Motivation and Emotion, Vol. 11, No. 2, 1987

Thought Contents and Cognitive Functioning in Motivational versus Volitional States of Mind[1]

Heinz Heckhausen[2] and Peter M. Gollwitzer

Max-Planck-Institut für psychologische Forschung

Do people who are about to make a decision differ from people who are about to enact a decision just made with respect to (1) the contents of their spontaneous stream of thought, and (2) aspects of cognitive functioning reflective of short-term memory? Subjects either made a choice between, or were assigned to, two available test materials allegedly designed to measure creativity and differentially suited to promote an individual's full creative potential. Subjects were, however, interrupted prior to or shortly after making this choice: In Study 1, they were asked to report on the thoughts they experienced during the time period just before the interruption; in Study 2, subjects were interrupted either before or after making a choice and were asked to recall lists of words designed to test memory span. The results of Study 1 confirmed our assumption that predecisional versus postdecisional streams of spontaneous thought reflect motivational *versus* volitional *states of mind. That is, predecisional thought was preoccupied with incentive values of goal options, expectancy of performance outcomes, and metamotivational directives, whereas postdecisional thought was concerned with questions of how to implement the pursued goal. In Study 2, subjects in a motivational state of mind exhibited a greater memory span than subjects in a volitional state of mind. Since, in a further study, performance on arithmetic tasks did not improve for subjects in a motivational as opposed to a volitional state of mind, the results of Study 2 are understood as a state-dependent increase in receptivity with respect to incoming information. In interpreting the present findings, the characteristic features of motivational and volitional states are explicated. Furthermore, it is suggested that the dominating research*

[1]We would like to acknowledge the assistance of Martina Eckert and Thomas Grözinger, who ably served as experimenters. Jürgen Beckmann, Ronald F. Kinney, and Franz E. Weinert made helpful comments on earlier drafts of this paper.

[2]Address all correspondence to Heinz Heckhausen, Max-Planck-Institut für psychologische Forschung, Leopoldstrasse 24, D-8000 Munich 40, Federal Republic of Germany.

0146-7239/87/0600-0101$05.00/0

tradition focusing on motivational problems (i.e., expectancy-value models) and the abandoned research tradition concerned with volitional problems (i.e., formation and implementation of an intent) should be integrated into a functional unit.

Research on human motivation can be divided into two distinct traditions. The older tradition was preoccupied with the issue of how people go about implementing their intentions. It experienced its heyday in the early 20th century in conjunction with the theoretical work of Narziss Ach (1905, 1910), which introduced the concept of a *determining tendency* into the emerging European psychology of will as a force that guides human functioning toward implementation of an intended course of action. Throughout its history, will psychology consistently refrained from addressing predecisional issues, such as *how* a certain intent becomes established.

The more recent tradition, however, has focused upon predecisional issues with respect to the conditions and processes that result in the making of a choice, a resolution, or a decision. Expectancy-value theories (see Atkinson, 1964; Feather, 1982) have provided the conceptual framework that has guided research on human motivation for the last 50 years. Even though questions of a postdecisional nature are occasionally raised, the answers provided draw upon the same conceptual framework applied to explain predecisional phenomena. For example, a person's expenditure of effort, task persistence, or quantity and quality of performance on a given task are explained by referring to the same motivational tendency that compelled the person to choose the task in the first place (Atkinson & Raynor, 1974). This has led to great confusion on conceptual and empirical grounds.

According to the risk-taking model (Atkinson, 1957), the strength of a motivational tendency reaches a peak for tasks of intermediate difficulty. Consequently, people should be inclined to choose and to perform best at tasks of perceived intermediate difficulty (Karabenick & Yousseff, 1968). Yet Locke (1968) has amassed evidence revealing that people's performance at a given task can be increased by making them set *higher* than intermediate performance goals. These seemingly contradictory results can, however, be reconciled by employing a predecisional–postdecisional perspective. Whereas Atkinson's model applies to motivational, predecisional issues, Locke's studies addressed phenomena of a postdecisional nature. His subjects were induced to set themselves goals at higher than intermediate levels of difficulty. As compared to subjects who set themselves goals of intermediate difficulty, a commitment to goals of higher than intermediate levels of difficulty increases expended effort, which, in turn, improves performance, particularly in speed tasks. It appears, then, that the scope of the risk-taking model is

limited to predicting the outcome of predecisional processes, such as choosing between tasks of varying difficulty.

Kuhl (1983), as well as Heckhausen and Kuhl (1985), recently suggested that predecisional and postdecisional motivational phenomena not only are different in nature but also operate under separate and distinct principles. In this regard, it seems appropriate to recast motivational processes into two successive psychological states, labeling the predecisional state as "motivation" and the postdecisional state as "volition." Motivation encompasses all processes related to deliberation on incentives and expectancies for the purpose of choosing between alternative goals and the implied courses of action. The motivational state of mind is terminated with the making of a decision, a more or less conscious event that launches the individual into the volitional state of mind.

Volition entails consideration of when and how to act for the purpose of implementing the intended course of action. Deliberative issues, such as whether it would be worthwhile to pursue a particular goal as opposed to an alternative goal, or whether the achievement of a particular goal could bring about the desired incentives, are disregarded in favor of concerns with the proper implementation of the decision made. Moreover, it is assumed that once a decision is made, further deliberative reflection is precluded—a principle that Julius Caesar is said to have succinctly expressed with the words "Alea iacta est," as he initiated civil war in crossing the Rubicon with his legions. That is, the transition from the motivational state of deliberation to the volitional state of implementation implies a qualitative leap with respect to an individual's cognitive functioning.

