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Collaborative inhibition: A counterintuitive phenomenon

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Abstract

Recollection is frequently social; people tend to remember with others and when they do, their joint recollection is enhanced (Meudell, Hitch & Kirby, 1992). While one intuitively thinks that collaboration would enhance memory, Weldon, et al. (1997) argued that recalling with others impairs retrieval of “unique items.” This collaborative inhibition (CI), occurs when pairs of subjects recall fewer correct “unique” items than others recall in isolation. This is a common result in many studies and has been attributed to both social and cognitive causes. This study examined whether or not collaborative inhibition would disappear if the total possible number of unique items were equal in groups and individuals randomly put into pairs and triads. In a series of experiments, we showed that the nominal grouping condition remembered more unique correct items than collaborative groups, but the effects of collaborative inhibition disappeared when the collaborative subjects were given an equal number of chances to remember as the isolated subjects. This provides evidence that the effects of collaborative inhibition are caused by an artifact in the scoring procedure and not a memory failure. This finding is vital in memory research because it alleviates the doubt on group recall caused by collaborative inhibition.
Collaborative inhibition: A counterintuitive phenomenon

Most memory research conducted analyzes individual participants’ data. The few past studies that investigated the relationship between individual recall and recall in a group all concluded that groups remember more items accurately than an individual (Meudell et al., 1992). Thus the expression “Two heads are better than one,” became a common belief. With memory, particularly episodic memory, relying heavily on interpersonal interactions through the reminiscing of shared experiences, that conclusion seemed both logical and precise.

Early Collaborative Research

Meudell, Hitch, and Kirby (1992) took the analysis of collaborative recall a step further by asking whether the trend of groups recalling more items was due to collaborative groups facilitating memory or simply due to the a statistical pooling of responses.

The authors tested their theory by having participants recall in two separate sessions immediately after each other. In the first session all participants individually completed a free-recall of words learned three months before. Immediately after the first recall participants performed another recall with some put into pairs (dyads) and some left as individuals to act as a control group. Scoring the data played an important part in how the results were analyzed. Meudell et al. (1992) theorized that if group recall facilitated individual recall then group recall would not only contain more items than individual recall, but it would also contain items that had not appeared on either of the participants’ individual recall. That is, collaborative group recall would elicit new information that would not have been recalled if the individuals stayed separate. To
Collaborative Inhibition

Collaborative Inhibition occurs when interacting collaborative groups fail to out perform the combined performance of individuals (Weldon & Bellinger, 1997).

Nominal Groups: Optimizing Group Recall

Before continuing the examination of collaborative inhibition, some explanations in terminology and methodology need to be made. First of all, the terms collaborative group and group are used interchangeable. Secondly, the method used in collaborative inhibition studies to determine the predicted performance value of a group requires some clarification.

In order to compare the output of a collaborating group to that of an individual, it is necessary to compare the performance of a collaborating or interacting group to the performance of a nominal or non-interacting group (Thompson, 2008). Nominal groups
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consist of at least two individuals who work alone during the entire experiment. The nominal groups are then formed during the analysis of the data by randomly placing individual participants’ data together as if they had worked together collaboratively. The data are scored by pooling together unique, non-redundant, answers from each individual set of data. For example, if the nominal group consists of two participants with participant 1 recalling items a,b,c,d,e while participant 2 recalling items d,e,f,g,h,j then the combined performance would be a,b,c,d,e,f,g,h,j and would be the nominal group’s performance (Thompson, 2008). The scores from the nominal group act as a predictor for the performance of a collaborating group due to the findings in collaborative memory research that collaborative group performance is just a pooling of the individuals (Meudell et al., 1992). Comparing the scores of a nominal group to a collaborating group produces three potential predictions. (1) If the collaborating group performs greater than the nominal group, then collaboration facilitates, or enhances performance. (2) If the performance of both the collaborating and the nominal groups are equal, then there is no effect of collaboration on performance. (3) If the collaborating groups perform less than the nominal groups, then collaboration must inhibit performance (Weldon & Bellinger, 1997). Collaborative inhibition is found when the third prediction is correct.

Early Collaborative Inhibition Research

Using the concept of nominal groups, Weldon and Bellinger (1997) were the first to explore collaboration in memory specifically set on determining whether groups or individuals are more productive in recall. The goal of their study was to determine whether collaboration facilitates, inhibits, or pools individual’s knowledge. They set up their experiments in a similar fashion to Meudell et al. (1992), having participants recall
the same items in two testing sessions, one after the other, either individually-individually (II), collaboratively-collaboratively (CC), individually-collaboratively (IC), or collaboratively-individually (CI). For example, when working in isolation, one person might remember the items coffee, eggs, toast, jam and bacon and the other remembers coffee, eggs, jelly, juice and cereal (See Table 1). When these two people remember together after a one-week delay, they remember coffee, eggs, jelly, jam, juice and cereal. While they remember more at the one-week delay (six items instead of the five each remembered individually), the number of unique correct items recalled between the two of them is less than when they worked alone (six unique items as a pair instead of eight when working alone).

The results showed that despite the output of a collaborating group being larger than an individual’s output, collaborating group’s performance did not exceed the predicted performance of the nominal group. They called this curious lack of optimization collaborative inhibition.

