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Let's Take This One Step at a Time: The Effect of Presenting the Brainstorming Rules in Stages on Brainstorming Effectiveness

Cassondra Batz
Loyola University Chicago

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Abstract

The purpose of this research is to further our understanding of the way groups work together to generate ideas while using a procedure called brainstorming. Brainstorming requires groups to follow four procedural rules while generating their ideas (Osborn 1957). However, two of theses rules seem to call for contradictory processes. One of these rules states that "free-wheeling is welcomed; the wilder the idea the better," while another rule says to "combine and build on the ideas already generated." The contradiction is apparent when a person notices that one rule requests a group to generate ideas that are different from previously generated ideas and the other rule requests a group to generate ideas that are similar to previously generated ideas. The implication of this contradiction was examined by presenting the rules to groups in two different ways. In the first condition, groups received all four rules at once, which is the standard way they are usually presented. In the second condition groups received all four rules again but they received the "free-wheeling" instruction first and, after generating ideas for a set amount of time, the groups then received the final "build-on" instruction. It was found that when groups were given the two contradictory rules separately and sequentially, they generated significantly more feasible ideas, though not more original. These results suggest that this presentation of the rules could be used with real-world groups to help improve their ability to generate more viable and useful ideas.

Let's Take This One Step at a Time:

The Effect of Presenting the Brainstorming Rules in Stages on Brainstorming Effectiveness

Sitting around a long table in a dimly lit room, the president, brow furrowed, contemplates the options presented before him by his advisors for yet another life or death scenario. The situation seems as dim as the room as his advisors suggest ideas that most certainly will result in numerous lives lost not to mention intense and, perhaps, retaliatory anger from the opposing side. Amidst raised voices and lost tempers, a myriad of ideas are tossed into the fray and heatedly rejected. Time seems to stand still as the final decision leaves a number of people in the room, and in the country, unhappy. The unhappiness stems from a belief that with more time, better minds, or more or less extreme political views, the conclusion of this meeting could have resulted in a better outcome. However, another, less considered, possibility is that the flawed ideas could be a result of a flaw in the idea generation process in which they were engaged. Most people are familiar with this process of idea generation, also referred to as brainstorming, in their own lives though they may not see it as a process but as an ordinary, everyday means to an end.

The process that the general public uses and refers to as brainstorming has diverged from the original, intended process. It has only maintaining the same goal as the original process which to come up with the best ideas possible. The original, true brainstorming process was introduced in the 1930s by Alex Osborn (1957) who was an executive at a large advertising firm. Osborn coined the word "brainstorming" and believed that he had found the key to successful idea generation. His process involved a set of procedural rules which include the following:

(1) *Criticism is ruled out*. No evaluative judgments are allowed.

(2) *Quantity is desired*. It is important to generate as many ideas as possible to increase the likeliness of generating a good idea.

(3) *"Free-wheeling" is welcomed*. Wild and crazy ideas are encouraged to ensure the ideas that are generated are highly original.

(4) *Build on the ideas already mentioned*. It is important to branch off of and/or improve ideas already generated.

Osborn (1957) believed that if these rules were followed, the ideas generated would improve. Specifically, he believed both groups and individuals would generate a greater number of ideas and higher quality ideas than would have been realized if his brainstorming process had not been used. Since this claim was made, numerous researchers have tested Osborn's prediction, while at the same time attempting to understand, and perhaps expand on, the underlying workings of idea generation.

Groups' Poor Performance on Brainstorming Tasks

The first and largest body of research on this topic calls into question the positive impact of Osborn's process on groups' idea-generating performance. This research has demonstrated that group dynamics tend to negatively affect the brainstorming process by hindering a group's ability to perform well (Larson, 2010). Studies commonly report that it is this deficiency that causes a group to generate fewer ideas in general, and fewer good ideas, in particular when compared to nominal groups, which are the combined efforts of individuals who work independently. This has been a shocking conclusion in the literature.

This finding is shocking because it is somewhat counterintuitive. One would think that, with more minds working together more ideas of a higher quality would be created. However, this does not appear to be the case, and theorists suggest that complicating interactions within the group are the cause of this phenomenon. As a result, a number of different group dynamics have been suggested as the complication causing groups' inferior performance, including social loafing, production blocking, evaluation apprehension, performance matching, cognitive interference, and many others that are still being explored (for a complete review see Larson, 2010).

