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Reports

Effects of correspondence between encoding and retrieval organization in social memory☆

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ABSTRACT

Memory research has shown impaired recall performance when a subset of the studied stimuli is presented at recall (the part-list cueing effect, Slamecka, 1968) or when the recall is collaborative (collaborative-inhibition effect, Weldon & Bellinger, 1997). In two experiments we explore these effects in an impression-formation context and compare two prominent accounts (retrieval blocking versus strategy disruption) for them. We varied the correspondence between item organization at encoding and retrieval, either by manipulating the organization of part-list cues (Experiment 1) or the organization of the stimulus list that was later recalled collaboratively (Experiment 2). Results showed that when encoding and recall organizations did not correspond recall was impaired, replicating part-list cueing and collaborative-inhibition effects. However, when encoding and retrieval organization corresponded, these effects were greatly reduced. Such results support the recall strategy disruption hypothesis and challenge the retrieval blocking account. Implications for understanding memory in a social context are discussed.

Anyone who has participated in a college class reunion knows that memory is a cooperative and social endeavor. A multitude of details (awkward details, most of the time) suddenly come to mind and you find yourself remembering episodes that you thought (and sometimes, hoped) were forever gone. But memories from the past do not always facilitate further memory. Sometimes cues from specific memories can disrupt altogether the course of recall. Being told the name of your math teacher during your freshman year when you are trying to remember the name of the school's star athlete may hinder your memory attempts beyond hope.

Intriguingly, research concerned with memory in social information processing has often been oblivious both to the importance of externally provided cues and to their collaborative nature. Memory has often been portrayed as an individual mental activity performed under a minimum of external influences. Yet as the introductory examples illustrate, the social and informational context can facilitate or impede memory for past events. Moreover, the information we acquire is organized during encoding in a particular structure. Later, when that information is to be retrieved, the context that is active at the time may or may not correspond to the previous organizational framework. Such correspondence (or lack thereof) should influence one's ability to remember previously acquired information.

This paper reports two experiments exploring the effects of such correspondence on information recall. To do so, we use two well-established paradigms in the cognitive literature on memory effects. This literature has shown that when participants are presented, at the time of recall, with a subset of the stimulus items provided earlier, the recall of non-cued items is less than when recall is performed without presentation of those items — the *part-list cueing effect* (e.g., Anderson & Bjork, 1994; Nickerson, 1984; Slamecka, 1968). Similarly, collaborative-groups, composed of individuals recalling together previously presented items, do worse than nominal-groups (composed of an equal number of participants tested individually) — the *collaborative-inhibition effect* (e.g., Basden & Basden, 1995; Basden, Basden, Bryner, & Thomas, 1997; Weldon & Bellinger, 1997; Weldon, Blair, & Huebsch, 2000). Although part-list cueing and collaborative-inhibition effects emerged in different literatures, Basden et al. (1997) suggested the existence of a parallel between the two effects namely that the theoretical accounts of part-list cueing can easily be extended to collaborative-inhibition.

Our research had several goals. First, we tested the effects of correspondence between encoding and retrieval contexts on retrieval interference. Second, we explored further the parallel between part-list cueing and collaborative-inhibition and extended this work to person-memory. Third, we compared two of the most prominent accounts of retrieval interference effects, the *retrieval blocking account* and the *recall strategy disruption hypothesis*. We conducted two

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experiments to address these goals. In Experiment 1, using a part-list cueing paradigm, we manipulated the degree of correspondence between the organization of stimulus items and the organization of retrieval cues represented in the part-list cues. In Experiment 2 we manipulated the degree of correspondence between the stimulus lists of different members of collaborative and non-collaborative recall groups. In both cases, the recall strategy disruption hypothesis predicts retrieval interference to be a function of this correspondence, whereas no such prediction can be derived from the retrieval blocking account.

Part-list cueing effects

In the part-list cueing paradigm (Slamecka, 1968) participants are presented a list of words for future recall. Before the recall task, participants receive a written subset of the stimulus items as cues and are instructed to recall the remaining items, whereas a control group, which is given no cues, is asked to recall as many of the items as possible from the entire list. Results typically show that participants who were given recall cues recalled a smaller proportion of the non-cued items than did those in the absence of cues. This finding was surprising because it contradicted the assumption that the access to a subset of associatively stored items would increase the probability of retrieving the non-accessed items (e.g., Tulving & Pearlstone, 1966). Instead, providing retrieval cues not only failed to facilitate the recall of the remaining items but actually diminished recall.

Two prominent explanations for the part-list cuing effects are the *retrieval blocking* account (sometimes called *occlusion*, see Anderson & Spellman, 1995) and the *recall strategy disruption* hypothesis. According to the *retrieval blocking* account (Rundus, 1973), the probability of an item being recalled given a specific cue is a function of the portion of associative strength that is drawn on by the item and the cue (relative to the sum of the strength of all items associated with that cue). As a consequence, cueing list items at recall increases their accessibility relative to non-cued items. Therefore, cued items are more likely to be recalled first and to block the recall of the less accessible non-cued items. Alternatively, the *recall strategy disruption* hypothesis posits that when participants are asked to recall the stimulus items, they set up a recall plan that will most likely correspond to the way the items were encoded and organized when they were learned. Providing part of the learning set as cues disrupts this initial retrieval strategy because participants will deviate from their original recall plan and follow whatever recall strategy is suggested by the part-list cues (Basden, Basden, & Galloway, 1977; Basden & Basden, 1995; see Basden et al., 1997 for a review).