_Social Explanations of Collaborative Inhibition_

With memory being a social activity, a logical reason for CI can be attributed to previously established theories of social inhibition dealing with other cognitive functions, such as brainstorming and group productivity. One such theory of is social loafing. As described by Latané, Williams and Harkins (1979), social loafing refers to “a decrease in individual effort due to the social presence of other persons.” Latané et al. (1979) demonstrated social loafing though two physical tasks, cheering and clapping, that are usually done in social settings. They compared the measured intensity of an individual clapping/cheering by themselves to the intensities of clapping/cheering in groups of two,
four, and six. The results showed that, although the overall intensity of the group was higher than the individuals', the group's intensity level was not just a summation of the individual's intensity. Instead, group intensity level never represented the predicted value of multiplying the individual intensity level by number of people in the group. In fact, as the group size increased, ratio of actual intensity level to predicted intensity level decreased. That is, two-person groups only performed to 71% of their predicted performance, while six-person groups performed at 40%. These results support the social loafing because in a group, one feels as if they do not need to put as much effort into the activity because there are other people to contribute.

Social loafing fits logically as the cause of collaborative inhibition because the effect of collaborative inhibition matches the effect seen in social loafing, that as a group gets larger they stray even farther away from the predicted value of performance because there are others to assist in the contributions to the group (Latane et. al, 1979). Weldon, Blair, and Huebsch (2000) investigated whether motivational factors, such as social loafing, contributed to CI during recall. They predicted that if collaborative inhibition was eliminated when motivation is increased, then collaborative inhibition is due to reduced motivation in the interacting collaborative group.

Each of the five experiments Weldon et al. (2000) conducted dealt with various motivation factors. Experiment 1 used a straightforward motivational manipulation by offering participants money for recalling the most words. If collaborative inhibition was merely due to a decrease in motivation, then with the monetary incentive, performance of the group should match the predicted nominal performance, thus eliminating collaborative inhibition completely. Experiment 2 was designed to test whether or not
evaluation apprehension caused people to withhold answers during the collaborative recall. Evaluation apprehension occurs when people do not recall items that they are unsure of due to an increased worry about how they may appear to the group if they make a contribution that appears to be erroneous (Collaros & Anderson, 1969). By telling participants they were not to leave the experiment until reaching a set amount of items, the experimenters set a high performance standard and forced people to recall. This rewarded them for recalling even the items they were uncertain, which, according to the evaluation apprehension theory, would not have been recalled in the usual group collaboration settings. Experiment 3 addressed personal accountability, or the effect that people in groups feel less personally accountable for the outcome, leading to a reduced effort made by the individual. Accountability was established by participants writing their names on the scoring sheet and documenting each word recalled under their name. Experiment 4 examined group performance when the group members were more cohesive than just by random assignment. If people feel more familiar or connected with other members of the group, they might feel less afraid of making a mistake, be more flexible in coordinating their recall strategies, or be more invested in the group outcome, any of which could lead to a raised level of performance. The last experiment looked at recall in groups of just women. Some research on gender differences has suggested that in mixed-gender collaborating groups, women are more reserved than in same-gender groups. This reticent behavior could account for the reduced recall observed in collaborating groups.

Every motivational factor in the experiments failed to eliminate collaborative inhibition. Those results suggest that motivational factors that would usually elevate
reduced performance in social loafing play an insignificant, if any, role in collaborative inhibition.

_Cognitive Explanations of Collaborative Inhibition_

According to the results of Weldon et al. (2000), the seemingly logical assumption that social interactions play a significant part in collaborative recall is actually a faulty assumption. This provides evidence to suggest a more cognitive origin for collaborative inhibition.

An early study by Andersson and Rönnberg (1995) looked at the recall in collaborative groups consisting of friends vs. non-friends. They hypothesized that due to encoding specificity (Tulving & Thomson, 1973), groups consisting of friends would be less affected by collaborative inhibition. Encoding specificity states that the best cues for encoding are self-generated cues and so the more specific the cue is at encoding, the easier it will be to retrieve events when the cue is reinstated. Because friends know some of the subtle features of each other's habits, values, knowledge structure, and memory skills, they will be able to cue each other better and thus reduce, if not eliminate, collaborative inhibition effects. This study differed from the method of Meudell et al. (1992) only in recall type. Andersson and Rönnberg used two stories of varying complexity to mimic episodic memory, and then asked participants to do a free-recall of those stories. The results showed that in the simpler episodic memory task, both groups of friends and non-friends still showed the effects of collaborative inhibition. However, in the more complex episodic memory task, the groups of friends were able to reduce the effects of collaborative inhibition, but not eliminate it completely. Given the knowledge on episodic memory, their conclusions make sense. Because episodic memories are
memories for events, most episodic memories are shared with other people. It can be concluded from their results that collaborating with others will help in remembering complex events, which could help avoidance of a possible dangerous experience. This reduction goes against Weldon et al. (2000) analysis of group cohesion, but the contradiction could be attributed to the different recall conditions.

