke and Kuhl (1996) characterize intentions as cases in which "the individual is committed to the execution of a particular course of action (as opposed to merely wishing or desiring a goal state)" (p. 55). Following Smith (2008) the basic element of an intention is an intent, that is, the conscious decision to

act in a certain way as a result of volitional processes. She defines an intent as a mental representation of the agent and the action, for example “I return the library book”. She distinguishes intentional and nonintentional intents. The latter refers to reflexive action-trigger schema (e.g., to pick up the receiver when the phone rings), whereas the former requires that a plan of acting was formed before the action was executed. She proposes to use the term intention to refer to previously planned actions (i.e., intentional intents). A key feature of both definitions of intention is that an individual has decided on and is committed to a certain course of action. In contrast, Kvavilashvili and Ellis (1996) define an intention as “a person’s readiness to act in a certain way in the future, where what has to be done and when it has to be done are defined with more or less clarity” (p. 26). As Ellis (1996) further elaborates an individual’s readiness to act may depend on the motivational status of an intention, varying from whishes to wants and musts. Thus, the latter definition takes a broader perspective on what might be considered an intention. In the current research we adopted a restrictive definition of intentions: All participants were obligated to act in a particular way. To strengthen their commitment to fulfil those experimenter-defined intentions properly, we usually announced an evaluation of their accomplishment at the intended activity. In other words, the motivational status of the intention was a “must” (but see Experiment 3 for an exception). The implications of our findings for these different views of intentions are elaborated in the Final Discussion.

It is commonly acknowledged that prospective memory proceeds through the following phases: encoding, retention, retrieval, execution, and output evaluation. Following Ellis’ (1996) conceptual framework during the encoding phase, three components and the associations among them are encoded: action, cue, and intent. The action-component refers to information related with the activity that one has planned to perform at a retrieval occasion. Sometimes it refers to physical actions (e.g., to return a library book), but other intentions may be described as more verbal (e.g., to tell a colleague who has called during her absence). The cue component describes an appropriate retrieval occasion that may be event based, such as the occurrence of a particular stimulus (e.g., when seeing Linda), time based, related to a particular time (at 2 p.m.) or when a time interval has elapsed (after 20 minutes), or activity based, that is, related to the beginning or end of another task (after breakfast). Naturally occurring intentions are often a mixture of different kinds of retrieval occassions. Finally, the intent component refers to the motivational status of an intention. As mentioned above, most researcher restrict the term intent[ion] to prospective memory tasks, in which individuals have decided to act in a particular way (e.g., Goschke & Kuhl, 1993; McDaniel & Einstein,

2007; Smith, 2008), whereas Ellis (1996; Ellis & Freeman, 2008; Kvavilashvili & Ellis, 1996) adopts a broader definition including whishes, wants, and musts.

After encoding the intention must be delayed until an appropriate retrieval occasion occurs. This delay interval is filled with other activities and the intention is out of conscious awareness for most of the time (e.g., Graf & Uttl, 2001). Ellis (1996) distinguishes two kinds of delay intervals: a retention interval and a performance interval. The term retention interval refers to activities unrelated with a retrieval occassion, whereas performance interval refers to the time window during which an occasion to execute the intention might occur. For example, if one formed the intention to stop on one's way home at the local supermarket to buy milk, the retention interval is the period between encoding of the intention and the moment one heads for home after work. En route home a retrieval occasion arrives each time one passes a supermarket. The latter period describes the performance interval. We will come back to the distinction of retention and performance interval in the Final Discussion.

Successful prospective memory requires that a previously more or less well-specified retrieval occasion (e.g., passing the supermarket) is detected as an intention-relevant situation (e.g., today one has the intention to buy something). In other words, if a situation maps a previously specified retrieval cue the intent to do something as well as the associated action must be retrieved. As a consequence of retrieval, the intended activity is executed and the consequences of intention execution are evaluated.

Different underlying mechanisms of successful intention retrieval have been discussed in the literature. One possible mechanism is that intention-related information is represented at a higher level of accessibility than other long-term memory contents. Since there are no explicit prompts to initiate the retrieval of delayed intentions, a heightened accessibility of intention-related information would be adaptive. Lewin (1926) suggested that there is an internal task-tension which presses to carry out the intention and that this tension exists over long periods of time until the goal has been attained. The state of tension arises from the act of intending. Thus, whether a concept enjoys a special storage status in memory depends on the intentional status of this information. This assumption is also reflected in Ellis' (1996) framework. The author suggested that the above mentioned action- and cue component are represented as action-trigger schema. The intent is interpreted as an additional source of activation that increases the baseline level of activation of a particular action-trigger schema. Thus, again the intentional status determines the accessibility of an activity or related information.

There is some indirect evidence for the assumption of a special status of intentions from research on everyday intentions. For example, Freeman and Ellis (2003a) asked participants to list all activities they were planning to fulfil over the following week. One week later participants were asked to list all planned activities they had carried out over the last week. Student participants generated intended activities more fluently than fulfilled activities. Further analyses indicated that participants tended to forget to recall previously listed intended activities rather than forgot to generate intended activities at the first session (see also Maylor, Darby, & Sala, 2000, for a similar result for a student population). Zeigarnik (1927) reported a similar recall advantage for uncompleted (interrupted) laboratory-based tasks relative to completed tasks (e.g., Butterfield, 1964, for a critical review of the Zeigarnik effect). In sum, uncompleted or intended activities seem more easily accessible than completed ones in terms of higher recall rates.

A more direct approach to test the assumption of a heightened accessibility of intention-related information was taken by Goschke and Kuhl (1993). In a set of four experiments they demonstrated faster recognition latencies for actions participants intended to carry out after the recognition test compared to intention-irrelevant actions. They labelled this reaction-time advantage for near-term intentions as *intention-superiority effect.* The authors attributed the reaction-time advantage for some actions to the intentional status of those materials (see also Goschke & Kuhl, 1996, for details). They proposed that if an activity receives the status of an intention (i.e. if an individual is committed to performing a denoted activity), action-related information is more easily accessible until the activity is executed. Supporting this view Marsh, Hicks and Bink (1998) demonstrated an intention-superiority effect for interrupted (i.e., still intention-relevant) action scripts in a lexical-decision task. Interestingly, there was no difference in latencies between already completed and intended actions of the interrupted script. In this study it seemed that as long as the script was associated with an intention, all related action steps were more easily accessible. In addition, the reaction-time advantage for intention-relevant information seems to vanish or even reverse into a reaction-time disavantage for cancelled (Marsh, Hicks, & Bryan, 1999) or completed activities (Marsh, et al., 1998; ; but see Penningroth, 2011, for an exception). Taken together, the intentional status of actions seems crucial for demonstrating an intention-superiority effect.

Goschke and Kuhl's (1993, 1996) proposition that the intention-superiority effect reflects the intentional status of the to-be-performed actions has been criticized by different authors. In an alternative account, Freeman and Ellis (2003b; Ellis & Freeman, 2008) argued

that actions intended for future enactment are functionally similar to actions enacted at encoding. According to this reasoning, the encoding of well-defined intentions such as "setting a table" entails a multimodal representations of the task which enhances memory similar to an enactment effect (e.g., Engelkamp, 1998, for a review on the enactment effect). Thus, a heightened accessibility of intentions may reflect a rich encoding rather than some special status due to the intention. We will elaborate on this view in the Final Discussion. At present, we may conclude that both explanations focus on specific properties of the representation of intentions: the intentional status or motor-code information. Thus, in these authors' views, the intention-superiority effect is a phenomenon of encoding.

Another line of research focuses on the role of attentional resources in the retrieval of an intention. Successful prospective remembering, during a performance interval, relies on detecting and recognizing a situation as a cue for an planned activity and retrieving (and executing) that activity. There is some debate whether the detection of a retrieval occasion requires attentional resources. The most elaborated models concentrate on event-based intentions. According to the multiprocess model, event-based cue detection will be spontaneous when certain conditions are met: when the cue is salient, when the cue is highly associated with the action, and/or when the ongoing task focuses attention on the relevant features of the cue (Einstein & McDaniel, 2005; McDaniel & Einstein, 2000, 2007). Otherwise, cue detection can require attentional resources. Whether individuals rely on spontaneous or attentional-demanding strategic processes depends on characteristics of the prospective memory tasks, the nature of the ongoing tasks in which a retrieval occasion is embedded, and characteristics of the individual undertaking the task. In contrast, Smith (2003; Smith & Bayen, 2004) proposed in her preparatory attentional and memory process (PAM) model that resource-demanding preparatory processes are obligatory for successful event-based prospective memory performance. Smith (2003) introduced a new method that examined "costs" of prospective memory tasks on the performance of an ongoing activity in which a retrieval cue was embedded. In this research response latencies and accuracy for intention-irrelevant stimuli in an ongoing task with a prospective memory task are contrasted with ongoing task performance when the prospective memory task is absent or postponed until after the ongoing task. She reasoned that if limited attentional resources are devoted to some degree to the preparation of the prospective task and away from the processing of the ongoing activity, this should reflect in slowing latencies of the ongoing activity. Holding an intention should interfere with processing of the ongoing activity. In line with this reasoning Smith (2003) reported slower response latencies if an event-based prospective memory task

was embedded in the ongoing activity relative to a no-intention condition and slowing latencies were associated with better prospective memory performance. Subsequent research, however, found no task interference costs if the prospective task met the conditions described by the multiprocess model for spontaneous retrieval detection (e.g., A.-L. Cohen, Jaudas, & Gollwitzer, 2008; Einstein, et al., 2005). Such null findings are more consistent with a multiprocess view than the PAM model that assumes obligatory attention-demanding processes (cf. Kliegel, McDaniel, & Einstein, 2008, for a detailed discussion of task interference effects in prospective memory).

The current research was not conducted to adjucate between the PAM and the multiprocess model. Yet, we think there might be some interesting parallels between observed task interference costs in the ongoing activity and the intention-superiority effect introduced by Goschke and Kuhl (1993). Both phenomena might be two sides of the same coin. The successful detection of a retrieval cue implies that the representation of the intention is activated to a certain degree. A supermarket only is a relevant retrieval cue to buy milk if one has previously formed the intention to buy milk. It seems reasonable to assume that next to information related to the retrieval cue, other information related to the intention, for example the intended action of buying milk, is also more activated. The intention-superiority effect may reflect a biased allocation of attentional resources towards information related to the intention (e.g., the action component). A slowing in the ongoing activity may reflect the flipside of this allocation policy. We will return to this idea in the Final Discussion.

1.1 Outline of the present research

As Ellis and Freeman (2008) concluded in their work on the intention-superiority effect "[t]hus far cognitive psychologists have focused primarily on the action component of an intention, with some work on the cue component, but scant regard to the intent (strength of decision to act, including will or commitment)" (p. 22). The current research consists of two series of experiments, related to the thus far rather neglected intent and the cue component, respectively. In a first series we focused on the role of the intent. Specifically, previous research on the intention-superiority effect reported faster latencies for reactions to stimuli intended for future enactment relative to stimuli associated with no enactment or cancelled enactment. Previous attempts to demonstrate an intention-superiority effect for other types of tasks, for instance observing the experimenter executing actions, have not yielded an intention-superiority effect. A reason for this could be that the typical enactment task was

associated with a higher degree of commitment than other laboratory-based tasks, and that task importance or its consequences heighten the accessibility of intention-relevant materials. In the three experiments described in Chapter 2 we investigated whether an intention-superiority effect can be found for different types of tasks (e.g., grading a verbal report) when task realization has personally relevant consequences in terms of a performance evaluation.

In a second series of experiments we focused on the cue component. Goschke and Kuhl (1993) interpreted the intention-superiority effect in terms of a more persistent activation of intention-related materials. However, persistency of activation and proximity of retrieval opportunity have not been disentangled yet. Typically participants are instructed to realize the intention immediately after completing the task that assesses response latencies (e.g. a recognition test) and yields the intention-superiority effect. Thus, the response-latency task is also associated with a retrieval occasion in the near future. Three experiments in Chapter 3 tested whether the proximity of a retrieval opportunity affects the intention-superiority effect.

In each chapter the immediate implications of the presented findings are discussed. A Final Discussion chapter relates the findings to each other and to this introduction.

2 Do Personally Relevant Consequences Determine Activation?

Prospective memory refers to the ability to realize an intended task at an appropriate moment in the future. A key feature of prospective memory tasks such as remembering to pass on a message to a colleague when seeing her, buying milk on one's way home, or attending the yearly routine check at the dentist is that task execution is postponed for hours, days, or even weeks or months. During postponement a representation of the intended task must be retained until appropriate opportunity to fulfil the task occurs (e.g., Ellis, 1996). Previous research has found that stimuli describing the actions intended for future enactment remain activated during postponement. The aim of the present research was testing whether this finding is more general, extending to all intention-relevant information, be they related to the execution of actions or not.

In 1993, Goschke and Kuhl introduced a paradigm to examine the accessibility of intention-relevant materials during postponement. Participants learned two short lists of actions (for example, 'setting a dinner table' and 'clearing a messy desk') for a later recognition test. After the study phase, they were informed that they should carry out the actions of one list (prospective list), but not of the other list (neutral list) after a recognition test for both lists. In the recognition test, response latencies for verbs and nouns of the prospective list were faster than latencies for stimuli of the neutral list. The authors labelled this reaction-time advantage for stimuli related to the intended actions *intention-superiority effect*. This effect has been replicated with a more direct measure of accessibility, a lexical decision task (Marsh, et al., 1998; Marsh, et al., 1999; Penningroth, 2011), and in a more naturalistic setting (Dockree & Ellis, 2001).

Different mechanisms underlying the intention-superiority effect have been discussed. For example, Goschke and Kuhl (1993, 1996) suggested that intentions are represented as subthreshold nodes in long-term memory that decay more slowly than more neutral contents. According to that view, a heightened accessibility of intention-related concepts is an intrinsic property of the representation of the intention. Alternatively, Freeman and Ellis (2003b) proposed that motor or sensorimotor information associated with the future execution of actions is stored with the representation of the intention. Thus the intention-superiority effect might be due to a rich multimodal representation of intentions compared to verbal representations (e.g., Koriat, Ben-Zur, & Nussbaum, 1990, for a similar reasoning). Finally, intentions are related to motivational states and thus the strength or value of the intention may

determine the accessibility of intention-related concepts (e.g., Förster, Liberman, & Friedman, 2007; Förster, Liberman, & Higgins, 2005). Thus, the intention-superiority effect could reflect the participant's degree of commitment to realize the intention. The role of motivation-related processes remains an open question in studies on the intention-superiority effect in a postponed-intention paradigm.

The existing studies suggest that the intention-superiority effect is restricted to one type of task: the future enactment of the learned actions. Stimuli of the prospective list were faster responded to than stimuli of the neutral list if participants intended to carry out the actions of the prospective list after the assessment of response latencies (Dockree & Ellis, 2001; Goschke & Kuhl, 1993; Marsh, et al., 1998; Marsh, et al., 1999; Penningroth, 2011). If participants, however, intended to observe the experimenter executing the actions (Goschke & Kuhl, 1993; Marsh, et al., 1998) or if they were asked to verbally recall the actions (Freeman & Ellis, 2003b), response latencies were comparable for stimuli of the prospective and the neutral list. In order to explain this pattern of findings, we suggest that the types of laboratory-based tasks differed with regard to the degree of commitment to realize the intention. In particular, we assume that the future enactment task was associated with a higher degree of personal relevance for the participants compared to an observation task or verbal recall. Thus the intention-superiority effect for future enactment might reflect a higher motivation to fulfil the denoted task rather than the multimodal representation of the intention that Freeman and Ellis (2003b, see previous paragraph) postulated. There are hints for this in the previous studies.

In studies comparing an enactment and an observation task (Goschke & Kuhl, 1993; Marsh, et al., 1998), the incentive to fulfil the enactment task properly was higher than that to fulfil the observation task. For the enactment task, task requirements were clearly defined (enact a list of specified actions) and task realization resulted in an observable outcome that could be evaluated by the experimenter (e.g., how many or in which order actions were performed). In addition, failing to perform a short, well-known script such as 'setting a dinner table' in the presence of the experimenter might be perceived as embarrassing. Although an evaluation of participants' performance was not explicitly announced, participants were replaced who did not perform all actions (Goschke & Kuhl, 1993) or who enacted the list in the wrong order (Marsh, et al., 1998). In the respective observation condition, participants were instructed to watch the experimenter and register mistakes (Goschke & Kuhl, 1993) or to verify whether the experimenter performed the correct list of actions (Marsh, et al., 1998). Whether they did monitor the experimenter attentively was not reported. Thus participants

could faithfully fulfil the instructions, but in contrast to the enactment task they did not have to. No participant was replaced in the observation condition due to task failure. Consequences such as an evaluation of one's monitoring performance were also rather unlikely since task requirements were only vaguely defined. In short, the public outcome as well as an anticipated evaluation of one's enactment performance may have strengthened the motivation to fulfil the enactment task properly compared to the observation task.

A similar reasoning applies to potential differences in motivation in Freeman and Ellis' (2003b) research. Participants were asked to either to pantomimically enact a list of verbs or to orally recall them. Thus, for both types of tasks, task requirements were clear and the quality of task performance was evaluated in terms of recall performance. Yet, the idea of having to recall verbs such as "to eat" or "to grasp" by bodily or facial movements in the presence of the experimenter could be perceived as more unpleasant or embarrassing than verbally recalling them (e.g., Saltz, 1988). Again, this may result in an increased effort to encode or store stimuli related to the more unpleasant future enactment task, which could imply these stimuli are more easily accessible during postponement than those intended for verbal recall.

To sum up, prior studies have demonstrated faster latencies for intention-related materials relative to more neutral materials during postponement if materials were to be enacted (usually in the presence of an experimenter). We propose that the anticipated evaluation of one's enactment has strengthened the motivation to fulfil the enactment task properly compared to other tasks. Assuming that the strength of motivation increases the accessibility of intention-related concepts, one would expect an intention-superiority effect for more relevant tasks (such as the previously used enactment task) and the intention-superiority effect should be less pronounced for less relevant tasks (for example the previously used observation task).

2.1 Experiment 1

The primary aim of Experiment 1 was to test whether an intention-superiority effect could be demonstrated in a monitoring task if this task was personally relevant for participants. The general procedure was similar to that of Dockree and Ellis (2001): Participants studied two lists of actions for future tasks. Later one list was cancelled and the other list remained relevant for the intended task. Prior to realisation of the intended task, response latencies for stimuli of the prospective list and the cancelled list were assessed.

We used two types of intended tasks. Participants were asked to enact one list of actions and to monitor a videotaped performance of the other list of actions. Similar to Goschke and Kuhl's (1993) observation task participants were instructed to register mistakes and to judge the quality of the observed enactment performance. To strengthen the personal relevance of the monitoring task, participants were informed that they had to discuss their judgement with other participants. Being able to give an explanation for one's judgement (e.g., it was a poor performance because several actions were omitted) requires that the videotaped performance was monitored attentively. A public response should strengthen the commitment to fulfil the intended task (e.g., Meacham, 1988). For the enactment task, participants expected to pantomimically enact one list of actions and being judged by other participants. We assume that participants perceive the typical prospective enactment task as a personally relevant evaluation situation. Consequently, an explicit feedback announcement should be of small impact for an enactment task. If motor information were crucial one would expect an intention-superiority effect in the enactment task, but not in the observation task. If, however, strength of motivation contributes to a heightened accessibility of intention-related materials, then there should be an intention-superiority effect for both types of task, that is, enactment and monitoring. In line with previous research, we also expected that stimuli of both lists would be more easily accessible than new distracter stimuli because they had been encountered previously during the study phase (e.g., Dockree & Ellis, 2001; Marsh, et al., 1998; Marsh, et al., 1999)

In addition, we assessed one motivational aspect that could differ between enactment and monitoring task and/or affect the size of the intention-superiority effect: negative feelings concerning task execution. The idea of having to enact a list simple actions in the presence of others could be more unpleasant or embarrassing than monitoring someone's enactment (e.g., Arar, Nilsson, & Molander, 1993). This may result in increased effort to encode and store the elements of the intended task, which means that stimuli related to the more unpleasant task are more easily accessible during postponement. Thus, the intention-superiority effect could be more pronounced for the enactment task than for the observation task. Further we assessed negative feelings concerning the evaluation of one's performance. We did not expect differences between both types of tasks. Whether one's ability to enact a list of actions or one's ability to monitor someone else's performance is discussed with others should be of little impact. However, participants who regard an evaluation as rather embarrassing could try harder to encode or store intention-related materials. Consequently, the intention-superiority effect may be more pronounced for these participants. To control for these factors

we assessed how unpleasant, stressful, and embarrassing participants expected the task realization per se to be as well as the succeeding outcome evaluation.