Part-list cueing in social memory

Garcia-Marques, Hamilton, and Maddox (2002, Experiment 3) extended part-list cueing to an impression-formation paradigm. Participants were first given several traits that described a target-person to induce an initial trait-expectancy. They then were asked to form an impression of the person as they read a list of 30 sentences describing the person's behaviors. Participants' memory for this information was later assessed in one of two conditions. In the part-list cueing condition, participants received four of the previously-presented behaviors and were asked to use these items as cues to help them retrieve the behaviors or to estimate the frequency of behaviors reflecting the traits presented earlier. In the no-cues condition, participants were asked to perform the same tasks without the provision of cues. Participants who were given the sample of behaviors as cues recalled fewer items than did those in the no-cues condition. This finding received additional support in a recent replication (Garrido, Garcia-Marques, & Hamilton, 2011), confirming the extension of part-list cueing effects to person-memory contexts.

The purpose of our first experiment was to provide a direct test between the two accounts of part-list cueing effects, *retrieval blocking* and *recall strategy disruption*. In our view a useful direct test would be to compare two conditions in which the same part-list cues are provided, but in different arrangements. In one condition these cues would correspond to the organization in stimulus presentation whereas in the other condition the cues would diverge from that organization. The retrieval blocking account would not predict any difference in the effects of cues across these two conditions because exactly the same cues were being used. However, the recall strategy disruption hypothesis would predict that the disruptive effect of part-list cues would be reduced when cue organization corresponds to the participants' recall strategy.

Experiment 1

In Experiment 1 we manipulated the correspondence between the organization of the stimulus information at encoding and at retrieval through the organizational framework provided by the part-list cues. Our manipulation was based on earlier work regarding the way the information acquired in multi-target settings is organized in memory (e.g., Pryor & Ostrom, 1981). In fact, although most studies in person-memory use single targets as stimuli, social life is not a series of individual encounters. Often social perceivers are immersed in multi-target settings such as a party, a job meeting, or a ride on a commuter train. Research has shown that social perceivers often organize multi-target information by target-person, but they also resort to alternative forms of organization like trait-based and context-based categories and there seems not to be an overall preference for one particular form of organization (Ostrom, 1981; Ostrom, Pryor, & Simpson, 1981; Pryor, Simpson, Mitchell, Ostrom, & Lydon, 1982; Sedikides & Ostrom, 1988; 1990). The specific basis of this organization is flexible and probably depends on the specifics of its learning history (McCann, Ostrom, Mitchell, Herstein, & Pusateri, 1983). This literature also offers some possible ways to identify which organizations people spontaneously use to represent that information. Consequently, it is possible to create competing designs in which different kinds of organization of information can be used.

Building on this idea, we provided participants with a list of behavior-descriptive items organized by individuals, personality-traits, or contexts. Immediately before recall, they were exposed to a subset of those behaviors.[1] In one condition, that subset followed the organization used at encoding whereas in another condition it presented an alternative organization.

We predicted that (a) presenting retrieval cues will impair free recall of non-cued behaviors (replicating the part-list cueing effect), and (b) when the organization of retrieval cues does not correspond to the encoding organization, the magnitude of the impairment will be increased.

Method

Participants and design

129 undergraduate students (109 female; $M_{age} = 21$; 20 male; $M_{age} = 21$) participated in this study for course credit. Participants were randomly assigned to the conditions of a 3 encoding organization (individuals: *John/Peter/Louis/Anthony;* personality-traits: *intelligent/friendly/ecological/artistic;* context: *home/vacations/work/public-holiday*) × 3 part-list cueing organization (correspondence,

[1] Our manipulation of part-list cueing was taken from Roediger, Stellon, and Tulving (1977) and differs slightly from the original Slamecka's manipulation in that participants were asked to re-study the cues for a brief time and then are asked to recall all of the items presented.

noncorrespondence, no-cues)×2 cue-replication (1st block, 3rd block) between subjects factorial design.

Stimulus materials

Stimulus materials consisted of 32 trait-implying behavioral descriptions generated by a different sample of 108 undergraduates and evaluated by another group of 85 participants who indicated on a 9-point Likert scale (1–"not at all"/9–"very much") to what extent each behavior was illustrative of the respective trait (e.g., *John designs and manufactures his own clothes at home*; *Louis sensitized his co-workers for environmental issues*). The behaviors most illustrative of each trait were selected. Finally, each behavior was ascribed to an individual who performed it (John/Peter/Louis/Anthony) and to a context where the behavior was performed (home/vacations/work/public-holiday).