Basden, Basden, Bryer, and Thomas (1997) also looked at the cause of collaboration inhibition as an effect of cognitive processes. However, they focused on the opposite side of the remembering process than Andersson and Rönnberg (1995) and paid special attention to the extent in which collaborative inhibition resulted from the disruption of normal recall strategies. They predicted that recall strategies would be disrupted in collaborative interacting group remembering, resulting in poorer recall and organization in collaborative groups than in nominal groups. To test this theory, they used the theory of part-list cueing inhibition to evaluate recall disruption in collaborative inhibition. Part-list cueing inhibition occurs when recall performance is reduced when participants are provided with some members of the list they are to remember at the time of recall. An explanation for part-list cueing inhibition is that cues disrupt retrieval strategies in the individual who is trying to remember (Basden & Draper, 1973). If collaborative inhibition is analogous to part-list cueing then it would exhibit the same effects in recall disruption.

Basden et al. used the sequential test-retest method in establishing comparison data, as used in the previous studies described. They also used the same lists used by Basden & Draper (1973) in their part-list cueing study in order to make an accurate comparison of effects. The procedure was unique to this study, and unlike other
investigations of collaborative recall, participants gave all their answers aloud, with the experimenter typing the answer on a screen visible to all participants in the groups. Participants took turn in recalling, giving only one answer at a time. No category labels were provided during testing, but they were scored in relation to which category they belonged to and whether or not those categories were recalled as a whole or in parts. This study contained multiple experiments to serve as a comparison of the various manipulations. In some experiments, no category cues were given at time of recall, while in others, only some category-name cues were given. If collaborative inhibition is a result of the disruption of retrieval strategies, then there would be a reduction in category recall for lists containing a large number, but to reduce instance recall for lists containing a relatively small number of categories. Also, if group remembering disrupts retrieval, then the clustering of categories by the groups should be lower than for individuals.

Results provided substantial support that some form of retrieval-strategy is involved in both part-list cueing inhibition and collaborative inhibition. Recall was found to be greater for groups than for individuals and recall was greater for nominal groups than for collaborative groups. Also, the magnitude of collaborative inhibition varied with list structure. With lists that contained many categories, nominal groups recalled significantly more than collaborative groups, but with lists of smaller amounts of categories, nominal and collaborative groups did not differ, which suggests that retrieval strategies are disrupted when there are too many different categorized words to place into categories efficiently. Low levels of clustering found in groups provided even more evidence for a retrieval based origin of collaborative inhibition because clustering determines how recall is organized by category. It indicates that a word recalled by a
participant in a collaborating group was usually unrelated by category to the word
recalled by the previous participant.

Some of the varying results found in Basden et al. (1997), can be attributed to the
number of variables manipulated. In comparison to Weldon and Bellinger (1997), they
added many sources of variation, such as using categorized words and forcing
participants to take turn. Just by making participants wait until it is their turn to speak
could cause an inhibitory effect. Just as people sometimes forget what they wanted to say
while waiting for their turn to speak in a conversation, participants could have lost
recalled items while waiting for a chance to say them aloud. This causes the
collaborative groups and nominal groups to have two different testing environments
because individuals in nominal groups could write down a recalled item as soon as it
came to them, which may allow for fewer items forgotten.

In recent studies, there have been accounts of collaborative inhibition resulting
from things other than the processes of memory. Wright and Klumpp (2004)
hypothesized that collaborative inhibition is a result of the product, not the process of
recalling in groups. In other words, it is the structure of the group dialogue that impairs
group performance. Like previous studies, participants worked either independently or in
pairs. For half of the pairs, the participants were able to see what their partner had
written, resulting in collaborative inhibition. Conversely, when the participants in pairs
did not see the words recalled by the other person recall matched that in nominal groups.
From those results they concluded that collaborative inhibition was due to interference
caused by the product of recall, not the process.
All of the aforementioned explanations have been proposed to account for the differences in remembering between dyads and nominal groups. Whereas each of the theories are competing candidates, none of them completely explains the phenomenon of collaborative remembering. The present study is aimed at finding an alternative hypothesis behind the discrepancies in collaborative remembering. The previously mentioned theories take into consideration some of the fundamental processes at work when people recall events; however they may be overlooking a simple flaw in the measurement technique. Past studies (e.g., Weldon, et al., 2000) used joint recollection where groups had only one opportunity to answer each question. Assuming some of the items are going to be difficult (e.g., Wright and Matthews, 2004), nominal rememberers each have a chance to guess at the answer. Collaborative groups must come up with a common guess between them. Thus, collaborative groups get half the guesses allowed to nominal groups. We hypothesized that by changing the design such that collaborative groups have the same number of guesses as isolated subjects the inhibitory effect of collaborative inhibition should disappear. This new collaborative group, the equal chance group, will allow for each member in the group to write down their answer without losing the effects of collaborative remembering (See Table 2).

Hypotheses

1. If collaborative inhibition is merely an artifact of measurement, then allowing collaborative groups the same number of guesses as the isolated nominal groups should erase the collaborative inhibition effect. We hypothesized that when we followed the same scoring method used by Weldon and Bellinger (1997), collaborative inhibition would be observed in the comparison of nominal groups and collaborative groups.
However, the effects of collaborative inhibition would disappear in collaborative groups given equal chances as nominal groups to recall unique items (equal chance groups).

2. Because of the artificial inflation of memory in the nominal groups, we predicted that triads would increase the effects of collaborative inhibition in comparison to dyads because the total chances given to a collaborative group triad was cut by one third.

