# COLLECTIVE REMEMBERING IN THE COMMUNICATIVE REGULATION OF GROUP ACTION
## A Functional Approach

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*Starting from a review of existing literature on collective or group memory, an action-theoretical approach to the study of verbal remembering in task-oriented groups is presented. Memory processes on the group level are part of group communication and as such are functionally related to the regulation of group action and achievement of group goals. This was investigated in a simulated group action situation: Nine structured 4-person groups managed a computer simulation game together. Task-related communication was subjected to content analysis to isolate memory utterances and collective memory processes, that is, sequences of thematically homogenous communicative references to past events. Different qualitative aspects of these collective memory processes (types of content) are investigated in relation to their function for ongoing action regulation.*

This study is concerned with describing how groups in an action situation reconstruct recent past events, situations, and actions in the medium of task-relevant verbal communication. To situate the theoretical perspective that serves as the basis for the study, existing literature on collective and group memory is reviewed. The literature is composed of contributions originating from very different research traditions.

Experimental research on group memory has existed since the 1950s and has traditionally focused on ad hoc groups using classical memory tasks; for example, comparing performance of groups and individuals on tasks such as learning nonsense syllables (Perlmutter & de Montmollin, 1952) or recalling stories (Perlmutter, 1953). More recent research has investigated recall and recognition of more complex and

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realistic material. However, the comparison between individual and group performance is still a main focus of interest (Vollrath, Sheppard, Hinsz, & Davis, 1989).

Research in applied contexts also exists. Stephenson, Brandstätter, and Wagner (1983) investigated individual and dyadic reconstructions of story material. They were interested in possible psycholegal consequences of their research. Dyads were found to produce more complete reproductions, exhibited more confidence in their reproductions than individuals did, and also produced more implicational errors (errors that do not contradict the original version). Subsequent research (reconstruction of a simulated police interrogation) found that confidence was greater for 4-person groups (Stephenson, Clark, & Wade, 1986) and also assessed the effect of professional motivation on performance (Stephenson, Kniveton, & Wagner, 1991).

In a recent review, Levine and Moreland (1990) emphasized the fact that small-group research is directed toward the practical concern of finding ways of enhancing group performance. This seems to be largely the case for research on group memory as well. Small-group research on group memory can be summarized as relying largely on laboratory experimentation using ad hoc groups and classical measures of memory performance. In these respects, it reflects the interests of small-group psychology and cognitive psychology of memory researchers. However, this empirical focus also reflects a deficit of theoretical work on the processes mediating group memory and, more seriously, on the very nature of group memory. Indeed, it is not clear in these studies what group memory is exactly. In this respect, group memory research differs very much from research on individual memory, where there exist very detailed models and theories on the nature of memory.

A notable exception to this is the work by Wegner, Giuliano, and Hertel (1985), in which both an explanation for the lack of theoretical inquiry and a theoretical framework for conceptualizing group memory are offered. Concerning the first point, the authors refer to the metaphor of the group mind, which was very popular among social theorists at the turn of the century (Durkheim, 1898/1924; Halbwachs, 1950). The idea consisted of speculation on quasi-mystical analogies between the workings of the individual mind and the functioning of groups. With the rise of individualism in social psychology, such ideas disappeared. The authors propose a somewhat similar notion to capture what they call "cognitive interdependence": the notion of a transactive memory system. The basic idea is that a group can be considered as a unit that is functionally equivalent to the individual concerning the encoding, organizing, and decoding of knowledge. Thus, a transactive memory system consists of a set of individual memory systems plus the transactive (i.e., communicative) processes occurring between these individuals. The result is a pool of knowledge that is potentially larger than that available to the individual members in isolation. This

notion, therefore, captures the essence of the idea of the group mind without its drawbacks because the group mind is embodied in communication processes between group members. A distinction between transactive structure and processes is also introduced. Transactive memory processes are communicative processes, and the authors distinguish between stages of transactive encoding, storage and modification, and retrieval. Concerning transactive memory structures, the authors distinguish between differentiated (i.e., unique knowledge) and integrated (i.e., shared knowledge) aspects of transactive structure. Subsequent experimental research (Wegner, Erber, & Raymond, 1991) was directed toward testing the effects of interference in established transactive memory structures on memory performance.

The transactive memory approach seems remarkable in several respects. First, it identifies communication as the medium in which the memory of a collectivity is implemented. This point is very important, for if one is to take the reality of a collective memory seriously, one must also be in a position to specify in what medium such processes exist. Thus, the transactive memory approach offers an ontology of collective memory. Another point is the emphasis on the fact that a transactive memory system evolves as a by-product of sustained and stable social interaction. If one accepts this, then it seems necessary to study group memory in natural rather than ad hoc groups. Indeed, a collective memory presupposes a common past or history (Halbwachs, 1950), and this is naturally not the case for an ad hoc group.

The transactive memory approach highlights the main benefit of an interpersonal distribution of knowledge: The group as a whole is potentially able to recall and use more information than any of its individual members. However, a number of studies derived from the so-called information sampling model shows that this is often not the case. Stasser and Titus (1985) propose a probabilistic model that predicts that groups may often fail to benefit adequately from pooling members' information because group discussion tends to focus on items of information shared among group members at the expense of unshared items. Some recent contributions from this paradigm emphasize the attribution of expert roles to group members as a means of reducing the sampling bias (Stasser, Stewart, & Wittenbaum, 1995). Dynamic aspects are also emphasized; for example, shared information tends to be discussed earlier than unshared information (Larson, Foster-Fisherman, & Keys, 1994).

The experimental, performance-oriented approach to group memory outlined above stands in marked contrast to a number of alternative approaches, which can be broadly labelled as social constructivist. These approaches can be divided into two main groups: approaches based on activity theory and discursive approaches (Stetsenko & Arievitch, 1997).

