Considering the rules of brainstorming in untrained idea generating groups

David Dryden Henningsen[1] and Mary Lynn Henningsen[1]

Abstract: *Brainstorming (Osborn, 1957), as an idea generating technique, is widely used in businesses and organizations despite evidence that it fails to produce more ideas than non-interacting groups (e.g., Mullen, Johnson, & Salas, 1991). Past tests of the technique employ comparisons of groups instructed to follow the rules of brainstorming (i.e., focus on quantity, free-wheeling, non-evaluation, and piggy-backing) to groups without such instructions. In the current study, the connection between the activities proposed in the rules of brainstorming and idea generation are examined. The perceived occurrence of these activities are examined in untrained idea generating groups to assess how they influence idea generation. 188 participants (61% men, 39% women), performed an idea generation task (i.e., the typewriter task) and assessed perceptions of the occurrence of the activities highlighted by the brainstorming rules in the group discussion. Overall, perceptions of brainstorming rules influence the number of ideas generated with piggy-backing emerging as a significant predictor variable.*

Keywords*: brainstorming; idea generation; groupwork; group work; group dynamics*

1. Professor, Department of Communication, Northern Illinois University, USA

Address for correspondence*: dhennin1@niu.edu*

Date of first (onlilne) publication*: 23rd June 2022*

Introduction

Alex Osborn, an advertising executive, developed a technique he believed would help stimulate his employees' creativity. Osborn (1957) proposed a technique intended to allow interactive groups to produce more, and more creative, ideas during group idea generating sessions. This technique, which he dubbed brainstorming, gained enough adherents that the term is now part of the common lexicon. In some ways, it has come to reflect any time people work together to generate ideas although in reality brainstorming prescribes a specific set of rules for idea generating groups.

If a group were to truly employ brainstorming in the manner recommended by Osborn (1957), four key rules would be enacted. First, group members would refrain from judgment (i.e., *non-evaluation*) during the idea generation process. Second, brainstormers would share whatever ideas they come up with, without regard to whether they were practicable, with wilder ideas being encouraged (i.e., *free wheeling*). Third, groups would focus on generating as many ideas as possible (i.e., *focus on quantity*). And finally, group members would pay close attention to the ideas shared by others and suggest ways those ideas could be expanded or modified (i.e., *piggy-backing*).

The goal of brainstorming is greater productivity in idea generation tasks (i.e., generating more ideas). Osborn (1957) claimed brainstorming groups would generate more ideas than those not using brainstorming. Interestingly, despite widespread use of the technique in organizations (e.g., Sutton & Hargadon, 1996), social scientific research has been generally unsupportive of Osborn's claims about brainstorming (e.g., Mullen, Johnson, & Salas, 1991). Tests of brainstorming have generally employed a comparison between *brainstorming groups* and *nominal groups* (e.g., Blomstrom, et al., 2008; Jablin, 1981;Kramer, Kuo, & Dailey, 1997; Taylor et al., 1958). Brainstorming groups employ fully interactive groups, instructed to adhere to the four rules of brainstorming, to generate a list of ideas on a single topic. Nominal groups, as the name implies, are truly groups in name only having individuals generate ideas without interaction. Afterwards, the researcher combines the non-redundant contributions of each person in the nominal group to form the nominal group output.

Generally research on brainstorming indicates nominal groups

outperform brainstorming groups (e.g., Mullen et al., 1991) when working for set amounts of time. On the other hand, recent findings are more optimistic about the potential of brainstorming. Nijstad, et al., (2004), for instance, found that brainstorming groups were more likely to stay on task longer than were individuals working in nominal groups. This added time on task creates the potential for greater productivity. Further, Henningsen and Henningsen (2013) found that the advantages of nominal groups over brainstorming groups, in terms of the total ideas produced, is short lived. The optimism inherent in these findings provides a warrant for further exploration of brainstorming and idea generation.

More specifically, we plan to consider each rule of brainstorming individually to determine their unique effects on productivity in idea generating groups. This approach will allow us to better understand which specific aspects of brainstorming, if any, promote productivity.