3. We also hypothesized that the effects of collaborative inhibition would still disappear when participants were not forced to answer, or when we eliminated guessing by not requiring participants to response to all questions.

Experiment One

Methods

Participants

366 Butler University students participated in this study for extra credit in their psychology courses. All participants were of traditional college age (18-23 yrs). Each participant signed a statement of informed consent and was informed of his right to leave the experiment at any time.

Materials

A slide show, created on Microsoft Powerpoint, was used to present the TBR slide material. The slide show contained a total of 40 slides; 13 were pictures showing a house for sale. Before each picture slide, there was a blank slide and then a slide containing a title for the following picture slide. Each slide was presented for five seconds. The slide show was projected on a large screen to ensure that all participants were able to see the slides. The slides were complex in nature, each having several items
on which to focus one’s attention. For example, the slide depicting the sunroom showed a sliding door, fireplace with a lifejacket leaning against it, a can of soda and a chair. All of the slides were neutral in content.

Procedure

All participants viewed the narrated slide show showing a house for sale. Each slide was shown for five seconds. During the blank screen delay, a short narrative describing the scene was read. The presentation took five minutes to complete.

Participants then completed word search puzzles for ten minutes, as a distracter task, before completing a questionnaire about the slideshow. The questionnaire focused on the middle three slides, each of which showed multiple household items varying in relevance and placement (Figure 1). Focusing the questions on the three middle slides eliminated any primacy and recency effects.

Each questionnaire included 24 questions, 8 questions from each slide, alternating between recall and recognition questions (Appendix A). Questionnaires varied in three different grouping conditions, nominal, group, and equal chance, each of which had two forms in order to counterbalance recall and recognition questions. Participants were then randomly assigned the forms and completed the questionnaires. If the participants were assigned to the nominal condition, they completed the questionnaire by themselves. If the participants were assigned to either the equal chance condition or the group condition, they completed the questionnaire with one or two partners, depending on whether they were assigned to triad or dyad group size. For each question in the questionnaire, participants were asked not to leave any questions blank and participants were asked to rate their confidence in the correctness of their answer.
In the equal chance condition, participants were given slightly different instructions. They were instructed to think about their answer, write it down individually, collaborate with their members, and circle the agreed upon answer they discussed with their partners as well as their joint confidence that their answer was correct. This allowed the equal chance condition to take on aspects of the two other grouping conditions. Also, it gave the participants the same number of guesses as the nominal condition, while maintaining the collaborative discussion associated with the group condition.

After the data was collected from the participants, it was scored and entered into a data analysis program. Each correct answer was assigned a 1 and wrong answers, as well as questions left blank, received a zero. The means were calculated and expressed as a proportion correct.

Results

Unique Correct

An examination of the mean proportions of unique correct memory of slide items using a two-way analysis of variance, 2(group size: 2 vs. 3) x 3(condition: nominal vs. group vs. equal chance group) revealed the collaborative inhibition effect, with a significant condition effect, $F(2,365) = 75.25, p < .0001$ (Figure 2), as well as a group size effect, $F(1,362) = 58.22, p < .0001$. Both the nominal ($M = .669$) and equal chance ($M = .641$) groups recalled significantly more than the collaborative groups ($M = .514$). Fisher’s LSD test showed a significant difference existed between the comparison of group vs. nominal and group vs. equal chance, but not between the nominal vs. equal chance groups (see Table 3). The group size effect was due to triads ($M = .659$) recalling more unique correct items than dyads ($M = .583$). Figure 3 shows the grouping condition.
split by group size where triads had a greater mean unique correct memory than dyads in each grouping condition.

**Total Memory**

Total slide memory was examined using a two-way analysis of variance, 2(group size: 2 vs. 3) x 3(condition: nominal vs. group vs. equal chance group). The collaborative inhibition phenomenon disappeared with participants in the group and equal chance conditions out performing participants in the nominal condition (Figure 4). A significant effect was found in group condition, $F(2, 365) = 105.31; p < .0001$, with participants from both the group ($M = .514$) and equal chance conditions ($M = .641$) performing better than nominal groups ($M = .420$). A Fisher’s LSD analysis revealed that all three conditions were significant different from each other (see Table 3). Also, a significant effect was found in group size ($F(2, 365) = 7.71; p < .0005$) with triads performing better than pairs in both the collaborative groups and the equal chance groups, but not in the nominal groups. Overall group size, showed a linear increase as group membership increased (Figure 5).

The results supported our hypothesis that when collaborative groups are given the same amount of chances to guess, the collaborative inhibition disappeared. The results also supported our hypothesis that even though the collaborative inhibition effect would be greater in triads in the unique recall, the effect would still disappear once all groups had the same amount of guesses.

**Discussion**

These results suggest collaborative inhibition is artifactual. Past studies have shown fewer unique items in grouped pairs in comparison with nominal pairs. The
grouping/scoring method (Weldon & Bellinger, 1997) gave nominal pairs (actually tested in isolation) more guesses at each memory question whereas their grouped subjects had but one mutual chance to get the question correct. When grouped subjects were given the same number of tries as the nominal subjects, their unique item performance was identical to the nominal paired subjects. Our results also showed that for mean unique correct there was a significant difference between dyads and triads in the nominal condition. Because each participant answered the questions in isolation, there should not be an increase in items recalled when the group size increased. When looking at the total memory correct, there was no significant difference between dyads and triads in the isolated condition. This provides strong evidence for the collaborative inhibition effect is due to the nominal groups artificially pooling individual responses.