Subscribing to a straightforward functionalist point of view, we contend that the predecisional state of motivation involves a deliberative orientation and, therefore, requires an accurate view of reality in order to properly weigh the incentives and correctly estimate the probabilities of success and failure. In contrast, the postdecisional state of volition necessitates an implementation orientation, focused on how and when to bring about the intended goal. Accordingly, thought contents and mode of information processing are expected to differ for each of these states of mind. Prior to a decision, a preoccupation with goal-related incentives and probabilities of goal attainment should predominate, guided by a receptiveness to a broad range of information that is probed in an impartial manner. After a decision has been made, however, a preoccupation with the intended goal and, therefore, a selective orientation toward how to achieve this goal should come to the fore, thus turning people into narrow-minded partisans of their plans of action.

In order to experimentally test these ideas, it was necessary to develop a paradigm that juxtaposed a predicisional and postdecisional state under

ceteris-paribus conditions, such that subjects in both experimental conditions felt that they were attempting to solve the same task. In addition, this paradigm needed to meet the following demands: The task to be performed by subjects had to involve the making of a decision, and the outcome of having solved the task had to be important enough for subjects to make them ponder this decision; moreover, the moment the decision was made had to be controllable by the experimenter in order to randomly assign some subjects to the predecisional state and others to a postdecisional state.

The following paradigm fully satisfies these requirements: Subjects are told that their creativity will be measured. For this purpose, two different test materials are prepared. Subjects are asked to inspect both test materials and to choose the type of test material that is best suited to reveal their personal creative potential. For some subjects, a short interruption of the experiment just prior to choosing one of the two test materials is arranged, whereas for other subjects this interruption occurs shortly after their having made a choice.

All studies to be reported employed this paradigm. We used the waiting periods created by the interruptions to probe into subjects' momentary cognitive functioning. In the first study, subjects were asked to report the conscious contents of their stream of thought experienced just prior to these interruptions. In the second study, a structural feature of cognitive functioning, receptivity for new information, was examined by asking subjects to take a test of short-term memory span for nouns. In a further study, these waiting periods were filled by having subjects solve simple arithmetic tasks.

STUDY 1: THOUGHT CONTENTS

Overview and Design

In the first study, half of the subjects had to make a choice between two available test materials allegedly designed to measure creativity. They were interrupted either prior to or shortly after making this choice; all subjects were asked to report on the thoughts they had experienced just prior to the interruption.

The remaining subjects were not required to make a choice, but rather were simply assigned to one of the two test materials. As with the first half of the subjects, they were asked to report on the thoughts they experienced immediately before the interruption, which occurred either prior to or following the assignment. Accordingly, the experiment follows a 2(pre vs. post) × 2(choice vs. assignment) factorial design.

It was expected that thought contents would reflect the respective states associated with having to make a decision and having made a decision, i.e.,

the motivational state and the volitional state. That is, prior to a decision, thought contents should entail issues such as weighing the incentive value of one as compared to the other test material, or assessing the extent to which one will be successful with a particular test material. In the postdecisional state of volition, deliberative thoughts should vanish and concerns with how to solve the upcoming creativity test should come to the fore.

In addition, we predicted that those subjects waiting to be assigned to one of the two available test materials would not engage in deliberative thoughts. However, concerns about how to solve the creativity test were expected to be evident not only in postdecisional subjects who had been given the opportunity to choose a test material but also with subjects who had simply been assigned to one of the two test materials.

Method

Subjects and Equipment. Eighty-two female university students with different majors were invited to participate in the present study and were paid for their participation. Upon arrival at the laboratory, subjects were ushered into separate experimental cubicles, where they received tape-recorded instructions via an intercom system. Each cubicle was equipped with a TV monitor and a small switchboard on which a red and a green light and a square and a round button were mounted. The red light was switched on when subjects entered the cubicle.

Procedure. In all conditions, subjects were told that two personality traits, social sensitivity and creativity, would be assessed during the course of the experiment. The female experimenter further explained that two alternative test materials had been prepared in order to measure each of the two traits. She stated that half of the subjects would be allowed to choose between test materials, whereas the other half would simply be assigned to one of the two available test materials. In this way, it was said to be possible to find an answer to the central question of the study, that is, whether people can improve their test scores when they are given a chance to choose test materials that most appeal to them.

The first trait measured was social sensitivity. The experimenter confronted subjects with short descriptions of two interpersonal conflicts that differed in content: a marital problem and a conflict between friends of the same sex. Subjects were asked first to select the problem they personally found most engaging and then to suggest an appropriate solution to the conflict by writing a short essay. In addition, subjects were told that they would receive feedback concerning the usefulness of their suggested solutions at a later time.

After subjects had finished working on the social sensitivity problem they had chosen, the experimenter explained that the next trait to be measured was creativity. On the basis of a series of seemingly unrelated pictures, a

creative story was to be composed, placing these pictures into a cohesive, meaningful course of action. It was stated that two different sets of pictures were available for this task, one set consisting of rather drab black-and-white pictures showing little detail, and the other set consisting of rather gorgeous color pictures containing many details.

In the *choice condition*, the experimenter then explained that sample pictures would first be shown (6 black-and-white pictures, 6 color pictures). Subjects were told to scrutinize these pictures in order to discern which type of pictures, i.e., color or black-and-white, would best bring out their creative potential in composing a story. However, subjects were instructed to refrain from making a choice of test material while viewing the sample pictures. Impulsive choices, as well as choices based only on initial preferences, were said to have proven problematic. Therefore, subjects should take their time, lean back, and ponder over the best choice. The experimenter explained that some time after the sample pictures have been shown the red light on the switchboard would go off and the green light would come on. At this point, subjects would finally have to make up their minds on what type of test material (color pictures or black-and-white pictures) they preferred.

Shortly before viewing the sample pictures, subjects were given feedback with respect to the quality of their performance on the social sensitivity test. All subjects were given feedback indicating that if they had chosen the alternative test material their score would have been higher than the average score achieved. This feedback, along with instructions to refrain from impulsive choices, was given for the sole purpose of reducing the likelihood of snap judgments in choosing test materials.