The traditional approach to brainstorming (i.e., brainstorming versus nominal groups) involves not only the presence or absence of the rules of brainstorming but also the use of interactive versus non-interactive groups. Interestingly, Osborn (1957) seemed to believe that the rules of brainstorming could be applied in either context as evidenced by the following claim:

> … the average person can think up about twice as many ideas when working in a group than when working alone – unless the individual adheres to the brainstorming principles of suspended judgment. (pp. 229-230)

We propose to examine the perceptions of the brainstorming rules (nonevaluation, free wheeling, focus on quantity, and piggy-backing) in untrained, interacting groups. In this way, as opposed to comparing interacting and non-interacting groups, we examine only interacting groups and assess how naïve adherence to brainstorming rules influence productivity. Thus, we can examine whether the rules of brainstorming, as they are perceived to occur naturally in groups, predict the number of ideas generated by groups. This will speak to the effectiveness of brainstorming when mode of interaction (i.e., face to face discussion versus no interaction) is controlled for as well as allowing an assessment of which rules of brainstorming most strongly

predict productivity. In the following section, we explore the rules of brainstorming and consider how each rule may lead to increased idea generation productivity.

Rules of brainstorming

Consistent with the assertions of Osborn (1957), we posit that the rules of brainstorming should influence productivity in idea generating groups. If we start with the assumption the technique works, increasing the behaviors proposed in these rules (i.e., non-evaluation, free-wheeling, focusing on quantity, and piggy-backing) should result in increases in idea generation. Accordingly, as groups avoid evaluation (i.e., non-evaluation), access even impractical ideas (i.e., free-wheeling), place an emphasis on the quantity of ideas being generated (i.e., focus on quantity), and build on the ideas of others (i.e., piggy-backing), they should produce a larger number of ideas. We will next consider how adhering to the rules of brainstorming should increase the number of ideas generated.

Non-evaluation

The rules of brainstorming include avoiding evaluation or criticism of ideas as they are being presented (Osborn, 1957). Evaluation of ideas as they are generated is presumed to have a jamming effect on the flow of creativity in idea generation (Mongeau & Morr, 1999). As such, idea generation should be improved as the dilatory effects of evaluation are removed. We consider research consistent with this principle.

One aspect of removing evaluation is the potential to reduce apprehension among idea generators. Several studies have explored how communication apprehension relates to the performance of individuals in brainstorming groups (e.g., Comadena, 1984; Jablin & Sussman, 1978). Communication apprehension reflects the level of anxiety a person experiences in anticipation of engaging in communicative acts (McCroskey, 1982). These studies reveal that high apprehensive individuals contribute fewer ideas in brainstorming groups than do low apprehensive individuals. Jablin, Seibold, and Sorenson (1977) demonstrated that the advantage inherent in low levels of communication apprehension are eliminated in nominal groups. One may infer that the prospect of negative evaluation during group

interaction produces a reduction in productivity by individuals with high communication apprehension. Thus, consistent with the rules of brainstorming (Osborn, 1957), reducing the prospect of critical evaluation during idea generation should improve productivity in groups. Consistent with this reasoning, Diehl and Stroebe (1987) found introducing the potential for evaluation reduced idea generation in brainstorming groups as well as for individuals working alone.

Others have found that inclusion of the no evaluation rule of brainstorming does not necessarily lead to improved idea generation (Nemeth, Personnaz, Personnaz, & Goncalo, 2004). Nemeth et al.(2004) had groups generate ideas in traditional brainstorming conditions, in a condition in which debate, including criticism, was encouraged during idea generation, and in a control condition. No significant difference emerged between the debate and the brainstorming conditions for ideas generated during discussion. This implies the presence of evaluation did not negatively influence interacting groups' productivity. However, although different instructions were given to each group, there is no indication of whether actual criticism in groups or perceptions of evaluation differed.

We propose a hypothesis consistent with Osborn's (1957) rules of brainstorming and findings regarding communication apprehension (e.g., Jablin et al., 1977). As individuals perceive the group members are evaluating the ideas being generated, the number of ideas generated should decrease. Thus, as perceptions of non-evaluation increase, so to should group productivity. We propose the following hypothesis to test this prediction.

Hypothesis 1

Perceptions that group members withhold evaluation of ideas as they are presented during an idea generation task will be positively associated with the number of ideas generated.