Activity theory approaches are based on the works of Vygotsky and his disciples (Leont'ev, 1981; Vygotsky, 1978). Although this is not the place to describe this approach at length, mention of some basic principles is in order. A main difference between activity-oriented and cognitive approaches is the unit of analysis. In activity theory, analysis does not consist of reducing a whole into constitutive elements, but rather into units that retain the essential features of the whole. Leont'ev (1981) distinguishes between different levels of analysis: activity, action, and operation. *Activities* are socially organized, stable units of behavior, which are composed of goal-directed actions, which themselves can be decomposed into operations (the means by which actions are accomplished). Activity thus has a hierarchical and multilevel structure. It is also important to recognize that these levels of analysis are not absolute but are dynamic. For example, an activity may lose its motivating force and become an action in the service of another activity, or an oft-performed routine of actions may become an operation.

Activity theory is a general theory. However, it has been applied to the study of memory by Zinchenko (1939/1983), who distinguishes between voluntary and involuntary memory. Voluntary memory can, in the terminology outlined above, be considered as an action directed toward the goal of remembering. In contrast to this, involuntary remembering occurs within the context of an action directed to some other goal than that of remembering. This distinction corresponds closely to the general distinction between action and operation proposed by Leont'ev. Other authors have applied this insight to research on memory. Meacham (1982) has argued that the theoretical framework of activity theory can be usefully applied to research on prospective memory (remembering to execute planned actions). Stevens (1988) used this framework to study the role of memory for the regulation of activity in a work setting.

However, the most meaningful application of activity theory in the present context is as a means to conceptualize the problem of collective or group memory. Indeed, because the theoretical entities postulated by activity theory are those of activity, action, and operation, activity theory is neutral regarding the nature of the acting system; for example, it is not intrinsically individualistic as is cognitive psychology. Activity theory thus provides a framework for integrating individual memory into overall collective activity. Recently, a number of authors have also suggested that remembering can be considered as a component of collective activity (Engeström, Brown, Engeström, & Koistinen, 1990; Hirst & Levine, 1985; Meacham, 1984). Meacham (1984) argues that intrapersonal remembering can be considered as a subroutine within the wider context of collective activity. Hirst and Levine (1985) point out that retrieval cues can be generated in the context of interpersonal discussion. However, merely recognizing that memory pro-

cesses of individuals are influenced by social cues and are part of a larger social context is missing the point. Indeed, one must also realize that the group per se also functions as a remembering unit and that the nature of the processes taking place at this level are not reducible to a concatenation of (albeit ecologically sensitive) cognitive processes of different individuals. Memory of a group is a qualitatively different phenomenon and takes place in a different medium. Memory processes on the collective level are implemented in the medium of communication between individuals.

If one accepts that memory processes on a collective level are qualitatively different from and irreducible to the study of individual memory and that the medium of these collective memory processes is interpersonal communication, then research on memory as it is manifested in verbal communication is needed. Discursive psychology (Harré & Gillett, 1994; Potter & Edwards, 1992) was developed partly on the basis of the Wittgensteinian insight that language is not to be understood as primarily constituting a means to represent reality, but as a kind of action. Correspondingly, the ontology of psychology from a discursive standpoint is not "things and events" but rather "speech acts" (Harré & Gillett, 1994, p. 29). Thus, discursive psychology has a radical constructivist component (Harré, 1989). However, even if one does not necessarily accept this thesis, the discursive approach offers some interesting insights into the nature of linguistic activity.

Discursive psychology has also been applied to the study of collective memory to emphasize the active nature of the reconstruction process (these studies usually speak of collective remembering rather than memory; see Edwards, Potter, & Middleton, 1992; Middleton & Edwards, 1990). Such approaches practice field research rather than experimentation. Manipulation of the group processes is reduced to a minimum; indeed, group members are often just asked to recount some event they all experienced together. Research methodology is very similar to that of conversational analysis (Atkinson & Heritage, 1984).

Middleton and Edwards (1990) present an overview of their research on conversational remembering. In one example, participants (students taking part in a research seminar) were asked to recall and discuss a movie that they all had seen recently. Analysis revealed that individual memory contributions are negotiated, evaluated, and validated in the context of conversation, all of this going toward constructing a version of what occurred. Conversational remembering is not restricted to an impartial reconstruction of the past; it is intermingled with personal reactions to the material remembered. The authors also hint at some kind of typology of remembering acts, such as overt agreement, requests for assistance, metacognitive formulations, ratifications, and so on. These results contribute to the plausibility of an account of collective remembering considered as a cooperative activity. Hirst and Manier (1996) have further developed such insights in their

research on autobiographical family remembering. The narrative task of remembering a past event is spontaneously distributed among family members according to different conversational roles. It was shown that although certain default roles exist, family members took on a variety of roles when contributing to the narrative.

Thus, it seems that research on memory in small, face-to-face groups can be roughly grouped into two different traditions. Small-group research on group memory is experimental in nature, using mainly ad hoc groups and classical measures of memory performance. Researchers are concerned with accuracy and performance, for example, the extent to which group processes affect group memory performance. There is less interest for theoretical considerations. Research on collective remembering issues from a social constructivist tradition is largely concerned with investigating natural groups in the field. Remembering tasks involve few or no preconstraints, consisting mainly of instructions to reminisce about some given topic. Analysis focuses on verbal transcripts in the effort to understand the dynamics of remembering as a collective activity; interest for accuracy is secondary. Research in this tradition is based on sophisticated theoretical considerations.

The present contribution is based on action theory, which is a research tradition of predominantly German origin (for English introductions, see Cranach & Harré, 1982; Cranach, Kalbermatten, Indermühle, & Gugler, 1982; Frese & Sabini, 1985; Frese & Zapf, 1994). Action theory is both historically and conceptually related to activity theory, but also retains the more Western influences of cognitive psychology and the psychology of control (Carver & Scheier, 1982; Miller, Galanter, & Pribram, 1960). In action theory, goal-directed action is described from two points of view: as a sequential process and as a hierarchically organized structure (Frese & Zapf, 1994).