Procedure

Participants were tested in small groups of up to 12 persons at a time and informed that they were participating in an impression-formation experiment. Before receiving the stimulus booklet and depending on the experimental condition, participants were informed that they would be asked some questions about (a) "the behaviors that characterize each of the individuals" (individuals-encoding condition); (b) "the personality-traits that characterize different individuals" (trait-encoding condition); or (c) "the context where the behaviors were performed" (context-encoding condition).

All participants were then presented with the same 32 behaviors, organized in four different eight item booklets. The booklets organized by individuals included eight behaviors describing each of the four individuals (John/Peter/Louis/Anthony). Each behavior also made reference to a personality-trait implied by the behavior and to a particular context where the behavior was performed. The booklets organized by personality-trait included eight behaviors describing each of the four personality-traits (intelligent/friendly/ecological/artistic). Each behavior also made reference to the individual who performed it and to a particular context where the behavior was performed. The booklets organized by context included behaviors performed in each of the four contexts (home/vacations/ work/public-holyday). Each behavior also made reference to the individual who performed it and to a personality-trait implied by the behavior. Note that all participants read exactly the same behaviors, and that there was no relation between individuals, personality-traits and contexts. That is, all four individuals performed behaviors illustrative of the four personality-traits and in the four different contexts.

Participants read through the booklets, following recorded instructions to turn to the next page every eight seconds and to change booklet whenever indicated. Participants then performed a 15 minute filler task. The part-list cueing manipulation was conveyed by asking participants to study a subset of previously presented behaviors in order to "aid their performance in the subsequent memory test." We used six subsets of cues relative to the three possible organizations of the stimulus information (*individuals*/*personality-traits*/*contexts*) and to either the first or the third booklet. In correspondence conditions, in which cues followed the encoding organization (e.g., individuals), the eight cues provided were behaviors from the first or the third booklet presented at encoding (e.g., behaviors from John or Louis). In the noncorrespondence conditions, in which cues followed a different organization from encoding, the eight cues were behaviors from the first or the third booklet presented in one of the other two encoding conditions (e.g., intelligent or ecological behaviors or behaviors displayed during vacations or public-holiday). A third no-cueing condition was also included in which no part-list cues were presented. Finally, participants were asked to free recall all the behaviors and were thanked and debriefed.

Results and discussion

A coder blind to the experimental conditions used a lenient gist criterion to code the behaviors recalled by each participant. Recall intrusions were infrequent and were excluded from all analyses.

Manipulation check

A first analysis was performed to verify the extent to which the recalled information was organized according to the encoding categories presented. For that purpose, we used the Adjusted Ratio of Clustering (ARC) proposed by Roencker, Thompson, and Brown (1971)[2].Two ARC indices were calculated for the non-cued recall conditions [3]: the "ARC-corresponding" refers to the adjusted ratio of clustering of recalled items according to the categories represented in the stimulus list and the "ARC-non-corresponding" refers to the adjusted ratio of clustering of recalled items according to the other two alternative encoding categories (averaged).

For example, to analyze if participants encoded the information by individuals (i.e., when information presented at encoding was organized in blocks of behaviors performed by the four different individuals), we determined whether the ARC for individuals (i.e., the frequency with which two items from the same cognitive category – each individual, in the present case – were listed in direct sequence during recall) was greater than the average of ARC scores of the other two alternative organizations (personality-traits/contexts).

We computed an ARC-corresponding×ARC-non-corresponding one-way ANOVA. The two indices differed significantly, $F(1,29)=.22$; $p<.012$; $MS=.20$, $\acute{\eta}^2=.20$, showing that the ARC for recalled items corresponding to the encoding categories (ARC-corresponding; $M=0.28$) was significantly higher than the ARC for recalled items of the other two alternative categories (ARC-non-corresponding; $M=-0.03$). These results from the non-cued conditions provide evidence that, in the absence of part-list cues, participants' recall was organized in a similar way as the stimulus items were presented at encoding. This condition, serves as a baseline against which the other conditions can be compared.

Recall

To enhance comparability across conditions, we excluded from the protocols of all participants the recall of behaviors that had been used as part-list cues. We then computed a 3 (encoding organization: individuals, personality-trait, context)×3 (part-list cueing organization: correspondence, noncorrespondence, no-cue)×2 (cue-replication: 1st block, 3rd block) ANOVA on the number of recalled items (24=maximum number of non-cued items).

Two main effects were significant. First, a non-meaningful main effect of Cue-Replication was significant, $F(2,111)=4.57$; $p<.04$; $MSE=5.05$, $\acute{\eta}=.04$. Second, a Part-list Cueing Organization main effect, $F(2,111)=24.27$; $p<.001$; $MSE=5.05$, $\acute{\eta}=.28$, revealed that the three part-list cueing conditions differed significantly. Planned contrasts between no-cueing vs. cueing (same and different organization) conditions, $t(111)=6.50$, $p<.001$, $SD=2.25$, $d=1.24$, one-tailed, showed that recall performance in the absence of part-list cues ($M=6.48$; $SD=1.90$) was higher than when cues were presented ($M=3.41$; $SD=2.32$). This result is consistent with the part-list cueing effects found in the literature as well as in our previous

[2] Although a variety of mathematical indexes are available for assessing categorical clustering, according to Pryor and Ostrom (1981), the ARC measure has advantages over most alternative clustering indexes.