Another complication has been more recently examined by Kohn and Smith (2011) and is called "idea fixation." This is another possible side effect of a group's interaction during an idea generation task. Their theory suggests that idea fixation occurs when individuals within a group get stuck on domains -- subjects or topics -- in the brainstorming process, thus limiting the range of ideas that are explored. They claim that this restricts the group's ability to generate a large number of ideas. Kohn and Smith (2011) found that this phenomenon can be diminished when groups take breaks during the process, a recommendation that was not something originally suggested by Osborn. By adjusting the brainstorming process to improve the outcome, Kohn and Smith (2011) have provided support and encouragement for future studies to alter the process in an attempt to overcome some of the complications that arise in group interactions.

Despite the numerous theories and studies in this area, few have looked to the brainstorming rules themselves and the way they are presented as possible culprits behind a group's poor performance during the idea generation process. This is what the current study attempts to do. Additionally, this study's focus is not the comparison of a group's performance to

that of an individual's, which is what many of the previous studies have done. Rather, the present focus is aimed at determining whether or not a change in the way the rules are presented might result in a more successful outcome. This follows the precedent set by Kohn and Smith (2011) in which they modified the structure of the brainstorming process itself to improve the outcome of the idea generation process.

The Impact of Osborn's Brainstorming Rules on Groups' Performance

As mentioned previously, only a small number of studies have investigated the very essence of the brainstorming process, Osborn's rules, in the search for the underlying reasons for groups' poor performances. Initially, these rules were widely accepted as a critical component of the process until Parnes and Meadows (1959) first called them into question. They conducted a comparison study between the performance of groups that were given the rules and the performance of groups that were given only a general instruction to generate good ideas. It was found that groups that used the brainstorming rules were able to generate more good ideas than the groups that used only the general instruction. This study was ground-breaking in the sense that it was one of the first to question the effectiveness of the brainstorming rules themselves, and seemed to provide substantial evidence in support of these rules.

Upon closer investigation, however, it is clear that the study by Parnes and Meadows (1959) provided insufficient as well as inconclusive evidence regarding the seemingly positive impact of the brainstorming rules for two main reasons. First, they did not publish the total number of ideas generated in each condition, a possible factor in the eventual conclusion. For example, if one condition had substantially more ideas than the other condition, then it would

also be likely it would have more ideas that were deemed good. If this was the case, the impact of the brainstorming rules would be diminished. The evidence would be more credible if Parnes and Meadows (1959) had reported the proportion of good ideas relative to the total number of ideas generated. Without this information, the results could be misleading in the sense that it would be possible that fifty percent of the ideas in both conditions were good but, because one condition had more ideas, it would appear that this condition had more good ideas. Additionally, as pointed out by other researchers, the study did not include a control condition in which no rules were given at all. This means that one cannot determine if the effect found was due to a boosting effect of the brainstorming rules or a hindering effect of the general instruction (Paulus, Kohn, and Arditti, 2011). In order to know which of the possibilities is occurring, it would be important to see how each of the two conditions compared to a control condition. It may be that the rules did not actually help the process but, rather, the "Good Idea" instruction hindered the process, causing an illusion that the brainstorming rules were beneficial while, in fact, they may have had no effect.

Since this initial study, other research has been done in this area to see if similar results could be found after correcting these methodological problems. To answer one of the questions left in the wake of the first study, Nemeth, Personnaz, Personnaz, and Goncalo (2004) compared the impact of the brainstorming rules to a control condition in which no instructions were provided to the groups. When comparing the number of ideas generated in each condition, they found that the brainstorming rules did not increase the number of ideas generated when compared to the control. However, this study focused only on the number of ideas generated by each condition. It did not compare the quality of the ideas, which could explain why no

difference was found between the two conditions. It is possible that the impact of the rules lies not in the number of ideas generated but in the quality of those ideas.

A Brainstorming Rule's Independent Effect on Groups' Performance

To further investigate the power of the rules, researchers began to study them independently. The goal of this work was to understand the rules individual impacts on the brainstorming process. This research specifically focused on Osborn's first two rules: *(1) criticism is ruled out*, and *(2) quantity is desired*. Overall, the findings from these studies suggest differing and independent impacts of these rules. For example, two studies, one by Diehl and Stroebe (1987) and one by Camacho and Paulus (1995), supported Osborn's claim of the impact and importance of his first rule, *criticism is ruled out*, by finding evidence of its enhancement of the idea generation process in a measure of quantity. However, studies have also found that criticism and debate can actually improve the ideas that are generated when compared to both a control condition and a condition in which participants are asked to avoid criticism (Nemeth et al, 2004). Again, this study only compared the number of ideas generated, leaving one to wonder if the impact of the rule may have been found in the quality of the ideas rather than in the quantity.

