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Abstract

Research has demonstrated that individuals provided with examples in a creative idea generation task tend to fixate on the most salient aspects of the examples and incorporate those features into their own creative products. The purpose of this study is to ascertain the extent to which this occurs within the context of interacting groups. The process by which groups generate creative products under two conditions was investigated, with examples provided and without. Groups were also compared to participants working alone. Participants were asked to create new creatures and toys either after having seen examples or not. They were then asked to choose their favorite toy and creature drawing. Participants who saw examples before beginning to draw created toy drawings with more features of examples than those who did not see examples. Individuals also created toy drawings with more fixated features than did groups. Participants who saw examples also chose toy drawings with more fixated features as their best than those who did not see examples. Groups who saw examples chose best drawings with significantly fewer fixated features than groups who did not see examples. Conversely, individuals who saw examples chose drawings with significantly more fixated features than those who did not. The first three creature drawings that groups created were compared to the fourth, fifth, and sixth creature drawings. Those who saw examples first created three creatures with more fixated features, but there was no effect of examples on the fourth, fifth, and sixth creatures drawn. The possible reasons for discrepancies between toy and creature drawings are discussed, as well as direction for future research.

Group and individual performance on a creativity task: *The constraining effects of examples*

Fixation occurs when previously learned information blocks the successful execution of any number of cognitive tasks, including problem solving and creative idea generation (Smith, 2003). A number of studies have explored fixation in a variety of contexts.

Sio and Rudowicz (2007) compared responses to remote association tasks (RATs) of experts and novices of a Chinese chess game, GO. RATs consist of three seemingly unrelated words which can be related by a fourth word. For example, "blue," "rat," and "cottage," are all related with the word "cheese." In their study, GO experts were distracted when the first two words presented were GO-related and the third was not. Experts performed worse on misleading RATs than non-experts and were more sensitive to the GO-related word that would solve for the first two words than novices, as shown by a lexical decision task performed later (Sio & Rudowicz, 2007). It seems that experts' knowledge of GO terms blocked successful access to non-GO related terms, thereby preventing the generation of a RAT solution. The internally-produced words became fixated and constrained their ability to come up with solutions.

Groups have been shown in a number of studies to perform better than individuals in problem- solving situations. There are a number of benefits of working in groups that lead to better problem- solving performance. For instance, groups benefit from cross-cuing, when one group member's memory triggers others to remember during collaborative recall. This is to the group's advantage when effective problem solving relies on memory (Smith, Bushouse, & Lord, 2010). Working with groups may also help break individuals away from fixation by offering varying perspectives. However, it is also likely that being exposed to group members' ideas could fixate the group, disabling them to

come up with future ideas (Smith, 2003).

Although there are a number of benefits to working with a group, in situations where misleading clues are given, individuals would be expected to perform better than groups because they are more likely to forget the misleading clue. In a study by Smith, Bushouse, and Lord (2010), rebus puzzles, a reliable tool for measuring insight (MacGregor, & Cunningham, 2008), were given to groups and individuals. Rebus puzzles are word puzzles that rely on spatial information to be solved. Some puzzles were accompanied by misleading clues and some with helpful clues. After a period of occupied time, individuals had forgotten more clues than groups (Smith, et al., 2010). However, pretest and posttest scores for completing rebuses for both individuals and groups improved, including on rebuses associated with misleading clues. This would support the idea that while clues were remembered, they may not have been fixated. This could also be explained by the possibility that some group members forgot the clues and were able to help their group solve the rebuses at posttest, while the group collectively could still come up with the misleading clue (Smith, et al., 2010). This study gives us some information about how fixation functions in group settings.

In a series of studies by Smith, Ward, and Shumacher (1993), participants were asked to create creatures to live on a planet just like earth and to imagine that they were employed by a toy company and create new toys. Some of these participants were shown examples before beginning to draw. The examples had certain features in common. For creatures it was the presence of four legs, antennae, and a tail, and for toys it was the use of electricity, exercise, and a ball. It was shown that individuals conformed to common features of examples when asked to generate their own creative drawings, even after a delay between when the example was shown and when they began drawing, and when asked explicitly to deviate from the examples given. This shows that common features of examples can be fixated in individuals and constrain creativity, even when attempting to work against it. It also shows that the conformity effects found could not be the result of participants assuming that their creations should resemble the examples shown to them; they simply could not forget the common features of the examples given (Smith et al., 1993).