[3] Clusters were only calculated for the conditions where no cues were presented. Because our goal was to explore whether participants would spontaneously organize the information according to the organization provided, this verification test would only be possible under no cueing conditions.

experiments (Garcia-Marques et al., 2002; Garrido et al., 2011) indicating that this effect generalizes to person-memory contexts.

Third, and most importantly, the planned contrast between the 2 cueing conditions was reliable, $t(111) = 2.38$, $p < .009$, $SD = 2.25$, $d = .45$, one-tailed. As predicted, when the organization of the retrieval cues corresponded to the initial encoding organization, recall performance was significantly higher ($M = 3.98$; $SD = 2.76$) than when encoding and retrieval-cues organizations did not correspond ($M = 2.84$; $SD = 1.87$).

The results of Experiment 1 supported our hypotheses in that (1) they replicate part-list cueing impairments in recall, as obtained in past research, (2) they show that correspondence of the organization of retrieval cues to the organization in the stimulus presentation significantly reduced the inhibitory effect of those cues on recall, and (3) they support the recall strategy disruption explanation of part-list cueing effects by showing that, when the organization of retrieval cues does not correspond to the associative organization presented at encoding, the magnitude of this impairment increases. At the same time, these results are difficult for the retrieval blocking framework to explain because the same cues were provided and hence response competition would remain constant across the correspondence and noncorrespondence conditions.

Experiment 2

As the examples in the opening paragraph of this paper illustrate, memory can often be a social experience. Friends reminiscing about events of their youth, a couple recalling the highlights of last year's vacation trip, research collaborators trying to remember articles relevant to their current research — in all of these cases memories are generated from a shared knowledge base. Does such collaboration in recall facilitate or impede retrieval of past episodes when compared to the products of individual retrieval of the same knowledge?

The effects of collaborative retrieval

Several studies on collaborative memory have reported the superiority of group versus individual recall (Clark & Stephenson, 1989; Hoppe, 1962; Lorge & Solomon, 1961; Meudell, Hitch, & Boyle, 1995; Meudell, Hitch, & Kirby, 1992). However, some of these studies failed to contrast the performance of the individuals and the group under directly comparable conditions. Such contrast requires the comparison of the recall performance of two groups of participants (a collaborative and a nominal group) that have read the same stimulus information (see Weldon & Bellinger, 1997).

In the collaborative-group, the individual members take turns in recalling aloud the stimulus items. Collaborative recall performance corresponds to non-redundant recall (i.e., the number of items that are recalled by at least one group member). The nominal-group members recall individually and the group's recall score is created by pooling the non-redundant responses of individuals working alone.

A large number of studies using this paradigm have shown that the recall performance of collaborative-groups is poorer than that of nominal-groups (Andersson & Rönnberg, 1995, 1996, 1997; Basden et al., 1997; Basden, Basden, & Henry, 2000; Basden, Basden, Thomas, & Souphasith, 1998; Johansson, Andersson, & Rönnberg, 2000; Meudell et al., 1995; Meudell et al., 1992; Weldon & Bellinger, 1997). This relative memory impairment is known as *collaborative-inhibition*. However, "there persists resistance and disbelief to the reports of harmful effects of collaboration on memory (because) this finding is undoubtedly counterintuitive" (Rajaram & Pereira-Pasarin, 2010, p. 658).

The most established account for the collaborative-inhibition effect shares the basic assumptions of the part-list cueing effects explanation (Basden et al., 1997), suggesting that the exposure to another person's recall disrupts the individual's optimal retrieval strategy. Note however that a *retrieval blocking* account could easily be developed to explain collaborative-inhibition because the items recalled by other group members, functioning as part-list cues, can cause the blocking of items not yet recalled (Rundus, 1973).

Collaborative retrieval in social memory

Although collaborative recall has been studied by cognitive psychologists, social-cognitive approaches of the phenomenon are surprisingly sparse (for a review, see Weldon, 2001). Therefore it is our aim to further extend collaborative recall paradigms to person-memory contexts. Very often our memories represent experiences or events that are profoundly shaped by environmental influences namely the contact and exchange with other people with whom these memories are shared (e.g., Barnier & Sutton, 2008; Barnier, Sutton, Harris, & Wilson, 2008; Echterhoff & Hirst, 2009; Levine, Resnick, & Higgins, 1993; Roediger, Bergman, & Meade, 2000). Thus, we suggest that, like other cognitive activities, person-memory can often be a socially distributed enterprise (cf. see Garrido et al., 2011; Hinsz, Tindale, & Vollrath, 1997; Wegner, 1986). The following experiment was designed to address these assumptions in person-memory contexts.