Subjects were then shown the sample pictures on the TV monitor. In the *predecisional condition*, the experimenter waited for 90 seconds after the last sample pictures had been shown. Then she reported back to the subjects and explained that the experiment would have to be interrupted for a couple of minutes. During this waiting period, subjects were asked to busy themselves with filling out a self-report sheet that the experimenter immediately brought to each subject's cubicle. This self-report sheet was designed to probe into subjects' thoughts experienced from the time that the last sample picture had been viewed until the time when the experimenter interrupted the experiment. The format was as follows: Subjects *first* reported their *most* recent thought, then the second most recent thought, thereafter the first thought that came to their minds after viewing the last sample picture, and finally, everything they had thought of in between. After subjects had completed the thought-sampling questionnaire, the green light on the switchboard was turned on, and subjects were told to make up their minds for either color pictures (press round push button) or black-and-white pictures (press square push button). The experimenter recorded the subjects' decisions and terminated the experiment. Subjects were then thoroughly debriefed and paid for their participation.

In the *postdecisional condition*, the experimenter also waited for 90 seconds after the last sample picture had been shown. Then she turned on the green light and reported back to the subjects with the instruction to make their choice of test material. After subjects had indicated their choices, the experimenter explained that the type of pictures selected would appear on the subject's TV monitor as soon as possible so subjects could start composing creative stories. The experimenter again waited for 90 seconds and then announced that a short interruption of the experiment was necessary. Subjects were asked to fill out the thought-sampling self-report sheet during the waiting period. However, subjects were instructed to report the thoughts they had experienced from the time that they had indicated their choice of test material up to the point of interruption. After subjects had finished working on the questionaire, the experiment was terminated.

The course of events in the *assignment condition* mirrored that of the choice condition. However, subjects were not instructed to choose between black-and-white pictures and color pictures but rather were told that they would be assigned to one of the two types of test material. In the *preassignment condition*, subjects were asked to report the thoughts they had experienced prior to the assignment of the test material (yoked to the choice made by the predecisional subjects). Subjects in the *postassignment condition* were asked to report the thoughts experienced just after having been assigned to the test material (yoked to the choices made by the postdecisional subjects).

Data Scoring. Subjects' reported thoughts were scored by two independent raters with respect to the incidence of motivational, volitional, or other (task-irrelevant) contents in response to the four questions of the thought-sampling self-report sheet. The categories of thought contents are defined in Table I. Each category could be checked a maximum of four times per subject. Agreement among raters was determined by counting the number of "hits," defined as classifications on which the two raters agreed. Interrater reliability was quite high, for 97% percent of all the rating made were hits.

Results

Motivational Thought Contents. The three variables—incentive value, action-outcome expectancy, and metamotivation—were combined to form an index of motivational thought contents. A 2(pre vs. post) × 2(choice vs. assignment) ANOVA revealed a significant interaction effect ($F(1, 78) = 21.0$, $p < .001$). Whereas the highest mean frequency of motivational thoughts was observed for predecisional subjects ($M = 3.34$), the lowest mean frequency of motivational thoughts was found for postdecisional subjects ($M = .79$; $t(78) = 7.5$, $p < .001$). For both assignment groups—

Table I. Scoring Key for Thought Contents

Motivational thought contents
- Incentive value
  - Deliberation on the incentive value of one or the other test material (e.g., "Color pictures have more appeal").
- Action-outcome expectancy
  - Deliberation on the extent to which one will be successful with a particular test material (e.g., "My fantasy will be best aroused by the black-and-white material").
- Metamotivation
  - Control processes such as the following: An expressed need to clarify matters or to terminate deliberation; all directives or explicit questions referring to deliberation (e.g., "How do I arrive at a decision?" "What was my impression of the color pictures?" "Which pictures appeal to me most?"); a critical attitude toward an intuitive preference for one of the two types of material; becoming aware of one's biases; the intention to apply certain strategies in order to arrive at a decision (e.g., "I am going to return all the pictures in my mind once again"); particular doubts about the sufficiency of the informational basis; and, finally, any attempts to summarize the attained state of deliberation.

Volitional thought contents
- Instrumental procedures in composing stories
  - Considerations of, and expressed intentions about, what stories should be told and how the stories should be told. Also, expressed desires (e.g., "I want to give my stories a sense of humor") as well as apprehensions (e.g., "I am so easily taken in by commonplace plots") with respect to performing the task of writing a creative story.

Task irrelevant thought contents
- Thoughts about the purpose of the experiment
  - Consideration of how seriously the experiment should be taken; thoughts about the experimenter, other subjects, payment of subjects, or psychology at large; concerns with what one would tell others about the experiment.
- Thoughts stimulated by sense perceptions
  - Thoughts elicited by the pictures viewed or by perceptions of the surrounding environment (e.g., the cubicle or the appearance and behavior of the experimenter).
- Unfinished business
  - Ruminations about the negative feedback received, with respect to individual performance on the test of social sensitivity; irrelevant intentions and plans of action as well as the recalling of autobiographical episodes unrelated to the given task situation.
- Moods and states of need
  - Momentary moods (e.g., boredom, exhaustion) and primary needs (e.g., hunger, thirst).

preassignment subjects ($M = 1.11$) as well as postassignment subjects ($M = .84$)—low mean frequencies of motivational thoughts were observed that did not differ from each other significantly, ($t(78) = .72$, n.s.). However, contrasting each of these groups to the predecisional group revealed highly significant differences (t's$(78) > 6.3$, p's $< .001$). Thus, the observed interaction effect is due to the predecisional subjects' high frequency of motivational thoughts. This pattern of data also led to a significant main effect of the factor choice versus assignment ($F(1, 78) = 19.3$, $p < .001$), and the factor pre versus post ($F(1, 78) = 35.8$, $p < .001$). As can be seen from Table II, the same pattern of data was found for all three variables composing the index of motivational thought.