2.1.1 Method

2.1.1.1 Participants

Fifty-two undergraduates volunteered in exchange for course credit (age: 19 – 31 years, *M* = 22, *SD* = 3; 85% women). Six students were replaced due to language problems or task comprehension failures. Twenty-three participants were randomly assigned to each task condition.

2.1.1.2 Materials

Three lists describing simple actions (mixing a cocktail, preparing chocolate candy, and cooking a sushi dish) were generated. Lists were modelled after Goschke and Kuhl (1993). Each list consisted of a title and four typical actions (materials can be found in Appendix A). The lists were grouped into three pairs (cocktail – candy, cocktail – sushi, candy – sushi) that formed study materials. Lists were counterbalanced across participants.

The lexical-decision task (LDT) included words from the two study lists, distracter words, and nonwords. Four nouns and four verbs were chosen from each study list, for example mixing a cocktail and preparing chocolate candy. Distracter words comprised the nouns and verbs of the third, unlearned list, in the latter example cooking a sushi dish, and eight other words (four nouns, four verbs). Words did not differ in word length or word frequency. Nonwords consisted of 32 pronounceable letter strings that were matched in word length with words. Half of the nonwords had typical German verb endings (e.g. –ieren). A further 12 stimuli (six words, six nonwords) were used as buffer items that preceded the critical lexical-decision trials. The critical trials were presented in a random order with the restriction that half of each type of item was presented in the first or second half of the LDT.

Feelings about the task realization as well as the succeeding performance discussion were assessed on separate scales. Both situations, task realization itself and discussion of one's performance, were rated on three items (unpleasant, stressful, embarrassing) on a 7-point-scale (1 "very much"; 7 "not at all").

2.1.1.3 Procedure

Participants were tested in groups of two to four. They were told they were going to learn two lists of actions for two future tasks. One task would be the pantomimic enactment

of a list of actions, the other task would be to monitor and judge a videotaped pantomimic performance of the other list of actions. After each task a discussion of task performance with other participants was expected. We stated that our primary interest was the quality of their statements in the discussion, for example whether they could give reasons for their judgement of someone else's performance. Instructions were given in written form and were reiterated by the experimenter. Then the LDT was introduced as computer task and practiced for eight trials.

Next participants studied two lists of actions (e.g., mixing a cocktail and preparing chocolate candy). The two study lists were given on separate sheets. All participants at one test session received the same two lists, but the order of lists was randomized for each participant. Study time was restricted to 1.5 min and the experimenter informed participants about the remaining study time every 30 seconds. The lists were then removed. A pre-test had shown that study time was sufficient to learn both lists. During the study phase, participants expected that both lists are important for future tasks, but they did not know which list would be combined with what task. The encoding of a particular list for a specific task is therefore unlikely.

In order to stress the experimental set-up and as a delay between list learning and retrieval, the experimenter initiated a get-to-know-each-other that lasted about five minutes. Then the experimenter cancelled one task (e.g., enactment) and one list (e.g., mixing a cocktail) due to time constraints. The other task (e.g., monitoring a videotape) and the second learned list (e.g., preparing chocolate candy) remained intention-relevant. The wording was modelled after Dockree and Ellis (2001), in the enactment condition: "The get-to-know-each-other lasted relatively long. Because of time constraints, you are to carry out only one task: Pantomimic enactment. You no longer are to monitor [List A], but only pantomime [List B]. Please attend the computer task, while I prepare everything." Instructions for the monitoring condition were: "The get-to-know-each-other lasted relatively long. Because of time constraints, you are to carry out only one task: Monitoring a video clip. You no longer are to pantomime [List A], but only monitor [List B]. Please attend the computer task, while I prepare everything." The assignment of prospective and cancelled list was counterbalanced across participants.

After finishing the computer task (the LDT), participants expected to have to realize the intended task. Yet, the experimenter gave them several sheets of paper. First, they were asked to write down which task they were going to realize (enactment or monitoring) as a manipulation check. Second, they rated how unpleasant, stressful, and embarrassing the

anticipated task realization (e.g., monitoring) would be. Third, an unexpected free recall for both lists was given. Participants were instructed to write down "all actions of the list you have to [pantomime/monitor]", then "all actions of the second list you learned". Recall time was restricted to 1 min for each list. Participants who either indicated the wrong task in the manipulation check or wrote down the wrong list first (i.e., the list associated with the cancelled task), were replaced.

After recall, participants were informed that they did not have to perform the intended task and consequently, there was no group-based discussion.[1] Still, they rated how unpleasant, stressful and embarrassing a discussion of their performance would have been. Additionally, the importance of the intended task ("A good performance at the task is … 1 "not at all important" – 7 "very important") and demographic data (age, sex, nationality) were assessed in a short questionnaire. Finally, participants were debriefed and received course credit.

2.1.1.4 Design

The task (enactment vs. monitor a video clip) was manipulated between subjects. For all participants performance in the respective task was relevant because a public discussion of one's performance was expected. The word type (prospective list, cancelled list, distracter) was manipulated within subject. Main dependent variables were response latencies in the lexical-decision task. In addition, free recall and ratings on both scales concerning feelings during task realization as well as feelings concerning performance evaluation were collected.

2.1.2 Results

For all statistical analyses, the Type-I-error was set at $\alpha = .05$. As an indicator of the effect size, partial R^2 (R^2_p) is reported for statistically significant effects (J. Cohen, 1977).

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[1] We reasoned that participants' intention to realize the task when the LDT is administered is more important than the actual realization of the intended task after completing the LDT. Therefore free recall for the prospective list is considered as an indicator of task performance. For example, participants who recalled all actions would probably also enact all actions or register omitted actions in the videotaped performance. In Experiment 2 and 3, all participants realized the denoted intended task after free recall.

2.1.2.1 Preliminary Analyses

As a manipulation check we inspected the importance ratings of the task. Participants in both groups rated a good performance at the intended tasks as equally important ($M = 3.7$ for the enactment task and $M = 3.5$ for the monitoring task, $t < 1$). All free recall data were analyzed using a liberal scoring criterion: Phrases were counted as correct if original or synonymous nouns and verbs were written down. For a successful task realization (enacting or monitor a performance), a verbatim recall of the actions would not be necessary and we did not instruct participants to recall actions word by word. Most participants (out of 23: 21 in the enactment task; 22 in the observation task) recalled both lists perfectly. The remaining three participants remembered at least three actions of each list. Thus, study time was sufficient to learn both lists equally well and any differences in LDT latencies would reflect differences in accessibility of intention-relevant versus more neutral information rather than differences in memory accuracy. In this and the following experiments the reported pattern of results did not change if participants with imperfect recall were excluded.

2.1.2.2 Lexical-decision Task

In all experiments, incorrect trials and latencies beyond 3 *SD*s of each participant's individual mean response were excluded from analyses of lexical decision data, and statistical analyses were carried out on log-transformed scores. In Experiment 1, 4.9% of the total number of trials were incorrect and 1.6% were outliers.

As Figure 1 shows reactions to words of the prospective list were faster than reactions to words associated with the cancelled list or distracter words for the enactment task as well as the monitoring task. A 2 (task) × 3 (word type) mixed ANOVA revealed a main effect of word type, $F(2,88) = 17.17$, $R^2_p = .28$. Post-hoc (Bonferroni-corrected) *t*-tests confirmed an intention-superiority effect: Words of the prospective list ($M = 656$ ms) were faster classified than words of the previously learned, but cancelled list ($M = 720$ ms), $t(45) = 5.75$, $R^2_p = .42$. As expected, words of the prospective list were also faster classified than new distracter words ($M = 689$ ms), $t(45) = 4.14$, $R^2_p = .28$. In contrast to our expectations, response latencies for words of the previously learned, but cancelled list were somewhat slower than latencies for previously not encountered distracter words, $t(45) = 2.42$, $R^2_p = .12$, $p = .02$. Neither the main effect of task nor the task × word type interaction was significant, both *F*s < 1. In other words, the type of intended task did not affect the intention-superiority effect.

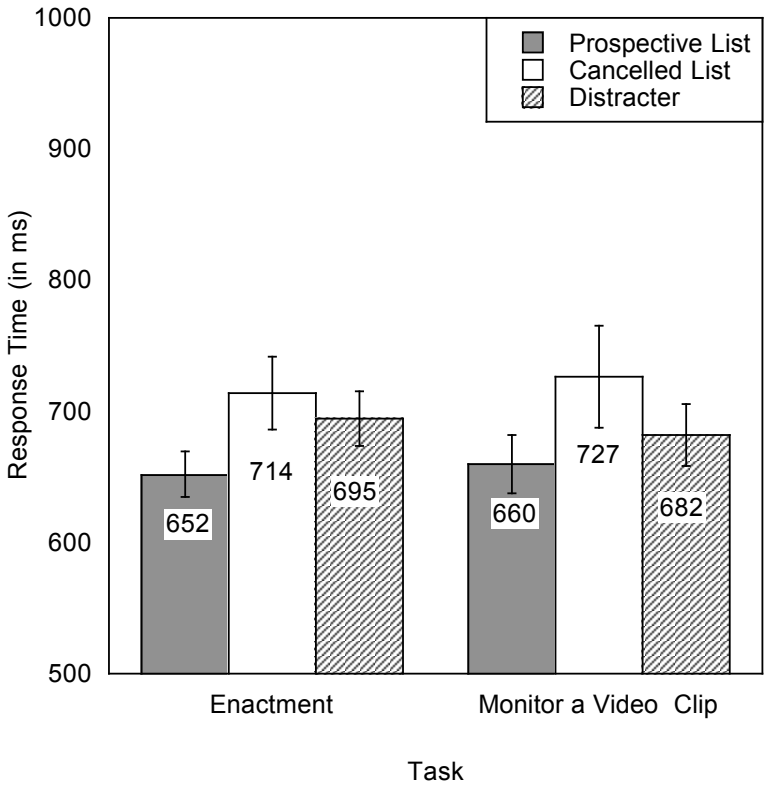

Figure 1. Mean response latencies for words of the prospective list, the cancelled list, and distracter words separately for the task of enactment and monitoring a video clip. All participants expected an outcome evaluation in Experiment 1. Error bars represent standard errors of means.

2.1.2.3 Ratings

Participants indicated once how unpleasant, stressful, and embarrassing the anticipated task realization (enactment or monitoring) would be, and they rated on the same items their feelings concerning the discussion of their performance in this task. Rating scores on unpleasantness, stress, and embarrassment about task realization (Cronbach's $\alpha = .78$) and about discussion of one's performance ($\alpha = .90$) were each summarized. Higher scores indicate more negative feelings concerning task realization and performance evaluation, respectively. The prospective enactment task ($M = 4.1$) was rated more negative than monitoring a videotape ($M = 2.4$), $t(38) = 4.15$. The anticipated evaluation of one's

performance was rated similarly negative by both groups ($M = 3.4$ for the enactment task and $M = 3.2$ for the monitoring task, $t < 1$). However, neither the degree of negative feelings concerning the task realization ($r < .06$) nor feelings about the outcome evaluation ($r < .14$) was related to the size of the intention-superiority effect (cancelled list – prospective list) in the lexical-decision task. In other words, whether participants expected the task performance to be embarrassing or not, did not affect the size of the intention-superiority effect.

2.1.3 Discussion

In Experiment 1 we demonstrated an intention-superiority effect for an enactment task as well as a monitoring task. Previous experiments reported comparable latencies for stimuli of the prospective and neutral list for a monitoring task (Goschke & Kuhl, 1993; Marsh, et al., 1998). In these experiments participants were instructed to observe the experimenter's enactment of the prospective list. Our task of monitoring a videotaped performance is very similar to such an observation task. In contrast to these experiments our task also required some kind of output result (a judgement). In addition, the quality of this output was evaluated in public. Participants expected to explain why they judged a performance good or poor. Thus, the quality of the monitoring-performance was personally relevant. Similarly, the quality of the enactment performance was personally relevant because participants expected a feedback from others. The finding of an intention-superiority effect independent of the type of task corroborate our hypothesis that the accessibility of intention-related materials may depend on motivational aspects, for example outcome evaluation, rather than on a motor response during realization.

We also expected that list words, having been learned only some minutes earlier, should be more easily accessible than distracter words. This was true for words of the prospective list, but not for words of the cancelled list. The same pattern of results was also obtained in the succeeding experiments. We will discuss a possible reason in the General Discussion.

There is a potential limitation of Experiment 1. We told participants that they were going to enact one list and observe the other one. We expected that both types of task are equally important due to the subsequent discussion of performance. Indeed, the anticipated discussion of one's performance was rated similarly unpleasant for the enactment and the observation task. However, ratings concerning the task realization indicate that pantomimic enactment was considered more unpleasant than monitoring a videotape. Although unpleasantness-ratings did not affect the size of the intention-superiority effect, it might be

that participants encoded as a precaution both lists for the more unpleasant task: That is, for pantomimic enactment. The reported intention-superiority effect for the monitoring task could thus be a covert prospective enactment effect. To exclude this potential criticism we used in a second experiment two tasks that required evaluating others' memory performance. Participants either evaluated a written recall test or a videotaped performance. The main job, that is, evaluating someone's performance, was similar for both tasks. A strategic encoding in terms of prospective enactment was rather unlikely for these tasks.

2.2 Experiment 2

Experiment 2 was conducted to exclude the potential criticism of activated motor representations due to anticipated future enactment of one list. We chose two rather simple tasks that draw attention to conceptual information instead of motor information. Participants were asked to monitor someone else's recall and to give a school grade for the recall performance. Thus the availability of conceptual information, the content of the list, was crucial for task realization, not motor information. We used two types of monitoring tasks that only differed concerning the mode of presentation of the to-be-monitored materials: Half of the participants expected to monitor a videotaped performance of the prospective list of actions (comparable to an observation task in prior studies) and the other half expected to monitor a written report of the prospective list. Both tasks required no overt enactment of the studied actions, but monitoring the videotaped performance involved observing actions, whereas monitoring a written report appeared maximally unrelated to motor enactment. Previous studies that used similar materials (that is descriptions of actions) and prospective tasks without future enactment have not yielded an intention-superiority effect (Freeman & Ellis, 2003b; Goschke & Kuhl, 1993; Marsh, et al., 1998).

To make sure that task performance (the grading decision) was personally relevant, participants were informed that they had to justify their grading decision in the presence of other participants. Again, the public task realization should strengthen the commitment to fulfil the task proper. If strength of motivation contributes to a heightened accessibility of intention-relevant materials, as we assume, then we should observe faster responses to stimuli of the intention-relevant prospective list than to stimuli linked with the cancelled list for both types of tasks. If the intention-superiority effect is due to the availability of motor information, then there should be no reaction-time advantage for intention-related materials in the present experiment because the used tasks did not require a future motor response.

2.2.1 Method

2.2.1.1 Participants

Thirty-three participants were recruited on campus (age: 19 – 37 years, *M* = 24, *SD* = 4; 63% women). They received financial compensation for participation (3 €). One participant failed to indicate the correct prospective list and was replaced. Sixteen participants were randomly allocated to each task condition.

2.2.1.2 Materials

Materials were taken from Experiment 1. Two lists (mixing a cocktail, preparing chocolate candy) served as study materials. The lexical-decision task was identical to Experiment 1. List words included words from the two study lists. Distracter words consisted for all participants of the eight words related to the other, unmentioned list (cooking a sushi dish) and eight other words.

As to-be-monitored materials a video clip as well as a written report of each study list was constructed. Materials were incomplete and the order of actions was incoherent, allowing flexibility in grading decisions. The errors contained in the video clips and the written reports of each list were identical. All materials were prepared for presentation via a video projector. A simple yes-no checklist (Was the correct list remembered? Were all actions remembered? Were the actions remembered in a correct order?) was prepared to guide grading decisions.

2.2.1.3 Procedure

The procedure was similar to Experiment 1. Participants were tested in groups of two to four. They were told that we were mainly interested in their ability to evaluate others' memory performance correctly. They were going to learn two lists of actions and later they would see a written recall test for one list and a videotaped performance test for the other list. Their main job was to give school grades for recall performance in those tests and subsequently justify their grading decision. Thus task realization itself (the grading decision) was private, but the quality of task performance had relevant consequences (being able to give other participants a good reason for one's decision). Instructions were given in written form and were reiterated by the experimenter. Then the LDT was practiced for eight trials.

Next participants studied both lists for 1.5 min. Lists were then removed and the experimenter initiated a get-to-know that lasted about 5 minutes. After the delay the experimenter cancelled one task (e.g., monitoring a written report) and one list (e.g., mixing a

cocktail) allegedly due to time constraints. The other task (e.g., monitoring a video clip) and the other list (e.g., preparing chocolate candy) remained relevant for the prospective task. The assignment of prospective and cancelled list was counterbalanced across participants. We also counterbalanced the order of prospective and cancelled list (i.e. half of the participants were told first what to do and second what not to do, and vice versa). While participants worked on the LDT proper, the experimenter prepared a video projector.

Instead of presenting the to-be-monitored materials immediately after the LDT, participants were first asked to write down what they were supposed to do (monitor a video clip or a written report) as a manipulation check and memory for both lists was tested in unexpected written free recalls. The order of recall tests (prospective list, cancelled list) was fixed and recall time restricted to 1 min for each list. In contrast to Experiment 1, participants then realized the intended task. The to-be-monitored written report or the respective video clip was presented via projector. Participants completed the simple yes-no checklist individually and wrote down a school grade for overall memory performance. Afterwards they compared and discussed their grading decision with other participants. Finally, they completed a short questionnaire including importance of the intended task (1 “not at all important”; 7 “very important”) and demographic data and were debriefed. Because the main requirements were identical for both tasks, we omitted rating scales concerning feelings during task realization and evaluation.

2.2.1.4 Design

Independent variables were task (monitor a video clip vs. monitor a written report; between subjects) and word type (prospective list, cancelled list, distracter; within subject). For all participants performance in the respective task was relevant because a public discussion of one’s grading decision was expected. Main dependent variables were response latencies in the lexical-decision task.

2.2.2 Results

2.2.2.1 Preliminary Analyses

Participants in both groups rated a good performance at the respective monitoring task as equally important ($M = 5.2$ for the video clip and $M = 5.3$ for the written report, $t < 1$). The majority (out of 16: 14 for the video clip; 11 for the written report) recalled both lists perfectly. The remaining seven participants remembered at least three actions of each list.