A study conducted by Paulus, Kohn, and Arditti (2011) resulted in a similar finding when gauging the impact of Rule 2, *quantity is desired*. The evidence from this study suggested that this rule led to the generation of more good ideas when compared to a control condition with no instructions, a condition with only a quality instruction, and a condition with both a quantity and

quality instruction. Overall, most findings were consistent with Osborn's original claim that his first two rules did, in fact, make a positive impact on the brainstorming process.

Research on the Impact of Rule 3 and Rule 4

The individual, independent effects of Rule 3 and Rule 4 have also been studied by some researchers, and overall they have found that groups do seem to benefit from both instructions. Most of these studies compare groups' performances to those of individuals rather than comparing the presence of either Rule 3 or Rule 4 to the absence of the rule. However, a study by Goldenberg, Larson, and Wiley (2013) did present groups, as well as individuals, with either all four rules, a combination of Rules 1, 2, and 3 or Rules 1, 2, and 4. They then compared the different conditions on the number of semantic categories, or domains, found among the ideas generated by the groups and individuals. They found that groups that were given Rules 1, 2, and 3 touched on a broader variety of topics than groups presented either all four rules or Rules 1, 2, and 4. Additionally they noted that groups that were presented the rules in the latter two ways did not differ from one another. However, these authors did not compare the conditions on the number of good, feasible, or novel ideas. Rather, their study focused on comparing the breadth of the ideas instead of the quality. Although, overall this study did provide insight into how groups perform when given both instructions, Rule 3 and Rule 4, and suggested that when groups are presented all four rules, they perform similarly to how they perform when presented just Rule 1, 2, and 4. These results suggest that groups may be ignoring one of the final two rules when the rules are presented together, leaving a conundrum of how to ensure that groups focus on and, therefore, benefit from both Rule 3 and Rule 4 rather than just one or the other.

The Brainstorming Rules Viewed as Goals Rather than a Process

The first step in figuring out how to ensure groups focus on and benefit from both of the final rules is to understand why groups would ignore one of the rules when presented both of the final two rules. A recent theory by Litchfield (2008) provides some insight into this question. The theory suggests the brainstorming rules should be understood as goals rather than as pointed instructions, which allows a person to view the rues with a different, insightful perspective. When one views these rules as independent goals, as Litchfield (2008) suggests, another complication becomes apparent. When it comes to Rule 3 and Rule 4 it is as if the goals, or rules, are competing against each other. Specifically, Rule 3, *wild and crazy ideas are welcomed*, asks for ideas that are unique and that stand apart from ideas that have already been generated. By contrast, Rule 4, *build on the ideas already generated*, requests ideas that branch off of one another, using previous ideas as the foundation for new and better solutions. Rule 3 solicits ideas that touch on numerous, unique domains, and in contrast Rule 4 calls for ideas which delve more deeply into a select few domains. These goals are completely contradictory, and it may be that understanding how groups go about handling this conflict may provide further insight into why groups do not perform as well as one would expect.

When applying this theory's perspective to the previous study by Goldenberg et al. (2013), one can see that the difference in how groups or individuals deal with the conflicting goals, or rules, may play a role in their performance. Goldenberg et al. (2013) found that groups in the condition where all four rules were given performed essentially the same as groups in the condition where only Rules 1, 2, and 4 were given. This suggests that when groups are given the two competing rules, they focus their attention more on Rule 4. In contrast, individuals given the

four rules performed relatively similar to individuals given only Rules 1, 2, and 3. This suggests that individuals give Rule 3 more attention than Rule 4. Because Rule 3 and Rule 4 ask for different things, one can surmise that it is possible that it is the way that groups are choosing to focus on the rules that is hindering their ability to perform as well as individuals do.

Other studies have found that Rule 3 and Rule 4 can both be included and still produce results that are beneficial to the brainstorming task. Although they did not set out to do so, Kohn, Paulus, and Choi (2011) in their study of Rule 4, *build on ideas already generated*, discovered that when groups were provided novel ideas and then asked to build on those ideas that the ideas generated are more novel and more feasible. Although this study did not technically deal with Rule 3, *wild and crazy ideas are welcomed*, it did construct a similar stage to what Rule 3 sets out to do which is to create, or establish, ideas that are unique, and by starting the participants off with ideas already deemed novel they do just that. This, therefore, suggests that a focus on Rule 3 that allows a group to first establish novel ideas followed by a focus on Rule 4, which has participants build-on to and improve upon those ideas, may prove to be quite beneficial to a group's performance on measures of originality and feasibility.