Frese and Zapf (1994) describe the action process as being composed of the following steps: goal development, orientation, plan generation, decision, execution and monitoring, and processing of feedback. Frese and Zapf note that this is an ideal-typical model and that real actions do not always follow this orderly scheme. An action begins with the selection of a goal, although real-life actions (e.g., in a work setting) are defined as tasks: A task determines how an individual or group internalizes a part of an organization's overall goals. Orientation concerns processing of relevant environmental information. Plan generation and decision consist of specifying different ways of attaining a given goal or of completing a given task (e.g., by specifying subgoals to be attained) and choosing one of them. Execution involves initiating the implementation of the plan, monitoring progress, and terminating the implementation at the right moment. Processing of feedback is directed to evaluating progress toward attainment of the goal. The action process is of a cyclical nature (Tschan, 1995), and processing

feedback may lead to a second cycle of goal development, planning, and so on. Some authors have proposed slightly different models of action regulation; for example, Cranach et al. (1982) distinguish between phases of orientation, planning, execution, and evaluation.

The idea that action is hierarchically organized harks back to the test-operate-test-exit (TOTE) model of Miller et al. (1960). Like the activity-action-operation distinction of Leont'ev (1981), TOTE units can be considered relative to a specific level of analysis. There exists a distinction in action theory between different levels of action regulation: the intellectual level, the level of flexible action patterns, the sensorimotor level, and the heuristic level (Semmer & Frese, 1985). This classification corresponds to a more basic dimension of automatized skills versus abstract problem-solving processes.

The main applications of action theory are in the fields of work, organizational psychology (Frese & Zapf, 1994), and clinical psychology (Semmer & Frese, 1985). There also exist applications to the study of memory. For example, Oesterreich (1994) has presented a model of the use of memory in the regulation of simple motor actions. Prospective memory and the use of external aids has also been studied (Esser, 1996).

Action theory in its original formulation describes the goal-directed behavior of individuals. However, its basic principles and theoretical language can also be applied to the study of larger social systems such as groups and organizations, which can be considered as acting systems in their own right (Cranach, 1996). To do this, it is necessary to recognize that the steps of the action process described above constitute functional requirements of action regulation that can be described either on an individual or group level. Action regulation is thus a multilevel process: Individual actions are regulated by cognitive processes, and these individual actions often are a part of a large-scale group action, which is regulated by processes of communication between individuals (Cranach, 1996; Cranach, Ochsenbein, & Valach, 1986).

## THE PRESENT STUDY

This study analyzes communicative memory as it relates to the task the group is trying to accomplish. This is where it differs from most of the literature discussed above. Indeed, the primary focus of interest here is with memory as it functions within action; for example, the instrumental role of memory is studied. This corresponds to what Zinchenko (1939/1983) called involuntary memory—memory occurring in the context of an action directed toward some goal other than the remembering itself. The focus of interest is on cases in which the groups

are not engaged in remembering to construct some version of a past event (Edwards et al., 1992) but to get something done. It is apparent that the immense majority of work on memory described above focuses on cases of voluntary memory: The task in itself is a memory task (i.e., groups were specifically asked to recall something). In contrast, a study of memory as it is functional for action requires starting from the action rather than from the memory side of the problem; it implies analyzing action to locate mnemonic activity as it is spontaneously produced.

Thus, the problem to be addressed in this study is the following: How are unitary acts of remembering manifested in task-related communication and what purposes do they serve? This question can be broken down into two others. The first is a methodological and linguistic one—How is one to identify instances of remembering? In other words, How can they be differentiated from other types of communication? One must seek to establish if basic linguistic criteria exist that allow this. And if not, one must seek to establish the different forms in which remembering is manifested. This is the question of differentiating memories from nonmemories. The second question is a substantive one, the research question proper. How do communicated memories relate to the communicative context in which they are embedded, to the (argumentative and other) goals pursued by the participants in a given discussion?

Investigating these problems requires that the action of a group be simulated under controlled conditions that allow systematic observation and analysis. According to the maxim elaborated above (starting from the action side of the problem), a complex task was designed for the group so that how memory would be deployed during its resolution could be observed (notice the reversal of the classical logic: Usually it is the memory task that is defined in advance). It was also desirable to have a group that interacted over a longer period of time than is usually the case in the research cited above. The study, therefore, lasted more than one session.

Small-group research depends largely on unstructured groups. In natural contexts, groups always possess some kind of structure (Cranach, 1996). This structure (e.g., a set of roles) can be implicit, as in the case of a friendship, or explicit, as in an institutionalized work group. In the latter case, the role structure is often imposed by the organization or supersystem in which the group is embedded. In some cases, a mixture of explicit and implicit roles exists (e.g., families; see Hirst & Manier, 1996). By regulating expectations, roles partially determine interaction between individuals. Roles are often designed in the context of a task; there exists an interdependence between the task to be accomplished by a group and the distribution of labor in the group (Cranach et al., 1986). The study was also designed with this in mind.[1]

## METHOD

### SIMULATION

Goal-directed group action was simulated in a controlled observational situation in which a 4-person group with a formal role structure had to manage a complex computer simulation of a modern city over 4 days. The study consisted of two main phases. The first was the training phase (Days 1 and 2), during which participants learned the basic functioning of the computer simulation (Day 1) and acquired specialized knowledge and responsibilities according to their different roles in the group (Day 2). This lasted an hour each day. The second was the simulation phase (Days 3 and 4), during which participants managed the computer simulation together. This phase occupied 90 minutes each day.

The computer simulation used is the game Sim City (Maxis Software, 1993). Players must build and manage a city, and the game allows one to manipulate different game variables and build things such as roads; police stations; commercial, industrial, and residential zones; and so on. Simultaneously, players must take into account factors such as environmental problems, crime, public opinion, and the like. In short, it is a simulation that is complex enough to serve as a task for a small group, although it was not designed with this purpose in mind.