However, by asking participants not to leave any questions blank, we did not follow similar procedures used in recent studies. In our procedure, we specifically told the participants not to leave any questions blank. Because of this, a correct answer can either occur because the participant remembered the answer correctly or the participant guessed correctly, which is not a common method of assessing memory. Therefore, this forced choice procedure may have inflated the overall memory results and decreased our validity. To eliminate the possible effects of the forced choice procedure, and to make our study more comparable to the results of other current studies investigating collaborative inhibition, we accounted for guesses in the next experiment.
Experiment 2

Methods

Participants
88 Butler University undergraduates participated in this study for extra credit in their psychology courses. All participants were of traditional college age (18-23 yrs). Participants signed a statement of informed consent and were informed of their right to leave the experiment at any time.

Procedure
The same procedure (and materials) that was used in the first experiment was followed except for two minor changes. All participants were only put into dyads instead of both triads and dyads. Also, at the time of assessment, participants were instructed to leave questionnaire questions blank if they were sure they did not know the answer.

Results

Unique Correct
An examination of the mean proportions of unique correct using a 3(conditions) repeated measure ANOVA analysis failed to reveal any significant differences between testing conditions, $F(2, 86) = 2.19; p < .120$, (Figure 6). The mean proportions of unique correct memory for the nominal and group condition showed no difference thereby not showing the collaborative inhibition phenomenon (see Table 4). These results did not support our hypotheses because we were unable to elicit the collaborative inhibition effect.

Total Memory
Total memory showed a significant difference between groups, $F(2,86) = 6.041; p < .001$, (Figure 7). A Fisher’s LSD analysis showed a significant difference existed
between the group condition vs. nominal condition and the nominal condition vs. the equal chance condition. However, no significant difference was found in the comparison of group condition vs. equal chance condition (Table 5). The group condition (M = .571), and equal chance condition (M = .525), showed significantly higher means proportion than the nominal condition (M = .417). These results did support our hypotheses because we were able to show a significant difference between grouping condition, with group dyads and equal chance dyads being higher than nominal dyads. However, we were unable to elicit the collaborative inhibition effect in unique correct memory.

Discussion

Consistent with prior research (Andersson & Rönnberg, 1995) that failed to find collaborative inhibition effects in dyads, we did not see the effect in our analysis of dyad when participants were not required to answer. However, even though the collaborative inhibition effect was not induced, we were still able to see an increase in memory performance when the grouped subjects were given the same amount of chances to recall as the nominal subjects. This led us to believe that the phenomenon of collaborative inhibition is not a memory failure, but it due to an artifact of testing procedure.

Because we were unable to elicit collaborative inhibition in non-forced recall dyads, we decided to test whether or not the collaborative inhibition effects could be found and then eliminated in non-forced recall triads. The next experiment addressed this issue.
Experiment 3

Methods

Participants
105 Butler University students participated in this study for extra credit in their psychology courses. All participants were of traditional college age (18-23 yrs). Each participant signed a statement of informed consent and was informed of his right to leave the experiment at any time.

Materials

The same format was used as the first experiment except the theme of the slide show was altered. Instead of the picture slides showing rooms in a house, each picture slide depicted a scene from a nature center and park. The slides were complex in nature, each having several items on which to focus one's attention. For example, the slide depicting the sunroom showed a sliding door, fireplace with a lifejacket leaning against it, a can of soda and a chair. All of the slides were neutral in content. Once again, the questionnaire focused on the middle three slides, each of which showed multiple items varying in relevance and placement (Figure 8).

Procedure

The same procedure used in the first experiment was followed except for minor changes. All participants were only put into triads instead of both triads and dyads. Also, at the time of assessment, participants were instructed to leave questionnaire questions blank if they were sure they did not know the answer.
Results

Unique Correct

A repeated measure ANOVA analysis revealed a significant differences between testing conditions, $F(2, 104) = 18.83; p < .0001$, (Figure 9) thereby showing the collaborative inhibition phenomenon. Following the same trend as in the first experiment, the nominal condition ($M=.653$) and the equal chance condition ($M = .637$) were significantly higher than the group condition ($M = .501$). The Fisher’s LSD results revealed the relationship between the grouping conditions. There was a significant difference between the comparison of nominal condition vs. group condition, as well as group condition vs. equal chance condition. However, just as in the first experiment, there was not a significant difference in the comparison of nominal vs. equal chance condition (Table 6).

Total Memory

For total memory, there was an interaction between grouping condition and memory task, therefore to correctly analyze the results, total memory was broken by memory task and analyzed separately.

Recall

Total recall memory followed the same trend as in the previous studies with a significant difference between groups, $F(2,104) = 14.01; p < .001$, (Figure 10). A Fisher’s LSD supported this finding, revealing that a significant difference existed between all three conditions (Table 7). Participants in the equal chance
condition had the highest means proportion (M = .410) followed by group
(M = .333) and then nominal (M = .228). The results supported our hypothesis that
remembering in groups enhances the resulting shared memory of the individuals
in the group.