In Experiment 2 we extended the same approach used in Experiment 1 to a collaborative recall paradigm. We again manipulated the organization of the information given to the participants. In one condition we presented the same information *organized in the same* way to promote similar (corresponding) representations of the items among the three group members. In another condition the same information was presented with a *different organization* for each of the three participants to promote different (noncorresponding) representations of the items. All participants encoded the information individually. Later, participants either recalled the information collaboratively by taking turns in orally recalling the items (collaborative recall) or they recalled the information individually (base-line nominal recall). We predicted that (a) collaborative-groups would perform worse than nominal-groups (replicating the collaborative-inhibition effect), and (b) when collaborative-group members do not share the same encoding organization collaborative-inhibition will increase.

According to the recall strategy disruption hypothesis, collaborative-inhibition arises because when recall is performed collaboratively, each participant's attempt to follow his/her idiosyncratic associative encoding organization is disrupted by others' attempts to do the same. This is the state of affairs experienced by participants in the collaborative-groups and particularly by those with noncorresponding representations. However, for participants with corresponding representations, recall should not be so disrupted. Again, and in contrast to the recall disruption explanation, the retrieval blocking account would not predict such differences because response competition should remain constant across conditions regardless the correspondence of encoding organization for different members of the same group.

Method

Participants and design

129 undergraduate students (20 male; $M_{age} = 20$; 109 female; $M_{age} = 19$) participated in this experiment for course credit. Participants were randomly assigned to the cells of a 2 (encoding condition: corresponding, noncorresponding) × 2 (recall condition: nominal, collaborative) × 3 (encoding organization: individual, personality-trait, context) between subjects factorial, the last factor being nested in the same group encoding condition.

Procedure

Participants were tested in groups of three persons per session. The impression-formation phase was identical to Experiment 1, with the same instructions and the same stimulus materials.

In the *corresponding-encoding* condition, all three participants received the 32 items organized in the same way (e.g., grouped by individuals, by personality-traits, or by contexts). In the *noncorresponding-encoding* condition, each of the three participants received information organized in a different way (one participant received stimulus items grouped by individuals, another by personality-traits, and the other one by contexts).

After the completion of a filler task, participants were asked to free recall all the behaviors presented. The group recall manipulation involved asking the participants to complete recall individually (nominal-group recall) or in collaboration. In this latter condition we asked each successive member of the group to recall aloud a single behavior from the behaviors that were yet to be recalled (or passed his/her turn when unable to recall a new behavior) and to write them down (collaborative-group recall).

Results and discussion

A coder blind to the experimental conditions used a lenient gist criterion to code the behaviors recalled by each participant. Recall intrusions were infrequent and were excluded from all analyses.

Manipulation check

As in Experiment 1, the ARC index was calculated to determine the extent of spontaneous organization as a function of the encoding correspondence manipulation. Two ARC indices were calculated for the nominal-group recall conditions[4] and were analyzed in a one-way ANOVA. The two mean ARC scores differed significantly, $F(1,60) = 9.05$; $p < .004$; $MSE = .20$, $\acute{\eta}^2 = .13$, showing that the ARC index for corresponding encoding condition (ARC-corresponding; $M = 0.19$) was significantly higher than the ARC index for recalled items of the other two encoding conditions (ARC-non-corresponding $= -0.05$).

Recall

The three participants in a collaborative recall session generated a single (joint) recall protocol and constituted one group. To make the nominal recall sessions comparable to the collaborative-groups, data from the three participants in each nominal recall session were combined by aggregating non-redundant recalls from the three individual recall protocols. Thus sessions (rather than participants) were the unit of statistical analysis.

We computed a 2 (encoding condition: corresponding, noncorresponding) × 2 (recall condition: nominal, collaborative) ANOVA on the number of recalled items. Only a Group Recall main effect emerged, $F(1,39) = 8.08$, $p < .007$, $MSE = 13.52$, $\acute{\eta} = .16$, indicating that, overall, nominal-group recall ($M = 20.14$) was higher than collaborative-group recall ($M = 16.95$), replicating the collaborative-inhibition effect. Although the interaction was only marginal, $F(1, 39) = 2.39$, $p < .129$, we tested our specific hypothesis with planned contrast which showed, as predicted, that in collaborative-group conditions, group recall was significantly higher when encoding and retrieval organizations were correspondent than when they were not [$M = 18.64$ vs. $M = 15.27$, $t(39) = 2.15$, $p < .019$; $SD = 3.68$, $d = .69$ (one tailed)]. Also as predicted, the same contrast was not significant in nominal-groups ($t < 1$).

These results are consistent with collaborative-inhibition effects found in the literature and replicate the typical finding of poorer recall in collaborative than in nominal-groups. However, as predicted, the shared organization of items among members significantly reduced the collaborative-inhibition effect. This result is consistent with the recall strategy disruption hypothesis. When retrieval cues (provided by other participants' recall outputs) recapitulated the shared associative organization in the stimulus list recall was less affected, whereas noncorresponding retrieval cues led to more collaborative-inhibition and poorer recall. Of course, no such effects were found in nominal-groups (Fig. 1). As previously noted, the retrieval blocking account could not be used to predict such differences. That explanation rests on the effects of response competition at retrieval, which should remain constant across correspondence or noncorrespondence conditions.