The group was composed of two 2-person subgroups: the City Council and the Traffic and Environmental Commission. Each subgroup was composed of two roles: a group leader and a subordinate role, giving a total of four individual roles in all. The leader of the City Council is the Mayor, the leader of the whole group. The leader of the commission is the Chairperson, and the two subordinate roles in each subgroup are Analyst 1 and Analyst 2. Roles were designated at the beginning of the study. During the training phase, each participant received a booklet detailing the responsibilities incumbent on them as a function of their specific roles. Leaders were described as being responsible for long-term planning and decision making for their respective subgroups, and analysts were described as being responsible for implementation of these plans and problem solving. In addition, each booklet contained less detailed information about responsibilities of other group members.

This group structure corresponds to a specific task structure. The computer was used to design a city where several problems were particularly salient at the beginning of the simulation phase. Solving these problems constituted the specific tasks faced by the participants. From an action theory point of view, a complex task can be hierarchically broken down into subtasks. The group as a whole worked toward

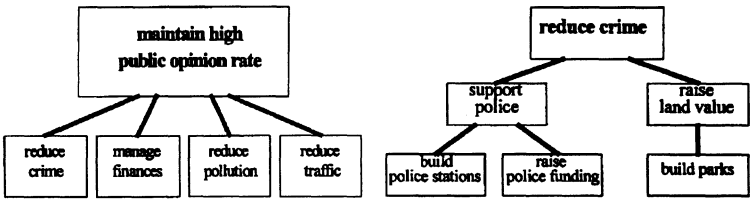


*Figure 1.* **The task structure on two different hierarchical levels.**

the superordinate goal of achieving and maintaining a high public opinion rate. To do this, it was necessary to simultaneously work toward the goals of reducing crime, managing finances, reducing traffic, and reducing pollution (see Figure 1). The City Council was responsible for managing crime and finances, and the commission was responsible for the other two tasks, traffic and pollution. Each task can also be further broken down into several subtasks and subsubtasks. At this level, actions consist of manipulating particular game variables, such as police stations, police funding, or parks (Figure 1). Leaders received detailed information concerning aspects of the task structure for which their group was responsible (including information on causal relations between game variables), whereas analysts received more practical training concerning the manipulation of the game system.

Given the fact that the group had four members, it was impractical that all of them simultaneously sit in front of the computer screen. It was also desirable to have the participants interact in a manner appropriate to the structure of the group. Therefore, interaction between group members took place according to a sequence that is depicted in Figure 2.

Figure 2 represents a discussion cycle. This cycle was enacted by the subjects twice on each day of the simulation phase, four times in all. A discussion cycle lasts about 40 minutes and consists of six dyadic meetings (sessions). During the first session (planning), the group leaders meet together and plan what to do during the coming cycle. They have access to the computer system for consultative purposes only. The analysts are inactive during this session, which lasts 10 minutes. During the next two sessions (discussion), each group simultaneously meets in separate rooms for 6 minutes and discusses group-specific aspects of the tasks in more detail. During the third session (execution), the analysts implement the plans together on the computer. During this session, which lasts for 15 minutes, the leaders are inactive. During the next two sessions (evaluation), both groups meet

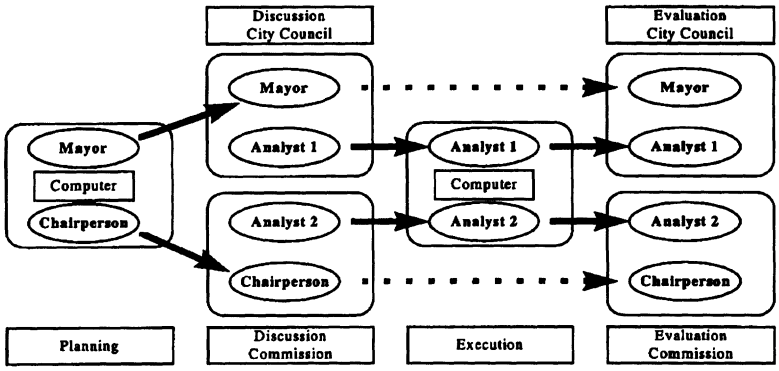


*Figure 2.* **Sequential order of the different discussion sessions.**
*Note.* Rounded rectangles symbolize the different sessions, ovals represent the different roles of the participants, and their sequence of participation in the sessions is symbolized by the arrows.

again separately for 6 minutes to discuss results and feedback from the game system and to initiate new plans for the next cycle (the simulation is saved at the end of the day so that on the next day, players begin where they left off). In this way, the group is confronted with an ongoing task lasting several days and implemented in a series of repeated dyadic interactions. A typical planning session might consist of the group leaders looking at the city map, discussing how to reduce crime, and deciding to build a number of police stations at strategic sites in the city. This decision would be discussed in more detail by the Mayor and Analyst 1 during the discussion session (i.e., where to build them), whereas it might not even be mentioned in the discussion between the Chairperson and Analyst 2. During the execution session, both Analysts would probably execute their respective tasks (taking turns as they do so) and deal with any problems that arise. During the evaluation session, Analyst 1 would then report on progress to the Mayor (e.g., that not all of the planned police stations could be built because of lack of time), whereupon the Mayor would then decide what to do in the coming discussion cycle (e.g., he or she might decide to continue building police stations).

Results presented are reported on the basis of nine groups that completed the study. All participants were recruited from students of the University of Berne, who participated in the study as part of a course requirement. Because participation lasted a total of 6 hours over

the course of 4 days, they were also remunerated to ensure optimal cooperation. The interaction between the subjects was recorded on videotape and word-for-word transcripts of verbal communication were written. Communication in the transcripts was segmented into units of analysis (single utterances) according to a procedure developed by Mösch (1990). Utterances correspond approximately to a sentence in written language. A separate transcript was written for each of the sessions. This amounted to writing a total of 216 transcripts totalling approximately 30 hours of discussion.