Table II. Mean Frequencies of Motivational, Volitional and Irrelevant Thought Contents[a]

	Choice		Assignment	
Thought contents	Pre	Post	Pre	Post
Motivational thoughts	3.34	.79	1.11	.84
Incentive value	1.16	.34	.58	.42
Action-outcome expectancy	1.27	.27	.40	.37
Metamotivation	.91	.18	.13	.05
Volitional thoughts	.05	.30	.18	.37
Task-irrelevant thoughts	1.30	2.57	3.21	3.60
Purpose of experiment	.25	.73	.95	.92
Sense perceptions	.48	.45	.87	1.21
Unfinished business	.43	1.02	.95	1.29
Moods and states of need	.14	.36	.45	.24

[a]The higher the score, the more incidences of thoughts with the respective content were observed.

Volitional Thought Contents. Computing a 2 × 2 ANOVA on this variable revealed a significant main effect of the prior-post manipulation ($F(1, 78) = 5.38$, $p < .03$), thus indicating that subjects who had already chosen a test material or had already been assigned to it ($M = .33$) reported more thoughts concerned with *how* to write a creative story than subjects who had not yet made a choice or who were waiting to be assigned to a test material ($M = .11$). The main effect of the factor choice versus assignment did not reach statistical significance ($F(1, 78) = 1.25$, n.s.). The same was true of the interaction effect ($F < 1.0$).

Task-Irrelevant Thought Contents. Thoughts about the purpose of the experiment or unfinished business, and thoughts elicited from moods, need states, or sense perceptions were combined to form an index of task-irrelevant thought contents. Subjecting this variable to a 2 × 2 ANOVA revealed a highly significant main effect of the choice versus assignment manipulation ($F1, 78) = 14.7$, $p < .001$), pointing to the fact that being assigned to a test material ($M = 3.43$) promotes more irrelevant thoughts than being allowed to choose between test materials ($M = 1.93$). In addition, a significant main effect of the pre versus post manipulation was observed ($F(1, 78) = 5.21$, $p < .04$), indicating that the period following the choice of or the assignment to test material was filled with more irrelevant thoughts ($M = 3.07$) than the period preceding these events ($M = 2.18$). The interaction effect did not reach statistical significance ($F < 1.2$).

Further Analyses. A three-factorial ANOVA was also conducted with the pre versus post manipulation and the choice versus assignment manipulation as between factors and the three categories of thought contents (motivational, volitional, task-irrelevant) as a within factor. As expected, the three-way interaction effect, as well as both two-way interaction effects with this

within factor (pre vs. post × thought content, choice vs. assignment × thought content), was highly significant (p's $< .001$). In addition, a significant main effect for category of thought content was found ($F(1, 78) = 92.2$, $p < .001$). Task-irrelevant thoughts ($M = 2.63$) and motivational thoughts ($M = 1.56$) were the most frequent; compared to these two types of thoughts, volitional thoughts ($M = .22$) were much less frequent (t's$(81) > 7.1$, p's $< .001$). However, neither the main effects nor the interaction effect of the two between factors reached statistical significance, indicating that subjects in the four experimental conditions overall reported about the same amount of thoughts.

Discussion

Our retrospective probes into the spontaneous stream of conscious thought were applied to time intervals of 90 seconds in which a motivational or a volitional state of mind had been previously established. The frequency patterns of both motivational and volitional thoughts fully confirmed our postulates concerning motivational versus volitional states of mind. Subjects engaged in motivational thoughts (such as weighing incentive values and action-outcome expectancies of alternative courses of action, or controlling these deliberations through metamotivational thoughts) whenever they were given the opportunity to choose materials freely and were still in the process of making a decision. Whenever one of these two conditions was lacking, i.e., when subjects expected that the decision would be made by others (preassignment condition), or when the decision had already been made by either oneself (postdecisional condition) or others (postassignment condition), motivational thoughts declined in frequency, as compared to volitional and task-irrelevant thought contents. In the approach to a decision, however, motivational thoughts preoccupy a person's consciousness and displace or suppress procedural thoughts, as well as task-irrelevant thoughts.

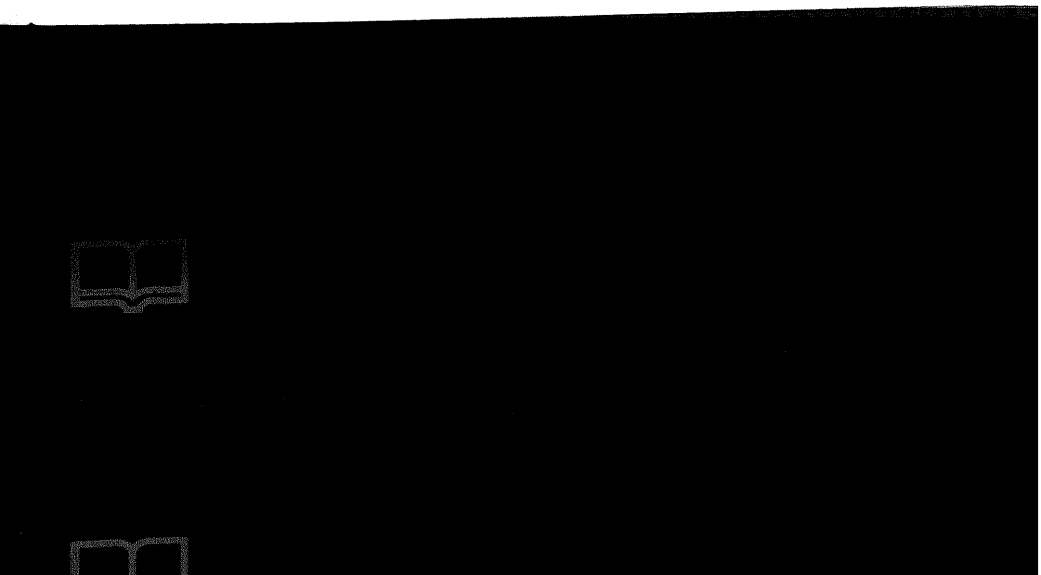
The three variables of motivational thought content deserve some comment. As Table II shows, the two main variables of motivational theories, incentive value and action-outcome expectancy, predominated in frequency, even though our experimental paradigm was not particularly suited to the arousal of incentive-related concerns. Since the category of incentive values referred, in our paradigm, only to the types of test material, i.e., only to means and not to goals as options, it is conceivable that incentive values related to conflicting goal options would have resulted in an even greater prominence of incentive-related concerns within the motivational state of mind. Noteworthy is also the frequent incidence of metamotivational thoughts controlling the motivational processes of decision making on choice of test material. This may have been due, in part, to the emphasis that the experimenter had placed upon the importance of making a correct decision.