The Present Study

In order to test this possibility the current study investigated the effects of presenting Rule 3 and Rule 4 in sequential order versus presenting them simultaneously, which is typically how they are given. The sequential presentation order creates a situation similar to what was created in Kohn et al. (2011) where novel ideas were first established and then improved upon. This allows idea generators to avoid the complication identified by Goldenberg et al. (2013)

where groups seemed to have to choose where to direct their focus. The two conditions in the present study were compared by measuring the group's effectiveness not simply by the quantity of ideas generated as previous studies have done, but by the quality of those ideas.

It is hypothesized that the separation of the competing rules will allow groups to better focus their attention on the specific, individual goals of the final two rules, thus leading to more feasible, more original, and, therefore, more high quality ideas than they would have had had the rules been given simultaneously.

Specifically, the following predictions were made:

Hypothesis 1: Groups that are presented the final two rules separately and sequentially (staged condition) will generate more highly feasible ideas than groups presented all four rules at the same time (standard condition).

Hypothesis 2: Groups that are presented the final two rules separately and sequentially (staged condition) will generate more highly original ideas than groups presented all four rules at the same time (standard condition).

Hypothesis 3: Groups that are presented the final two rules separately and sequentially (staged condition) will generate more high quality ideas than groups presented all four rules at the same time (standard condition).

Method

Participants and Design

The participants were eighty-two students, both male and female, who received credit in their introductory psychology classes in exchange for their participation in the study. The sample was recruited from Loyola University Chicago psychology undergraduate classes. Each participant was randomly assigned to be in one of two conditions: the Standard Condition, in which participants received all four brainstorming rules at the same time, or the Staged Condition, in which they received the brainstorming rules with Rule 3 and Rule 4 separately and sequentially.

Forty students were members of the eighteen groups in the Standard Condition and forty-two students were members of the eighteen groups in the Staged Condition. Although it was intended for the participants to work in groups of three, at times only two participants showed and, rather than dismiss them, they were run as two person groups, thereby creating four different conditions in which the students could participate. Therefore, despite the fact the study was planned as a two-group design, it ended up as a 2 (condition: staged vs. standard) x 2 (group size: 2 people vs. 3 people) factorial design. Although no hypotheses were made about the effects of group size, this factor was nevertheless accounted for in the analysis of the data below.

Procedure

Prior to the beginning of each experimental session, the experimenter set up the room with a set of two or three desks pushed together, depending on the number of participants who had registered for the session. Additional set up involved placing two pieces of white poster

board and a marker on the group of desks for participants to use to record their ideas. When the participants arrived at the room they were each handed a consent form that they were asked to read and sign.

The experimenter then explained that they would be engaging in a brainstorming task that involved two fifteen-minute brainstorming sessions. Their topic of discussion was "Ways to Improve Loyola University Chicago." Prior to the start of the first fifteen minute session in the Standard Condition, the experimenter gave as part of her instructions all four of Osborn's brainstorming rules. By contrast, prior to the start of the first fifteen minute session in the Staged Condition, the experimenter's instructions included only the first three of Osborn's brainstorming rules. In both conditions, the experimenter concluded the instructions for the first fifteen minute session by explaining that participants should use the poster board and marker on the desk to record their ideas. The participants were then told to begin brainstorming for fifteen minutes. While they did so, the experimenter sat at a desk in the corner of the room working on a computer so that the participants did not feel like they were being supervised.

At the conclusion of the first fifteen minutes, participants in both conditions engaged in an unrelated activity for a ten minutes that served as a separation for the presentation of Rule 3 and Rule 4. The activity involved a verbal fluency task in which categories, irrelevant to the topic, were named by the experimenter and the participants then had to list things in those categories until no one could think of anything else to add. If the participants ran out of things for one category, another was named. The task was stopped at the end of the ten minutes.

Prior to the beginning of the second fifteen minute brainstorming session, the experimenter explained that the participants would be brainstorming on the same topic as before. In second fifteen minutes of the Standard Condition, the experimenter repeated all four rules as she did previously. By contrast in the second fifteen minutes of the Staged Condition, the experimenter replaced the third brainstorming rule with the fourth. This replacement was clearly called to the participants' attention, as they were instructed to follow Rule 1, Rule 2, and Rule 4, instead of Rule 1, Rule 2, and Rule 3 as they had done previously. After receiving these instructions, the second fifteen minute brainstorming session began. At the end of the second session in both experimental conditions, the experimenter instructed the participants that the experiment had concluded, passed out a debriefing form, collected all of the ideas generated by the group, and thanked the participants for their time as they exited the room.

Dependent Variables

Feasibility Feasibility was defined as "the degree to which a product or an idea is relevant to the topic, or is thought to be practically feasible" (Rietzschel, Nijstad & Stroebe, 2007). Using this definition, each idea was scored for feasibility on a scale of "1 = not at all feasible" to "5 = highly feasible" by two evaluators who were blind to the experimental conditions. The final feasibility rating was defined as the average of these two ratings.