## MEMORY UTTERANCES AND COLLECTIVE MEMORY PROCESSES

The first problem to be solved is that of identifying instances of remembering. Because the transcripts were segmented into utterances, it was a question of establishing criteria for classifying single utterances as either constituting memory utterances (MUs) or not. Theoretical guidelines here are few and far between (see, however, Galliker, 1990). Therefore, criteria were established inductively, by collecting samples from the transcripts and generalizing. Because these criteria are also interesting in themselves, they are presented in some detail. An MU was defined as an utterance having the conversational function of reference to some past state of affairs. Thus, an MU is defined exclusively on a pragmatic (speech act) level. The criterion thus does not imply any kind of conclusion on the cognitive level. This general rule is instantiated in five more concrete criteria, which are outlined below.

The first and most certain criterion for identifying an utterance as an MU is the presence of a metacommunicative clause expressing rememberance on the part of the speaker. Examples of such an utterance would be "*I remember that* we built the power plant there" or "*then I thought* we have to build the power plant here."

The second criterion is perhaps the one most typically corresponding to what is usually considered as memory (Galliker, 1990) and concerns utterances in which something is expressed in the past tense, such as "well, I *built* the power plant where you told me to." Strictly speaking, however, such a criterion constitutes neither a necessary nor a sufficient condition for the classification of an utterance as an MU.

The third criterion concerns MUs identifiable as such on the basis of knowledge of the situational context of the utterance. For example, the utterance "crime is down to 15%" constitutes an MU if and only if the state of affairs referred to is not present in some form. If this utterance had been produced during the planning session (where such information might have been visually available), it would only be classified as an MU if examination of the videotapes excluded this

possibility. However, it would count as an MU if produced during one of the discussion sessions, because the source of the information referred to is not present (there is no access to the computer during this session).

All of the above criteria correspond to more or less explicit MUs in that the MUs express knowledge about some past state of affairs. However, there are also cases of implicit MUs, when the intention of the speaker is directed to some other affair than expressing the memory. The utterance counts as an MU because the observer analyzing the transcript has knowledge of the content of foregoing discussions and, therefore, is able to infer the operation of memory (note that this criterion is somewhat at odds with the more general rule mentioned above). For example, if during one of the execution sessions, Analyst 1 were to say "I have to build three police stations in the north part of the city," this would count as an MU if the project of building the police stations was decided on during the foregoing discussion session.

The fifth type of MU was not analyzed systematically in the present study, but is mentioned because of its theoretical relevance. Such utterances express nonepisodic knowledge acquired by the participants during the training phase of the simulation. For example, the Mayor, having learned during the training phase that building parks has the effect of lowering crime by raising the land value (see Figure 1), might express this fact verbally. Such an MU corresponds to what in cognitive psychology is designated as semantic memory, information that is not temporally encoded (Tulving, 1972).

MUs are individual productions that are nonetheless embedded in a dialogical context. They constitute conversational moves on the part of the speakers involved in the dialogue. As such, they are related to the preceding utterances and their production determines the context within which future utterances are produced (Markovà, 1990). MUs may be triggered by questions or may themselves provoke commentary, including other MUs. Therefore, it should be possible to identify larger groupings of utterances clustered around one or several thematically related MUs. If such groupings involve more than one conversational turn (i.e., contributions from more than one speaker), it seems justified to speak of some kind of collective processing of the MUs.

In this sense, the construct of a collective memory process (CMP) is defined as a set of thematically homogenous utterances containing and related to at least one MU and comprising more than one turn. CMPs designate communicative moments in which memories are produced and discussed by both persons. The criterion for assessing thematic homogeneity was a preestablished catalog defining approximately 40 possible themes available to discussion (such as police stations, pollution rate, etc.). A CMP begins with an initial MU or triggering question encountered and ends with the last comment on the last thematically

identical MU encountered. The following excerpt (from one of the planning sessions) is an example of a CMP.[2]

Excerpt 1

| | | | |
|---|---|---|---|
| 1 | Chair: | we have to raise taxes | |
| 2 | Mayor: | the question is how much | |
| 3 | | what do you think? | |
| 4 | Chair: | well, I think 7 or 8% is ok | |
| 5 | | considering the crime rate we have | |
| 6 | | *taxes were only 1% at the beginning* | MU |
| 7 | | *and that's nothing* | |
| 8 | Mayor: | right | |
| 9 | | we just have to be careful with the cash flow | |
| 10 | | we don't have much money anymore | |

In this example, the group leaders are discussing whether to raise the tax rate. The text in italics indicates a CMP: The Chairperson introduces a memory (Utterance 6) concerning the tax rate at the beginning of the simulation phase to support his proposal for a tax raise (Utterance 4). Utterance 6 constitutes an MU because the clause "at the beginning" refers to a past state of affairs. The two subsequent utterances are thematically and pragmatically related to Utterance 6 and are, therefore, considered as belonging to the CMP (the theme of which is tax rate). Utterance 9 concerns another theme (i.e., cash flow) and, therefore, does not belong to the CMP.

Based on the criteria presented above for the identification of MUs and CMPs, more elaborate coding rules (including procedures for special cases, exceptions, etc.) were formulated. All of the transcripts were then systematically coded for MUs and CMPs. This yielded a pool of more than 2,700 CMPs (the number of CMPs produced by a given group varied between 247 and 354). It is important to realize that the prototypical CMP presented above did not always appear in such a pristine form. It is possible to distinguish between CMPs in which both speakers produce MUs and CMPs where only one speaker does. Or, one may have CMPs in which commentary on an MU is limited to a back-channel utterance, whereas others may contain extended commentary lasting several utterances. There were also some cases (rare) of CMPs encapsulated within other CMPs and some exceptions (very rare) where CMPs contained two or more themes.

Interrater agreement for coding of both MUs and CMPs was assessed by means of Cohen's kappa statistic (based on independent coding of a third of the data by two persons). Kappas for MUs varied between .71 and .79 for the different discussion sessions, and kappas for CMPs varied between .60 and .74. According to Fleiss (1981), such values indicate adequate to excellent interrater agreement.