2.2.2.2 Lexical-decision Task

Incorrect trials (2.9%) and outliers (1.8%) were removed from lexical-decision data. As depicted in Figure 2, again, reactions to words of the prospective list were faster than reactions to words associated with the cancelled list or distracter words for both types of monitoring task. A 2 (task) × 3 (word type) mixed ANOVA revealed a main effect of word type, $F(2,60) = 6.24$, $R^2_p = .17$. As expected, there was an intention-superiority effect: Words of the prospective list ($M = 722$ ms) were faster classified than words of the cancelled list ($M = 763$ ms), $t(31) = 3.57$, $R^2_p = .29$. Words of the prospective list were also faster classified than new distracter words ($M = 746$ ms), $t(31) = 2.62$, $R^2_p = .18$, and response latencies for words of the cancelled list and new distracter words did not differ, $t < 1$. Participants' overall latencies were descriptively faster in the video-clip condition ($M = 697$ ms) compared to the written-report condition ($M = 790$ ms), but the respective main effect missed the preset criterion of statistical significance, $F(1,30) = 3.68$, $R^2_p = .11$, $p = .07$. More importantly, there was no indication of a task × word type interaction, $F < 1$.

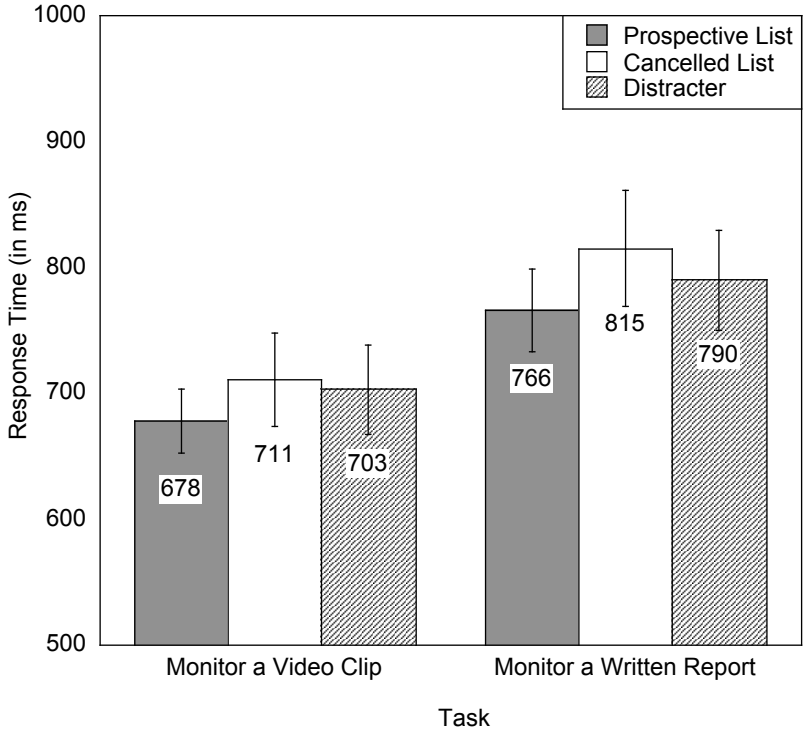

Figure 2. Mean response latencies for words of the prospective list, the cancelled list, and distracter words separately for the task of monitoring a video clip and monitoring a written report. All participants expected an outcome evaluation in Experiment 2. Error bars represent standard errors of means.

2.2.3 Discussion

Experiment 2 demonstrates an intention-superiority effect for two monitoring tasks unrelated to future enactment. For both types of monitoring task, words of the prospective list were faster responded to than words of the cancelled list. Previous experiments that used actions as study materials, reported comparable latencies for stimuli of the prospective and neutral list if participants were instructed to monitor someone's performance (Goschke & Kuhl, 1993; Marsh, et al., 1998) or verbally recall these actions (Freeman & Ellis, 2003b). In contrast to other experiments that yielded no intention-superiority effect, in our experiment the quality of the task output (the grading decision) was evaluated in public. Participants expected to justify in front of others the reasons that made them give a certain grade. The quality of their grading decision was personally relevant. Under these conditions, we observed an intention-superiority effect both for the monitoring task that involved grading

actions observed on a video clip and for a monitoring task maximally unrelated to enactment (i.e., monitoring a written report).

We assume that the observed intention-superiority effect in Experiments 1-2 reflects a participants' high commitment to fulfil the intended task properly because their outcome was evaluated. In other words, the crucial difference between our experiment where an intention-superiority effect was observed and previous null results appears to be outcome evaluation. What is missing to increase the strength of our argument is a direct manipulation of outcome evaluation.

2.3 Experiment 3

In Experiment 3 participants either expected to discuss their task performance with other participants or they expected to fulfil the intended task with no one evaluating their task performance. Thus the quality of task performance was either personally relevant or had no personally relevant consequences. We used two types of tasks: enactment and monitoring a written report.

Previous studies have demonstrated a robust intention-superiority effect for an enactment task (Dockree & Ellis, 2001; Freeman & Ellis, 2003b; Goschke & Kuhl, 1993; Marsh, et al., 1998; Marsh, et al., 1999). We assume that in these experiments the motivation to fulfil the enactment task properly was high because participants anticipated some kind of evaluation of their enactment performance by the experimenter. Consequently, we expected to replicate an intention-superiority effect for participants who were told that their enactment performance would be evaluated by other participants. Replicating Experiments 1-2, we also expected an intention-superiority effect for a monitoring task if an evaluation of monitoring performance was anticipated.

For participants who were told that they could realize the prospective tasks without evaluation, it was rather irrelevant how good they performed at the respective task although they also were asked to realize the intended tasks. Similar to the observation task used by Goschke and Kuhl (1993), participants could realize the task properly, but they did not have to. Thus if outcome evaluation were a crucial factor that increases the accessibility of intention-related materials, we should find comparable response latencies for stimuli of the prospective list and the neutral list if the task performance is not evaluated, irrespective of the type of task (enactment or monitoring). Contrasting our hypotheses, if the intention-superiority effect were mainly due to the availability of motor information as proposed by

Freeman and Ellis (2003b), we should observe an intention-superiority effect for all participants who intend to enact the actions, with or without evaluation.

2.3.1 Method

2.3.1.1 Participants

Sixty-four participants were recruited on campus (age: 18 – 29 years, *M* = 23, *SD* = 3; 50% female). They received financial compensation for participation (3 €). Sixteen participants were randomly allocated to each group.

2.3.1.2 Materials and Procedure

Study lists, the lexical-decision task, and to-be-monitored materials for the monitoring task were taken from Experiment 2. Two participants were tested in each session.[2] They were asked to learn two lists of actions for future tasks. They were going to enact one studied list and to monitor and grade a written report of the other list. Half of participants were informed that they were going to discuss their performance with the other participant. For these participants the motivation to fulfil the intended tasks properly should be high as in Experiments 1-2. The other half of participants was informed that they could realize tasks anonymously. It was emphasized that no one would watch the enactment performance behind a partition wall and that the grading decision of the written report could not be traced back to the specific person. Although participants had to realize the intended task, the quality of their task performance (the outcome) was irrelevant.

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[2] In Experiments 1-2 participants took part in groups of two to four. In Experiment 1, ten participants were tested in pairs, twenty-four participants were tested in groups of three, and twelve participants were tested in groups of four. In Experiment 2, six participants were tested in pairs, six participants were tested in groups of three, and another twenty participants were tested in groups of four. In order to rule out that group size affected the size of the intention-superiority effect in our previous experiments, we computed for each experiment an ANOVA with group size (two, three or four) and task as independent variables, and size of intention-superiority effect (latencies for cancelled list minus latencies for prospective list) as dependent variable. There were no significant effects in Experiment 1, all *F*s < 1, or Experiment 2, all *F*s < 1.4. Thus, the size of the group did not affect the intention-superiority effect in Experiment 1 and 2. In Experiment 3, all participants were tested in pairs.

Otherwise, the procedure was identical to our previous experiments. Participants studied the two lists with the intention of enacting one list and grading a written report of the other list. After a delay task, the experimenter cancelled for half of participants the enactment task (thus monitoring a written report remained the relevant task); for the other half the monitoring task was cancelled (and the enactment task remained the relevant task). Next participants completed the LDT. Then they indicated what task they were going to perform (enactment or monitoring) and memory for the prospective and cancelled list was tested in an unexpected free recall. Afterwards they completed the denoted task. Participants who expected an outcome evaluation either enacted the prospective list in the presence of their partner or they gave a school grade for recall performance, and subsequently discussed the respective task performance with their partner. Participants who expected no outcome evaluation enacted the prospective list behind a partition wall or they gave a grade for the verbal report without discussing it. Finally, importance ratings of the task and demographic data were collected and participants were debriefed.

A minor change to previous experiments concerned the delay task. In order to avoid social interactions between participants before task realization, we used a written task instead of a get-to-know-each-other as the delay task. The participants were instructed to write down their opinions about different topics (e.g., studying abroad, tuition fees). The experimenter interrupted the task after four minutes allegedly due to time constraints. This seemed a nice way to rule out that the social delay task affected the results of Experiments 1-2. Participants who expected their task performance to be evaluated interacted with the other participant only after the LDT. In addition, for participants who were told that task realization is anonymous and private, a social delay task may have reduced the credibility of this manipulation.

2.3.1.3 Design

Task (enactment vs. monitoring a written report) and outcome evaluation (with vs. without) were manipulated between subjects. Word type (prospective list, cancelled list, distracter) was manipulated within subject. Main dependent variables were response latencies in the lexical-decision task.

2.3.2 Results

2.3.2.1 Preliminary Analyses

Importance ratings were analysed in a 2 (task) × 2 (outcome evaluation) ANOVA. No effects were statistically significant (all *F*s < 3.4; with outcome evaluation: *M* = 4.8 for the enactment task and *M* = 4.7 for monitoring a written report; without outcome evaluation: *M* = 3.8 for the enactment task and *M* = 5.3 for monitoring a written report, with higher values indicating higher importance ratings). The majority of participants who expected an evaluation (out of 16: 11 for the enactment task, 13 for the monitoring task) as well as those who expected no evaluation (14 for the enactment task, 11 for the monitoring task) recalled both lists perfectly. The other participants remembered at least three actions of each list.

2.3.2.2 Lexical-decision Task

Incorrect trials (3.8%) and outliers (1.2%) were removed from lexical-decision data. As shown in the upper half of Figure 3 there was, again, an intention-superiority effect if an outcome evaluation was expected. The lower half of Figure 2 shows that there was no indication of an intention-superiority effect if the tasks were going to be realized without further relevant consequences. In a 2 (task) × 2 (outcome evaluation) × 3 (word type) mixed ANOVA the corresponding interaction of word type and outcome evaluation was significant, $F(2,120) = 4.09$, $R^2_p = .06$. Simple main effect analyses indicated differences between word types for participants expecting an outcome evaluation, $F(2,59) = 4.67$, $R^2_p = .14$, but not for participants expecting no evaluation, $F < 1$. Replicating Experiment 1, when participants expected a public evaluation of their performance, words of the prospective list (*M* = 713 ms) were faster classified than words of the cancelled list (*M* = 761 ms), $t(31) = 4.13$, $R^2_p = .35$. Again, prospective words were also faster classified than distracter words (*M* = 736 ms), $t(31) = 2.57$, $R^2_p = .18$, but latencies for words of the cancelled list and distracter words did not differ significantly, $t(31) < 1.8$, $p = .10$. However, if no evaluation of task performance was expected latencies for words of the prospective list (*M* = 740 ms), the cancelled list (*M* = 732 ms) and distracter words (*M* = 745 ms) were comparable, *t*s < 1.2. There was also a task × evaluation interaction, $F(1,60) = 5.46$, $R^2_p = .08$, indicating differences between groups in overall reaction times. More importantly, neither the task × word type interaction nor the three-way interaction was significant, *F*s < 1.

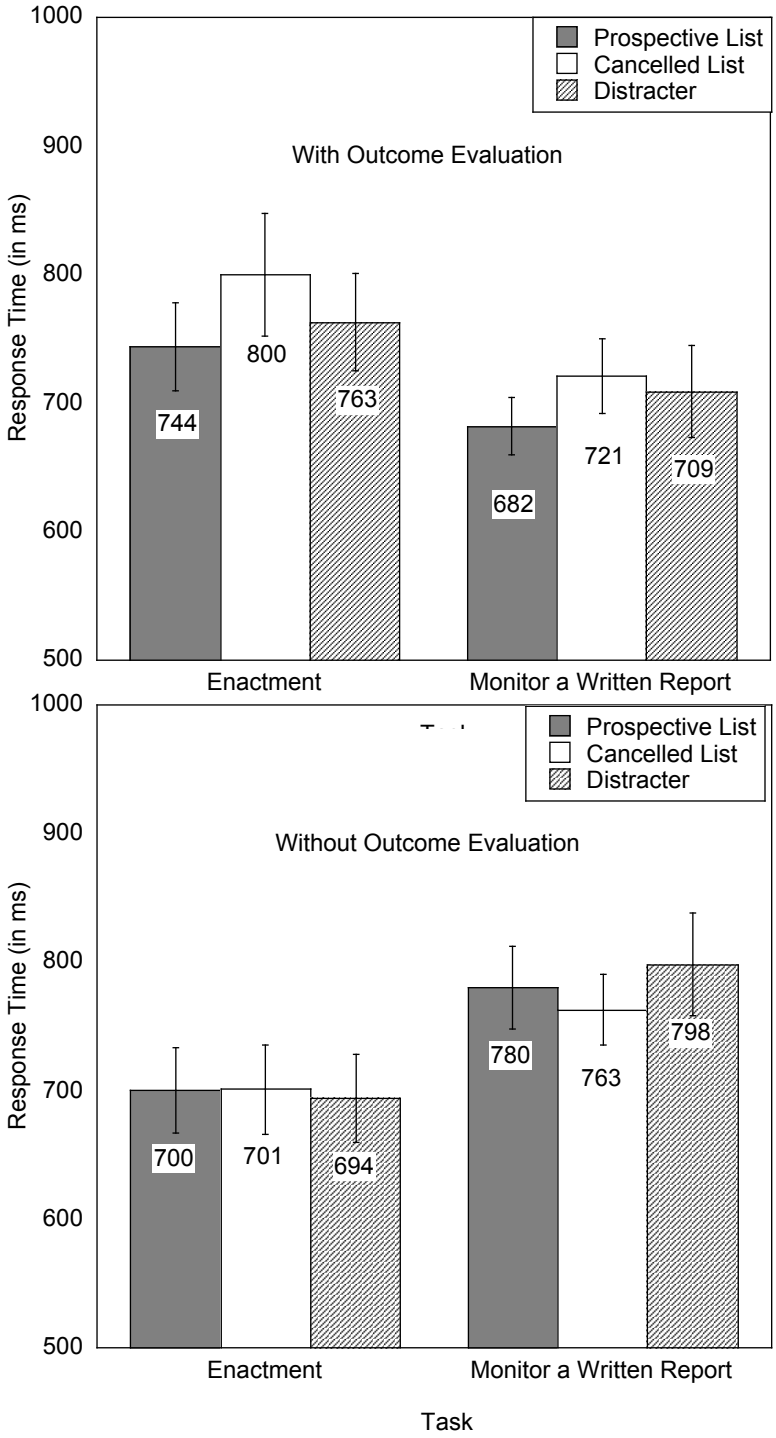

Figure 3. Mean response latencies for words of the prospective list, the cancelled list, and distracter words, separately for each task, enactment and monitoring a written report, and for participants expecting an outcome evaluation or no outcome evaluation in Experiment 3. Error bars represent standard errors of means.

2.3.3 Discussion

The results of Experiment 3 are in line with the assumption that motivational aspects, here the expectation of an outcome evaluation, contribute to the intention-superiority effect. Replicating Experiment 1-2 we observed an intention-superiority effect if task realization was going to be evaluated by others. In contrast, when task realization was private, there was no indication for faster reactions to intention-relevant stimuli. The null finding for the enactment task without evaluation is particularly interesting. If the availability of motor information determined the intention-superiority effect, there should have been a reaction-time advantage for to-be-enacted materials relative to neutral materials irrespective of the evaluation situation.

The ratings on the importance of the intended task did not differ significantly between groups. Yet, descriptively, the enactment task without evaluation was rated less important than the enactment task with relevant consequences in terms of an evaluation. At first sight this finding supports the assumption of an intention-superiority effect for more important tasks. However, if task importance per se was central we should have also observed an intention-superiority effect in both monitoring-task conditions. The importance ratings for the monitoring task without evaluation were descriptively even higher than ratings for the same task with relevant consequences. It thus seems that reported task importance is not a reliable proxy for the consequences of task realization in terms of an evaluation; the latter were essential for a heightened accessibility.

2.4 General Discussion

The main hypothesis brought forward in the present research was that motivational aspects such as expectation of an outcome evaluation or relevance of an intended task contribute to the intention-superiority effect. In three experiments we demonstrated a heightened accessibility for intention-relevant stimuli relative to other learned materials when task realization had personally relevant consequences in terms of an evaluation of the task performance. This intention-superiority effect was independent of the type of prospective task. There was an intention-superiority effect if task realization was checked in terms of an outcome evaluation and thus, presumably, participants' commitment to fulfil the task properly was high. Our findings are consistent with theories that consider intentions as motivational states characterized by enhanced accessibility (e.g., Förster, et al., 2005; Lewin, 1926). Although a strategic allocation of attentional resources may have also strengthened the

accessibility of intention-relevant material during postponement, we think the main source of activation is motivational. As Experiment 3 clearly demonstrates heightened activation was restricted to tasks associated with personally relevant consequences (here: an outcome evaluation), be they related to the execution of actions or not.

In contrast to other studies (Marsh, et al., 1998; Marsh, et al., 1999, but see Dockree & Ellis, 2001, Experiment 1), in our experiments responses to previously studied words were not generally faster than responses to new distracter words in the lexical-decision task. Although words of the previously learned, prospective list were faster classified than new distracter words, response latencies for words of the previously learned, but cancelled list did not differ significantly from new distracter words. Considering Marsh et al.'s (1999) findings of slower latencies for cancelled materials relative to other learned materials, an inhibitory account may explain our finding. Initial activation and subsequent inhibition may have led to comparable response latencies as to new distracter words. Inhibiting information associated with the cancelled task may be adaptive in order to avoid an accidental initiation of task execution when intentions become impossible to complete (e.g. going to stop at a library to borrow a book beyond opening hours) (for a more detailed discussion of inhibitory processes see Förster, et al., 2007).

In everyday life, the announced evaluation of one's performance in an intended task is a rather uncommon means to ensure prospective remembering. We used an evaluation announcement for several reasons. First, it allowed us to manipulate the type of intended task (enactment or monitoring) while holding the consequences of failure (a poor performance feedback) constant. Second, the announced evaluation ensured that the experimenter-defined tasks were personally relevant for participants. Third, we think the typical postponed enactment task can be described as an evaluation situation. It therefore seemed reasonable to design other tasks that share features with a laboratory task that reliably shows an intention-superiority effect. Future research should use more naturalistic manipulations to increase or decrease task relevance. In the present experiments, participants' rating of task importance was not associated with the size of the intention-superiority effect. Thus, stressing the importance of the intended task itself might not be sufficient (or: subjective ratings are not reliable proxies of importance as indicated by activation). As Experiment 3 suggests a manipulation of task importance in terms of anticipated negative consequences of failure is more promising. Another possibility to strengthen the commitment to fulfil a task is providing benefits for successful task realization. For instance, Förster et al. (2005) reported faster response latencies for intention-related stimuli when intention realization was

associated with a high monetary incentive (1 €), but not when associated with a low incentive (0.05 €).