Recognition

Recognition memory for total memory showed inconsistencies with the previous
experiments. While a one way analysis of variance revealed a significant
difference between grouping conditions, F(2,104) = 5.417; p < .006 (Figure 11), a
post-hoc analysis exposed an inconsistency. A Fisher’s LSD analysis revealed
that whereas the equal chance condition was significantly different from both the
nominal and group conditions, there was no significant difference between the
nominal and group condition (Table 7). The mean proportion of nominal (M = .464)
and group (M = .467) were lower than the mean proportion of the equal
chance condition (M = .590). This finding did not support our hypothesis because
the nominal and group condition showed no significant difference.

Discussion

Once again, the collaborative inhibition effects disappeared when the
collaborative groups were given the same amount of chances to respond as the nominal
groups. By having each individual in the equal chance condition write down his or her
answers before discussing the answer as a group, our method allowed for a grouping
condition to have equal opportunity for getting the correct answer. Even by correcting
for guessing, the collaborative inhibition effect was still elicited in unique correct
memory and eliminated in the total memory recall. The inconsistency found in the
recognition memory for total memory is most likely caused by the change in the slide-show viewed and questions asked in the questionnaire.

**General Discussion**

Through a series of three experiments, this study investigated collaborative inhibition occurring as result of the testing procedure. Although groups have been found to recall more items than individuals (Meudell et al., 1992), some studies have found that they failed to exceed the performance of nominal groups (Basden et al., 1997). This failure of a group to overcome the total unique recall of a nominal group was termed collaborative inhibition by Weldon and Bellinger (1997). Collaborative inhibition has been studied from many angles; social psychology tried to account for it with theories of social loafing and a lack of motivation to perform (Weldon et al., 2000) and cognitive psychology have attributed it to problems in both encoding (Andersson and Rönnberg, 1995) and retrieval (Basden et al., 1997). Recent studies provide evidence for alternative explanations, such as collaborative inhibition is a product of the product and not the process of group remembering (Wright and Klumpp, 2004).

The present results suggest collaborative inhibition is artifactual. The grouping and scoring method used by Weldon and Bellinger (1997) gave nominal pairs (actually tested in isolation) more chances to recall at each memory question whereas their grouped subjects had but one mutual chance to get the question correct. The equal chance condition behaved like the nominal condition when the unique correct items were scored, thus outperforming the group condition. However, when the group condition was given an equal amount of opportunities as nominal condition to recall, as seen in the equal chance condition, they performed greater than the nominal condition, thus
eliminating the collaborative inhibition phenomenon. Therefore, when grouped participants were given the same number of chances to recall as the nominal participants, their memory performance was greater than the nominal condition.

Triads increase the amount of answers given in the nominal condition, which exaggerated the collaborative inhibition effect. Even with this greater effect, when the groups were given equal chances to recall in the equal chance grouping condition, the effect disappeared. Also, when participants were not forced to answer, collaborative inhibition was still found in unique correct memory and then eliminated in total memory. This led us to believe that the phenomenon of collaborative inhibition is not a memory failure, but instead, due to the pooling of nominal participants memory, as well as grouped participants having only half, or one third, the opportunities to recall items.

One limitation in this study is that we did not have a true free recall condition. This study used cued recall questions to analyze recall memory. Current investigations into collaborative inhibition use free recall as the only measure of memory. To better match current investigations, as well as to further investigate collaborative inhibition as an artifact of the testing procedure, a free recall test should be done. We are currently in the progress of testing our hypotheses by only using free recall to measure memory.

Also, because of the limited participant pool, the theme of the slide show was changed for experiment three in attempts to reach more people who were able to participate. The change in the slide show, and thus the questions on the questionnaire made it impossible to directly compare the first two experiments to experiment three. This change in the slide show may have resulted in the inconsistency found in the
recognition results of the third experiment. More experiments run with the same changed slide show, such as a free recall study, should clear up any inconsistencies.

Because people often remember with others rather than in isolation, the belief in the collaborative inhibition phenomenon introduces hesitance for remembering in a group, which can lead to an overall hesitance for memory of our shared experiences, such as episodic memories. Without a firm belief in the memories of our own life, the core of our self-identity is shaken because what are we without our memories?

Past studies cast doubt on the memorial consequences of social remembering. The present results suggest that doubting group remembering is unnecessary. Rather, working with others to remember, at least in lab situations, enhances memory. When the artificial restrictions on recall were removed from the grouped subjects, dyads and triads, their memory for unique correct items did not differ from nominal participants.
References


Collaborative Inhibition


Table 1. Example of the grouping conditions that Weldon and Bellinger (1997) used in their investigations of collaborative inhibition.