The purpose of this study is to further the research done on fixation by using an experimental design similar to Smith et al.'s (1993) study of creativity, while extending it to include groups. While the previous study only addressed fixation in individuals, the purpose of this study is to explore whether groups or individuals produce work containing fixated features more often, and to understand what factors may lead to more or less creative groups. Will groups be fixated on features of samples similarly as the individuals in Smith's (1993) study? Or will they be able to deviate from the samples, while still recalling their features, as would be suggested by studies of group insight and fixation (Smith, et al., 2010)? In order to gain a better understanding of how group creativity is affected by the presence of examples, groups were video recorded during the procedure. From these videos, we were able to explore the process of group creativity. Examples are often given in professional settings to foster productivity (Smith, et al., 1993), making it important that we understand how to use examples to best serve that need.

Method

Participants

Two hundred twenty-two introductory psychology students were used as participants and were randomly assigned to work either in groups of three (N=174, 58 groups) or alone (N=48).

Design

Half of the participants were randomly selected to be shown examples for 90 seconds prior to beginning their drawings. They were then given 20 minutes to create as many new and creative drawings as possible. Each participant completed this procedure for creatures and for toys. Participants in the group condition were told before drawing that only one person could write or draw at any given time, in the interest of making their work the production of the group. The order of the type of drawing was chosen randomly so that about half of the participants created creatures first, while the other half first created toys. The creature examples had in common four legs, a tail, and antennae, while the toys had in common exercise, a ball, and electricity. After both tasks were completed, participants were asked to choose their best toy and creature and provide a reason for why they chose it.

After all data had been collected, drawings were content coded for presence of the fixated features: antennae, four legs, and tails for creatures, and electricity, balls, and exercise for toys. Coders were blind to the condition (examples shown or not) of the drawings being coded. Video footage of each of the groups was also coded. The order in which the drawings were created was recorded, as well as the presence of the fixated features. Similarly, the drawings that participants chose as their best were coded for presence of fixated features.

Results

The creature and toy drawings that participants chose as their best were analyzed using a 2 (condition: Group/Individual) X 2 (examples: Examples shown/No examples) ANOVA, for both the creature drawings and toy drawings. As expected, for toy drawings, there was a significant main effect of examples. Those who saw examples chose drawings with more fixated features (M=1.50, SD=.91) than those who did not see examples (M=1.19, SD=.72), $F(1,98)=3.90$, p=.05. There was no main effect of condition; those who worked individually chose best creatures with the same amount of fixated features (M=1.40, SD=.84) as those who worked in groups (M=1.23, SD=.82), $F(1,98)$=.458, p=.500.

With respect to the best creature drawings, there were no significant main effects. Groups did not differ from individuals in the number of fixated features found in the drawings they chose as their best (M=.85, SD=.85 and M=.76, SD=.95, respectively) $F(1,100)$=.215, p=.64. Those who saw examples (M=.86, SD=.86) also did not differ from those who did not see examples (M=.76, SD=.93) $F(1,100)$=.512, p=.47. There was a significant interaction effect, in that

groups who saw examples chose drawings with significantly fewer fixated features (M=.70, SD=.67) than groups who did not see examples (M=1.00, SD=.98). The exact opposite pattern was observed for the individuals. That is, individuals who saw examples chose drawings with more fixated features (M=1.04, SD=1.02) than those who did not (M=.50, SD= .81), $F(1,100)=5.91$, p=.01.

The total number of fixated features was analyzed using a 2 (condition: Group/Individual) X 2 (examples: Examples shown/No examples) ANOVA, again, separately for creature and toy drawings. The number of fixated features was calculated as a ratio of total fixated features in all drawings divided by the number of drawings created. This was done to ensure that the number of drawings created would not influence the number of fixated features attributed to each individual or group.

Within the creature drawings there was a marginal main effect of examples, such that those who saw examples created drawings with slightly more fixated features (M=.896, SD=.48) than those who did not see examples (M=.698, SD=.64), $F(1,100)=3.22$, p=.076. There were no other significant effects.

Within the toy drawings there was a significant main effect of examples, such that those who saw examples created toy drawings with more fixated features (M=1.37, SD=.52) than those who did not see examples (M=1.01, SD=.46), $F(1,97)=14.79$, p=.00. There was also a significant main effect of condition, such that individuals created drawings with more fixated features (M=1.296, SD=.599) than groups (M=1.09, SD=.42), $F(1,97)=5.29$, p=.02.