In contrast to previous work where participants were tested in the presence of an experimenter (e.g., Freeman & Ellis, 2003b; Goschke & Kuhl, 1993; Marsh, et al., 1998; Marsh, et al., 1999), in our experiments task realization involved the interaction with other participants. We assume that the presence of another participant does not affect participants differently than the presence of an unknown experimenter. The mere presence of others is not sufficient to influence someone's performance, but motivational factors are, such as evaluation apprehension (e.g., Cottrell, 1968). We demonstrated an intention-superiority effect when participants' anticipation of a (socially) relevant evaluation of their performance was high. Although the observation task in previous work (Goschke & Kuhl, 1993; Marsh, et al., 1998) was also a social situation, an evaluation of task performance was unlikely since no appraisable outcome was produced. Low evaluation apprehension in these observation tasks may explain the finding of comparable response latencies to intention-relevant and neutral stimuli. We think earlier work on the intention-superiority effect can be easily interpreted in terms of a heightened activation of motivation-related representations. In those studies task realization either was linked to an (implicit) evaluation of one's own enactment performance (Goschke & Kuhl, 1993; Marsh, et al., 1998; Marsh, et al., 1999) or remembering to do something was important for others (Dockree & Ellis, 2001). It may be that materials associated with prospective tasks that occur in a social context or carry implication for social relationships are particularly easily accessible (cf. Winograd, 1988). It would be interesting to test whether an intention-superiority effect can be obtained with other tasks that do not involve social interactions, but are personally relevant.

Freeman and Ellis (2003b) provided some evidence that the intention-superiority effect is based on the activation and storage of motor information when an intention for future execution is formed (see also Eschen, et al., 2007, for supporting data in a fMRI study). The general idea is that actions verbally encoded for future enactment elicit similar representations as actions carried out during encoding. In both cases motor-relevant information is activated that facilitates recall. Following this reasoning an enactment intention would be crucial for an intention-superiority effect. The data pattern we observed is not compatible with that account because anticipated outcome evaluation, not enactment intention, determined the intention-superiority effect that we found (see Experiment 3). We cannot exclude the possibility that the materials we chose stimulated the encoding of motor information at study since study lists described simple distinct activities. However, speaking

against this idea, other experiments that used lists of action phrases for an observation task (Goschke & Kuhl, 1993; Marsh et al., 1998) or lists of verbs for verbal recall (Freeman & Ellis, 2003b) found no reaction-time difference. In sum, the missing intention-superiority effect for an enactment task without outcome evaluation that we found, and the intention-superiority effect for monitoring tasks unrelated to enactment, challenge the proposition that motor processes are always involved in the activation of intentions in a postponed-intention paradigm.

We think the increased activation in the postponed-intention paradigm reflects a more general phenomenon: Heightened accessibility of intention-relevant information during postponement. For example, Förster et al. (2005) instructed participants to get up and notify the experimenter when they detected a certain object combination in a series of pictures. Between blocks of pictures participants performed a lexical-decision task. Instead of using stimuli describing the content of the intention, that is, the intended actions (e.g., to get up), they used stimuli associated with the cue that indicates an appropriate context to realize the intention. Similar to an intention-superiority effect for stimuli of the intention-relevant actions, the authors demonstrated faster latencies to words associated with the intention-relevant cue. Interestingly, in this research the prospective task (notifying the experimenter) could also be perceived as a personally relevant situation. Again, there was an appraisable outcome (whether participants detected the target combination or not) and an evaluator (the experimenter). In a similar vein, Fitzsimons and Shah (2008) demonstrated that names of other people who are instrumental for achieving a specific goal are more easily accessible when the goal is activated. Again, information that may help to realize an intention successfully was more easily accessible.

To conclude: Whereas future overt enactment at first appeared to be the relevant factor affecting the accessibility of intention-related stimuli, the present experiments show that factors presumably affecting motivation, such as anticipated outcome evaluation, determine the activation of intention-related materials. Whenever task performance matters, there is an intention-superiority effect. Thus, it appears that a more general mechanism than previously suggested is at work: Our cognitive system is tuned to materials associated with any important prospective task, be it an enactment task or not.

3 Rigid or Flexible Activation of Intentions? On the Role of the Proximity of a Retrieval Opportunity

Very often intentions cannot be realized immediately and their execution has to be postponed for hours, days, or even weeks or months. Possibly, a busy individual could list dozens of intentions at any point in time, ranging from short-term intentions such as e-mails to be written, phone calls to be placed, groceries to be bought, to long-term intentions such as presents to be found, insurances to be checked, and travel tickets to be booked. During this delay information concerning the content of the intention (what one wants to do), and the retrieval context (when one should retrieve and execute the intention) must be retained (e.g., Ellis, 1996). Prospective memory refers to our ability to retrieve and execute an intended activity at an appropriate moment in the future. A crucial feature of prospective memory tasks (in contrast to retrospective memory tasks) is the absence of explicit reminders to retrieve the intention when a retrieval opportunity is encountered (e.g., Graf & Uttl, 2001). For example, if one intends to post a letter, no one tells one to take the letter out of in one's briefcase when passing a letterbox. Kvavilashvili and Ellis (1996) distinguished three types of intentions based on characteristics of the retrieval opportunity. For event-based intentions the occurrence of a particular stimulus defines a retrieval opportunity (e.g., when seeing a letterbox), for time-based intentions a particular time (e.g., 10 a.m.) or a time interval elapsed (e.g., after 20 minutes) determines a retrieval opportunity, and for activity-based intentions the start or the end of another activity signals an appropriate retrieval opportunity (e.g., after reading the manuscript) (but see McDaniel & Einstein, 2007). An important question is what brings a representation of an intention into one's mind at an appropriate retrieval opportunity.

One potential mechanism discussed in the literature is that unfulfilled intentions are represented at a heightened level of activation compared to other long-term memory contents (e.g., Ellis, 1996; Förster, et al., 2005; Goschke & Kuhl, 1993; Lewin, 1926). A heightened activation of intention-related concepts could support successful prospective remembering. For example, it may help to detect retrieval cues in a potential retrieval context (e.g., Mäntylä, 1996; McDaniel, Guynn, Einstein, & Breneiser, 2004), or it could lead to more frequent recollections of the intention during the retention interval, which in turn raises the strength of activation at the present moment and/or initiates monitoring an appropriate moment to realize the intended activity (e.g., Ellis, 1996). Previous research has found that stimuli associated with (near-term) intentions were processed faster than equivalent materials with no intentionality. However, as stated by Marsh, Hicks, and Bink (1998) it seems

unrealistic that all unfulfilled intentions are represented at a heightened level of activation throughout the day (or week, month, or year). A potential mechanism for a flexible activation of intentions is context information specifying the likelihood of a retrieval opportunity (e.g., Marsh, Hicks, & Cook, 2006). The primary aim of the present research was testing to what degree context information affects the accessibility of intention-related information. In particular, we assumed that the accessibility of intention-related materials increases with the perceived proximity of a retrieval opportunity (e.g., Dörner, 1984), as is outlined in the following. While testing this, our secondary aim was finding further evidence on the generalizability of the intention-superiority effect to non-motor tasks, as we explain at the end of this paper's introduction.

3.1 The Intention-Superiority Effect

Previous series of experiments have examined the accessibility of intention-related concepts during a delay interval using a postponed-intention paradigm. Participants learned two short lists of actions (e.g., "setting a dinner table" and "clearing a messy desk"). After the study phase, they were instructed that they should carry out the actions of one list (prospective list), but not of the other list (neutral list) after completing a recognition test for both lists or a lexical-decision task. Thus, the execution of the intention had to be postponed until after the respective response-latency task. Response latencies for verbs and nouns of the prospective list were faster than latencies for stimuli of the neutral list in a recognition test (e.g., Freeman & Ellis, 2003b; Goschke & Kuhl, 1993) as well as in a more direct measure of accessibility, a lexical-decision task (e.g., Dockree & Ellis, 2001; Marsh, et al., 1998; Marsh, et al., 1999; Penningroth, 2011; Schult & Steffens, in press). This reaction-time advantage was labelled *intention-superiority effect*.

Several different accounts of the intention-superiority effect have been brought forward. Goschke and Kuhl (1993, 1996) interpreted the intention-superiority effect in terms of a more persistent activation of intention-related materials (henceforth: persistence hypothesis). Intended tasks are viewed as goals that are represented by special source nodes maintaining increased levels of sub threshold activation without rehearsal. According to this interpretation intention-related concepts ought to be activated for longer periods than other (long-term memory) concepts. However, the vast majority of studies on intention superiority assessed activation over a short period of time immediately after intention formation (Dockree & Ellis, 2001; Freeman & Ellis, 2003b, Experiment 3; Goschke & Kuhl, 1993, Experiments 1 and 2; Marsh, et al., 1998; Marsh, et al., 1999; Penningroth, 2011; Schult &

Steffens, in press) or after a short filler task (Freeman & Ellis, 2003b, Experiment 4; Goschke & Kuhl, 1993, Experiment 4). In addition, the response-latency task generally lasted only a few minutes. For example, in Goschke and Kuhl's experiments the recognition test lasted about 90-120 seconds. Based on these experiments we may conclude that a heightened activation of intentions "persists" over relatively short intervals. As Marsh et al. (1998) point out it may be functional to keep an intention active for such short delays (see also Lebiere & Lee, 2002). There is little evidence that the intention-superiority effect persists over an extended period of time after forming the intention: A heightened activation of intentions shortly after encoding does not necessarily imply a persistent heightened activation until a retrieval opportunity (e.g., Altmann & Trafton, 2002).

3.2 The Role of the Context

In the following we propose an alternative to the persistence hypothesis. In a postponed-intention paradigm participants are usually instructed to realize the intention immediately after completing the recognition test or the lexical-decision task (Dockree & Ellis, 2001, for an exception). Thus, the respective task could become associated with a retrieval opportunity. The potential beneficial effects of such context information have not been investigated when examining the intention-superiority effect. We argue that associated context information may modify the strength of activation of intention-related stimuli (see also Marsh, Hicks, et al., 2006).

There is some indirect evidence supporting this notion. Previous studies have demonstrated that linking an intention with a particular activity, that is, specifying a retrieval context, improves intention completion within this activity. For example, Nowinski and Dismukes (2005, Experiment 1) asked participants to press a specific key whenever a fruit word appeared within two activities (a matching task and an anagram task). During instructions they linked one activity with the event-based intention by giving an example (e.g. "in the anagram task, or during any other task", p. 652). Although instructions made clear that a retrieval opportunity could appear at any time in both activities, participants detected retrieval opportunities (fruit words) more often when these occurred during the associated activity (anagram task) compared to the other activity (matching task). Cook, Marsh and Hicks (2005) reported similar findings for time-based intentions. Participants responded more often in a critical time window (between 6 and 7 minutes after the start of the experiment) if the retrieval opportunity occurred during an activity specified during instructions than when no context information was given. Those authors argued that information specifying the

broader context during which a retrieval opportunity could occur serves as an additional source of activation that contributes to the level of activation of the intention, which in turn improves chances of intention completion (Cook, et al., 2005; Nowinski & Dismukes, 2005). Further research suggests that this associated context information is used to change attentional allocation policies away from the current activity (e.g. a lexical-decision task) and toward the processing of intention-related information (Marsh, Cook, & Hicks, 2006; Marsh, Hicks, et al., 2006) (for a computational simulation of the intention-superiority effect as a biased allocation of attentional resources see Lebiere & Lee, 2002).

A final piece of evidence for our notion of context-sensitive activation of intentions was reported by Förster et al. (2005). These authors instructed their participants to detect a particular sequence of items in a picture task. In addition, they manipulated participants' expectations concerning the probability that the critical sequence of pictures would occur in the experiment. The probability was either high or low. During blocks of the picture task participants completed a lexical-decision task. Thus the assessment of accessibility was immediately prior to a retrieval opportunity, that is, the next block of the picture task. Participants responded to intention-related stimuli faster than to other stimuli if a retrieval opportunity was highly probable, but not if the occurrence of a retrieval opportunity was rather improbable. The postponed-intention paradigm as introduced by Goschke and Kuhl (1993) is comparable to Förster et al.'s condition of a highly probable retrieval opportunity. Participants expect to complete the intention after completing an (short) intervening task that thus signals the retrieval opportunity. Extending these lines of research to a postponed-intention paradigm we would expect faster responses to prospective stimuli compared to neutral stimuli in a context associated with a likely retrieval opportunity, but not in other contexts. In other words, there should be an intention-superiority effect if a retrieval opportunity for the intention is linked to the respective task.

To summarize, several experiments on the intention-superiority effect have suggested that intention-related concepts enjoy a privileged status in memory in terms of heightened accessibility. However, we know little about the contribution of context information to the accessibility of intentions. Most experiments demonstrating an intention-superiority effect chose situations in which a persistent activation as well as context information would contribute to the accessibility of intention-related materials. First, the assessment of activation began shortly after intention formation. A heightened activation after intention formation does not necessarily imply a heightened accessibility of intention-related materials at some future moment as postulated by the persistence hypothesis. Second, the reaction-time

measure was usually associated with a retrieval opportunity during instructions and the occurrence of the retrieval opportunity in the near future was highly probable. Given previous evidence that context information may improve the probability of intention completion and the processing of intention-related materials, such context information might be crucial for a flexible accessibility of intentions. This would be in line with more general theories of prospective remembering. For example, Smith (2008) proposed that context information is used to instantiate preparatory attentional and memory processes. In order to test between the proposed context hypothesis and a persistence hypothesis, we inserted a short delay task between intention formation and the assessment of activation and then manipulated whether the intention was to be realized immediately after the assessment of activation, or not (Experiment 4); or we assessed activation across an extended time interval (Experiments 5-6).

3.3 Is the Intention-Superiority Effect Restricted to a Motor Task?

The secondary aim of the present research was to replicate an intention-superiority effect in a monitoring task. Freeman and Ellis (2003b) proposed that the intention-superiority effect is due to encoding of motor information associated with the intention of future enactment (e.g., Koriat, et al., 1990, for a similar reasoning) (see also Eschen, et al., 2007, for supporting data in a fMRI study). In line with this motor-code hypothesis the intention-superiority effect in previous studies appeared to be restricted to future enactment (e.g., Dockree & Ellis, 2001; Goschke & Kuhl, 1993; Marsh, et al., 1998; Marsh, et al., 1999; Penningroth, 2011), and attempts to demonstrate an intention-superiority effect for a observation task (Goschke & Kuhl, 1993; Marsh, et al., 1998) or verbal recall (Freeman & Ellis, 2003b) yielded no respective evidence. Recently, however, we provided some evidence that the intention-superiority effect may reflect a more general phenomenon of a heightened accessibility of personally relevant intentions, be they related to the future execution of actions or not (Schult & Steffens, in press). We found an intention-superiority effect in a lexical-decision task for different types of intended tasks that did not necessarily involve a motor response (e.g., giving a grade for a written recall test) provided that the quality of task performance was personally relevant for participants. In those experiments we strengthened personal relevance by announcing a public outcome evaluation: Participants expected to discuss their own performance at the intended task with a partner (e.g. comparing and justifying their grading decision). We reasoned that a public evaluation of one's outcome would strengthen participants' motivation to complete the intention properly (Meacham,

1988). One may object against our findings that intention-related materials were relevant for two future tasks: For performing the intended task (e.g. giving a grade) and subsequently for discussing one's decision in the presence of another participant. By implication it is possible that no intention-superiority effect can be observed for single non-motor tasks. In order to exclude this possibility in the present experiments we also included non-motor tasks and, in order to increase the motivation to fulfil the task, we simply stated that the experimenter would judge participants' performance. Hence, as in our previous experiments participants expected an outcome evaluation, but intention-related materials were only relevant for performing the intended task. If the expectation of an outcome evaluation is a contributing factor in the intention-superiority effect, as we argue, we should replicate an intention-superiority effect for the monitoring intention as well as the enactment intention in a recognition test.

3.4 Overview of Experiments

Starting point of the present research was the notion that context information allows a flexible activation and deactivation of intentions. In three experiments we tested to which extent context information modifies the accessibility of intention-related concepts. All experiments included an enactment as well as a monitoring condition. Our expectation was that intention-superiority effects should generalize across task conditions.

In Experiment 4 we manipulated the significance of a recognition test as a cue for a proximate retrieval opportunity. Half of our participants expected, analogous to previous experiments, to realize the intended task after the recognition test. The other half of the participants expected a retrieval opportunity after the recognition test and another task. In both retrieval conditions accessibility of intention-related and neutral materials were assessed at the same time about one minute after intention formation. Thus, if intentions persisted on a higher level of activation as originally proposed by Goschke and Kuhl (1993, 1996), we should observe an intention-superiority effect in both conditions. If the accessibility of intention-related materials, however, is sensitive to context information, we should observe an intention-superiority effect only for those participants who expect to realize the intention immediately after the recognition test.

In Experiment 5 and 6 we tested whether the accessibility of intention-related materials fluctuates within an associated task as a function of the probability of a retrieval opportunity. Participants expected to realize the intention after finishing a recognition test consisting of several blocks. Information concerning task progression was given between

recognition blocks. This information offered cues to estimate whether a retrieval occasion was probable in the near future, that is, after the next block. Again, if the accessibility of intention-related materials were sensitive to context information, there should be a pronounced intention-superiority effect in the last block prior intention execution, but not in other blocks after which there was no retrieval opportunity. If, however, intentions were generally supported by stronger or longer-lasting representations, one would expect an intention-superiority effect across the different blocks.

3.5 Experiment 4

In most experiments using a postponed-intention paradigm the task that assessed the accessibility of intention-related concepts was also associated with a retrieval opportunity. We argue that such context information increases the accessibility of intention-related information. In Experiment 4 we manipulated the role of a recognition test as an associated retrieval context. Half of the participants expected to realize the intended task after completing the recognition test (proximate retrieval opportunity). As in previous experiments the recognition test was associated with a retrieval opportunity. The other half of participants expected to realize the intention after completing the recognition test and another successive task (distant retrieval opportunity). Thus, although levels of activation were assessed at the same moment as in the proximate-retrieval condition, the recognition test itself was no relevant cue for a retrieval opportunity.

We added a short filler task between instructions specifying the prospective list and the beginning of the recognition test. First, an additional task unrelated to the recognition test or the intended task should prevent participants from maintaining the intention active in working memory during the whole retention interval. If we still demonstrate an intention-superiority effect this is more likely due to longer-lasting persistent activation or context-sensitive re-activation of intention-related materials rather than active maintaining processes. Second, as Goschke and Kuhl (1993) pointed out, intention-related materials may not constantly remain on a heightened level of activation, but decay at a slower rate than intention-irrelevant materials. Still, there should be a reliable intention-superiority effect after about one minute (cf. Goschke & Kuhl, 1993, Experiment 4). Thus if a heightened accessibility of intention-related materials persists after intention formation, we should find an intention-superiority effect in the recognition test. According to the persistence hypothesis, this effect should be independent of whether the task is going to be realized immediately after the recognition test or at a more distant moment in the future. In line with a context

hypothesis, however, there should be an intention-superiority effect for participants in the proximate-retrieval condition, but not for those in the distant-retrieval condition.

We also manipulated the type of intended task between participants. Half of them intended to carry out a list of actions in the presence of the experimenter (enactment task) and the other half intended to monitor and register mistakes in the experimenter's enactment performance (monitoring task). All participants were told that the experimenter would evaluate their performance in the respective task. In line with our previous findings we predicted an intention-superiority effect independent of the type of task (enactment or monitoring) because participants expected an evaluation of their outcome (Schult & Steffens, in press). The monitoring task was very similar to previous attempts that yielded no reaction-time differences between intention-related and neutral materials (Goschke & Kuhl, 1993; Marsh, et al., 1998). The major difference to previous studies was that participants in our monitoring condition were asked to produce some kind of objective performance outcome (which errors did the experimenter made?) and that this outcome would be evaluated by the experimenter, whereas in the previous studies, task performance was not evaluated.