<table>
<thead>
<tr>
<th>Word List</th>
<th>Nominal Pairs</th>
<th>Grouped Pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>egg</td>
<td>egg</td>
<td>egg</td>
</tr>
<tr>
<td>toast</td>
<td>toast</td>
<td>toast</td>
</tr>
<tr>
<td>milk</td>
<td>orange</td>
<td>milk</td>
</tr>
<tr>
<td>cereal</td>
<td>bacon</td>
<td>juice</td>
</tr>
<tr>
<td>orange</td>
<td>coffee</td>
<td>jam</td>
</tr>
<tr>
<td>bagel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>juice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>bacon</td>
<td>average: 5</td>
<td>total: 6</td>
</tr>
<tr>
<td>jam</td>
<td>unique: 8</td>
<td>unique: 6</td>
</tr>
<tr>
<td>coffee</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Example of the grouping conditions that Weldon and Bellinger (1997) used in their investigations of collaborative inhibition compared to our new grouping condition, the equal chance condition.

<table>
<thead>
<tr>
<th>TBR Word List</th>
<th>Nominal Pairs</th>
<th>Grouped Pairs</th>
<th>Equal Chance Pairs (agreed answer)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>1 &amp; 2</td>
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<tr>
<td>egg</td>
<td>egg</td>
<td>egg</td>
<td>egg</td>
</tr>
<tr>
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<td>toast</td>
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<td>milk</td>
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<tr>
<td>milk</td>
<td>orange</td>
<td>milk</td>
<td>cereal</td>
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<tr>
<td>cereal</td>
<td>bacon</td>
<td>juice</td>
<td>bagel</td>
</tr>
<tr>
<td>orange</td>
<td>coffee</td>
<td>jam</td>
<td>juice</td>
</tr>
<tr>
<td>bagel</td>
<td></td>
<td>bacon</td>
<td>coffee</td>
</tr>
<tr>
<td>juice</td>
<td></td>
<td></td>
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</tr>
<tr>
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<td>unique: 8</td>
</tr>
<tr>
<td>coffee</td>
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</tbody>
</table>
Table 3

Fisher’s PLSD for Unique Correct

<table>
<thead>
<tr>
<th>Condition</th>
<th>Mean Difference</th>
<th>Critical Difference</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group, Nominal*</td>
<td>.156</td>
<td>.023</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Nominal, Equal Chance*</td>
<td>.029</td>
<td>.027</td>
<td>.0389</td>
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<td>Group, Equal Chance*</td>
<td>-.127</td>
<td>.031</td>
<td>&lt;.0001</td>
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</tbody>
</table>

Fisher’s PLSD for Total Correct

<table>
<thead>
<tr>
<th>Condition</th>
<th>Mean Difference</th>
<th>Critical Difference</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group, Nominal*</td>
<td>-.094</td>
<td>.026</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Nominal, Equal Chance*</td>
<td>-.221</td>
<td>.031</td>
<td>&lt;.0001</td>
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<tr>
<td>Group, Equal Chance*</td>
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<td>.034</td>
<td>&lt;.0001</td>
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</tbody>
</table>

Notes: * Significant at the p<.05 level.
<table>
<thead>
<tr>
<th>Condition</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Standard Error</th>
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</thead>
<tbody>
<tr>
<td>Nominal</td>
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<tr>
<td>Group</td>
<td>.661</td>
<td>.324</td>
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<tr>
<td>Equal Chance</td>
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Table 5  
*Fisher's PLSD for Total Memory in Dyads*

<table>
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</thead>
<tbody>
<tr>
<td>Group, Nominal</td>
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<td>.089</td>
<td>.0009*</td>
</tr>
<tr>
<td>Group, Equal Chance</td>
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<td>.1989</td>
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<td>Nominal, Equal Chance</td>
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</table>

Notes: * Significant at the p<.05 level.
Table 6
Fisher's PLSD for Unique Correct in Triads

<table>
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<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal, Group*</td>
<td>.151</td>
<td>.055</td>
<td>&lt;.0001</td>
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<tr>
<td>Nominal, Equal Chance</td>
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<td>.051</td>
<td>.5373</td>
</tr>
<tr>
<td>Group, Equal Chance*</td>
<td>-.135</td>
<td>.051</td>
<td>&lt;.0001</td>
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</tbody>
</table>

Notes: * Significant at the p<.05 level.
Table 7
Fisher's PLSD for Total Memory Recall in Triads

<table>
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<th>Condition</th>
<th>Mean Difference</th>
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<th>P-Value</th>
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</thead>
<tbody>
<tr>
<td>Group, Nominal*</td>
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<td>.073</td>
<td>.0049</td>
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<tr>
<td>Group, Equal Chance*</td>
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<td>.068</td>
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<tr>
<td>Nominal, Equal Chance*</td>
<td>-.077</td>
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<td>.0280</td>
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</tbody>
</table>

Fisher's PLSD for Total Memory Recognition in Triads

<table>
<thead>
<tr>
<th>Condition</th>
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<th>Critical Difference</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group, Nominal</td>
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<td>.9535</td>
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<tr>
<td>Nominal, Equal Chance*</td>
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<td>.089</td>
<td>.0059</td>
</tr>
<tr>
<td>Group, Equal Chance*</td>
<td>-.123</td>
<td>.089</td>
<td>.0070</td>
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</table>