To investigate the differences in effects found between creature and toy drawings, additional analysis was carried out on the order of the drawings done. To investigate if the number of fixated features found in participants' creature drawings changed as they continued to create more drawings, a 2 (examples: Examples shown/No examples) X 1 (condition: Groups) ANOVA was used to analyze the first three drawings and second three drawings that were made.

For the first three creatures that were drawn by groups, there was a main effect of examples. Groups who saw examples created first three creatures with more fixated features (M=3.14, SD=1.67), than groups who did not see examples (M=1.83, SD=1.54), $F(1,38)=6.45$, p=.015. For the second three creatures that were drawn by groups, there was no main effect of examples. Groups who saw examples created fourth, fifth, and sixth creatures with the same amount of fixated features (M=1.33, SD=1.50) as groups who saw no examples (M=1.00, SD=1.41) $F(1,14)=.204$, p=.658.

Discussion

Overall, our results are somewhat unexpected. While we were partially able to recreate the findings of Smith et al.'s (1993) study with respect to the toy drawings, where individuals who saw examples created more drawings containing features of those examples, our other effects cannot always be explained by the presence of examples. For instance, when analyzing drawings of creatures, we only found a marginal effect of examples.

With respect to the drawings that participants chose as their best, the results show differing effects between creatures and toys. While there was a significant effect of examples on toy drawings, there was an interaction effect for creature drawings. We believe that these differences may be due to the types of examples that were given to participants. The features of the toy drawings that were common, and were coded as fixated features, were somewhat unconventional features for toys. However, the common features in the creature examples were conventional. We believe that when drawing creatures, participants who did not see examples could easily come up with features similar to the examples, and they included them in their drawings. Perhaps the pressure from being in a social situation led participants to include conventional features when in a group setting, while individuals felt more comfortable creating drawings more outside the norm. As Ward, Smith, and Finke (1999) reported, participants draw upon what is familiar to them when coming up with creative drawings: "…people's knowledge about the typical features of familiar categories structures their imaginative creations…" (p. 196). It is likely that people's ideas of what a "creature" looks like includes four legs, a tail, and antennae, so it is not surprising that these features would show up in drawings by participants who saw no examples before beginning to draw.

It is also interesting that, while attempting to examine what may have led groups to draw more or less conventional creatures, it was found that there was an effect of examples on the first three creatures drawn, but not on subsequent creatures. The first three drawings conformed more to examples, probably due to social influence. Over time, when group members became more comfortable with one another, they were able to break away from convention and create drawings with less fixated features.

In the future, we are interested in using different example sources to show participants. We would like to show participants creatures with less conventional common features and determine how that affects the level of fixation experienced by participants. We are also interested in investigating how groups chose their favorite drawings using the data set from this study. Because groups and individuals did not show the same effects when analyzing the number of fixated features in the drawings they chose as their best, it will be interesting to understand the various ways that groups and individuals decided upon which drawing to label their best.

References

MacGregor, J. N., & Cunningham, J. B. (2008). Rebus puzzles as insight problems. *Behavior Research Methods, 40,* 263-268. doi:10.3758/BRM.40.1.263

Sio, U. N., & Rudowicz, E. (2007). The role of an incubation period in creative problem solving. *Creativity Research Journal, 19,* 307-318. doi:10.1080/10400410701397453

Smith, C. M., Bushouse, E., & Lord, J. (2010). Individual and group performance on insight problems: The effects of experimentally induced fixation. *Group Processes & Intergroup Relations, 13,* 91-99. doi:10.1177/1368430209340276

Smith, S. M. (2003). The constraining effects of initial ideas. In P. B. Paulus & B. A. Nijstad (Eds.), *Group creativity: Innovation through collaboration* (pp. 15-31). Oxford, UK: Oxford University Press.

Smith, S. M., Ward, T. B., & Schumacher, J. S. (1993). *Constraining effects of examples in a creative generation task. Memory & Cognition, 21,* 837-845. Retrieved from http://www.springer.com/psychology/cognitive+psychology/journal/13421

Ward, T. B., Smith, S. M., & Finke, R. A. (1999). Creative cognition. In R. Sternberg (Ed.), *Handbook of creativity* (pp. 189-212). Cambridge, UK; New York: Cambridge University Press.