Free-wheeling

The rules of brainstorming include the instruction to engage in a free-wheeling idea generation, unconstrained by the practicality of the ideas (Osborn, 1957). This willingness to share any idea should increase the total pool of ideas presented. Free-wheeling discussion was intended

to spark creativity (Mongeau & Morr, 1999).
A recent study offers insight into free-wheeling in idea generation. Goldenberg, Larson, and Wiley (2013) explored the effect of the free-wheeling instruction on idea generating groups. They found that the instruction was associated with access to a larger number of response categories than was accessed by those without the instruction. Furthermore, the number of response categories accessed by a group was positively associated with the total number of ideas generated.

Again, based on the rules of brainstorming, free-wheeling should lead to increased productivity in idea generation (Osborn, 1957). Thus, we would expect that perceptions that group members display willingness to share any idea, unburdened by concerns of practicality, should be associated with increased productivity. We offer the following hypothesis to test this prediction:

Hypothesis 2

Perceptions that group members willingly share even impractical ideas during an idea generation task will be positively associated with the number of ideas generated.

Focus on quantity

The brainstorming rules further involve the instruction to focus on generating a high quantity of ideas, regardless of quality (Osborn, 1957). The focus on quantity is viewed as the over-riding goal of brainstorming groups engaged in idea generation (Mongeau & Morr, 1999).

Paulus, Kohn, and Arditti (2011) examined if the focus on quantity had the effects proposed by Osborn (1957). They compared groups instructed to focus on quantity to those with no such instruction, those instructed to focus on quality, and those instructed to focus on quality in addition to quantity. They found that the instruction to focus on quantity led to a greater number of ideas being generated than was generated in the other conditions. Thus, the focus on producing a large number of ideas without regard to idea quality appears to increase the overall number of ideas generated by groups.

We propose the perception that groups are focused on generating as many ideas as possible should be associated with increased idea

generation. Consistent with the rules of brainstorming, we propose the more individuals perceive that groups focus on generating a high quantity of ideas, the more ideas they will tend to produce. This it tested in hypothesis 3:

Hypothesis 3

Perceptions that group members focus on generating a high quantity of ideas during an idea generation task will be positively associated with the number of ideas generated.

Piggy-backing

Brainstorming rules assert that individuals should piggy-back on the ideas of others (Osborn, 1957). This piggy-backing involves building on ideas that have come earlier during idea generation. Group members may seek to improve on ideas already mentioned or the ideas may simply spark new ideas in others (Mongeau & Morr, 1999).

Support for the idea that piggy-backing on earlier ideas promotes idea generation comes from Deuja, Kohn, Paulus, and Korde, (2014). Deuja et al.(2014) examined the clustering of ideas during idea generation. Clustering represents the extent to which groups focus on a single category of possible ideas rather than generating ideas broadly across categories. Their findings indicated that clustering was associated with greater idea generation.

Deuja's et al. (2014) concept of clustering would be associated with building by group members. Goldenberg et al. (2013), for instance, explored the building rule in addition to the free-wheeling rule. For groups given only the building instruction, more practical ideas from fewer categories (i.e., clustering) were generated than compared to those instructed to engage in free-wheeling.

Consistent with the rules of brainstorming, we predict the tendency in groups to focus on building on the ideas of others will facilitate idea generation. More specifically, we hypothesize that members' perceptions of piggy-backing during group interaction will be associated with higher numbers of ideas generated.

Hypothesis 4

Perceptions that group members piggy-back on the ideas of other group members during an idea generation task will be positively associated with the number of ideas generated.

We next turn to the method we employed to test these hypotheses. In the following section we will highlight the participants, procedures, and measures utilized.

Method

Participants

188 participants, 61% men and 39% women of those who reported their sex, were students in upper division college courses at a large Midwestern university in the United States. Twenty percent of the sample was African American, five percent was Asian American, 60% was Caucasian American, and 10% were Latino/a American. The remainder either did not report their race or recorded other. The mean age of the sample was 21.72, *SD* = 3.03.

Procedure

Participants were randomly assigned to groups of three, *N* = 16. The four rules of brainstorming were assessed using measures derived from those used in Henningsen and Henningsen (2018). Each measure assesses group members' perceptions of a rule of brainstorming as it occurred in their groups during the exercise. Items are presented in the description of each measure.