General discussion

In two experiments we manipulated the correspondence between the organization of information present in the stimulus items and the organization activated in the retrieval context, using a part-list cueing paradigm (Experiment 1) and a collaborative recall paradigm (Experiment 2). Both paradigms represent situations in which the retrieval context is likely to provide cues organized in a way that fails to correspond to the idiosyncratic associations formed during encoding, thereby limiting the opportunity to follow those associations in retrieval. Our experiments provide evidence consistent with this interpretation.

Theoretical implications

The results of our two experiments provide additional and useful support for the assumed parallel between the mechanisms underlying the part-list cueing and the collaborative-inhibition effects. Additionally, they specify the limits of memory inhibition in part-list and collaborative recall situations. When part-list cues corresponded to the initial encoding organization, and when the members of collaborative recall groups shared the same encoding organization, participants could follow the (apparently similar) inter-item associations formed during encoding. This similar associative organization between encoding and retrieval substantially reduced recall impairment. More importantly, by directly demonstrating specific conditions that moderate inhibition affects the results provides additional support for the recall strategy disruption hypothesis. The failure to have available, at retrieval, associations that correspond to the associations formed during encoding contributes to the disruption of one's recall strategy producing a recall disadvantage. Conversely, this disadvantage is lessened when such correspondence is present. In contrast, they challenge the retrieval blocking account, which would not predict such a pattern of effects.

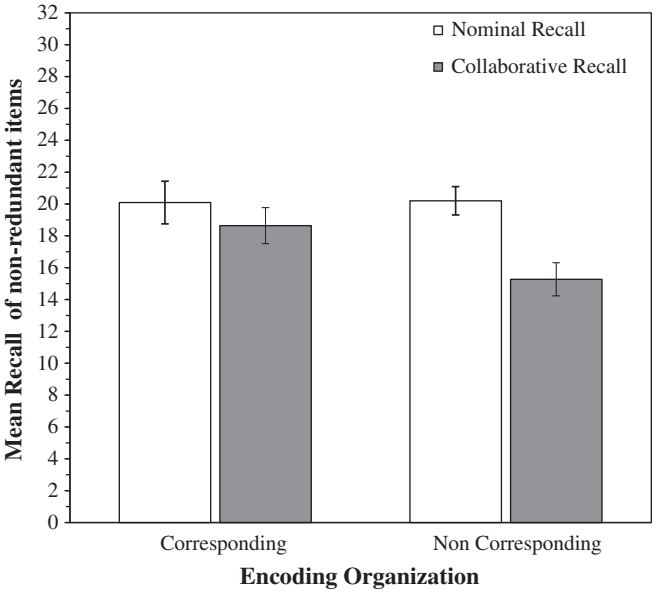

Fig. 1. Mean recall of non-redundant items (+ *SE*) as a function of encoding organization and group recall conditions.

[4] For similar reasons as in Experiment 1, spontaneous organization can only be explored under nominal conditions, where participants recall behaviors without interference.

Nevertheless we believe that some refinement of the recall strategy disruption is needed. Specifically, the very notion of "recall strategy disruption" suggests a reasoned process of developing a conscious and deliberate plan for retrieving information from memory. In our view this is not necessarily the case. For instance, Peynircioğlu (1989, 1995) reported inhibitory effects of the cues in implicit memory tasks when participants had no reason to follow a deliberate recall strategy (see Sloman, Bower, & Rohrer, 1991, for a similar criticism). We contend that explaining inhibition as a disruption of conscious strategies (as opposed to more spontaneous and efficient retrieval processes) would represent an overly restrictive view of memory, one that overlooks many circumstances in which such conscious strategies are unlikely.

Finally, although the present paper only contrasts two accounts for part-list cueing and collaborative-inhibition, we acknowledge that other potential accounts are possible, namely, a *suppression-inhibition* account. According to this account, interference arises when memory items that share a same cue compete for retrieval because the less accessible items are inhibited to facilitate the recall of the more accessible ones (Anderson, Bjork, & Bjork, 1994; Anderson & Spellman, 1995). To differentiate between the suppression-inhibition account and other non-inhibitory accounts (e.g., blocking or retrieval disruption), it is necessary to show that the access to non-cued items is lessened relative to a base-line, even when these non-cued items are in a later stage cued with new cues. As the paradigms we used lack this later stage, it is hard to assess the possible contribution of suppression-inhibition to our results. Nevertheless, it seems possible that the efficacy of the inhibition of non-cued items increases under conditions in which the organization of these retrieval cues mismatches the encoding organization. In that case, then a suppression-inhibition explanation could account for our results. However, the possible contribution of suppression-inhibition to our results can only be explored in future studies that include a later stage in which new cues are provided for the retrieval of previously non-cued items.