As expected from taking a functionalist point of view, volitional thoughts became significantly more frequent after a decision had been made. In anticipation of performing the announced task, subjects mentally prepared themselves by considering how best to proceed with the test material at hand. Whether this volitional state of mind had been attained by having made the decision oneself or by having been assigned to one of the two types of test material made no difference. In either case, subjects evidently experienced an impending necessity to act, which led to a volitional state of mind.

Although motivational thought contents dominated subjects' stream of thought in the predecisional condition, our results revealed that subjects in all of the other conditions experienced at least some motivational thoughts. At first glance, such results might be surprising; they can, however, be readily explained by considering the nature of the task employed. Apparently, by presenting subjects with a task that involved composing a story from a series of pictures to be viewed later on, we selected a task that required little prior planning in terms of procedural thoughts. As a result, a "vacuum" to be filled with nonprocedural thoughts should have existed.

Since even postdecisional subjects engaged in relatively little procedural thought, it seems justified to assume that the capacity still available for other concerns was quite extensive. As our data revealed, this "vacuum" was primarily filled with task-irrelevant thoughts. But, this vacuum should also have allowed for the occurrence of motivational thoughts. It therefore seems possible that subjects continued pondering their decision at least during the initial stage of the postdecisional period. Similarly, subjects in the postassignment condition also had more than enough time to think about matters unrelated to procedural issues: for preassignment subjects this was even more true, since they did not yet know with which type of test material they were to work. Accordingly, for both of these conditions, there was sufficient capacity left for nonprocedural thoughts, which subjects primarily filled with thoughts about task-irrelevant issues. However, the expectation that one will be assigned to a particular test material or the experience of having been assigned to one of two possible test materials should raise at least a momentary concern with the question of whether one or the other test material is better suited to the expression of one's personal creative potential.

As with any introspective data, it is conceivable that subjects told us more than they could possibly have known (Nisbett & Wilson, 1977). That is, subjects might not have been able to remember the thoughts experienced, and therefore they invented "new" thoughts when filling out the thought-sampling self-report sheet. Fortunately, we were in a position to check whether such was the case. Since the first item on the self-report sheet required that subjects write down the last thought experienced prior to the interruption, they should have had little difficulty in recalling this thought, for it could simply be retrieved from short-term memory. The thoughts reported for the first



item, therefore, provide a "baseline" by which to determine the relative validity of the thoughts reported for the other three items. However, the pattern of results with respect to the last thought experienced prior to the interruption showed that it did not differ from the data patterns observed for the less recent thoughts. Therefore, one can confidently rule out the possibility that subjects' reported less recent thoughts might be infiltrated with invented thoughts, rather than solely reflecting the experienced flow of thought.

STUDY 2: MEMORY SPAN

Overview and Design

The guiding hypothesis of the second experiment was the same as in Study 1; that is, we postulated that motivational and volitional states of mind affect a person's cognitive functioning differently. However, whereas the first study probed into the content of people's spontaneous stream of thought, the second experiment was designed to examine people's general receptivity for incoming information, an important structural feature of information processing. We hypothesized that people in a motivational state should be more receptive to new information and oriented toward a wider gathering of such information than people in a volitional state. To test this prediction, subjects' memory span for one-syllable nouns was assessed following the establishment of a motivational or volitional state of mind.

The same paradigm as in Study 1 was used, with only slight modifications in the design. First, for all subjects, a baseline measure of memory span was secured at the beginning of the experiment. Second, we did not apply the assignment condition but instead added a control group and a further postdecisional group to the predecisional and postdecisional group of subjects, thus yielding four conditions to which subjects were randomly assigned.

Method

Subjects, Equipment, and Test Material. Sixty-four female university students, all under 30 years of age, served as participants and received remuneration. Upon arrival at the laboratory, subjects were directed to separate cubicles, equipped as in Study 1. Taped instructions were administered over an intercom system.

In order to make a baseline assessment of short-term memory span, a set of lists of words was prepared. The first two lists contained five one-syllable nouns, the two middle lists six nouns, and the last lists seven nouns. (To avoid ceiling or bottom effects, we conducted a pilot study to determine the

number of words per list that was most appropriate for our sample of college students. All of the pilot subjects were able to correctly memorize four-word lists, whereas none of them succeeded with eight-word lists. Therefore, we provided subjects with word lists that varied in length from five to seven words.) Approximately two-thirds of the words had a concrete meaning (e.g., *house*, *tree*), and one-third an abstract meaning (e.g., *art*, *fate*). All words employed were unrelated to the task of choosing a particular test material for the purpose of composing a creative story. For the second assessment of short-term memory span, three entire sets of word lists (arranged like the set used for baseline assessment) were used.

Procedure. First, all subjects were informed by a female experimenter that interruptions would occur during the course of the experiment. She explained that the waiting periods caused by these interruptions would be employed for the completion of a memory test.