Non-evaluation

Group members recorded their perceptions of whether the group evaluated the ideas presented during the group discussion. Three items (i.e., Some of the ideas that were suggested were critiqued by members of the group; Group members pointed out the flaws and weaknesses of the ideas presented; Group members evaluated ideas

that were mentioned), α= .77, *M* = 3.52, *SD* = 1.19, were used to assess perceived evaluation. Items were scaled from 1 to 6. Scores were coded so that higher scores reflected non-evaluation.

Free-wheeling

Group members recorded their perceptions of whether the group members were willing to share ideas that were fanciful or impractical. Four items (i.e., Group members focused on suggesting only practical, plausible ideas (reverse coded); Group members offered some crazy, off-beat, and outlandish ideas; Some of the ideas offered by the group were clearly impossible; The group members did not worry about whether the ideas they suggested were realistic) α= .82, *M* = 3.30, *SD* = 1.33, were used to assess perceptions of whether group members were willing to share impractical ideas. Items were scaled from 1 to 6. Scores were coded so that higher scores reflected greater perceptions of free-wheeling.

Focus on quantity

Group members recorded their perceptions of whether group members focused on generating a high number of ideas. Three items (i.e., We focused on generating as many ideas as possible; The group really tried to generate a large number of ideas; The group applied a 'more is better' approach to idea generation) α= .71 *M* = 4.71, *SD* = 0.95, were used to assess perceptions of whether group members tried to generate as many ideas as possible. Items were scaled from 1 to 6. Scores were coded so that higher scores reflected higher focus on quantity.

Piggy-backing

Group members recorded their perceptions of whether group members attempted to build on the ideas shared by others. Four items (i.e., When one group member shared an idea, the others would try to build on that idea; Individuals rarely tried adding to the ideas raised by other group members (reverse coded); An idea offered by one group member was often added to by other members of the group; Group members modified or tweaked the ideas offered by others in the group) α= .63,

M = 4.55, *SD* = 0.80, were used to assess perceptions of whether group members tried to build on the ideas offered by others. Items were scaled from 1 to 6. Scores were coded so that higher scores reflected higher levels of piggy-backing.

Idea generation

During group discussion, individual group members recorded each novel idea they shared with the group during discussion on separate forms, *M* = 6.90, *SD* = 3.84. Thus, each group member recorded only the ideas they uniquely contributed to discussion. After group discussion was completed, each individual's list was compared to those of other group members and redundant ideas (i.e., ideas recorded on more than one member's form) were eliminated. Any slight variation was considered sufficient to consider an idea novel to account for the effects of piggy-backing. For instance, suggesting a manual typewriter could be used as a helmet was viewed as different from use as a football helmet. Agreement among coders on the number of novel ideas generated was over 99 percent. ICC was calculated for 3 person (ICC = .36) and four person (ICC = .10) groups to demonstrate the extent to which idea generation was influenced by other group members.
In the following section we will examine the results of our study. We will describe the approach employed to test the hypotheses as well as presenting the results for each hypothesis test.

Results

The perceptions of the activities recommended by the rules of brainstorming (i.e., free-wheeling, focus on quantity, non-evaluation, and piggy-backing) are all individual level data. In addition, each member recorded the ideas they uniquely contributed to the group. Because group members are nested in groups individual scores cannot be considered independent. In other words, there is a group effect that can influence the results drawn from individuals in the groups. The independence of data is considered an assumption of most statistical tests. We address this issue statistically.
In order to account for group effects, we employed the generalized

linear models (i.e., GLM) analysis in SPSS. GLM allows for simultaneous analysis of data collected at the group and individual level. Individuals working in groups can be influenced by the behavior of their fellow group members. GLM accounts for this within group influence and separates it from the effects of variables in the model. In the present case, this allows for a test of the rules of brainstorming on idea generation without the problems associated with non-independent data.