## CONTENT AND FUNCTION OF COLLECTIVE MEMORY PROCESSES

It is assumed that CMPs are units that have a functional significance for different phases of action regulation. Even though it is trivial to assume that the regulation of ongoing activity implies the operation of memory, it is not readily apparent in what ways memory is employed in different moments of the action process. For example, processing requirements during the planning phases are probably not the same as those during the execution phase. If this is the case, then CMPs with different functions should refer to different kinds of information.

The first step is defining some kind of functional variable. In accordance with the models of action regulation described above, four phases of action regulation were distinguished: orientation, planning, execution, and evaluation. *Orientation* consists of evaluating different aspects of the current situation, comparing them to past states, explaining or interpreting information, or just discussing things with no ostensible purpose. Orientation can designate activity on the level of the dyad (both participants in a discussion construct an interpretation of the present state of traffic in the city as disastrous) or on the level of the individual (one person orients another as to measures undertaken by the other group). *Planning* consists of generating plans and/or deciding between alternative plans by arguing in favor of or against a certain alternative. For example, the CMP in Excerpt 1 would be coded as having a planning function because the MU (Utterance 6) and subsequent comment (Utterance 7) were produced to support a proposal for a tax raise (Utterance 4). *Execution* consists of discussion directed toward implementing plans after a decision has been made. Generally, this includes initiating the overt component of the action, monitoring its progress, and terminating it when appropriate. In the present context, it may also include coordinating implementation between different people. *Evaluation* entails assessing the action or its intended or unintended consequences, including progress toward the goal. It should be mentioned that the modalities of this variable are not to be confused with the discussion sessions, which have similar names. In the rare case that two functions were equally plausible, double coding was allowed. Thus, coding the action function involves assessing the communicative context in which the CMP is produced. More specifically, it involves interpreting the utterances immediately surrounding the MUs. These neighboring utterances can be either before, after, or within the boundaries of the CMP (see Figure 3).

A content variable was also defined, consisting of the following categories: situation or event, goal, plan, and action. This variable designates the type of information evoked in the MUs of a CMP. *Situations* or *events* are information about states of affairs (e.g., the

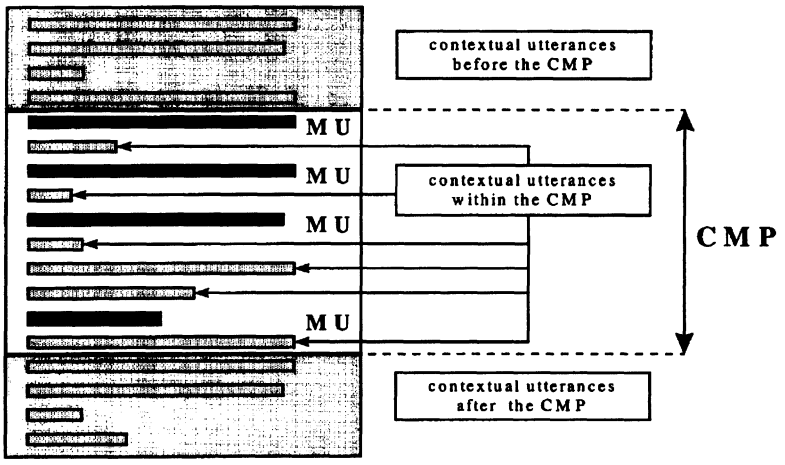


*Figure 3.* **Content and context of collective memory processes.**
*Note.* Black bars indicate memory utterances (MUs; content). Shaded bars indicate contextual utterances. The limits of a collective memory process (CMP), which are thematic limits, are indicated by the dotted lines.

current tax rate) or discrete events (e.g., a plane accident). *Goals* are formulations of desirable end states to be reached (e.g., reducing the crime rate by 50%). *Plans* are specific or general intentions, instructions, and so forth (such as the plan to build more roads). *Actions* are any kind of behavior on the part of the subjects (ranging from bulldozing a road section to not cooperating with one's partner). If the CMP had more than one MU, double coding of content was possible. Coding the contents of the CMP thus constitutes the complementary operation of coding the action function. This is illustrated in Figure 3: Coding the action function implies interpreting the context of the MUs; coding the content implies analyzing the MUs themselves.

Assessment of interrater agreement (based on two independent codings of 20% of the data) yielded the following results: $\kappa_{function} = .69$ and $\kappa_{content} = .83$. The content variable had eight categories when multiple content categories were taken into account (e.g., plans and actions mentioned together), and the function variable had five categories (the fifth category consisted of multiple codings of this variable).

Configural frequency analysis (CFA) was applied to the contingency table formed by the crosstabulation of these two variables. CFA is a nonparametric procedure developed by Krauth and Lienert (1973) that tests for local associations between states of different categorical variables by calculating the significance of residual scores (i.e., differences between observed and expected frequencies) for single cells of a

contingency table. Cells for which residuals are significantly positive (i.e., overfrequented configurations) are classified as types; cells for which residuals are significantly negative (i.e., underfrequented configurations) are classified as antitypes. First order exploratory CFA was performed (for a detailed description of CFA procedures applied here, see von Eye, 1990). Because CFA simultaneously tests each cell of a contingency table, tests are not mutually independent and the *a priori* $\alpha$ level of the test must be adjusted (adjusted $\alpha = \alpha^*$). The Bonferroni adjustment ($\alpha^* = \alpha/r$, with $r$ being the number of cells) was applied. *A priori* $\alpha$ was set at .05. The table contained $8 \times 5 = 40$ cells. Therefore, $\alpha^* = .05/40 = .00125$. CFA was applied to each of the nine groups separately to avoid bias toward statistical significance created by pooling data.[3] Thus, some of the expected counts were very low, and significance was, therefore, tested using the binomial test. Configurations that attained significance in only one group were disregarded.

## RESULTS

CFA resulted in a total of 6 types and 6 antitypes that are summarized in Table 1. Some idea of the strength of each type or antitype can be gathered by considering the total number of groups for which a given configuration attained significance. These results allow some rough generalizations about the contents typically remembered during different functional contexts. CMPs with an orientation function contain significantly more MUs than expected with situations or events (Configuration 1) and with actions (Configuration 3); they contain significantly fewer MUs than expected with plans (Configuration 2) and situations or events and plans (Configuration 4). In other words, during the orientation phase of action regulation, information concerning situations, events, and actions is typically remembered, and information in conjunction with plans is remembered less frequently.