3.5.1 Method

3.5.1.1 Participants

Forty-nine undergraduates (age: 18 – 39 years, M = 22, SD = 3.8; 81 % women) volunteered in exchange for course credit. One participant (proximate-retrieval opportunity, monitoring task) who thought the experiment was finished after the recognition test was replaced. Twelve students were randomly assigned to each condition.

3.5.1.2 Materials

Study materials were modelled after Goschke and Kuhl (1993): Two lists describing simple activities (brewing coffee, making a sandwich) were used. Each list consisted of six typical verb-object phrases. The recognition test consisted of 24 list words (the six verbs and six nouns of each study list) and 24 distracter words (eight words related to brewing coffee, eight words related to making a sandwich, eight unrelated words; see Appendix B). Stimuli of both study lists were comparable concerning word length and familiarity.

3.5.1.3 Procedure

Participants were tested individually. When entering the laboratory, they were seated in front of a computer. The experimenter left the room with the remark: „If you need me, I

am in the room next door“. All instructions were presented on a computer screen. At the beginning, participants were instructed to learn two lists of actions for a later (unspecified) memory test, emphasizing that they should be able to distinguish what action belonged to which list. Thus, neither the type of memory task nor the future performance task for one list was mentioned prior to the study phase. The presentation of study materials followed Goschke and Kuhl’s (1993) procedure: First, a list title (e.g. List 1) and each action of a list appeared on the screen one at a time for five seconds. Next, the whole list (and the list title) was presented for 30 seconds. Then the second list was presented in the same way. Both lists were presented alternately three times. The first presented list was always called List 1 and the second one List 2. The overall topic of the list (e.g. making a sandwich) was not mentioned during study phase. The presentation order of the two lists was counterbalanced across participants. Each list served equally often as List 1 and as List 2.

After studying both lists, participants were informed that they were going to work on a series of tasks and each task was explained shortly on a separate computer screen. Reading time was assessed for task explanations. First, the generation task was explained as „write down as many different examples of a given category within 30 seconds as possible“ and an example (flowers …rose, aster, geranium) was given. Second, the recognition test was introduced. Participants were told that a word would be presented in the middle of the screen. They should press the “y” -key as fast as possible if the word had appeared in one of the two studied lists or the “n” – key if it had not. Both keys were marked with a yellow point. Third, a performance task was announced. Half of the participants were told that they were going to carry out the actions of one list in a nearby kitchen in the presence of the experimenter (enactment task). The other half of participants were told that they were going to monitor the experimenter’s execution of one list of actions and notice all errors (monitoring task). To make sure that participants perceived the respective task as personally relevant, it was stated that the experimenter would evaluate their performance. An incomplete execution of the respective list of actions or the none-detection of errors in the experimenter’s performance would lead to a poor evaluation.

In addition to the type of intended task, we manipulated participants’ expectations when to realize the performance task. Half of the participants were instructed to get up and notify the experimenter in the room next door as soon as they had finished the memory task, that is, the recognition test (proximate-retrieval opportunity). The other half of the participants was asked to notify the experimenter after they had finished a short pre-test for another experiment following the memory task. The pre-test asked them to describe a

particular students subgroup (e.g., law students are …). Although these participants worked on the recognition test at the same time as participants of the other group (after the generation task), the recognition test did not signify an appropriate retrieval context (distant-retrieval opportunity). After those instructions, information specifying which list had to be executed or monitored, respectively, were presented on a separate screen. In the upper third of the screen the words “after the memory test” (proximate retrieval) or “after the pre-test” (distant retrieval) were displayed. After two seconds the computer beeped and two sentences appeared simultaneously in the middle of the same screen in two rows: One sentence indicated the prospective list (e.g., enact List 1), the other one indicated the neutral list (e.g., do not enact List 2). These instructions were displayed for another three seconds. Both study lists served equally often as prospective list. The position of the prospective and the neutral list was randomized across participants.

Subsequently, participants completed the series of tasks. Each type of task (generation task, memory task, pre-test) was announced for three seconds before the first trial of the respective task started. The first trial of each task was announced with a signal tone. First the words “generation task” appeared in the middle of the screen. The task consisted of two trials, each lasting 30 seconds. Different categories (e.g. furniture) were used across participants. Between both trials participants could rest for five seconds. During the break the information “Continuing soon” was displayed. Next the words “memory test” were presented. The related future performance task was not mentioned at that moment. During the recognition test the words “old” and “new” were displayed at the left and right upper side of the screen. Each trial started with a fixation cross for 250 ms followed by the presentation of the stimulus in the middle of the screen. The word remained on the screen until participants pressed the “y” or “n”-key. If participants pressed the wrong key they received an auditory feedback (a beep). The intertrial interval was 500 ms. In the proximate-retrieval condition the word “End” appeared on the screen after the last trial of the recognition test. In the distant-retrieval condition the word “Pre-test” appeared on the screen and participants wrote down typical characteristics of a particular students subgroup. The pre-test ended after 30 seconds and the word “End” appeared on the screen.

When participants went to the experimenter room, they were asked why they came. One participant thought the experiment was finished and was therefore replaced. The remaining participants expected that they were going to enact or monitor the prospective list in a nearby kitchen. Instead of performing the intended task participants were seated again in the laboratory and answered a short computer-based questionnaire. First, they indicated

which list they had intended to realize (List 1, List 2, or don't know) and how they would entitle the respective list (making a sandwich, brewing coffee, or don't know) as a manipulation check. Finally, free recall of the prospective list was assessed. No objects related to the list were available during recall.

3.5.1.4 Design

Retrieval opportunity (proximate vs. distant) and task (enactment vs. monitoring) were manipulated between subjects. List type (prospective vs. neutral) was manipulated within subject. Main dependent variables were response latencies and hit rates in the recognition test.

3.5.2 Results

For all statistical analyses, the Type-I-error was set at $\alpha < .06$. As an indicator of the effect size, partial R^2 (R^2_p) is reported for statistically significant effects (J. Cohen, 1977).

3.5.2.1 Preliminary Analyses

All participants indicated the correct prospective list (List 1 or List 2) and the correct, previously not mentioned topic (brewing coffee or making a sandwich). For free recall a liberal criterion was chosen because a successful task realization (enacting or monitoring the actions) did not require a verbatim recall of the intended actions and we did not instruct participants to recall actions word for word. All participants in the enactment condition completely recalled the prospective list. Three participants in the monitoring condition (one participant in the proximate-opportunity condition, two participants in the distant-opportunity condition) recalled at least four actions. In sum, free recall was rather good indicating that study time was sufficient to learn materials. In this and the following experiments the reported pattern of results did not change when participants with imperfect recall were excluded.

Instructions concerning the recognition test and the performance task were given after the study phase. Total reading time for instructions did not differ between groups (all Fs < 1.4; proximate-retrieval condition: $M = 84.1$, $SD = 13.6$ seconds for the enactment task and $M = 94.4$, $SD = 35.6$ seconds for the monitoring task; distant-retrieval condition: $M = 97.8$, $SD = 21.7$ seconds for the enactment task and $M = 98.2$, $SD = 28.7$ seconds for the monitoring task).

Table 1. Mean Response Latencies and Hit Rates (with Standard Deviations) for Stimuli of the Prospective and the Neutral List, separately for Retrieval Opportunity and Task in Experiment 4.

Retrieval Opportunity	Proximate				Distant			
List	Prospective		Neutral		Prospective		Neutral	
Task	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*
Response Latencies								
Enactment	889	(185)	974	(178)	1051	(159)	1031	(197)
Monitoring	889	(198)	1050	(317)	965	(190)	971	(225)
Hits								
Enactment	.96	(.08)	.89	(.09)	.89	(.10)	.93	(.11)
Monitoring	.88	(.14)	.90	(.12)	.92	(.12)	.92	(.08)

3.5.2.2 Recognition Task

In all experiments, incorrect trials and response latencies beyond 3 *SD*s of each participant's individual mean response were excluded from analyses, and statistical analyses were carried out on log-transformed scores. In Experiment 4, 9 % of the total number of trials were incorrect and 2 % were outliers. Table 1 presents mean response latencies and recognition accuracy for stimuli of both lists. Response latencies for stimuli from the prospective and the neutral list were analyzed in a 2 (retrieval opportunity) × 2 (task) × 2 (list) mixed ANOVA. In line with a previous set of experiments (Schult & Steffens, in press), no effects involving the factor task were significant, all *F*s < 1.3. There was a main effect of list, $F(1,44) = 4.64$, $R^2_p = .10$, and this effect was qualified by a list × retrieval opportunity interaction, $F(1,44) = 9.03$, $R^2_p = .17$. To examine the interaction we computed simple main effect tests. As expected following the context hypothesis, there was an intention-superiority effect if the recognition test was associated with a retrieval opportunity in the proximate future [$M = 889$ ms vs. $M = 1012$ ms; simple main effect: $F(1,44) = 13.3$, $R^2_p = .23$], and response latencies were comparable for prospective and neutral stimuli if the intention was going to be realized at a more distant moment after another task [$M = 1008$ ms vs. $M = 1001$ ms; simple main effect: $F < 1$].

As an index of recognition accuracy we computed the proportion of items correctly classified as old for each condition (cf. Freeman & Ellis, 2003b). There were no significant effects in a 2 (retrieval opportunity) × 2 (task) × 2 (list) mixed ANOVA, all *F*s < 2. Thus a privileged status of intention-related materials was not reflected in recognition accuracy. [3]

3.5.3 Discussion

Experiment 4 demonstrated that an association between the intention and the recognition test as a future retrieval context affects the intention-superiority effect. We found a reaction-time advantage for prospective stimuli compared to more neutral stimuli if the recognition test was associated with an opportunity to realize the intention. There was no intention-superiority effect if the recognition test was irrelevant in terms of a retrieval opportunity, although response latencies were assessed at the same moment as in the proximate-opportunity condition. The results are not easily compatible with the persistence hypothesis: If intentions simply persisted at a higher level of accessibility after intention formation than other materials we should have observed an intention-superiority effect in both retrieval conditions. Already one minute after intention-formation response latencies were comparable for intention-related and neutral stimuli in the distant-retrieval condition. This also indicates the rather quick vanishing of an intention-superiority effect present immediately after intention formation as demonstrated in most experiments (e.g., Dockree & Ellis, 2001; Goschke & Kuhl, 1993; Marsh et al., 1998, 1999). In sum, the results of Experiment 1 corroborate our notion of a context-sensitive activation of intentions. An interesting question is if intention-related materials are more accessible throughout a task

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[3] In Experiments 4-5 we also examined response latencies and false alarm rates for distracter stimuli related to the prospective as well as to the neutral list. We reasoned that if participants formed a more general intention (e.g., making a sandwich) this should result in slower response latencies or higher false alarm rates when rejecting intention-related distracter stimuli. In both experiments response latencies and false alarm rates did not differ significantly between distracter stimuli related to the prospective and the more neutral list. Thus in the present experiments it seems that a heightened accessibility of intention-related materials was specific to the learned actions. However, stimuli encoding with arbitrary list titles (e.g. List 1) instead of a general topic (e.g. “making a sandwich”) may have prevented a more generalized representation of the to-be-realized task. Because in Experiment 6 both lists shared a common topic no such comparison was possible.

associated with a retrieval opportunity or if accessibility fluctuates with perceived proximity to the retrieval opportunity. Therefore in the following experiments we held constant the context in which the retrieval opportunity would occur: All participants were instructed to complete the intention after completing a recognition test. Blocks within the recognition test, however, varied with regard to the proximity of a retrieval opportunity.

As expected, no effects involving the factor task were significant. Replicating previous findings intention-related information was processed faster if this intention was relevant for the participants, being related to a motor response or not (Schult & Steffens, in press). As in our earlier research we strengthened motivation by announcing an outcome evaluation. In contrast to those experiments, participants received a feedback from the experimenter rather than from other participants. The present findings indicate that motivational aspects such as evaluation apprehension rather than participants' active involvement in an evaluation contribute to a heightened activation of intentions in a postponed-intention paradigm.

A heightened accessibility of intention-related materials was reflected in faster recognition latencies, but not in increased recognition accuracy (see also Freeman & Ellis, 2003b). Considering that participants learned the two lists only a few minutes before the recognition test and that both lists were equally important during the study phase comparable recognition accuracy is not surprising. It shows that participants learned both lists rather well. Possibly, response latencies are a more sensitive measure than memory accuracy to assess the accessibility of intention-related materials for shortly postponed intentions.

3.6 Experiment 5

In Experiment 4 starting the recognition test indicated for participants in the proximate-retrieval condition that a retrieval opportunity would occur in the near future. We observed an intention-superiority effect over a short interval after the start of the recognition test. However, we can only speculate about the time-course of activation within an associated retrieval context. The knowledge that a retrieval opportunity will occur after the recognition test could increase the accessibility of intentions persistently within the associated task. There is at least some suggestive evidence for this interpretation. In one experiment Goschke and Kuhl (1993, Experiment 3; for details see also Goschke & Kuhl, 1996; Kuhl & Goschke, 1994) asked participants to work on a recognition test until "they felt that 15 min had passed" (p. 1216). They observed a main effect of intention-superiority across three blocks of the recognition test, but no statistically significant interaction of list (prospective vs. neutral) and

block (after intention formation, centre block, prior intention execution). Therefore the authors interpreted their results in terms of a more persistent activation of intention-related materials. However, a close inspection of the findings indicates a strong intention-superiority effect in the first block immediately after intention formation and in a last block immediately before participants interrupted the test. In a centre block the reaction-time advantage for intention-related materials was descriptively smaller. In sum, the notion that increased accessibility of intentions persists throughout the recognition test deserves replication.

In the following experiments the appropriate moment to execute the intention was defined as after the recognition test. The appropriate retrieval opportunity, that is the end of the task, was experimenter-defined rather than participant-defined as in Goschke and Kuhl (1993, Experiment 3). Our main interest was testing whether the accessibility of intention-related materials varied within the recognition test corresponding to the cue-signaled probability of a retrieval opportunity. In everyday intentions subtle cues signal when an associated activity is going to end in the near future (e.g., reading the last page of a manuscript). Attempting to model such cues in a computer-based recognition test, we divided the recognition test into distinct blocks separated by short breaks during which information concerning general task progression was given. For all participants the recognition test consisted of three blocks, but the number of blocks was not specified in advance. The first block began immediately after intention formation (e.g., enact List 1; do not enact List 2) without further introduction. The second block was introduced as “second block” and the third block as “last block”. Thus the significance of a given block in terms of probability of a retrieval opportunity varied. For example, the information “second block” was rather irrelevant with regard to a retrieval opportunity because participants did not know how many blocks they were to complete. In contrast, “last block” signalled a retrieval opportunity in the very near future. If intentions are flexibly activated depending on the probability of an opportunity to complete the intention, one might expect a pronounced intention-superiority effect in the last block, but none in previous blocks when a retrieval opportunity is rather unlikely. In contrast, if intention-related materials are represented with a stronger or longer-lasting level of activation as proposed by Goschke and Kuhl (1993) we should observe relatively stable intention-superiority effects across block.

To sum up, in Experiment 3 we compare response latencies for stimuli of the prospective and the neutral list across three blocks. In line with the persistence hypothesis we should observe an intention-superiority effect in the first block after intention formation, in the second one about two minutes later, and in the last one. If context information affects the

intention-superiority effect we should observe small reaction-time difference for the first and second blocks with a low probability of retrieval opportunity and a more increased intention-superiority effect in the last block. Again, we expected similar patterns of results for an enactment and a monitoring condition.

3.6.1 Method

3.6.1.1 Participants

Thirty-four undergraduates (age: 18 – 28 years, *M* = 21, *SD* = 2; 77% women) volunteered in exchange for course credit. Two participants were replaced because they forgot the intended task or indicated the wrong list. Sixteen students were randomly assigned to each task condition.

3.6.1.2 Materials

Study materials as well as recognition stimuli were taken from Experiment 4. In order to prolong the recognition test, the 48 stimuli (24 list words, 24 distracter words) were presented repeatedly in three blocks. The order of stimuli was randomized for each block.

3.6.1.3 Procedure

The general procedure was similar to Experiment 4. After seating the participant in front of the computer the experimenter went next door. First participants learned two lists of actions for a later (unspecified) memory test with the restriction that they should know which actions belonged to which list. The study materials were presented the same way as in Experiment 4. Presentation order of study lists was counterbalanced across participants.

After the study phase, the recognition test and the performance task (enactment or monitoring) were shortly explained. Instructions were taken from Experiment 4. For the recognition test we added two sentences informing participants that the memory test consisted of several blocks with short breaks between the blocks and that they would receive information about their task progression during the breaks. The number of blocks was not specified. Again, to strengthen personal relevance of the future performance task participants were told that the experimenter would evaluate their enactment or monitoring performance, respectively. All participants were instructed to knock on the door of the adjacent room as soon as they had finished the recognition test. After these general instructions, participants were informed which list had to be performed or monitored, respectively, after the recognition test. In the upper third of the screen the words “After the memory task” were

displayed. After two seconds, the computer beeped and the instructions specifying the prospective and the neutral list appeared in two rows on the middle of the same screen. Both lists served equally often as prospective and neutral lists and the position of both lists was counterbalanced across participants.

Then the first block of the recognition test began. There were short breaks lasting five seconds between consecutive blocks. During breaks the information “Continuing soon!” and “Second [Last] block” appeared on the screen. The beginning and end of the breaks was announced with a signal tone. After the last trial of the recognition test, the word “End” appeared on the screen.

When participants notified the experimenter, they were asked why they came. If participants indicated that they intended to carry out the performance in a nearby kitchen, they were thanked and debriefed.

3.6.1.4 Design

Independent variables were task (enactment vs. monitoring, between subjects), list (prospective vs. neutral, within subject) and recognition block (first, second, last, within subject). Main dependent variables were response latencies and hit rates in the recognition test.

3.6.2 Results

3.6.2.1 Preliminary Analyses

All participants indicated the correct prospective list and the correct title, suggesting that participants understood the general topic of prospective list. Reading time for instructions concerning the recognition test and the performance task were similar for both types of task (M = 69.3, SD = 22.4 seconds for the enactment task and M = 71.4, SD = 17 seconds for the monitoring task, $t < 1$).

3.6.2.2 Recognition Task

Individual outliers were determined for each block separately in Experiments 5 and 6. In Experiment 5, 10 % of the total number of trials were incorrect and 1 % were excluded as outliers. Table 2 presents mean response latencies and recognition accuracy. We analyzed log-transformed response latencies in a 2 (task) × 2 (list) × 3 (block) mixed ANOVA. Again, there were no significant effects involving the factor task, all Fs < 1.6. There was a main

effect of block, $F(1,44) = 28.38$, $R^2_p = .45$, and a main effect of list, $F(1,30) = 12.44$, $R^2_p = .29$, qualified by the expected list × block interaction, $F(2,60) = 2.87$, $p = .06$, $R^2_p = .09$. In line with the assumption of a context-sensitive activation of intentions, theoretically driven simple main effect tests showed an intention-superiority effect in the last block when a retrieval opportunity was near [$M = 840$ ms vs. $M = 917$ ms, $F(1,30) = 8.74$, $R^2_p = .23$], but no effect in the previous second block [$M = 872$ ms vs. $M = 896$ ms, simple main effect: $F < 1.4$]. There was also an intention-superiority effect in the first block after intention formation [$M = 938$ ms vs. $M = 1036$ ms, simple main effect: $F(1,30) = 12.84$, $R^2_p = .30$].

As in Experiment 4, recognition accuracy did not reflect a heightened accessibility of intention-related materials. A 2 (task) × 2 (list) × 3 (block) mixed ANOVA on hit rates revealed no significant effects, all Fs < 2.9. Specifically, neither the main effect of list, $F < 2.3$, nor the list × block interaction, $F < 1.3$, was significant.