Notes: * Significant at the p<.05 level.
Figure 1: The three middle slides containing the to be remembered items used in experiments one and two. The slides depict scenes from a house and contain various household items varying in placement and relevance.
Figure 2. Mean proportions of unique correct items ($p$) in grouping condition with standard error bars. The collaborative inhibition effect is shown with the nominal condition having higher mean proportion than the group condition. The equal chance condition matches the nominal condition due to the method of scoring only the unique correct items.
Figure 3. Mean proportions of unique correct items (p) for group size. The collaborative inhibition effect is shown again by the nominal condition having a higher mean proportion than the group condition. Group size shows a linear increase as group size increases in all three grouping condition. Because the nominal condition was tested in isolation, increasing the group size should have no effect. The increase in mean proportion for the nominal condition suggests a pooling effect.
Figure 4. Mean proportion of total memory (p) for grouping condition with standard error bars. The collaborative inhibition effect disappeared as seen by the mean proportion of the group condition being significantly higher than the nominal condition.
Figure 5. Comparison of mean proportions of total recognition memory for group size with standard error bars. The collaborative inhibition effect disappeared with the group condition performing better than the nominal condition. There was a linear increase in group size for both the group and equal chance conditions, but not for the nominal condition. The nominal condition did not show an increase due to group size.
Figure 6: Means proportion of unique correct memory in non-forced dyads for grouping condition with standard error bars. The collaborative inhibition effect was not found due to the nominal condition not outperforming the group condition.
Figure 7: Means proportion of total correct memory in dyads for grouping condition. The group and equal chance condition performed better than the nominal condition.
Figure 8. The three middle slides containing the to be remembered items used in experiments one and two. The slides depict scenes from a nature center and a park and contain various items varying in placement and relevance.
Figure 9: Mean proportions of unique correct memory of triads for grouping condition with standard error bars. The collaborative inhibition effect was found with the nominal condition outperforming the group condition.
Figure 10: Means proportion of total recall memory in triads by grouping condition. The collaborative inhibition effect disappeared with the group and equal chance conditions performing better than the nominal condition.
Figure 11. Means proportion of total recognition memory in triads for group condition. The recognition memory results were inconsistent with our other findings in that the group and nominal condition showed no difference from each other.
Appendix A: Example of Equal Chance protocol

Please answer the following questions as accurately and as detailed as you can remember. Make your best guess if you are not sure, please do not leave any questions blank.

Person 1 should use the black pen and answer questions on the lines provided for person 1. Person 2 should use the blue pen and answer questions on the lines provided for person 2. Next, common/agreed answers should be circled with the red pen.

For recognition questions, please circle only one of the provided answers.

For each question, each person should indicate the confidence using the 5-point scale below. Then come up with an agreed confidence for your agreed answer.

<table>
<thead>
<tr>
<th>Confidence Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>Not at all Little Confident</td>
</tr>
</tbody>
</table>

Confidence (1-5)

Answer the following 8 questions about the breakfast scene.

1. How many pieces of silverware were there? (1) ____________ (1) _____
   (2) ____________ (2) _____

2. What kind of cosmetic was on the table? (1) ____________ (1) _____
   Eye Shadow
   Lipstick
   Powder
   Compact

3. What was in the jar on the table? (1) ____________ (1) _____
   Cookies
   Jelly
   Pickles

4. What band’s CD was sitting on the table? (1) ____________ (1) _____
   (2) ____________ (2) _____

5. What color was the toy car on the table? (1) ____________ (1) _____
   Pink
   Yellow
   Blue

6. How many pieces of toast were there? (1) ____________ (1) _____
   (2) ____________ (2) _____

7. What drink was being served with breakfast? (1) ____________ (1) _____
   OJ
   Milk
   Coffee

(2) _____
Confidence Scale

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>Little</th>
<th>Average</th>
<th>Very</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Confident</td>
<td></td>
<td>Confidence</td>
<td></td>
<td>Confident</td>
</tr>
</tbody>
</table>

Confidence (1-5)

8. What tool accompanied the breakfast on the table? (1) __________ (2) __________

Answer the following 8 questions about the lunch preparation scene.

9. What item was being cut? (1) __________ (2) __________

10. What brand of cigarettes was on the table? (1) __________ (2) __________

11. What type of soup was there? Chicken Noodle Tomato Vegetable (1) __________ (2) __________

12. What vegetable was on the plate? Lettuce Carrot Onion (1) __________ (2) __________

13. What type of ball was on the table? (1) __________ (2) __________

14. What was in the large red box? (1) __________ (2) __________

15. What color was the crayon? Red Black Orange (1) __________ (2) __________

16. What type of figurine was on the table? Barbie Soldier GI Joe (1) __________ (2) __________

Answer the following 8 questions about the bathroom scene.

17. What brand of shaving cream was on the counter? (1) __________ (2) __________

18. What color was the highlighter? Blue Pink Yellow (1) __________ (2) __________
19. What tool was in the sink? (1) ____________________________  
(2) ____________________________  

20. How many toothbrushes were in the toothbrush holder? 0 1 2  
(1) ___  
(2) ___  

21. What color was the deodorant? (1) ____________________________  
(2) ____________________________  

22. What type of knife was on the counter? Swiss Plastic Steak  
   Army Knife Knife  
(1) ___  
(2) ___  

23. What sports equipment was in there? (1) ____________________________  
(2) ____________________________  

24. What type of shampoo was on the counter? Herbal Head and Suave  
   Essences Shoulders  
(1) ___  
(2) ___