CMPs with an execution function contain significantly more MUs than expected with plans (Configuration 6) and situations or events and plans (Configuration 8); they contain significantly fewer MUs than expected with situations or events (Configuration 5), with actions (Configuration 7), and with situations or events and actions (Configuration 9). During execution (after a plan has been adopted), remembering focuses more often on plans (see Excerpts 3 and 4 below), whereas information about actions, situations, and events is less frequently referred to only in conjunction with plans. This could possibly serve to contextualize the plans when they are communicated (e.g., "taxes are too high/we decided to lower them" would constitute a case of situations or events and plans mentioned in a CMP).

CMPs with an evaluation function contain significantly more MUs than expected with situations or events and actions (Configuration 11)

Table 1

*Summary Per Group of Observed and Expected Frequencies for the 12 Types and Antitypes Identified by Configural Frequency Analysis of Content by Action Function*

| Configuration Number | Content | Function | Type (T)/ Antitype (A) | Frequency | Group 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | S/E | Or | T | o | 98* | 62* | 93* | 53* | 51 | 92* | 54* | 66 | 92* | 7 |
| | | | | e | 62.6* | 36.4* | 68.8* | 33.4* | 34.4 | 63.4* | 34.6* | 48.5 | 59.6* | |
| 2 | P | Or | A | o | 2* | 4* | 12* | 3* | 4* | 3* | 2* | 3* | 5* | 9 |
| | | | | e | 32.8* | 22.9* | 33.4* | 30.6* | 28.0* | 29.4* | 25.0* | 24.3* | 31.6* | |
| 3 | A | Or | T | o | 29* | 18 | 21 | 40 | 33* | 24 | 32 | 24 | 28 | 2 |
| | | | | e | 19.7* | 12.0 | 19.2 | 27.1 | 17.6* | 20.1 | 18.8 | 15.5 | 19.6 | |
| 4 | S/E+P | Or | A | o | 1* | 2* | 7 | 2* | 1* | 1* | 1 | 1 | 6* | 6 |
| | | | | e | 14.9* | 12.0* | 17.2 | 13.5* | 12.9* | 13.9* | 6.90 | 4.20 | 17.8* | |
| 5 | S/E | Ex | A | o | 7* | 4* | 8* | 12* | 16* | 4* | 7* | 12* | 7* | 9 |
| | | | | e | 43.2* | 30.3* | 35.6* | 31.4* | 38.1* | 28.1* | 29.9* | 35.2* | 40.1* | |
| 6 | P | Ex | T | o | 67* | 53* | 45* | 60* | 63* | 45* | 56* | 57* | 56* | 9 |
| | | | | e | 22.7* | 19.1* | 17.3* | 28.8* | 30.9* | 13.0* | 21.6* | 17.6* | 21.2* | |
| 7 | A | Ex | A | o | 0* | 0* | 4 | 5* | 0* | 0* | 0* | 1* | 5 | 7 |
| | | | | e | 13.6* | 10.0* | 10.0 | 25.4* | 19.4* | 8.9* | 16.3* | 11.2* | 13.2 | |
| 8 | S/E+P | Ex | T | o | 30* | 24* | 22* | 28* | 33* | 16* | 16* | 6 | 29* | 8 |
| | | | | e | 10.3* | 10.0* | 8.90* | 12.7* | 14.3* | 6.20* | 6.00* | 3.10 | 12.0* | |
| 9 | S/E+A | Ex | A | o | 0* | 0* | 1 | 0* | 1 | 0* | 0* | 0* | 1* | 7 |
| | | | | e | 12.4* | 10.9* | 7.10 | 6.00* | 6.30 | 5.70* | 6.30* | 6.60* | 12.9* | |
| 10 | P | Ev | A | o | 1* | 1* | 1 | 2 | 2* | 1 | 0* | 1* | 0 | 5 |
| | | | | e | 10.2* | 9.20* | 7.30 | 9.10 | 11.0* | 5.70 | 10.0* | 14.9* | 6.5 | |
| 11 | S/E+A | Ev | T | o | 14* | 18* | 10* | 3 | 9* | 9* | 13* | 11 | 16* | 7 |
| | | | | e | 5.60* | 5.30* | 3.00* | 1.90 | 2.30* | 2.50* | 2.90* | 5.60 | 3.90* | |
| 12 | P+A | Ev | T | o | 8* | 3 | 2 | 2 | 2 | 2 | 0 | 6 | 3* | 2 |
| | | | | e | 1.60* | 1.40 | .80 | .50 | .70 | 1.10 | .20 | 1.50 | .90* | |

*Note.* In the content and function columns, A = action, Ev = Evaluation, Ex = Execution, Or = Orientation, P = plan, S/E = Situation or event. In the frequency column, O = Observed frequency, e = Expected frequency. Total = Total number of types or antitypes identified for the configuration.

*$p < .00125$ after Bonferroni correction.

and with plans and actions (Configuration 12); they contain significantly fewer MUs than expected with plans (Configuration 10). The evaluation phase of action regulation entails assessing the consequences of actions undertaken, and thus, it is not surprising that actions are more typically remembered. Plans are less typically remembered. Other types of information (e.g., situations or events, plans) are typically remembered in conjunction with actions. Thus, the conjunction of remembering situational information and either plans or actions seems to be a precondition of evaluative activity; plans or actions are assessed by relating them to the relevant situational variables (see Excerpt 2 below).