Table 2. Mean Response Latencies and Hit Rates (with Standard Deviations) for Stimuli of the Prospective and the Neutral List, separately for Block and Task in Experiment 5.

Block	First				Second				Last			
List	Prospective		Neutral		Prospective		Neutral		Prospective		Neutral	
Task	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*
Response Latencies												
Enactment	944	(162)	1043	(256)	865	(168)	873	(196)	816	(138)	864	(148)
Monitoring	931	(165)	1030	(257)	879	(220)	919	(252)	866	(178)	971	(301)
Hits												
Enactment	.93	(.12)	.92	(.09)	.94	(.09)	.90	(.10)	.91	(.08)	.93	(.07)
Monitoring	.93	(.09)	.86	(.09)	.91	(.09)	.87	(.12)	.90	(.09)	.88	(.12)

Note. The first block started immediately after instructions specifying the prospective list and the neutral list. Between subsequent blocks were short breaks during which information concerning next block (second or last block) were displayed.

3.6.3 Discussion

In Experiment 5 we tested whether the level of activation of intention-related materials fluctuates within the ongoing activity as a function of the probability of the retrieval opportunity. In particular, we assumed a more pronounced intention-superiority effect in the last block prior to intention completion compared to the other blocks after which a retrieval opportunity was unlikely. In line with our assumption there was a reaction-time advantage for intention-related materials compared to neutral materials in the last block when a retrieval opportunity was proximate, but not in the previous second block. Interestingly, there was also an intention-superiority effect in the first block although the block itself was irrelevant with regard to a proximate retrieval opportunity. The first block was reacted to immediately after intention formation. After-effects of intention formation, for example planning or rehearsal, may have contributed to the intention-superiority effect in the first block (e.g., Altmann & Trafton, 2002). As the comparisons show these effects perished after a short delay. This finding contradicts the persistence hypothesis. In line with the findings of Experiment 4, even a short moment after intention formation latencies for prospective and neutral stimuli were comparable in the second block. In general, the latency data corroborate a context-sensitive activation of intentions. Yet, there was a small descriptive intention-superiority effect in the second block (24 ms) and the effect size of the crucial interaction of list and block was not very large. For replication a third experiment was conducted.

In hindsight the manipulation of task progression or the probability of the retrieval opportunity was not perfect. Although we informed participants that they would perform several blocks of the recognition test with breaks in which they would receive information about task progression, the instructions were rather vague on how they could use this information. When testing the comprehensibility of instructions we also asked how many blocks participants expected after such instructions. People guessed that the recognition test would last three or more blocks. Therefore we simply assumed that participants would not expect a retrieval opportunity after the second block when told that the recognition test consists of several blocks. Yet we did not explicitly assess participants' expectations. In Experiment 6 we gave more specific instructions what to expect and how to interpret the information during the breaks.

3.7 Experiment 6

The main aim of Experiment 6 was to replicate and extend the findings of Experiment 5 using another set of stimuli. In this experiment actions of both lists were related to a common context (office-related actions) making a distinction between prospective and neutral stimuli more difficult (see also Goschke & Kuhl, 1993, Experiment 2).

We modified the instructions concerning how to use information about task progression between blocks of the recognition task. The cover story was that we were interested in participants' ability to improve recognition performance across several blocks. We explained that the recognition test consisted of several blocks and that the exact number of to-be-completed blocks would depend on one's recognition performance. If one achieved a certain level of recognition accuracy there would be only one other block to test the stability of the achieved performance level. During the breaks between blocks one could check if this special block began. The words "Last block" were not mentioned in these instructions. All participants completed four blocks irrespective of their recognition performance. This allowed us to explore the pattern of activation for stimuli of the prospective and neutral list more closely across blocks.

Compared to Experiment 5, several details of the general procedure were changed. First, the order of task explanations and study phase was exchanged. Participants read explanations concerning the recognition test and the performance task before the study phase. Consequently, they were aware of what kind of information was needed for the memory task and that they additionally were either asked to execute (enactment task) or to monitor the execution (monitoring task) of one of the two study lists after the recognition test when studying the lists. As in our previous experiments for both types of tasks it was stressed that the experimenter would evaluate participants' performance. In order to avoid strategic encoding the type of task and the prospective list was only specified after the study phase. Another consequence of this change of presentation order was the addition of a delay task between study phase and the start of the recognition test. Participants solved maths problems for two minutes. Thus, in contrast to Experiment 4-5, in which the delay between study phase and recognition task varied with participants' reading time, the delay interval was held constant across participants. Second, study lists had titles ("tidying up the desk", "clearing away materials") instead of being called List 1 and List 2. Since both study lists consisted of actions that could be summarized as tidying up or clearing away, it was rather difficult to strategically rehearse specific list contents during the short interval specifying the prospective

list and the beginning of the recognition test. We were interested whether we could still observe an intention-superiority effect in the first block. Third, during intention formation the instructions specifying the type of task and the prospective list (e.g. “enact tidying up the desk”) and the neutral list (e.g. “do not enact clearing away materials”) were presented in two rows without specifically mentioning when to realize the task. In other words, participants had to remind themselves to perform the enactment or monitoring task after completing the recognition test. The retrieval opportunity (after the memory task) was last specified before the study phase (about nine minutes before). Finally, all participants realized the denoted task after the recognition test. We assessed free recall for both task conditions. Participants in the enactment condition were asked to carry out the prospective list. Participants in the monitoring condition made a checklist with all actions the person was supposed to carry out before monitoring a videotaped performance. Free recall differed between task conditions only concerning the mode of recall (motor or verbal). The recall situation was identical: All objects listed in both study lists (and distracter objects) were present during recall.

We expected to replicate the findings of Experiment 5. In line with a context hypothesis we should observe an intention-superiority effect in the fourth (last) block when a retrieval opportunity was expected, but not in the previous blocks when the retrieval opportunity was unlikely. The type of task (enactment or monitoring) should not affect the described pattern of latency data.

3.7.1 Method

3.7.1.1 Participants

Seventy-four participants were recruited on campus (age: 18 – 28 years, $M = 21$, $SD = 2$; 77% women). Three participants were replaced due to severe language problems and another seven participants because they forgot the performance task or failed to indicate the correct prospective list. Of the remaining 64 participants half was assigned to each task condition.

3.7.1.2 Materials

Two new study lists were constructed, each describing eight office-related actions (e.g. file a letter; see Appendix C). Lists were entitled as “tidying up the desk” and “clearing away materials”. The recognition test consisted of the 24 task words (six nouns and six verbs from each list) and 24 distracter words (12 related to the office context, 12 unrelated). The

whole set of stimuli was presented repeatedly in different random orders in each of the four blocks.

3.7.1.3 Procedure

All instructions were presented on a computer screen. At the beginning the math distracter task, the recognition test, and the subsequent performance task were explained. We told participants that they should perform several blocks of the recognition test and that they would be informed when the recognition test was going to end soon. Instructions for the performance task indicated that the task could be realized after the recognition test. Participants were asked to notify the experimenter as soon as they had finished the recognition test. The experimenter was in the same room during the whole experiment, but out of sight behind a partition wall. To strengthen the perceived relevance of the performance task we announced an immediate feedback from the experimenter.

The study phase was similar to Experiments 4-5. First the list title and each action appeared on the screen separately for five seconds, then the whole list was presented for another 30 seconds. Then the second list was presented. Both lists were shown alternately three times. The order of both lists was counterbalanced across participants. Next the math distracter task started. Participants saw two equations (e.g. 14 – 6 = and 6 + 3 =) on the left and right side of the screen. They indicated with a key press which equation had the higher result ("y" for the left and "n" for the right equation). After two minutes the computer beeped. Then information specifying the task (enact or observe) and the prospective and neutral list were presented for three seconds in two rows in the middle of the screen. The retrieval context (after the recognition test) was not mentioned. Next the recognition test started. Trial design was identical to our previous experiments. Wrong decisions were indicated with a beep. Breaks between blocks began and ended with a distinctive tone and lasted five seconds. During breaks the information "Continuing soon" and "Second [third; last] block" appeared on the screen. After the last trial the word "End" remained on the screen.

When participants went to the experimenter they were asked whether the experiment was finished. If they said no the experimenter asked what type of task and which list they intended to carry out in the performance task. If they gave the correct answer they went with experimenter to another part of the room. Behind a partition wall all materials needed to execute the actions as well distracter objects were put on two desks. These desks were not visible during the study phase or recognition test. Participants in the enactment condition

carried out all actions of the prospective list they remembered and the experimenter recorded their recall. Participants in the monitoring condition expected to monitor a videotaped performance of the respective list. Beforehand they were asked to write down all actions of the prospective list. When they indicated that they could not remember any more actions, the experimenter gave them a differently coloured pen. This way we could easily see if participants added any other actions during or after watching the video. We counted only the number of correctly recalled actions before watching the video.

3.7.2 Results

3.7.2.1 Preliminary Analyses

In the enactment condition the number of correctly performed actions was counted. In the monitoring condition the number of verbally recalled actions before videotape presentation was counted. Free recall of the prospective list did not differ between the enactment task ($M = 6.5$) and the monitoring task ($M = 6.7$), $t < 1$. All participants recalled at least four out of eight actions.

3.7.2.2 Recognition Task

In Experiment 6, 15 % of all trials were incorrect and 1.7 % were classified as outliers. Table 3 presents mean latencies and recognition accuracy for both types of list stimuli across blocks. Response latencies were analyzed in a 2 (task) × 2 (list) × 4 (block) mixed ANOVA. Again, no effects involving the factor task were significant, all Fs < 1.2. The main effect of block, $F(2,142) = 19.35$, $R^2_p = .24$, the main effect of list, $F(1,62) = 29.25$, $R^2_p = .32$, and the predicted list × block interaction, $F(3,186) = 9.33$, $R^2_p = .13$, were significant. As in Experiment 5, prospective stimuli were faster recognized than neutral stimuli in the first block immediately after intention formation [$M = 961$ ms vs. $M = 1077$ ms, simple main effect: $F(1,62) = 35.60$, $R^2_p = .37$] and in the last block prior intention execution [$M = 876$ ms vs. $M = 961$ ms, simple main effect: $F(1,62) = 38.73$, $R^2_p = .38$]. In line with a context hypothesis response latencies were comparable for the centre blocks [$M = 949$ ms vs. $M = 965$, simple main effect: $F < 2.1$ for the second block and $M = 943$ ms vs. $M = 952$ ms, simple main effect: $F < 1$ for the third block, respectively].

To gain further information about the activation of prospective and neutral stimuli across blocks we computed pairwise (Sidak-adjusted) comparisons. Comparisons for stimuli of the prospective list indicated that these stimuli were recognized particularly fast in the last

block compared to the previous blocks in which a heightened accessibility of intention-related information was rather irrelevant (M = 961 ms for the first block, M = 949 ms for the second block, M = 941 ms for the third block, and M = 876 ms for the last block, respectively). Response latencies for neutral list stimuli were slower in the first block relative to later blocks, which did not differ from each other (M = 1077 ms for the first block, M = 965 ms for the second block, M = 952 ms for the third block, and M = 961 ms for the last block, respectively).

For accuracy data, the 2 (task) × 2 (list) × 4 (block) mixed ANOVA revealed a main effect of block, $F(3,186) = 8.81$, $R^2_p = .12$. There was a small increase in hit rate across blocks (M = .81 for the first, M = .83 for the second, M = .86 for the third, and M = .86 for the last block). Again neither the main effect of list nor any interactions involving this factor were significant, all Fs < 2.5.

Table 3. Mean Response Latencies and Hit Rates (with Standard Deviations) for Stimuli of the Prospective and the Neutral List, separately for Block and Task in Experiment 6.

Block	First				Second				Third				Last			
List	Prospective		Neutral		Prospective		Neutral		Prospective		Neutral		Prospective		Neutral	
Task	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*(SD)*	*M*	*(SD)*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*	*M*	*(SD)*
Response Latencies																
Enactment	955	(185)	1056	(226)	943	(239)	954	(168)	952	(201)	955	(203)	861	(153)	913	(161)
Monitoring	968	(210)	1090	(316)	956	(212)	978	(233)	935	(215)	950	(233)	891	(314)	1008	(422)
Hits																
Enactment	.83	(.14)	.83	(.13)	.82	(.15)	.84	(.10)	.89	(.11)	.83	(.13)	.88	(.11)	.84	(.12)
Monitoring	.82	(.11)	.77	(.16)	.83	(.12)	.84	(.10)	.85	(.14)	.85	(.08)	.85	(.13)	.86	(.10)

Note. The first block started immediately after instructions specifying the prospective list and the neutral list. Between subsequent blocks were short breaks during which information concerning next block (second, third, or last block) were displayed.

3.7.3 Discussion

Again, the overall pattern of results corroborates our hypothesis of a context-sensitive activation of intention-related materials. As in Experiment 5 the size of the intention-superiority effect varied with the proximity of a retrieval opportunity: We demonstrated an intention-superiority effect in the last block prior to intention execution, but not in centre blocks when a retrieval opportunity was unlikely. Again there was a large intention-superiority effect in the first block immediately after intention formation, but the effect vanished quickly. As in our previous experiments the type of intended task (enactment vs. observation) did not influence the intention-superiority effect.

Pairwise comparisons of latencies for prospective and neutral stimuli respectively suggest that different mechanisms support the intention-superiority effect in the first and last block. Prospective stimuli were accessible particularly fast when a retrieval opportunity was proximate, but not in previous blocks which were irrelevant with regard to intention completion. This finding nicely fits our assumption of a context-sensitive activation: Intention-related stimuli are easily accessible if a retrieval opportunity is likely, that is, if a heightened accessibility is functional for successful remembering of intentions. In contrast, recognition latencies for neutral stimuli were slower in the first block compared to the following blocks. Since participants were only told not to perform the neutral list, one explanation is that stimuli of the cancelled list were shortly inhibited (Marsh et al., 1999). Findings by Förster et al. (2005) suggest that the inhibition of completed intentions is short-lived (but see Penningroth, 2011). A similar inhibitory mechanism may work for uncompleted, but cancelled intentions as used in the current experiment.

3.8 General Discussion

Starting point of the present research was the notion that context information may allow a flexible activation and deactivation of intentions. In line with this assumption Experiment 4 shows an intention-superiority effect (i.e., heightened activation of intention-related words) in a recognition test only if the task was associated with a (proximate) retrieval opportunity. Experiments 5-6 demonstrate further that the accessibility of intention-related information varies within a task associated with a retrieval opportunity as a function of the probability or proximity of the retrieval occasion. If the retrieval opportunity was rather unlikely to occur or more distant there was no intention-superiority effect (except immediately after reading the instruction during the first block of trials). If simple cues (e.g.,

"last block") signalled that the intention could be realized soon there was an intention-superiority effect.

Our finding that the intention-superiority effect occurred in the last block, but not in the preceding one(s), is in line with the notion of a (gradually) increasing accessibility of intentions before intention completion (e.g., Dörner, 1984; Kvavilashvili & Fisher, 2007; Martin & Tesser, 1996; Sellen, Louie, Harris, & Wilkins, 1997). However, in our paradigm the manipulation of the level of retrieval proximity was rather coarse. Before the information "last block" participants were not able to estimate the proximity of the retrieval opportunity. A more fine-grained picture would emerge if the role of a gradually increasing proximity of the retrieval context was more closely examined.

We argue that participants' expectations about the likelihood or the perceived proximity of a retrieval opportunity modify the accessibility of intentions. Environmental cues such as arriving in a context associated with an intention (Experiment 4) or task progression (Experiments 5-6) could provide the information needed to evaluate the proximity of a retrieval opportunity. A heightened accessibility of intentions during time intervals in which the probability of occurrence of the specified retrieval event is high may improve the chances of actual intention completion. Thus, from a functional point of view a heightened accessibility of intention-related materials would not be necessary during the first of many blocks, but still we found such an effect. This raises the question whether the same processes contribute to an intention-superiority effect in the first and last block. A heightened activation of intention-related materials immediately after intention formation may reflect encoding processes, whereas the same effect in the last block may reflect retrieval-related processes, for example, monitoring.

There are some parallels between the intention-superiority effect in associated retrieval contexts in our experiments and research on task interference by Marsh and colleagues (Cook, et al., 2005; Marsh, Hicks, et al., 2006; Marsh, Hicks, & Cook, 2008). For example, Marsh, Hicks, and Cook (2006) examined task interference of keeping a time-based intention when working on a lexical-decision task. They observed slower responses to neutral stimuli relative to a no-intention control condition across two blocks of the lexical-decision task if the retrieval context was ill defined (i.e., press a specific key in about six minutes). If, however, participants received the additional information that the response window would occur in the second block, task interference effects were restricted to the respective block. Some authors attribute task interference effects to monitoring processes: To some extent attentional resources are devoted to the detection of intention-related information during a

delay interval (e.g., Guynn, 2003; Smith, 2003, 2008). Recently, Smith (2008) suggested that such monitoring processes could be restricted to intervals in which a retrieval opportunity is likely. In line with this reasoning we demonstrated an intention-superiority effect under conditions associated with a retrieval opportunity.

Similarly, the current findings nicely fit the context-switching account of the intention-superiority effect that Lebiere and Lee (2002) proposed using the ACT-R cognitive architecture (e.g., Anderson & Lebiere, 1998). The main idea behind their modelling studies was that uncompleted intentions provide the context for the current goal, priming the respective memory items. "If a task is expected to be performed in the near future (and no other pressing one is currently being performed) then the context is set to that task to facilitate the retrieval of related information" (p. 62). In line with the brackets in that citation, our findings demonstrate that the task preceding the intention needs to be taken into account in the goal-activation process. We suppose that it activates the context. However, as we demonstrated, if it is not associated with the intended task because there is an intervening task or additional blocks of trials serve as pressing tasks before "the near future", then no extra activation of intention-related stimuli can be observed. Those authors had already acknowledged that it is clearly not possible that prospective tasks remain activated until the time to perform them if longer time intervals in a busy schedule are concerned. In relation to the secondary aim of the present research, those authors had hypothesized that the context is set only to a to-be-performed task, but not to a "less demanding *observe* condition" (p. 62). Going beyond that, our findings demonstrate that a monitoring (i.e. observe) condition can indeed lead to equivalent findings as a performance condition as soon as it is not perceived as less demanding. This can easily be incorporated into their model by assuming that the context is set to any task that appears important, performance or monitoring.

An explanation for the increased activation that we observed after intention formation was suggested by Altmann and Trafton (2002). They assume that participants use the short time at intention formation in which the prospective list is presented to strategically rehearse the topic of the more important prospective list. In line with this account in Experiments 5-6 we found a large intention-superiority effect immediately after intention formation that decreased quickly after the first block when the intention was irrelevant. Similarly, Dockree and Ellis (2001) reported an intention-superiority effect after intention encoding although the retrieval opportunity was far away and the response-latency task itself was no relevant cue for a retrieval opportunity. Taken together, these findings indicate that intentions appear to be strongly activated immediately after they have been formed, and then again when the context

signals a retrieval opportunity. Altmann and Trafton's (2002) account may also explain the re-appearing intention-superiority effect in the last block of Experiments 5-6 as well as an intention-superiority effect in the proximate-retrieval condition in Experiment 4: The break before the first trial was long enough to (partially) rehearse the prospective list. In line with this idea, a recent study on time-based intentions showed that participants tend to check the clock more often during breaks than within an ongoing task (Occhionero, Esposito, Cicogna, & Nigro, 2010). Future research should systematically examine the relationship between the temporal proximity of intention formation, the assessment of activation, and the association of the respective task with a retrieval context. At present we may conclude that an intention-superiority effect immediately after intention formation is short-lived.