In order to familiarize subjects with the memory test, as well as attain baseline data, a brief practice testing session was conducted before the actual experiment began. The experimenter slowly read off a list of words and immediately thereafter signaled subjects to write all of these words in the order presented. Six lists were read to subjects, the first two lists containing five words, the second two lists six words, and the last two lists seven words.

Upon completion of the memory test, the experimenter read subjects the instructions of Study 1. As in Study 1, *predecisional* subjects were interrupted prior to making a choice for one of the two materials. However, unlike Study 1, subjects were not instructed to report on the thoughts they had experienced prior to the disruption. Rather, further lists of words were read to subjects, with the instruction to write them down in the order presented. The lists were presented in the following sequence: Two lists of five words were followed by two lists of six words, which were followed by two lists of seven words: Upon completion thereof, a second set of word lists was read to subjects according to the format described above.

Postdecisional subjects were interrupted after they had made a decision for one of the two test materials. However, as with the predecisional subjects, the resulting waiting period was employed for completion of the memory test. In a further postdecisional condition, the *activated intent* condition, subjects received additional instructions before the lists of words were read to them. The experimenter explained that creative performances of high quality depend greatly on a person's frame of mind, that is, on whether one feels active and attentive. She stated that the performance of memory tasks such as those prepared facilitates the acquisition of a frame of mind that is most conducive to creative performance. It was further explained that some people need to solve many, others only a few memory tasks in order to induce the mood. However, subjects were advised that solving too many tasks could also cause one to surpass or move beyond the ideal frame of mind

for creative endeavors. The experimenter instructed subjects to pay attention to their mood while working on the memory tasks. As soon as they felt they had reached the proper mood for creative achievements, they were told to signal the experimenter. The experimenter would then terminate the memory tasks and begin with the creativity test.

Subjects in the *activated intent* condition varied widely with respect to when they wanted the memory tasks to be stopped. Some objects wanted to move on to the creativity test after only 4 lists of words had been read to them, whereas others tried to recall as many as 17 lists of words. The number of lists presented in the other conditions was yoked to the number of lists on which subjects chose to work in the activated-intent condition.

The activated-intent condition was added in order to determine what effect reflecting on the question of *when* to perform a chosen task has on a person's receptivity to incoming information. Postdecisional subjects engaged in such reflection are thus occupied with a second task in addition to storing word lists in short-term memory. Accordingly, we expected a comparatively smaller short-term memory span.

Finally, a group of subjects was assigned to a control condition, in which the interruption occurred rather early in the course of the experiment. That is, control subjects were provided only with the information that two personality traits, social sensitivity and creativity, would be assessed; that two alternative test materials had been prepared for measuring each of these traits; and that half of the subjects would be allowed to choose between test materials, whereas the other half would simply be assigned to one of the test materials. Thereafter, subjects were interrupted, and the waiting period caused by this interruption was used to administer the short-term memory test.

Data Scoring. Subjects' short-term memory span was determined via a procedure described by Woodworth and Schlosberg (1954, p. 696). Consider the case where four five-word lists, four six-word lists, and three seven-word lists are read to the subjects. If the subject correctly recalls all of the five-word lists, two of the six-word lists, and one of the seven-word lists, the attained memory span score is $5 + \frac{1}{2} + \frac{1}{3} = 5.83$. This procedure was followed for the baseline assessment, as well as the critical second measurement, thus providing us with a baseline score and a critical score of short-term memory span.

Results

As depicted in Figure 1, predecisional subjects showed an increased short-term memory span on the second, critical assessment, as compared to baseline scores. No such enhancement effects were found with the other groups of subjects. To test the statistical significance of this data pattern, two dif-

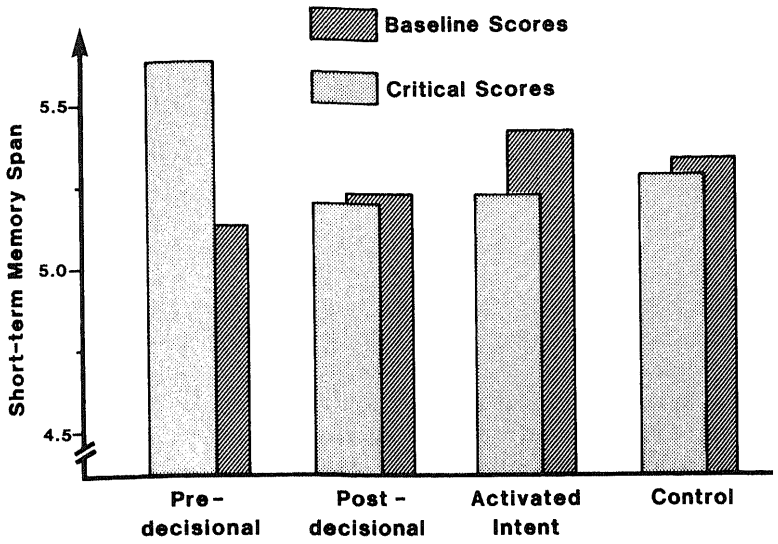


Fig. 1. Short-term memory span in predecisional, postdecisional and activated intent subjects.

ferent analyses were conducted. First, an analysis of covariance was computed that treated the baseline scores of short-term memory span as a covariate. The baseline scores correlated positively with the critical assessment of memory span ($r = .54$, $p < .001$); baseline scores did not differ significantly across conditions ($F(3, 59) = .45$, $p = .72$). The analysis of covariance revealed a significant overall F score ($F(3, 59) = 2.93$, $p < .05$). Follow-up contrasts showed that the memory span scores for predecisional subjects were significantly higher than those for postdecisional subjects, activated-intent subjects, or control subjects (all p's $< .05$). For all of these contrasts, memory span scores were corrected for baseline scores.