Hypotheses

We predicted, consistent with the suggestions of the brainstorming technique (Osborn, 1957), that the rules of brainstorming (i.e., non-evaluation, focus on quantity, free-wheeling, and piggy-backing) would be positively and significantly associated with the number of ideas generated in idea generating groups. We tested these predictions by using generalized linear models analysis in SPSS. Perceptions of free-wheeling, focus on quantity, non-evaluation, and piggy-backing were predictor variables entered as covariates and group assignment was entered as a factor. The criterion variable was the number of ideas generated.

The omnibus test revealed that the tested model differed significantly from the intercept-only model, $\chi^2 = 100.21$, $p < .05$, indicating the predictor variables (i.e., piggy-backing, free-wheeling, focus on quantity, and non-evaluation) significantly impacted the criterion variable (i.e., ideas). Piggy-backing, $B = .95$, $p < .05$, produced a significant, positive effect (See table 1) on idea generation supporting hypothesis 4. The fixed effects estimates for free-wheeling, $B = .13$, $p > .05$, focus on quantity, $B = -.06$, $p > .05$, and non-evaluation, $B = .40$, $p > .05$, were not significant providing no support for hypotheses 1-3.

Table 1
Model effects

	Waid X^2	*df*	*p*	*Cramer's V*
Group	86.07	50	.001	.10
Free-wheeling	0.25	1	.618	.03
Focus on quantity	0.06	1	.809	.01
Non-evaluation	2.93	1	.087	.12
Piggy-backing	8.27	1	.004	.21

We have presented our findings. In the following section we will explore what these findings mean for brainstorming as an idea generating technique in organizations. We will also discuss potential limitations of this study.

Discussion

Brainstorming was developed as a technique to allow groups to generate high numbers of ideas (Osborn, 1957). Given this background, it is not surprising that researchers have tended to test brainstorming as a technique by focusing on the effects of instructions about the rules of brainstorming compared to groups or individuals without such instructions (e.g., Blomstrom et al., 2008; Henningsen & Henningsen, 2013; Jablin, 1981; Taylor et al., 1958).

In the present study, we proposed to examine brainstorming by considering how perceptions of the rules of brainstorming in group idea generation influenced the number of ideas generated. Specifically, rather than comparing groups with brainstorming instructions to nominal groups, we had group members assess their perceptions of the natural occurrence of behaviors consistent with the rules of brainstorming. We refrained from providing brainstorming instructions intentionally to allow for the organic emergence of non-evaluation, a focus on quantity, free-wheeling, and piggy-backing. We then statistically assessed how differences in the emergence of these features predicted the number of ideas generated in groups.

We measured perceptions of the four rules of brainstorming in untrained, idea generating groups and assessed how these perceptions related to idea generation. This provides a test of the influence of the naturally occurring elements of brainstorming on idea generation. We next provide a brief summary of our findings.

Summary of Findings

We examined the perceptions of the natural emergence of the rules of brainstorming in groups who received no brainstorming instructions. Our analysis revealed that, as a block, group members perceptions that the group refrained from evaluation, engaged in free-wheeling idea

generation, focused on generating a high quantity of ideas, and piggy-backed on each other's ideas did significantly influence the number of ideas generated by the groups. Thus, consistent with the assertions of Osborn (1957), we found the underlying concepts upon which brainstorming is based were associated with generating more ideas. Further analysis, examining the unique contribution of each brainstorming rule, revealed that only piggy-backing produced a positive and significant effect on the total number of ideas generated. This finding indicates the benefit of brainstorming was largely predicted by a single rule. It implies idea generating groups should focus on the piggy-backing aspect of brainstorming when trying to enhance productivity.

Next, we consider our findings for each rule of brainstorming in relation to past findings.

Idea generation

Based on Osborn's (1957) assertions, we predicted that non-evaluation, free-wheeling, focus on quantity, and piggy-backing would each be positively associated with idea generation. Our analyses revealed perceptions of non-evaluation, free-wheeling, and piggy-backing produced positive effects on the number of ideas generated in groups, although only piggy-backing produced a significant effect. Focus on quantity produced a non-significant, negative effect on idea generation. Our results do not support the value of non-evaluation when focusing on the number of ideas generated in groups. This finding is consistent with those of Nemeth et al. (2004). Nemeth et al.(2004) found no difference in ideas generated between groups provided with the non-evaluation instruction and those expressly encouraged to critique ideas. In the current study, we expand on this result by examining perceptions of evaluation during discussion in groups who received no specific instruction about evaluation.