We cannot rule out that strategic rehearsal processes before the first and last block contributed to the observed level of activation. (Even if the comparable response latencies for centre blocks compared to the last block suggests that participants adapted intention rehearsal to task requirements.) For several reasons we think the demonstrated intention-superiority effects are more than activation after strategic rehearsal. First, our study material was constructed in a way to make a detailed rehearsal of actions unlikely. For example, in Experiment 6 the titles for both lists were rather interchangeable (filing a letter away could be described as clearing something away or as tidying up the desk). In Experiments 5-6 we avoided naming the topic of each list (e.g. brewing coffee). Lists were simply labelled List 1 and 2. Thus a conscious rehearsal of the intention-related actions included something like 'List 1' = 'making a sandwich' = 'to slice a bun', to smear butter on it' etc. This should have at least slowed down strategic rehearsal activities. Second, if participants rehearsed the topic of the prospective list, they should also have more difficulties to reject distracter stimuli related to the prospective list compared to distracters of the neutral list. However, neither response latencies nor false alarm rates differed for prospective and neutral distracter stimuli in Experiments 4 or 5 (see Footnote 3). Finally, other findings such as an intention-superiority effect for lists of unrelated actions (Marsh et al., 1999) or similar intention-superiority effects for participants who report a biased rehearsal of the prospective list and those who report similar rehearsal of both lists before a recognition test (Goschke & Kuhl, 1993) also suggest that the intention-superiority effect is due to more than strategic rehearsal.

Our results are not easily compatible with the notion of persistently activated intentions (Goschke & Kuhl, 1993; 1996). In Experiments 5 and 6 the intention-superiority effect vanished quickly after intention formation. Experiment 4 suggests that intentions do not remain active after intention formation until the intention is fulfilled, but are re-activated

in a context-sensitive way when a retrieval opportunity is approached. Future research should examine whether other types of intentions reveal a similar pattern. For several reasons in the present research we focused on activity-based intentions. First, most experiments that examined an intention-superiority effect also used instructions that we can summarize as activity based. In general, participants were simply instructed to do something after the recognition test or the lexical-decision task. Second, task requirements for detecting the activity-based retrieval opportunity are minimal (e.g., Kvavilashvili & Ellis, 1996; ; but see McDaniel & Einstein, 2007). One may rely on external cues that signal an approaching retrieval opportunity. In addition, in contrast to time-based intentions that require an interruption of the ongoing task at a specific moment in time or event-based intentions that require the interruption of the task when a particular stimulus occurs, an activity-based retrieval context is embedded in different activities, for example in our paradigm between the recognition test and the end of the experiment. Keeping the intention active during the retention interval is not necessary. It would have been sufficient to check for unfulfilled tasks after completing the recognition task. Still, some attentional resources seem to be allocated to the prospective list before a retrieval opportunity occurs. Finally, using activity-based intentions offered a nice way to vary the proximity of a retrieval context without initiating other processes such as time monitoring. Future research should examine whether the reported results are restricted to activity-based intentions. For example, in laboratory event-based intentions a retrieval context is also based on external stimuli. Yet these stimuli are embedded in a continuous activity. The probability of a retrieval opportunity could be more difficult to estimate within the activity. This may result in a more persistent activation of the intention. Time-based intentions provide the fewest external cues concerning when an appropriate moment to realize the intention appears. It has been suggested that time-based intentions are represented on a higher level of activation than other types of intentions (e.g., Kvavilashvili & Fisher, 2007; Sellen, et al., 1997). Again this may result in a more persistent activation of time-based intentions relative to other types of intentions. Another important factor may be whether participants are able to specify a retrieval context further when encountering associated task (e.g., to re-define the context “after the memory task” into “after the final block of this task”).

Freeman and Ellis (2003b) proposed that the encoding of motor information contributes to the accessibility of intended actions. Replicating an intention-superiority effect, actions encoded verbally for future enactment were faster recognized than actions encoded verbally for future verbal recall. However, actions enacted at encoding did not additionally

benefit from the enactment intention. Latencies for actions enacted at encoding for future enactment were comparable to latencies for actions enacted at encoding for future verbal recall in their studies. If motor information were crucial we should have observed intention-superiority effects in the enactment task, but not in the monitoring task. In none of the three experiments did we find differences between task conditions. This extends a previous set of experiments that demonstrated an intention-superiority effect irrespective of the type of task if the intended task was personally relevant, but not for a personally irrelevant task (Schult & Steffens, in press). It extends the finding of comparable results for different types of intended tasks to another type of assessment (recognition test instead of lexical-decision test) and a more subtle manipulation of personal relevance. Expectation of a feedback from another person (Experiment 6) or the knowledge that the other person will form an impression (Experiments 4-5) seems sufficient to induce a feeling of personal relevance. In sum, motor recall is no pre-condition for a heightened accessibility of intention-related concepts.

3.9 Conclusion

At this very moment, among the intentions that I have formed for today, but currently postponed, are those to feed the pet turkey for dinner; make a phone call in two hours; post a letter; buy three different train tickets for next week; check my checking account online; write three e-mails; and check my calendar to see when tonight's appointment starts. This list could be considerably extended, and other intentions have been formed for the week, month, and even year. The clever paradigms that psychologists have invented in order to study the cognitive representation of intentions have so far demonstrated the increased accessibility of short-term delayed intentions across an intervening task. However, a cognitive system extending this activity level across hours or even longer would be highly dysfunctional. In line with this notion, as we have shown, even short-term activity-based intentions are flexibly activated and deactivated depending on the proximity of a retrieval opportunity. Environmental details are used to gain such information (Smith, 2008). A heightened accessibility of delayed intentions in moments in which a retrieval opportunity is likely to occur increases the chances that the opportunity is detected, improving the probability of intention completion. Such a flexible accessibility of intentions is highly functional whenever execution has to be considerably postponed.

4 Final Discussion

One crucial question in prospective memory research is what brings the representation of a previously formed intention into one's mind at the right moment given there are no explicit prompts to initiate retrieval processes. Already Lewin (1926) suggested that intended activities may enjoy a special storage status in memory until the are fulfilled. In other words, intentions may enjoy a heightened level of activation or enhanced accessibility compared to other memory contents. For example, with a heightened accessibility intentions may pop into one's mind when a previously specified retrieval opportunity is encountered. An enhanced accessibility may also lead to periodic recollections of the intention during the retention interval, which in turn may trigger monitoring processes, and consequently increase the probability of detecting an opportunity to realize the intention. In short, a heightened availability of intentions would be highly functional for supporting successful prospective remembering. The postponed-intention paradigm as introduced by Goschke and Kuhl (1993) offers an approach to investigate the accessibility of intention-related materials in the intervening period between encoding and retrieval of intentions. In the following we first discuss the theoretical implications of each finding. Then we will highlight some general limitations of the used paradigm and indicate future research strategies.

4.1 The Role of Intent

Consistent across six experiments we demonstrated an intention-superiority effect (i.e. faster response latencies for reactions to stimuli associated with a future task relative to stimuli associated with no or a cancelled task) for different types of task when task realization has personally relevant consequences in terms of a performance evaluation. This effect was found in a lexical-decision task (Experiments 1-3) as well as a recognition task (Experiments 4-6) using different materials. The type of intended tasks varied between experiments, ranging from grading a written report (Experiments 2-3) to monitoring someone's enactment performance (Experiments 1-2; Experiments 4-6) and carrying out a list of actions (Experiments 1, 3-6). As Experiment 3 clearly shows, participants' expectations concerning the relevance of the intended task are more important than the type of intended task. We found an intention-superiority effect when the denoted task was relevant in terms of an outcome evaluation. In contrast, we found no intention-superiority effect when future task had no personally relevant consequences for participants. Taken together, the intentional status of materials was more important than specific properties of the intended task. This

implies that the intention-superiority effect is not restricted to to-be-executed actions, but generally occurs for (momentarily) relevant plans.

The finding of an intention-superiority effect independent of the type of task is not easily compatible with Freeman and Ellis' (2003b; Ellis & Freeman, 2008) notion that this effect reflects the availability of motor information. In detail, these authors argued that the reaction-time advantage for to-be-enacted actions (i.e. the intention-superiority effect) in a postponed-intention paradigm is functionally similar to an enactment-encoding effect (e.g., Engelkamp, 1998, for a review on enactment encoding). The general idea is that actions verbally encoded for future enactment elicit similar representations as actions carried out during encoding. In both cases motor-relevant information is activated that facilitates recall. Consistent with this hypothesis Freeman and Ellis reported comparable recognition latencies for verbs that were enacted at encoding and intended for verbal recall (enactment-encoding task) and verbs verbally encoded with the intention of enactment at recall (prospective enactment task). In both encoding conditions verbs were faster recognized than in a no-motor control condition (verbal encoding with the intention of future verbal recall or a verbal encoding for recognition only). Thus, materials were more easily accessible if a motor response was necessary at encoding or intended at retrieval. In addition, once motor-relevant information was activated at encoding, the intention to execute these actions at a future moment did not increase the accessibility of intention-related stimuli any further.

In the current research we did not manipulate the type of encoding. All participants encoded the lists of actions by reading and the type of intended task was specified after study phase. Following Freeman and Ellis' (2003b; Ellis & Freeman, 2008) line of reasoning we should have found a reaction-time advantage only for such actions participants intended to carry out at some future moment. The intention-superiority effect should have been restricted to prospective enactment tasks. In contrast, we found an intention-superiority effect for an enactment task as well as a variety of other tasks that did not require an overt motor response when an evaluation was expected. In addition, we found no intention-superiority effect for an enactment task when this task had no personally relevant consequences for participants (Experiment 3). The finding of a context-sensitive intention-superiority effect (Experiments 4-6) also challenges the notion that this effect is mainly due to encoding and storage of motor information. Once encoded, motor information should have been available independent of the moment of assessment. Thus, our findings indicate that the intention-superiority effect reflects the intentional quality of these materials rather than motor information. If materials are associated with personally relevant consequences (here: outcome evaluation), then they

are stored at a heightened level of activation. The findings of Chapter 3 suggest that expectation of a feedback from another person (Experiment 6) or the knowledge that the other person will form an impression (Experiments 4-5) is sufficient to induce such a feeling of personal relevance.

Announcing an outcome evaluation may contribute in different ways to the intention-superiority effect. First, it may guarantee that participants form an intention. As outlined in the Introduction, some researchers restrict the term intention to future tasks participants have decided on and are committed to perform (in contrast to mere wishing) (e.g., Goschke & Kuhl, 1993; Goschke & Kuhl, 1996; Smith, 2008). Expecting an outcome evaluation might be a pre-condition to elicit a feeling of commitment for intentions as used in a postponed-intention paradigm. Typically, the intention is a request from an experimenter and is of little or no personal relevance for participants' long-term aims and goals. Without an outcome evaluation participants may formally agree to comply with such a request, but it does not necessarily imply that participants formed an intention to do so (cf. Kvavilashvili & Ellis, 1996). In contrast, if the intended task is associated with an outcome evaluation participants have to comply. This reasoning may explain why there was no intention-superiority effect for an observation task without outcome evaluation in previous studies (Goschke & Kuhl, 1993; Marsh, et al., 1998) or when participants expected a written copy of the to-be-executed actions during retrieval (Dockree & Ellis, 2001). It may also give an explanation for our null finding in Experiment 3 when participants were told that the intention could be performed anonymously. Yet, such a strategy did not reflect in ratings of task importance ("A good performance at the task is … 1 "not at all important" – 7 "very important"). Ratings were comparable for participants who expected an outcome evaluation or none, and individual importance ratings did not correlate with the size of the intention-superiority effect ($|r|$s < .07). In addition, this reasoning does not explain the absence of an intention-superiority effect for verbal recall tasks as used in Freeman and Ellis' (2003b) research. In these studies participants were asked to orally recall a list of previously learned verbs in the presence of an experimenter. Although the intended task was clearly associated with an outcome evaluation there was no intention-superiority effect for verbs associated with verbal recall relative to verbs with no intention.

We assume that the announcement of an outcome evaluation increases the importance or strength of this intention. Personal importance as well as consequences of failure and anticipated benefits of success for one self or others influence the probability of remembering an intention (e.g., Brandimonte & Ferrante, 2008; Ellis & Freeman, 2008, for reviews).

Introducing an outcome evaluation is a means to link a rather unimportant intention with personally relevant consequences. Thus, announcing an outcome evaluation may increase participants' effort to encode and store these intentions, which in turn could reflect in faster response latencies. Participants' beliefs about task requirements (as well as the general tone of task instructions) may affect to what extent a feeling of personal relevance is established. This might also explain the absence of an intention-superiority effect for a verbal task in Freeman and Ellis (2003b) research. Although there was an outcome evaluation, the task of recalling a list of verbs could be interpreted as less personally important compared to pantomimic enactment at recall. Against this explanation speaks that the intention-superiority effect was not related to ratings on negative feelings about the anticipated task performance (Experiment 1). Also, there were no reliable differences in task-importance ratings for participants with and without outcome evaluation (Experiment 3). However, these importance ratings might not be reliable proxies for the consequences of task realization in terms of an evaluation. It is well known that evaluation apprehension and related variables such as expectancies of negative evaluations or the tendency to avoid criticism affects task performance and memory (e.g., Cottrell, 1968; Geen, 1991, for reviews). Similar factors may contribute to the encoding, storage and retrieval of delayed intentions. Thus, social-emotional factors such as needs to avoid criticism or negative evaluations might be more appropriate variables to explain differences in the size of the intention-superiority effect. In addition, importance ratings were assessed at the end of the experiment after cancelling (Experiment 1) or completing (Experiments 2-3) the intended activity. Thus, ratings might not reflect feelings prior task completion.

At the present we cannot disentangle whether the announcement of an outcome evaluation forced participants to form an intention per se or rather increased the strength of this intention. The intentions used in this research are best described as experimenter-defined "musts". Whether the intention-superiority effect is restricted to such obligations with outcome evaluation or generalizes to other types of intentions (e.g., wants), as suggested by Ellis (1996), remains to be tested. Ellis outlined a number of factors that modify the strength of an intention. For example, the origin of an intention (self or other), the primary beneficiary (self or other), and the relative importance of other persons may contribute to the importance of an intention (see also Kvavilashvili & Ellis, 1996). Thus far, laboratory-based tasks demonstrating an intention-superiority effect were experimenter-defined and associated with an (implicit or explicit) outcome evaluation. Future research should focus on other influential factors, for example the role of incentives. Research by Förster et al. (2005, Experiment 5)

suggests a rather complex relationship between (monetary) incentives and the accessibility of intention-related information.

4.2 The Role of the Retrieval Cue

Some authors interpreted the intention-superiority effect as a phenomenon of encoding. They attributed a heightened availability of intention-related information to the intentional status of this materials (e.g., Goschke & Kuhl, 1993, 1996), motor information (e.g., Ellis & Freeman, 2008; Freeman & Ellis, 2003b), or rehearsal processes at encoding (e.g., Altmann & Trafton, 2002). The demonstration of intention-superiority effects immediately after intention encoding in Experiments 5-6 support this notion. The quick vanishing of the effect also indicates that the intention-superiority effect may reflect strategic encoding or rehearsal processes (e.g., Altmann & Trafton, 2002; Ellis & Freeman, 2008) rather than a nonstrategic phenomenon (Goschke & Kuhl, 1993, 1996).

More interestingly, we also found an intention-superiority effect in periods associated with a retrieval opportunity. In Experiment 4 we manipulated whether a recognition test indicated a near retrieval opportunity or not. We observed an intention-superiority effect only if the task itself was a meaningful cue for a near retrieval opportunity. In Experiments 5-6 we manipulated the proximity of a retrieval opportunity within a recognition test. Besides an intention-superiority effect in the first block after intention formation, we found an intention-superiority effect the last block prior to intention realization, but not in preceding centre blocks. In sum, these findings indicate that even short-term delayed intentions are flexibly activated and deactivated depending on the proximity of a retrieval opportunity.

Ellis (1996) made an important distinction between a retention interval in which an intention must be retained and a performance interval in which an intention can be realized. Findings of Chapter 3 indicate a heightened accessibility of intention-related information during a performance interval. The critical retrieval occasion, that is, the end of the recognition task, had to occur at some moment in the task (Experiment 4) or the last block of the task (Experiments 5-6). The finding nicely extends previous research that demonstrated task interference effects of holding an intention on the processing of ongoing activities during previously specified performance intervals (e.g., Marsh, Cook, et al., 2006; Marsh, Hicks, et al., 2006; see also Marsh, et al., 2008, for review). Typically, task interference effects (i.e. a slowing of response latencies in an ongoing activity compared to a no-intention control condition) are interpreted as a result of a biased allocation of attentional resources towards the processing of intention-related stimuli. The reported intention-superiority effect during

performance intervals supports this notion more directly (see also Hicks, Marsh, & Cook, 2005).

In the current research we assessed the accessibility of information related to the action component of an intention. A heightened availability of such information when a retrieval cue (a performance interval) is present may support the successful retrieval of the intended activity. Yet, whether the enhanced accessibility of this information also supports prospective memory performance remains to be established. Results of Chapter 3 also indicate that retrieval cues trigger the activation of action-related information. It remains to be established whether a similar pattern of results occurs for the cue component. Prospective memory requires that a given situation is recognized as a potential performance interval. Thus, a heightened accessibility of information related to the cue component might be more persistent than the accessibility of action-related information (e.g., Ellis & Freeman, 2008). For example, Förster et al. (2005) observed an increasing reaction-time advantage for information related to the cue component across blocks. Yet, in this research the response-latency task always signalled a potential retrieval opportunity, that is a performance interval, in the very near future. Whether information related to the cue component is also more easily available during a retention interval remains to be tested.

4.3 Limitations and Future Research Directions

One question is whether an intention-superiority effect as revealed in a lexical-decision task (Experiments 1-3) or a recognition task (Experiments 4-6) is also linked with performance in prospective memory tasks. A key feature of prospective tasks is the self-initiated retrieval of the intention. For experiments described in Chapter 2 one may argue that the intended tasks were no real prospective memory tasks. Instructions concerning the retrieval condition were rather vague and we do not know whether or what type of cue participants expected from the experimenter. If they expected a reminder, this may limit our results. For experiments reported in Chapter 3 participants had to remind themselves to notify the experimenter that they were ready to realize the intended activity. Technically, one may argue that notifying the experimenter was another prospective task than executing or monitoring the prospective list of actions for which we assessed response latencies. Yet, we think that both tasks were highly associated, and thus the intended activity (enactment or monitoring) could be described as prospective task. Yet, our argument would be stronger if we demonstrated an intention-superiority effect for tasks participants had to initiate without previously notifying the experimenter (e.g., Dockree & Ellis, 2001, for an example).

A more critical issue is whether intention superiority supports prospective remembering. Findings of Chapter 3 indicate that there are two kinds of intention-superiority effects. An intention-superiority effect after intention formation might reflect processes related to encoding or planning, whereas the same phenomenon in a performance interval might reflect preparatory processes. If the former effect reflects planning processes, the size of this effect may depend on the complexity of the to-be-performed task. Thus far, lists of simple actions were used as study materials. Future research may manipulate complexity of prospective tasks directly. The number of items to be retained, familiarity of these items, and the kind of relations between them may influence planning processes (Ellis, 1996).