A more detailed interpretation of the results implies analyzing specific examples of types and antitypes. For example, one may consider the type constituted by situations or events and actions remembered with an evaluation function (Configuration 11). This type is exemplified by the following CMP (the CMP is the whole excerpt; MUs are in italics):

Excerpt 2

| | | | |
|---|---|---|---|
| *1* | Analyst: | *and we just changed things around* | Action |
| 2 | Chair: | so you just built some new things | |
| 3 | Analyst: | yeah so that | |
| *4* | | *and then we for example next to the power plant we built two or three industrial zones* | Action |
| 5 | | [points to sketch] | |
| 6 | Chair: | mhm | |
| *7* | Analyst: | *and then they were already occupied after two or three seconds* | Situation or event |

In this CMP from an evaluation session, the two participants are the commission Chairperson and Analyst 2. Analyst 2 is reporting about the preceding session (execution session) and produces several MUs (Utterances 1, 4, 7). The content of these MUs are situational information and events (Utterance 7) and actions (Utterances 1, 4), and the function of the CMP as a whole is evaluation because its purpose is to assess the consequences of the construction of industrial zones; Utterance 7 constitutes such an assessment.

A second example corresponds to Configuration 6 (plans remembered with an execution function). The excerpt is taken from one of the discussion sessions (City Council).

Excerpt 3

| | | |
|---|---|---|
| 1 | Mayor: | then I thought we have to be careful with spending |
| 2 | | because we might have to lower taxes in the last round |
| 3 | Analyst: | exactly |

| | | | |
|---|---|---|---|
| *4* | Mayor: | *let's try it with three police stations here* | Plan |
| *5* | | [points to sketch] | |
| *6* | Analyst: | *mhm* | |
| 7 | Mayor: | they cost around 500 | |

Here, the City Council is discussing measures to be taken during the upcoming execution phase (CMP in italics). Utterance 4 constitutes an implicit MU on the part of the Mayor. The utterance constitutes a plan (to build three police stations at a certain location) and the function is execution because the purpose of the CMP is to transmit the necessary information to the Analyst for it to be implemented.

Plans are not only remembered during the discussion sessions; they are also remembered by the analysts themselves during the execution sessions. In such cases, remembering a plan often directly precedes its implementation. This is illustrated in the following excerpt.

Excerpt 4

| | | | |
|---|---|---|---|
| *1* | Analyst 1: | *then we have to raise that to 100%* | Plan |
| 2 | | [points to police fund] | |
| *3* | Analyst 2: | *oh yes, it's a little low* | |
| 4 | Analyst 1: | [raises police fund to 100%] | |
| *5* | Analyst 2: | *transport fund, shall we raise that as well* | Plan |
| 6 | Analyst 1: | oh yes | |
| 7 | | *we apparently have to raise that as well* | Plan |
| 8 | Analyst 2: | [unintelligible] | |
| 9 | Analyst 1: | yes | |
| 10 | | [raises transport fund to 100%] | |

This excerpt contains two CMPs (themes are police and transport funding; italics in the text indicate MUs). Both analysts are executing plans concerning funding of city services. The actual motor actions of raising the funding levels (Utterances 4, 10) are preceded by verbal recall of the instructions to do so. Here also, MUs (Utterances 1, 5, 7) are expressed implicitly: The actual intentions of the speakers are directed toward modifying the funding levels; however, these proposals are part of the instructions discussed in the foregoing session and, therefore, constitute MUs. This example corresponds to execution monitoring and is somewhat different from Excerpt 4, which illustrates interpersonal coordination of execution. Thus, exemplars of a given configuration (both of the examples correspond to Configuration 6) can vary quite significantly when examined qualitatively.

## DISCUSSION

Two main contributions were presented in this article. First, a theoretically founded concept was outlined: the notion of a collective

memory process. Second, different aspects of these CMPs were analyzed. The point of this was to illustrate the thesis that (a) collective memory can be understood as a communicative process and (b) that it is functionally related to the regulation of collective action.

Concerning the first point, it seems that the concept of a collective memory process is flexible enough to capture some of the diversity of interpersonal remembering in verbal communication (cf. the different types of MUs) while lending itself to both quantitative and qualitative detailed analysis. In particular, it can be considered as a further contribution to a growing body of research dedicated to the analysis of the "micro-processes of collective remembering" (Middleton & Edwards, 1990, p. 24).

Concerning the second point, it seems that there are marked qualitative differences in acts of remembering produced in different regulative contexts. It should be emphasized that the types and antitypes identified very probably do not generalize to other situations. Indeed, they probably reflect the situational constraints of the task to a large degree. If the task situation had been modified, this would probably also have led to different typical and antitypical configurations of content and function. For example, the participants were allowed to freely take and pass notes during the sessions. Had this not been the case, they probably would have had to verbalize much more information.

Nevertheless, a basic finding of the study is that specific remembered contents exhibit meaningful relationships to the global activity context in which the remembering takes place. This finding could inform research on memory in group discussion. The probabilistic information sampling model of Stasser and Titus (1985) predicts discussion of specific items of knowledge predominantly as a function of their distribution among group members. The present finding indicates that the relation between an item of information and the immediate discussion context is also an important determinant of whether it is or is not remembered. More important, this relation also determines the meaning of what is remembered (consider the fact that situational information takes on a different meaning in different action contexts).

As a final remark, one may position the present approach in relation to research on collective remembering (Hirst & Manier, 1996; Middleton & Edwards, 1990), which has largely focused on cases in which groups were instructed to recall an event. Collective remembering does not take place only when people are explicitly trying to remember something. Instead, remembrances are also intertwined in an inextricable fashion with other types of communicative acts, and they play an essential role in maintaining ongoing collective activity. This is an aspect of collective remembering that has been somewhat neglected as

of yet (see, however, Hutchins, 1995) but should be taken seriously by any research on memory in natural contexts.

## NOTES

1. Results concerning these points will be reported elsewhere.

2. Participants in the study were Swiss German native speakers; all excerpts are translations.

3. Note that the units of analysis, collective memory processes (CMPs), are still pooled across the dyads that produced them. There are some problems associated with this procedure (Sillars, 1991), although opinions vary as to their seriousness (Bakeman & Gottman, 1986). Given the explorative nature of the present study, such a procedure was considered acceptable.

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