Wrapping up

The results of our research challenge the mainstream characterization of cognitive mechanisms as processes taking place exclusively within the individual mind. Like most cognitive activities, person-memory often takes place in a context – either an informational context or a social context – that influences one's ability to remember previously-acquired information. In these ways memory becomes truly a social phenomenon. Individuals do not operate in a social vacuum. On the contrary, the ongoing interactions with others continuously provide retrieval cues, and these cues may or may not recapitulate the idiosyncratic associative organization that individuals form. Such differences, when they occur, can hinder default recall strategies. By showing the moderating role of informational and social context at retrieval, our results stress the importance of studying person-memory within a framework that views cognition as a fundamentally social activity and memory processes as cognitively situated and distributed (Smith & Conrey, 2009; Smith & Semin, 2004; Wegner, 1995) rather than simply individual phenomena.

References

Anderson, M. C., & Bjork, R. (1994). Mechanisms of inhibition in long-term memory: A new taxonomy. In D. Dagenbach, & T. H. Carr (Eds.), *Inhibitory processes in attention, memory and language* (pp. 265–325). San Diego, CA, USA: Academic Press, Inc.

Anderson, M. C., Bjork, R. A., & Bjork, E. L. (1994). Remembering can cause forgetting: Retrieval dynamics in long-term memory. *Journal of Experimental Psychology: Learning, Memory & Cognition*, *20*, 1063–1087.

Anderson, M. C., & Spellman, B. A. (1995). On the status of inhibitory mechanisms in cognition: Memory retrieval as a model case. *Psychological Review*, *102*, 68–100.

Andersson, J., & Rönnberg, J. (1995). Recall suffers from collaboration: Joint recall effects of friendship and task complexity. *Applied Cognitive Psychology*, *9*, 199–211.

Andersson, J., & Rönnberg, J. (1996). Collaboration and memory: Effects of dyadic retrieval on different memory tasks. *Applied Cognitive Psychology*, *10*, 171–181.

Andersson, J., & Rönnberg, J. (1997). Cued memory collaboration: Effects of friendship and type of retrieval cue. *European Journal of Cognitive Psychology*, *9*, 273–287.

Barnier, A. J., & Sutton, J. (2008). From individual to collective memory: Theoretical and empirical perspectives. *Memory*, *16*, 177–182.

Barnier, A. J., Sutton, J., Harris, C. B., & Wilson, R. A. (2008). A conceptual and empirical framework for the social distribution of cognition: The case of memory. *Cognitive Systems Research*, *9*, 33–51.

Basden, D. R., & Basden, B. H. (1995). Some tests of the strategy disruption interpretation of part-set cuing inhibition. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *21*, 1656–1669.

Basden, B. H., Basden, D. R., Bryner, S., & Thomas, R. L. (1997). A comparison of group and individual remembering: Does group participation disrupt retrieval? *Journal of Experimental Psychology: Learning, Memory and Cognition*, *23*, 1176–1189.

Basden, D. R., Basden, B. H., & Galloway, B. C. (1977). Inhibition with part-set cuing. *Journal of Experimental Psychology: Human Learning and Memory*, *3*, 100–108.

Basden, B. H., Basden, D. R., & Henry, S. (2000). Cost and benefits of collaborative remembering. *Applied Cognitive Psychology*, *14*, 497–507.

Basden, B. H., Basden, D. R., Thomas, R. L., III, & Souphasith, S. (1998). Memory distortions in collaborative recall. *Current Psychology*, *16*, 225–246.

Clark, N. K., & Stephenson, G. M. (1989). Group remembering. In P. B. Paulus (Ed.), *Psychology of group influence* (pp. 357–391). Hillsdale, NJ: Laurence Erlbaum Associates.

Echterhoff, G., & Hirst, W. (2009). Social influence on memory. *Social Psychology*, *40*, 106–110.

Garcia-Marques, L., Hamilton, D. L., & Maddox, K. (2002). Exhaustive and heuristic retrieval processes in person cognition: Further tests of the TRAP model. *Journal of Personality and Social Psychology*, *82*, 193–207.

Garrido, M. V., Garcia-Marques, L., & Hamilton, D. (2011). *Hard to recall but easy to judge: Retrieval strategies in social information processing. Social cognition.*

Hinsz, V. B., Tindale, R. S., & Vollrath, D. A. (1997). The emerging conceptualization of groups as information processors. *Psychological Bulletin*, *121*, 43–64.

Hoppe, R. A. (1962). Memorizing by individuals and groups. A test of the polling-of-ability model. *Journal of Abnormal and Social Psychology*, *65*, 64–67.

Johansson, O., Andersson, J., & Rönnberg, J. R. (2000). Do elderly couples have a better prospective memory than other elderly people when they collaborate? *Applied Cognitive Psychology*, *14*, 121–133.

Levine, J., Resnick, L., & Higgins, E. (1993). Social foundations of cognition. *Annual Review of Psychology*, *44*, 588–612.

Lorge, I., & Solomon, H. (1961). Group and individual behavior in free recall. In J. H. Criswell, H. Solomon, & P. Suppes (Eds.), *Mathematical methods in small group processes* (pp. 221–231). Stanford, CA: Stanford University Press.

McCann, D. C., Ostrom, T. M., Mitchell, M. L., Herstein, J. A., & Pusateri, T. P. (1983). Blocking of person information in small social groupings: The formation of person categories. *Technical report no TR/ONR-9, Social Psychology Bulletin* (pp. 3–18).