Number of Highly Feasible Ideas. A highly feasible idea was defined as an idea thats feasibility score was greater than "3" on the "1" to "5" feasibility scale. The total number of highly feasible ideas that were generated by each group was then totaled to serve as the number of highly feasible ideas.

Percent of Highly Feasible Ideas. In order to control for the difference in total number of ideas generated, the percentage of highly feasible ideas was also calculated. This was done by taking the number of highly feasible ideas generated by each group and dividing it by the total number of ideas generated by each group.

Average Feasibility of Ideas. The average feasibility of ideas generated by each group was calculated by summing the feasibility rating of each idea generated by the group and diving it by the total number of ideas generated by that group.

Originality. Originality was defined as "the degree to which an idea is innovative" (Rietzschel, Nijstad & Stroebe, 2007). Using this definition, each idea was scored for originality on a scale of "1 = not at all original" to "5 = highly original" by two evaluators who were blind to the experimental conditions. The final originality rating was defined as the average of these two ratings.

Number of Highly Original Ideas. A highly original idea was defined as an idea thats originality score was greater than "3" on the "1" to "5" originality scale. The total number of highly original ideas that were generated by each group was then totaled to serve as the number of highly original ideas.

Percent of Highly Original Ideas. In order to control for the difference in total number of ideas generated, the percentage of highly original ideas was also calculated. This was done by taking the number of highly original ideas generated by each group and dividing it by the total number of ideas generated by each group.

Average Originality of Ideas. The average originality of ideas generated by each group was calculated by summing the the originality rating of each idea generated by the group and diving it by the total number of ideas generated by that group.

Good Ideas. Good ideas was defined as "some combination of originality and appropriateness, or feasibility" (Rietzschel, Nijstad and Stroebe, 2007), which is consistent with the accepted definition of the concept in brainstorming literature (Diehl & Stroebe, 1987; Reinig, Briggs, & Nunamaker, 2007). In this study, it is clearly defined as an idea that has a feasibility rating and an originality rating that when averaged produced a number that is greater than "3" on a "1" to "5" scale. This combination was important because an idea is most useful when it is a original idea that can actually be put into practice.

Number of Good Ideas. The number of good ideas was calculated by totaling the number of ideas for each group that had a feasibility and originality rating that produced an average greater than "3" on a "1" to "5" scale.

Percentage of Good Ideas. In order to control for the difference in total ideas generated the percentage of good ideas was also calculated. This was done by taking the total number of good ideas generated by the group and dividing it by the total number of ideas generated by that group.

Reliability of the Ratings

In order to ensure reliability, each idea was rated by two evaluators on both originality and feasibility. The ratings were considered in agreement when they fell within one point of each

other on the five point scale (Diehl & Stroebe, 1991). The ratings for feasibility were in agreement 87.47% of the time. The ratings for originality were in agreement 89.13% of the time.

Results

The means and standard deviations for all the variables in the study can be found in Table 1.

Hypothesis 1: Feasibility

Hypothesis 1 stated that groups that are presented the final two rules separately and sequentially (staged condition) will generate more highly feasible ideas than groups that are presented all four rules at the same time (standard condition). To test this hypothesis the total number of highly feasible ideas, the percentage of highly feasible ideas, and the average feasibility of the ideas were calculated and compared between conditions.

These three scores (the number of highly feasible ideas, the percentage of highly feasible ideas, and the average feasibility of the ideas) were analyzed using a 2 (condition: staged vs. standard) x 2 (group size: 2 people vs. 3 people) analysis of variance. These analyses are summarized in the Tables 2, 3, and 4.

Regarding the total number of highly feasible ideas, as can be seen in Table 2, there was a statistically significant main effect both for condition, $F(1,32) = 6.64$, $p < .05$, and for group size, $F(1,32) = 7.26$, $p < .05$, as well as a marginally significant interaction between these two variables, $F(1,32) = 3.30$, $p < .10$. In support of hypothesis 1, the condition effect indicates that those groups working in the staged condition generated more highly feasible ideas than did groups working in the standard condition. However, the marginally significant interactions

suggest that this effect tended to be a little stronger in the 3-person groups (46.50 vs. 27.75 for the staged and standard conditions, respectively) than in the 2-person groups (27.25 vs. 24.00 for the staged and standard conditions, respectively).