Second, we computed a 2×4 ANOVA that treated the point of time for the assessment of memory span (baseline vs. critical assessment) as a within factor. As expected, a significant interaction effect emerged ($F(3, 60) = 3.26$, $p < .03$). Contrasting the predecisional condition with each of the other three conditions by computing three separate 2(baseline vs. critical assessment) $\times$ 2(predecisional vs. other condition) ANOVAs revealed significant interaction effects for each analysis (all F's$(1, 30) \geq 4.15$, $p \leq .05$). Contrasting the critical scores for each condition with the baseline scores also indicates that the interaction is due to the predecisional subjects' increase in memory span. For the predecisional subjects, critical scores ($M = 5.63$) were significantly higher than baseline scores ($M = 5.13$; $t(15) = 2.60$, p

$< .02$). Activated-intent subjects showed slightly lower critical scores ($M = 5.22$) than baseline scores ($M = 5.41$); this difference did not reach statistical significance ($t(15) = 1.2, p < .25$). For postdecisional subjects, baseline scores ($M = 5.22$) were nearly identical to critical scores ($M = 5.21$); the same was true for control subjects ($M = 5.34$ vs. $M = 5.29$).

Discussion

In the present study, we explored a structural feature of information receptivity when being in a motivational as compared to a volitional state of mind. Most noteworthy is the greater receptivity for incoming information while in a motivational state of mind. As a test for sheer breadth of receptivity to incoming information, memory-span tasks composed of lists of unrelated nouns were employed, since they appeared most appropriate, for they require the storage of rather large amounts of new information.

Memory span for one-syllable nouns increased after subjects had moved from the ordinary test situation (testing session for baseline data) into the motivational state associated with a predecisional condition. In addition, memory span was greater for predecisional than for postdecisional subjects, that is, higher in the motivational as compared to the volitional state of mind. These differences imply that the two states of mind experimentally induced are not elusive but rather stable phenomena. They do not vanish when other activities, such as a test procedure to assess memory span, are interspersed.

The intent to tell creative stories based upon a certain type of test material was further activated by instructing subjects to wait until the critical mood for writing stories had developed before engaging in the task at hand. The data of the activated-intent condition, however, did not sustain the expected diminution of memory span. Further research will have to explore the question of why the activated intent did not significantly impair short-term memory span. One explanation may be that the degree of intent activation was not sufficient enough to substantially increase subjects' mental load. In addition, it cannot be ruled out that contemplating on whether the critical mood is established, being essentially a deliberational type of problem, could counter the prevailing volitional state, thus annulling any impairing effects.

Receptiveness to incoming information is only one basic feature of cognitive functioning, that is, the pickup and storage of information in short-term memory. Of particular importance is whether further stages of information processing are also facilitated by a motivational, as compared to a volitional state of mind. In the event that the processing of information in

working memory should also benefit from a motivational state of mind, people in such a state of mind should be better prepared to execute mental operations of the problem-solving type than people in a volitional state of mind – a conclusion we find difficult to accept.

It might be suggested that predecisional subjects' superior performance on the memory-span tasks may be rooted in an increase of nonspecific activation caused by the disruption of a motivational state of mind. However, this line of reasoning is rather questionable since a nonspecific activation explanation would also imply that memory span should increase for the activated-intent group. Such was not observed, however. In addition, the results of a further study conducted did not support a nonspecific activation explanation.

In this study, we chose overlearned mental operations with some demand on short-term memory storage. We figured that the performance of highly routinized and nearly informationless mental tasks, such as simple arithmetic tasks, should profit from an increased level of activation. Accordingly, if performance on such tasks is not facilitated when these tasks are solved within a motivational state of mind, a nonspecific activation effect is less likely. The design of the study was the same as in Study 2. Instead of memorizing strings of words, however, subjects solved arithmetic problems (Duker, 1949). In order to provide baseline data, male and female high school students (16 to 19 years of age) were first asked to solve as many problems as possible within an 8-minute time period. Each problem task consisted of two lines of three single digits, with one line placed above the other. Whenever the sum of the top line was larger than the sum of the lower line, the subject was instructed to subtract the sums; when the reverse was true, the subject was to add the two sums.

Our results did not reveal any significant differences in performance between conditions. Partialing out the time spent working on tasks, or partialing out arithmetic proficiency, did not change the null result. Apparently, nonspecific activation is not a likely candidate for having produced the increase in memory span found for predecisional subjects in Study 2. Therefore, we are inclined to interpret the superior memory span as reflective of an increased receptivity to incoming information in a motivational state. However, this interpretation warrants further exploration that employs tasks putting demands on short-term memory and subsequent operations of information processing, that is, tasks that draw on working memory. Asking subjects to recall word lists backwards or employing perceptual tasks involving width of attention, such as the central-incidental task (Lane & Pearson, 1982) or the dual-task technique, qualify as appropriate tasks for such further explorations.

GENERAL DISCUSSION

We have found considerable evidence in support of the assumption that decision making demarcates a Rubicon-type transition from a "motivational" to a "volitional" state of mind. As expected, a motivational state of mind could be established under the predecisional but not under the preassignment condition. In *predecisional phases*, subjects' spontaneous stream of thought centered on such motivational issues as value and expectancy aspects of alternative courses of action: What is the most valuable action goal, or what is the likelihood of a particular course of events, or what are the particular outcomes of one's endeavors? Anticipating what will happen should one choose to become actively involved, assessing future realities, weighing possibilities for acting in order to reach a resolution—all are characteristic of a motivational state of mind. Subjects' flow of conscious thought was found to be intermixed with a high frequency of diverse metamotivational concerns, providing for a more realistic orientation throughout the deliberative phase, as well as for effective preparation of an eventual future action. Receptivity to incoming information was, as our memory-span data suggest, enhanced. Although sufficient experimental evidence has yet to be gathered, we would like to suggest that the reality orientation intrinsic to a motivational state makes for an impartial open-mindedness, perhaps going so far as to process discouraging information as completely and correctly as encouraging information.