Meudell, P. R., Hitch, G. J., & Boyle, M. (1995). Collaboration in recall: Do pairs of people cross cue each other to produce new memories? *Quarterly Journal of Experimental Psychology*, *48*, 141–152.

Meudell, P. R., Hitch, G. J., & Kirby, P. (1992). Are two heads better than one? Experimental investigations of the social facilitation of memory. *Applied Cognitive Psychology*, *6*, 525–543.

Nickerson, R. S. (1984). Retrieval inhibition from part-set cuing: A persisting enigma in memory research. *Memory & Cognition*, *12*, 531–552.

Ostrom, T. M. (1981). Theoretical perspectives in the analysis of cognitive responses. In R. E. Petty, T. M. Ostrom, & T. C. Brock (Eds.), *Cognitive responses in persuasion* (pp. 283–290). New Jersey: Hillsdale.

Ostrom, T. M., Pryor, J. B., & Simpson, D. D. (1981). The organization of social information. In E. T. Higgins, C. P. Hennan, & M. P. Zanna (Eds.), *Social cognition: The Ontario Symposium*, *vol. 1*. (pp. 3–37)Hillsdale, N.J.: Erlbaum.

Peynircioğlu, Z. (1989). Part-set cuing effect with word-fragment cuing: Evidence against the strategy disruption and increased-list-length explanations. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *15*, 147–152.

Peynircioğlu, Z. (1995). Part-set cuing in incidental and implicit memory. *American Journal of Psychology*, *108*(1995), 1–11.

Pryor, J. B., & Ostrom, T. M. (1981). The cognitive organization of social information: A converging-operations approach. *Journal of Personality and Social Psychology*, *41*, 628–641.

Pryor, J. B., Simpson, D. D., Mitchell, M., Ostrom, T. M., & Lydon, J. (1982). Structural selectivity in the retrieval of social information. *Social Cognition*, *1*, 336–357.

Rajaram, S., & Pereira-Pasarin, L. P. (2010). Collaborative memory: Cognitive research and theory. *Perspectives on Psychological Science*, *5*, 649–663.

Roediger, H. L., Bergman, E. T., & Meade, M. L. (2000). Repeated reproduction from memory. In A. Saito (Ed.), *Bartlett, culture, and cognition* (pp. 115–134). London: Psychology Press.

Roediger, H. L., Stellon, C. C., & Tulving, E. (1977). Inhibition for part-list cues and rate of recall. *Journal of Experimental Psychology: Human Learning and Memory*, *3*, 174–188.

Roencker, D., Thompson, C., & Brown, S. (1971). Comparisons of measures for the estimation of clustering in free recall. *Psychological Bulletin*, *76*, 45–48.

Rundus, D. (1973). Negative effects of using list items as recall cues. *Journal of Verbal Learning and Verbal Behavior*, *12*, 43–50.

Sedikides, C., & Ostrom, T. M. (1988). Are person categories used when organizing information about unfamiliar sets of persons? *Social Cognition*, *7*, 252–267.

Sedikides, C., & Ostrom, T. M. (1990). Persons as privileged categories: A rejoinder to Mullen and Copper. *Social Cognition*, *8*, 229–240.

Slamecka, N. J. (1968). An examination of trace storage in free recall. *Journal of Experimental Psychology*, *76*, 504–513.

Sloman, S. A., Bower, G. H., & Rohrer, D. (1991). Congruency effects in part-set-cuing inhibition. *Journal of Experimental Psychology: Learning, Memory & Cognition*, *17*, 974–982.

Smith, E. R., & Conrey, F. R. (2009). The social context of cognition. In P. Robbins, & M. Aydede (Eds.), *The Cambridge handbook of situated cognition* (pp. 454–466). New York: Cambridge University Press.

Smith, E. R., & Semin, G. R. (2004). Socially situated cognition: Cognition in its social context. *Advances in Experimental Social Psychology*, *36*, 53–117.

Tulving, E., & Pearlstone, Z. (1966). Availability versus accessibility of information in memory for words. *Journal of Verbal Learning & Verbal Behavior.*, *5*(1966), 381–391.

Wegner, D. M. (1986). Transactive memory: A contemporary analysis of the group mind. In B. Mullen, & G. R. Goethals (Eds.), *Theories of group behavior* (pp. 185–208). New York: Springer-Verlag.

Wegner, D. M. (1995). A computer network model of human transactive memory. *Social Cognition*, *13*, 318–339.

Weldon, M. S. (2001). Remembering as a social process. In D. L. Medin (Ed.), *The psychology of learning and motivation, vol. 40.* (pp. 67–120)San Diego, CA: Academic Press.

Weldon, M. S., & Bellinger, K. D. (1997). Collective memory: Collaborative and individual processes in remembering. *Journal of Experimental Psychology: Learning, Memory and Cognition*, *23*, 1160–1175.

Weldon, M. S., Blair, C., & Huebsch, P. N. (2000). Group remembering: does social loafing underlie collaborative inhibition? *Journal of Experimental Psychology: Learning, Memory and Cognition*, *26*, 1568–1577.