Regarding the percentage of highly feasible ideas, as can be seen in Table 3, there was again a statistically significant main effect for condition, $F(1,32) = 7.28$, $p < .05$, but this time only a marginally significant effect for group size, $F(1,32) = 2.98$, $p < .10$. and no interaction between these two variables, $F(1,32) = 0.03$, $p = N.S.$ These results indicate that groups working in the staged condition generated a larger percentage of highly feasible ideas than did groups working in the standard condition. The marginally significant results for group size suggests that participants working in three-person groups tended to generate a slightly lower percentage of ideas that were highly feasible than participants working in two-person groups (51.30 vs. 56.94 for the 3-person groups and 2-person groups conditions, respectively).

Regarding the average feasibility of ideas, as can be seen in Table 4, again there was a statistically significant main effect either for condition, $F(1,32) = 6.47$, $p < .05$, but not for group size, $F(1,32) = 0.54$, $p = N.S.$ Nor was there a statistically significant interaction between these two variables, $F(1,32) = 0.36$, $p = N.S.$. These findings indicate that those groups working in the staged condition did generate ideas with a higher average feasibility rating than did groups working in the standard condition.

Hypothesis 2: Originality

Hypothesis 2 stated that groups that are presented the final two rules separately and sequentially (staged condition) will generate more highly original ideas than groups that are

presented all four rules at the same time (standard condition). To test this hypothesis the total number of highly original ideas, the percentage of highly original ideas, and the average originality of the ideas were calculated and compared between conditions.

These three scores (the total number of highly original ideas, the percentage of highly original ideas, and the average originality of the ideas) were analyzed using a 2 (condition: staged vs. standard) x 2 (group size: 2 people vs. 3 people) analysis of variance. These analyses are summarized in the Tables 5, 6, and 7.

Regarding the total number of highly original ideas, as can be seen in Table 5, there was not a statistically significant main effect for either condition, $F(1,32) = 0.49$, $p = N.S.$, or for group size, $F(1,32) = 1.51$, $p = N.S$, nor was there a statistically significant interaction between these two variables, $F(1,32) = .004$, $p = N.S.$ These findings suggest that those groups working in the staged condition did not generate more highly original ideas than did groups working in the standard condition. This result did not support hypothesis two.

Similarly, regarding the percentage of ideas that were highly original, as can be seen in Table 6, there was not a statistically significant effect for condition, $F(1,32) = 0.36$, $p = N.S$, for group size, $F(1,32) = 0.01$, $p = N.S.$, or for the interaction between these two variables, $F(1,32) = 0.45$, $p = N.S.$ These results indicate that those groups working in the staged condition did not generate a higher percentage of highly original ideas than did groups working in the standard condition.

Finally, regarding the average originality rating of ideas, as can be seen in Table 7, there was not a statistically significant effect for condition, $F(1,32) = 0.41$, $p = N.S.$, for group size, F

(1,32) = 0.13, *p* = *N.S.*, nor was the interaction between these two variables statistically signifigant, *F*(1,32) = 0.54, *p* =*N.S.* These findings indicate that those groups working in the staged condition did not generate ideas that had a higher average originality rating than did groups working in the standard condition.

Hypothesis 3: Good Ideas

Hypothesis 3 stated that groups that are presented the final two rules separately and sequentially (staged condition) will generate more high quality ideas than groups presented all four rules at the same time (standard condition). To test this hypothesis the total number of high quality ideas and the percentage of high quality ideas were calculated and compared between conditions.

The total number of good ideas and the percentage of good ideas were analyzed using a 2 (condition: staged vs. standard) x 2 (group size: 2 people vs. 3 people) analysis of variance. These analyses are summarized in the Tables 8 and 9.

Regarding the total number of good ideas, as can be seen in Table 8, there was not a statistically significant main effect either for condition, *F*(1,32) = 0.39, *p* = *N.S.*, or for group size, *F*(1,32) = 0.76, *p* = *N.S.*, nor was as the interaction between these two variables statistically significant, *F*(1,32) = 0.00, *p* =*N.S.* These findings suggest that those groups working in the staged condition did not generate more good ideas than did groups working in the standard condition. Thus, this result did not support hypothesis three.

The same pattern occurred for the percentage of good ideas. As can be seen in Table 9, there was not a statistically significant main effect either for condition, *F*(1,32) = 0.25, *p* = *N.S.*,

or for group size, $F(1,32) = 0.001$, $p = N.S.$, and the interaction between these two variables was also not significant, $F(1,32) = 0.34$, $p = N.S.$ These findings suggest that those groups working in the staged condition did not generate a higher percentage of good ideas than did groups working in the standard condition.