In *postdecisional phases,* the probes into subjects' stream of thought revealed the predicted radical change in focus of concern. Once a decision or assignment had been made, the succeeding spontaneous thoughts were concerned with the implementation of the intended course of action. The contemplation of incentive value and probability of success for alternative courses of action had lost its appeal in favor of immediate procedural considerations. Subjects were not inclined to resume motivational thoughts after having entered the postdecisional phase, even though they were never actually given the opportunity to translate procedural considerations into a concrete course of action. Rather, subjects' conscious flow of thoughts turned to other concerns, particularly unfinished business and sense perceptions (task-irrelevant thoughts).

A volitional state of mind, however, was created not only in the postdecisional but also in the postassignment condition. Thus, in order to establish volitional concerns, it apparently is not important whether the resolution to engage in a certain course of actions has come about through having made one's own decision or through having been assigned to a course of action by others. Rather, what matters is that one feels called upon to implement a certain goal, regardless of whether it is chosen or assigned.

Both *preassignment* and *postassignment phases* stood out by high frequencies of task-irrelevant thoughts. To the extent that the rare motivational or volitional thoughts did not require a full mental load, thoughts irrelevant to the task at hand were elicited by external or internal cues and interspersed within the stream of conscious thought. Irrelevant thoughts related to unfinished business, sense perceptions, or the purpose of the experiment were the most prevalent.

The latter finding makes one wonder how many irrelevant thoughts are created in the typical psychological experiment in which human subjects are treated as compliant organisms that are simply assigned to experimental tasks *ad libitum*. Therefore, experimenters seeking subjects whose thoughts are devoted solely to the task presented are well advised to refrain from assigning their subjects to a particular treatment or task. Instead, subjects should be given the opportunity to choose freely among alternatives, so as to place them into a motivational state of mind before launching them into a genuine volitional state (cf. Heckhausen, Boteram, & Fisch, 1970).

Predecisional processes essentially embrace the issues that psychology of "human motivation" has been investigating for the last half century, and postdecisional processes generally encompass the abandoned problems of a pre-Lewinian "psychology of the will." However, it is now time to put the two halves, "motivation" and "volition", together and regard both as one sequence within an overarching unit of the behavioral stream. The results gathered here are only a suggestive first step in discerning the precise nature of these two successive states of mind. Further studies are needed to demonstrate, among other things, the impartiality of motivational-state processes as compared to the enactment-prone bias of volitional-state processes. An apparent strength of the cognitive functioning of one of the two states, such as a greater receptivity to incoming information while in a motivational state, could actually turn into a functional handicap when in operation in a state to which it does not belong. However, it seems wise to show some hesitation with respect to a premature exaggeration in juxtaposing the two states of mind, since both states presumably rest on the full potential of identical basic processes of cognitive functioning. The equal performance on overlearned arithmetic tasks in both states of mind gave a first clue in this direction.

Still, the evidence gathered in the present studies is suggestive of a clear distinction between motivational and volitional states of mind, with respect to the stream of spontaneous thought as well as the patterns of cognitive functioning. Our forays into information processing have been rather crude in nature, for we have yet to explore more subtle processes, such as the processing of state-relevant or state-irrelevant, consonant or dissonant information. Nonetheless, we have established a definite difference between the

two states of mind with regard to the frequency of motivational versus volitional thought and the general breadth of receptivity to incoming information. The formation of an intent, and the associated transition from contemplating to enacting options, appears to represent a psychological Rubicon, a boundary line between different states of mind.

REFERENCES

Ach, N. (1905). *Über die Willenstätigkeit und das Denken.* Göttingen: Vandenhoeck & Ruprecht.

Ach, N. (1910). *Über den Willensakt und das Temperament.* Leipzig: Quelle & Meyer.

Atkinson, J. W. (1957). Motivational determinants of risk-taking behavior. *Psychological Review, 64,* 359-372.

Atkinson, J. W. (1964). *An introduction to motivation.* Princeton, New Jersey: Van Nostrand.

Atkinson, J. W., & Raynor, J. O. (Eds.). (1974). *Motivation and achievement.* Washington, D.C.: Winston.

Düker, H. (1949). Über ein Verfahren zur Untersuchung der psychischen Leistungsfähigkeit. *Psychologische Forschung, 23,* 10-24.

Feather, N. T. (Ed.). (1982). *Expectations and actions: Expectancy-value models in psychology.* Hillsdale, New Jersey: Erlbaum.

Heckhausen, H., Boteram, N., & Fisch, R. (1970). Attraktivitätsänderungen der Aufgabe nach Misserfolg: Kognitive Dissonanztheorie versus Leistungmotivationstheorie. *Psychologische Forschung, 33,* 208-222.

Heckhausen, H., & Kuhl, J. (1985). From wishes to action: The dead ends and short cuts on the long way to action. In M. Frese & J. Sabini (Eds.), *Goal-directed behavior: Psychological theory and research on action.* Hillsdale, New Jersey: Erlbaum.

Karabenick, S. A., & Yousseff, Z. I. (1968). Performance as a function of achievement level and perceived difficulty. *Journal of Personality and Social Psychology, 10,* 414-419.

Kuhl, J. (1983). *Motivation, Konflikt und Handlungskontrolle.* Berlin: Springer.

Lane, D. M., & Pearson, D. A. (1982). The development of selective attention. *Merrill-Palmer Quarterly, 28,* 317-337.

Locke, E. A. (1968). Toward a theory of task motivation and incentives. *Organizational Behavior and Human Performance, 3,* 157-189.

Nisbett, R. E., & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review, 84,* 231-259.

Woodworth, R. S., & Schlosberg, H. (1954). *Experimental psychology.* New York: Holt.