Demonstrating an intention-superiority effect in a performance interval extends previous findings. The current findings support a monitoring view as proposed by Smith (2003; Smith & Bayen, 2004). Yet, demonstrating an intention-superiority effect prior task execution does not necessarily imply that this is an obligatory process for successful remembering (McDaniel & Einstein, 2007). Instructions may have triggered reliance on more strategic processes. Several studies have demonstrated that stressing the importance of a prospective memory task relative to ongoing activities elicits more strategic monitoring processes, but prospective memory performance does not benefit from these strategic processes if the prospective task is rather simple (e.g., Einstein, et al., 2005; Kliegel, Martin, McDaniel, & Einstein, 2001; Kliegel, Martin, McDaniel, & Einstein, 2004). In these studies participants were simply told which of the two experimental tasks, that is, the prospective task or the ongoing activity in which retrieval events were embedded, was more important. Similarly, we stressed the importance of the intended task by means of an outcome evaluation. Participants probably interpreted the postponed task as the primary task of the experiment, and may have relied on more strategic monitoring processes. Dockree and Ellis (2001) introduced prospective task with less emphasis. They asked participants to perform some actions under the guise of preparatory tasks for the next participant and demonstrated an intention-superiority effect immediately after intention formation. Whether an intention-superiority effect prior task execution is observed remains to be tested.

In the current research the size of the intention-superiority effect was not related to recall performance. Across all experiments the reported pattern of results did not change when participants with imperfect free recall performance were excluded. However, these participants remembered most actions in an unexpected free recall. In other words, their recall was still very good, so the statistical power would have been too low to test dependencies between activation and recall. Consequently, future research is needed to assess

the relation between activation and remembering. If the intention-superiority effect reflects the degree of preparatory or monitoring processes, we would expect a positive relationship between intention superiority and the number of recalled actions.

Another question is what drives the intention-superiority effect. Our findings indicate that the strength of intent as well as the probability of a retrieval occasion contributes to the effect. Although our results do not support Freeman and Ellis (2003b) motor-code hypothesis, we cannot not exclude the possibility that the motor-related information is activated. Since study lists described simple, distinct activities, the materials we chose might have stimulated the encoding of motor-related information at study. Neuroimaging studies also indicate that motor regions are activated when an intention to do something is encoded (Leynes, Allen, & Marsh, 1998; Leynes, Marsh, Hicks, Allen, & Mayhorn, 2003). In addition, a simple motor interference task (drawing circles in the air) eliminates the intention-superiority effect (Freeman & Ellis, 2003b, Experiment 4) and also decreases prospective memory performance (Brandimonte & Passolunghi, 1994). In sum, there is some evidence that motor information, or more general, planning processes contribute the intention-superiority effect. However, an intention-superiority effect seems to be more than a prospective enactment effect. Announcing an outcome evaluation seems to strengthen different kinds of intentions. Future research could use this means to strengthen the commitment to more verbal tasks, for example giving a talk or pass on a message. If the intention-superiority effect reflects a heightened availability of information related to the action component we would expect a similar pattern of results as presented in this research.

5 References

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Appendix A: Stimuli used in Experiments 1-3

Stimuli of the study lists that were used in the lexical-decision task are highlighted in italics. None of those words were highlighted on the original study lists. Each study list consisted of a title and four typical actions presented on a single sheet of paper. In Experiment 1 two of the three lists were used as study materials and words of the third lists served as distracter words together with the eight additional words. In Experiments 2-3 participants always studied List A and B and words of List C served as distracter words.

Study Lists

List A (preparing chocolate candy):

Schoko-Pralinen herstellen

Die *Kuvertüre schmelzen*
und den *Zucker beigeben*.
Die *Schokolade* mit Buttercreme *mischen*.
Dann kleine *Kugeln gestalten*.

List B (mixing a cocktail):

Einen Cocktail mixen

Den *Alkohol abmessen*.
Alles in den *Shaker füllen*.
Mit beiden *Hände*n kräftig *schütteln*
und in ein *Glas gießen*.

List C (cooking a sushi dish):

Sushi kochen

Den *Reis kochen*.
Dann auf *Algen verteilen*,
mit weiteren *Zutaten belegen*.
und zu einer *Rolle formen*.

Additional words

Verpackung
entsorgen
Bücher
einsortieren
Anleitung
lesen
Löcher
bohren

Appendix B: Stimuli used in Experiments 4-5

Stimuli of the study lists used in the recognition task are highlighted in italics. None of those words were highlighted on the original study lists. Lists were labelled as List 1 or List 2. The overall topic (brewing coffee or making a sandwich) was not mentioned.

Study Lists

List A (brewing coffee):

Den *Kaffee kochen*.
Die *Tasse hinstellen*.
Die *Kanne nehmen*.
Die *Milch eingießen*.
Den *Zuckerwürfel reinwerfen*.
Das *Getränk umrühren*.

List B (making a sandwich):

Das *Brötchen aufschneiden*.
Mit *Butter bestreichen*.
Mit *Käse belegen*.
Mit *Salat bedecken*.
Mit *Salz würzen*.
Das *Sandwich zuklappen*.

Distracter stimuli used in Experiment 4-5

Distracter stimuli related to brewing coffee:

Kaffeepulver
löffeln
Filtertüte
knicken
Wasser
eingießen
aufschäumen
Espresso

Distracter stimuli related to making a sandwich:

Weißbrot
toasten
Tomate
zerteilen
Salami
abpellen
Gurkenscheibe
halbieren

Distracter stimuli unrelated to study lists:

Herd
Topf
Pfanne
Folie
auskratzen
einfetten
braten
abreißen

Appendix C: Stimuli used in Experiment 6

Stimuli of the study lists used in the recognition task are highlighted in italics. None of those words were highlighted on the original study lists. Each list consisted of a title and eight actions.

Study Lists

List A (clearing away materials):

Das Material weglegen

Die CD in den *Karton hineinlegen*.
Den *Fragebogen ausfüllen*,
mit dem *Tacker* zusammenheften.
Die Seiten *lochen*.
Den *Ordner holen*,
beim *Trennstreifen aufschlagen*.
Den Fragebogen *abheften*.
Den Ordner auf den *Nebentisch* stellen.

List B (tidying up the desk):

Den Tisch aufräumen

Das *Lehrbuch zuklappen*.
Den zerknitterten Zettel *wegwerfen*.
Das *Lineal* wegräumen.
Den *Bleistift anspitzen*.
Den großen *Umschlag öffnen*.
Das *Schriftstück abstempeln*,
in die rote *Ablage* einsortieren.
Die Tischfläche mit dem Lappen *abwischen.*

Distracter stimuli used in Experiment 6

Distracter stimuli related to the office context:

Papierkorb
Bürostuhl
Textmarker
Unterlagen
Kopie
Klebeband
verstauen
stapeln
arbeiten
abschreiben
faxen
tippen

Distracter stimuli unrelated to the office context:

Hammer
Schlagzeug
Schlüssel
Aktentasche
Teekanne
Pfanne
kochen
abwischen
streichen
addieren
auffalten
braten

Summary of Findings

Prospective memory describes our ability to realize previously planned activities at an appropriate moment in the future. Remembering to keep an appointment, pay bills in time, or turn off the stove after cooking are prospective memory tasks that highlight the importance of this ability in everyday life. Prospective memory proceeds through several phases. Ellis (1996) distinguishes the phases of (a) intention formation and encoding, (b) intention retention, (c) a delayed intention retrieval, (d) intention execution, and (e) a final evaluation of the resultant outcome. A crucial aspect of prospective memory task is the self-initiated retrieval of the intention after a delay interval. A specific situation (e.g., passing a letter box) must be recognized as an appropriate opportunity to intiiate a previously planned activity (e.g., to post a letter). There are no explict prompts to iniate retrieval processes. The mental representations of a prospective memory task consist of at least three components: the *when* (an retrieval cue to initiate the intention), *what* (the to-be-realized action), and the *intent* or decision to do something (Ellis, 1996). One possible mechanisms of successful prospective memory performance is that intention-relevant concepts are more easily accessible than other (long-term) memory contents during the delay between encoding and initiation of the intended activity (e.g., Ellis, 1996; Förster, et al., 2005; Goschke & Kuhl, 1993; Lewin, 1926).

Previous research on the formation, encoding and representation of delayed intentions found faster response latencies for stimuli associated with an activity that was going to be realized at some future moment compared to more neutral materials during a retention interval. Those studies used a postponed-intention paradigm in which latencies for nouns and verbs of two lists of simple actions (e.g., to take a cup) are compared. A so-called intention-superiority effect (Goschke & Kuhl, 1993) reflects in faster response latencies for stimuli of the list of actions intended for future enactment relative to stimuli of the second, previously learned list of actions. Thus, an intention-superiority effect reflects the heightened activation or increased accessibility of information related to the action component of intentions. The current research consists of two series of experiments, related to the thus far rather neglected intent and the cue component, respectively.

In a first series of experiments we focused on the role of the intent. Specifically, previous research on the intention-superiority effect reported faster latencies for reactions to stimuli intended for future enactment relative to stimuli associated with no enactment or

cancelled enactment. Previous attempts to demonstrate an intention-superiority effect for other types of tasks, for instance observing the experimenter executing actions, have not yielded an intention-superiority effect. A reason for this could be that the typical enactment task was associated with a higher degree of commitment than other laboratory-based tasks, and that task importance or its consequences heighten the accessibility of intention-relevant materials. In line with this reasoning we demonstrate in three experiments described in Chapter 2 an intention-superiority effect in a lexical-decision task for different types of intended activities (e.g., grading a written report) when task realization has personally relevant consequences in terms of a performance evaluation. In contrast, we found no intention-superiority effect when future enactment had no personally relevant consequences for participants. These findings imply that the intention-superiority effect is not restricted to to-be-executed actions, but generally occurs for relevant plans.

In a second series of experiments we focused on the cue component. Goschke and Kuhl (1993) interpreted the intention-superiority effect in terms of a more persistent activation of intention-related materials. However, persistency of activation and proximity of retrieval opportunity have not been disentangled yet. Typically participants are instructed to realize the intention immediately after completing the task that assesses response latencies (e.g. a recognition test) and yields the intention-superiority effect. Thus, the response-latency task is also associated with a retrieval occasion in the near future. In Experiment 4 we manipulated whether a recognition test indicated a near retrieval opportunity or not. We observed an intention-superiority effect only if the task itself was a meaningful cue for a near retrieval opportunity. In Experiments 5-6 we manipulated the proximity of a retrieval opportunity within a recognition test. The intention-superiority effect was restricted to the first block after intention formation and the last block prior to intention realization, but was not found in centre blocks. All three experiments further demonstrated that the intention-superiority effect is not restricted to future enactment tasks, but also found for monitoring tasks (replicating the findings of Chapter 2). In sum, these findings indicate that even short-term delayed intentions are flexibly activated and deactivated depending on the proximity of a retrieval opportunity.

Zusammenfassung der Ergebnisse

Der Begriff „Prospektives Gedächtnis“ beschreibt unsere Fähigkeit, Aufgaben im Voraus zu planen und sich dann später in einer geeigneten Situation selbstständig daran zu erinnern und auszuführen. Das Einhalten von Terminen, das rechtzeitige Bezahlen von Rechnungen, oder das Abschalten des Bügeleisens sind alltagsrelevante Beispiele prospektiver Gedächtnisaufgaben. Prospektives Erinnern ist ein aus mehreren Phasen bestehender Prozess. Ellis (1996) unterscheidet die Phasen (a) der Intentionsbildung und –enkodierung, (b) der Intentionsspeicherung, (c) des zeitverzögerten Intentionsabrufs, (d) der planmäßigen Intentionsausführung, und (e) der abschließenden Bewertung des erreichten Zielzustands. Ein zentraler Aspekt prospektiver Gedächtnisaufgaben ist der selbstinitiierte Abruf der Intention nach einer zeitlichen Verzögerung. Eine bestimmte Situation (z.B. das Vorbeigehen am Briefkasten) muss selbstständig als eine geeignete Gelegenheit zur Intentionsausführung erkannt werden (z.B. um eine Postkarte abschicken). In der gegebenen Situation erfolgt keine explizite Aufforderung sich an den zuvor gefassten Plan zu erinnern. Die mentale Repräsentation einer Intention umfasst demnach mindestens drei Elemente: das *wann* (der Abrufkontext: eine geeignete Gelegenheit zum Abruf und Ausführen der Intention), das *was* (die intendierte Handlung) und das Fassen der *Handlungsabsicht* per se (Ellis, 1996). Einige Autoren nehmen an, dass diese intentionsrelevanten Informationen während des Verzögerungsintervalls zwischen Intentionsenkodierung und -initiierung leichter verfügbar sind als andere Gedächtnisinhalte (z.B. Ellis, 1996; Förster, et al., 2005; Goschke & Kuhl, 1993; Lewin, 1926).

In bisherigen Untersuchungen zur Intentionsbildung, -enkodierung und -speicherung zeitverzögerter Intentionen zeigten sich während des Verzögerungsintervalls kürzere Reaktionszeiten für Stimuli, die mit einer zu einem späteren Zeitpunkt zu erledigenden Aufgabe verknüpft waren, im Vergleich zu neutraleren Stimuli. In dem zugrundeliegenden Paradigma werden Reaktionszeiten für Substantive und Verben von zwei zuvor gelernten Listen einfacher Handlungsanweisungen (z.B. die Tasse hinstellen) miteinander verglichen. Ein so genannter Intentionsüberlegenheitseffekt (Goschke & Kuhl, 1993) zeigt sich in einem Reaktionszeitvorteil für Handlungen, die zu einem späteren Zeitpunkt ausgeführt werden sollten, verglichen mit anderen ebenfalls kurz zuvor gelernten Handlungen. Dieser Effekt deutet auf eine höhere Aktivierung oder leichtere Verfügbarkeit von Informationen hin, welche sich auf die intendierte Handlung (das was-Element zeitverzögerter Intentionen) beziehen. Motivationale Faktoren, zum Beispiel die Relevanz der intendierten Aufgabe für die Teilnehmenden, sowie der Einfluss der zeitlichen Nähe einer geeigneten

Abrufgelegenheit auf die Verfügbarkeit intentionsrelevanter Informationen wurden in der Forschung zum Intentionsüberlegenheitseffekt bisher kaum berücksichtigt. In der vorliegenden Arbeit werden zwei Serien von Experimenten vorgestellt, welche den Einfluss dieser bisher vernachlässigten Faktoren auf den Intentionsüberlegenheitseffekt untersuchen.

In einer ersten Serie von Experimenten wurde der Einfluss der Aufgabenrelevanz auf die Verfügbarkeit intentionsrelevanter Stimuli untersucht. Bisherige Befunde legten nahe, dass der Intentionsüberlegenheitseffekt in laborbasierten Studien auf prospektive Aufgaben beschränkt ist, bei denen die Teilnehmenden beabsichtigten die Handlungen zu einem späteren Zeitpunkt aktiv auszuführen. Für andere prospektive Aufgaben (z.B. jemanden zu einem späteren Zeitpunkt bei der Handlungsausführung zu beobachten), konnte der Effekt bisher nicht repliziert werden. Eine Erklärung für dieses Ergebnismuster ist, dass die Instruktion zur späteren Handlungsausführung von den Teilnehmenden als (selbst-) relevanter oder wichtiger wahrgenommen wird als die Instruktion zur späteren Handlungsbeobachtung. In drei Experimenten (Exp.1-3) wird ein Intentionsüberlegenheitseffekt für verschiedene prospektive Aufgaben (z.B. das Benoten eines verbalen Gedächtnistests) in einer lexikalischen Entscheidungsaufgabe demonstriert, wenn die Aufgabenrealisierung mit für den Teilnehmenden relevanten Konsequenzen in Form einer Leistungsbewertung verknüpft war. Ein Intentionsüberlegenheitseffekt trat nicht auf, falls das Ausführen der prospektiven Aufgabe keine relevanten Konsequenzen für den Teilnehmenden hatte (Exp. 3). Die Befunde legen nahe, dass der Intentionsüberlegenheitseffekt nicht auf zu einem späteren Zeitpunkt aktiv auszuführende Handlungen beschränkt ist, sondern einen generellen Verfügbarkeitsvorteil für geplante Aufgaben darstellt.

In einer zweiten Serie von Experimenten wurde der Einfluss der zeitlichen Nähe einer geeigneten Abrufgelegenheit auf den Intentionsüberlegenheitseffekt untersucht. Goschke und Kuhl (1993) interpretierten den Intentionsüberlegenheitseffekt im Sinne einer länger anhaltenden (persistierenden) Aktivierung intentionsrelevanter Informationen. In den meisten Studien konnte jedoch nicht zwischen einer persistierenden Aktivierung intentionsrelevanter Informationen nach der Intentionsenkodierung und einer möglichen Reaktivierung derselben in einem mit der Intention assoziierten Abrufkontexts unterschieden werden. Typischerweise wurden die Teilnehmenden aufgefordert, die intendierte Aufgabe (z.B. eine Reihe von Handlungen ausführen) unmittelbar nach Beenden derjenigen Aufgabe umzusetzen, in der die Reaktionszeiten zur Berechnung des Intentionsüberlegenheitseffektes erfasst wurden. Die Reaktionszeitaufgabe signalisierte demnach eine zeitlich nahe Abrufgelegenheit. In

Experiment 4 wurde manipuliert, ob der Beginn der Reaktionszeitaufgabe (ein Rekognitionstest) ein Hinweisreiz für eine zeitlich nahe Abrufgelegenheit war oder nicht. Es wurde nur dann ein Intentionsüberlegenheitseffekt in der Reaktionszeitaufgabe beobachtet, wenn die Aufgabe auch eine zeitlich nahe Abrufgelegenheit signalisierte. In den folgenden zwei Experimenten (Exp. 5-6) wurde die zeitliche Nähe der Abrufgelegenheit innerhalb des Rekognitionstests manipuliert. Der Intentionsüberlegenheitseffekt war auf bestimmte Abschnitte des Rekognitionstests beschränkt. Es wurde ein Intentionsüberlegenheitseffekt in einem kurzen Intervall unmittelbar nach der Intentionsenkodierung beobachtet sowie in einem späteren Intervall, nachdem ein Hinweisreiz eine zeitlich nahe Abrufgelegenheit signalisiert hatte. In anderen Abschnitten des Rekognitionstests wurde kein Effekt gefunden. Die Befunde aus der ersten Serie von Experimenten replizierend, konnte der Intentionsüberlegenheitseffekt in allen drei Experimenten sowohl für eine Handlungsintention als auch eine Beobachtungsintention gezeigt werden. Die Befunde legen nahe, dass Intentionen, deren Realisierung momentan nicht möglich ist, in Abhängigkeit von der Nähe einer Gelegenheit zur Intentionsrealisierung flexibel aktiviert und deaktiviert werden.

Wissenschaftlicher Werdegang

Persönliche Daten

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Ehrenwörtliche Erklärung

Hiermit erkläre ich, dass mir die Promotionsordnung der Fakultät für Sozial- und Verhaltenswissenschaften an der Friedrich-Schiller-Universität Jena bekannt ist.

Weiterhin erkläre ich, dass ich die vorliegende Dissertation selbst und ohne unzulässige Hilfe Dritter angefertigt habe. Keine weiteren Personen waren bei der Auswahl und Auswertung des Materials beteiligt. Alle benutzten Hilfsmittel und Quellen sind in der Arbeit angegeben.

Ich habe weder die Hilfe eines Promotionsberaters in Anspruch genommen, noch haben Dritte unmittelbar oder mittelbare geldwerte Leistungen von mir für Arbeiten erhalten, die im Zusammenhang mit dem Inhalt der Dissertation stehen.

Die Arbeit wurde weder im In- noch im Ausland in gleicher oder ähnlicher Form einer anderen Prüfungsbehörde vorgelegt. Ich habe weder früher noch gegenwärtig an einer anderen Hochschule eine Dissertation eingereicht.

Ich versichere, dass ich nach bestem Wissen und Gewissen die Wahrheit gesagt habe und nichts verschwiegen habe.

Jena, den 20.06.2011 Janette Schult