Discussion

The present study investigated the effect of presenting the final two brainstorming rules, (3) *wild and crazy ideas are welcomed* and (4) *build on ideas already mentioned*, separately and sequentially on groups' brainstorming performance. The results of the experiment support Hypothesis 1 which states that groups in the staged condition will generate ideas that are more feasible. However, the results do not support Hypothesis 2 which contends that the groups in the staged condition will generate ideas that are more original. Further, Hypothesis 3, which focused on a combination of feasibility and originality (i.e. the number of good ideas) is also not supported because the findings suggest that there are not significantly more good ideas generated in the staged condition than in the standard condition.

Possible Explanations for the Findings

Two possibilities could explain the results supporting Hypothesis 1. First, it is possible that by presenting the final two rules separately, groups were first able to generate a list of unique ideas by following Rule 3, *wild and crazy ideas are welcomed*, and then modify, revise, and expand those original ideas under the instruction of Rule 4, *build on ideas already generated*. This rule presentation order, therefore, may have improved the feasibility by encouraging groups

to improve ideas already generated. This would not occur in the standard condition because of the lack of focus on Rule 4 specifically when applied to ideas generated with Rule 3 in mind.

A second possibility is that because there is less emphasis in the second session on Rule 3, participants may have created entirely new ideas that were more feasible simply because they were not focusing on the goal to make their ideas wild and crazy. In this case, it would not be the presence of Rule 4, *build on ideas already generated,* that is increasing their quality and feasibility but, rather, the absence of emphasis on Rule 3, *wild and crazy ideas are welcomed*.

The likely explanation for the lack of support for Hypothesis 2 is the fact that the ability to generate highly original ideas resides in the power of Rule 3, *wild and crazy ideas are welcomed*, and the presentation of this rule in the two conditions differs very little since both conditions received Rule 3 prior to starting the first fifteen minute brainstorming session. Therefore, the effect of the rule was not different enough between the two conditions to produce a significant effect.

Combining feasibility and originality into one measure is the most likely cause of the lack of support for Hypothesis 3. The results for feasibility are not strong enough to sway the insignificant results for originality. Their combination reaped lackluster results which did not support the hypothesis that more good ideas would be generated in the staged condition. However, this may be due to way that a good idea was defined. It is possible different results could be produced if a good idea was defined in another way involving more or less emphasis on originality or feasibility. For example, if one defined a good idea as an idea that was of average originality and highly feasible it is possible that these results could be different.

Future Directions

The purpose of future research should be to try to determine which of the previously mentioned possibilities account for the results found in support of Hypothesis 1 by measuring the degree to which the "building on" concept is actually occurring. One possibility is to keep the ideas generated from the two sessions separate. Then one could determine the degree to which the ideas in the second session were actually developed from previously generated ideas. This would allow one to deduce if the second set of ideas are truly being modified or if they are completely new. We would then be more certain of what is behind the increase in the feasibility of the ideas when the rules are presented in this way. If it looks as if the ideas are simply new, then one can assume it is because less attention is being focused on Rule 3 to generate wild and crazy ideas that increases the feasibility of the ideas. However, if the ideas are truly modifications of the original ones, then it can be assumed that some sort of polishing is occurring.

Additionally, a limitation similar to one documented in the earlier discussion of the study by Parnes and Meadows (1959) should be addressed. The present study would have benefited from a control condition in which no rules or instructions were given. This condition could possibly provide concrete evidence that Osborn's brainstorming rules do benefit a group's performance in idea generation tasks. One would be better able to estimate their true effect but only if a comparison could be made between this control condition and the staged condition where the rules are presented in a specific manner. Findings from a study such as this could potentially reverse the common conclusion in literature that Osborn's brainstorming rules simply do not work as well for groups as he claimed they did.

Finally, it would be interesting to compare groups' and individuals' performances when presented the rules in stages to see if this presentation of the rules allows individuals and groups to perform equally well on a measure of feasibility. The findings would provide additional evidence that the presentation method of the rules are a complicating factor holding groups back from performing as well as individuals. This study could be done by presenting the rules in stages to both interacting groups and to nominal groups, which is to say an equal number of individuals working independently, and then comparing their idea generation performance on different measures. To carry the investigation one step further, a second nominal group could be given all four rules at the same time as is normally done. This would allow the researcher the opportunity to compare between the nominal groups when given the rules in stages versus simultaneously. These comparisons would provide insight into whether or not the staged presentation of the rules actually benefits both groups and individuals.

Implications

The results of this study have implications for groups, businesses, or organizations that engage in the idea generation process and seek to improve the feasibility and overall quality of these ideas. Time spent on finding solutions does not come cheap. Therefore, it is important that the ideas can actually be implemented making the time spent generating the idea more cost-effective, both for the business and for the consumer. The findings suggest it would be advantageous for the goals of Rule 3 and Rule 4 to be addressed separately and sequentially to avoid possible complications from the conflict between them. Incorporating this relatively simple change within an group brainstorming session may lead to the production of more feasible ideas that can positively impact the business or organization as a whole.

Conclusion

This study does not claim that presenting Osborn's rules in a staged way will spark the perfect idea. Nor does it contend that that spark will grow into complete reason and understanding. What it suggests is that by slightly adjusting the presentation in which the rules of brainstorming are given the ideas generated will be more practical and implementable. As the brainstorming process continues to be tested, honed, and adapted, ideas will become more valuable and more viable.

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Table 1: Dependent Variable Means (Standard Deviations in Parentheses)

	Group Size			
	2-Person		3-Person	
	Rule Presentation		Rule Presentation	
Variable	**Staged**	**Standard**	**Staged**	**Standard**
N (Number of Groups)	12	14	6	4
Number of Highly Feasible	27.25 (10.11)	24.00 (10.22)	46.50 (17.39)	27.75 (5.38)
Percent of Highly Feasible	63.35 (11.99)	51.45 (12.27)	55.47 (6.15)	45.05 (5.81)
Avg. Feasibility	3.38 (.14)	3.26 (.16)	3.37 (.27)	3.17 (.18)
Number of Highly Original	14.92 (11.60)	12.43 (9.72)	20.00 (10.47)	17.00 (8.21)
Percent of Highly Original	32.64 (19.31)	24.00 (18.41)	27.48 (13.10)	27.96 (17.74)
Avg. Originality	2.99 (.32)	2.82 (.36)	2.94 (.24)	2.95 (.21)
Number of Good Ideas	7.92 (7.65)	6.50 (5.87)	10.00 (3.58)	8.50 (5.07)
Percent of Good Ideas	16.72 (10.98)	12.52 (10.80)	14.38 (7.17)	14.71 (10.82)

Table 2: Analysis of Variance Summary Table for the Total Number of Highly Feasible Ideas

Source	SS	df	MS	F
Condition (C)	847.00	1	847.00	6.64*
Group Size (S)	925.75	1	925.75	7.26*
C x S	420.44	1	420.44	3.30‡
Error	4080.50	32	127.52	

‡ $p < .10$; * $p < .05$

Table 3: Analysis of Variance Summary Table for the Percentage of Ideas that are Highly Feasible

Source	SS	df	MS	F
Condition (C)	871.92	1	871.92	7.28*
Group Size (S)	356.91	1	365.91	2.98‡
C x S	3.84	1	3.84	0.03
Error	3830.51	32	119.70	

‡ $p < .10$; * $p < .05$

Table 4: Analysis of Variance Summary Table for the Average Feasibility Rating

Source	SS	df	MS	F
Condition (C)	0.19	1	0.19	6.47*
Group Size (S)	0.02	1	0.02	0.54
C x S	0.01	1	0.01	0.36
Error	0.93	32	0.03	

* $p < .05$

Table 5: Analysis of Variance Summary Table for the Total Number of Highly Original Ideas

Source	SS	df	MS	F
Condition (C)	52.71	1	52.71	0.49
Group Size (S)	163.13	1	163.13	1.51
C x S	0.46	1	0.46	.004
Error	3458.51	32	108.07	

Table 6: Analysis of Variance Summary Table for the Percentage of Idea that are Highly Original

Source	SS	df	MS	F
Condition (C)	116.83	1	116.83	0.36
Group Size (S)	2.50	1	2.50	0.01
C x S	145.41	1	145.41	0.45
Error	10307.98	32	322.12	

Table 7: Analysis of Variance Summary Table for the Average Originality Rating

Source	SS	df	MS	F
Condition (C)	0.04	1	0.04	0.41
Group Size (S)	0.01	1	0.01	0.13
C x S	0.06	1	0.06	0.54
Error	3.23	32	0.10	

Table 8: Analysis of Variance Summary Table for the Total Number of Good Ideas

Source	SS	df	MS	F
Condition (C)	14.89	1	14.89	0.39
Group Size (S)	29.18	1	29.18	0.76
C x S	0.01	1	0.01	0.00
Error	1231.42	32	107.92	

Table 9: Analysis of Variance Summary Table for the Percentage of Ideas that were Good Ideas

Source	SS	df	MS	F
Condition (C)	26.88	1	26.88	0.25
Group Size (S)	0.07	1	0.07	0.001
C x S	36.74	1	36.74	0.34
Error	3453.44	32	107.92	