Contrary to the findings of Paulus et al. (2011), we found a focus on quantity failed to produce a significant, positive effect on idea generation. Paulus et al. (2011) compared groups instructed to focus on quantity to groups who received no such instructions. They found that groups with the focus on quantity instruction generated more ideas. We explored how the natural occurrence of a focus on quantity

related to idea generation. It is possible that we did not find a similar effect because groups did not reach the threshold level of focus on quantity needed to promote productivity. However, it is notable that group members reported a focus on quantity in discussion that was above the mid-point of the scale.

Goldenberg et al. (2013) suggest free-wheeling and piggy-backing work at cross purposes. That is, free-wheeling promotes drawing ideas from a wide set of categories whereas piggybacking suggests a narrowing of focus. We found that piggy-backing significantly predicted idea generation while free-wheeling did not. Deuja et al. (2014) indicate that this might mean the ideas generated derived from fewer categories. Although we might have had a restriction in the range of ideas considered, piggy-backing did lead to more ideas being generated.

Implications for groups

Our findings provide clear implications for groups engaging in idea generating tasks. It appears that focusing on piggy-backing will have the most positive impact on productivity. What does this imply? Essentially, piggy-backing calls on group members to carefully attend to the ideas shared by others during group discussion. Group members should then consider those ideas and, where appropriate, offer ways that the idea could be built upon or modified to be more effective.
On the other hand, it appears that less attention could be paid to avoiding evaluation of ideas, focusing on generating as many ideas as possible, and trying to engage in a free-wheeling discussion. Our results indicate this would simplify how brainstorming is utilized without any appreciable loss in productivity.

Limitations and directions for future research

Our results are informative about the nature of brainstorming in idea generating groups. However we are limited by examining a college student sample in zero-history groups. Levine, Heuett, and Reno (2017) found established groups perform differently on brainstorming tasks than non-established groups. Clearly, examining intact groups who work together regularly would provide a more accurate picture

of brainstorming in organizations and businesses. This issue could be addressed in future studies.

Conclusions

Our results indicate that the variables associated with brainstorming tend to promote idea generating productivity, consistent with the claims of Osborn (1957). At least when groups engage in face-to-face interaction to generate ideas, the variables identified in Osborn's rules, on the whole, can have a positive effect. Given the naturally occurring levels of these variables and their unique contributions to idea generating productivity, it appears promoting piggy-backing has the greatest potential for improving group performance.

References

Blomstrom, S., Boster, F. J., Levine, K. J., Butler, E.M.J. & Levine, S. L. (2008) The effects of training on brainstorming. *North Dakota Journal of Communication, Speech, & Theatre,* 21, 41-50

Comadena, M. E. (1984) Brainstorming groups: Ambiguity tolerance, communication apprehension, task attraction, and individual productivity. *Small Group Behavior,* 15, 251-264

Deuja, A., Kohn, N. W., Paulus, P. B., & Korde, R. M. (2014) Taking a broad perspective before brainstorming. *Group Dynamics: Theory, Research, and Practice,* 18, 222-236

Diehl, M., & Stroebe, W. (1987) Productivity loss in brainstorming groups: Toward the solution of a riddle. *Journal of Personality and Social Psychology,* 53, 497-509

Goldenberg, O., Larson, jr., J. R., & Wiley, J. (2013) Goal instructions, response format, and idea generation in groups. *Small Group Research,* 44, 227-256

Henningsen, D. D. & Henningsen, M. L. M. (2013) Generating ideas about the uses of brainstorming: Reconsidering the losses and gains of brainstorming groups relative to nominal groups. *Southern Communication Journal,* 78, 42-55

Henningsen, D. D., & Henningsen, M. L. M. (2018). Does brainstorming lead to symbolic convergence? Exploring the development of cohesiveness in idea generating groups. *Communication Reports,* 31, 103-114

Jablin, F. M. (1981) Cultivating imagination: Factors that enhance and inhibit creativity in brainstorming groups. *Human Communication Research,* 7, 245-258

Jablin, F. M., Seibold, D. R., & Sorenson, R. L. (1977) Potential inhibitory effects of group participation on brainstorming performance. *Central States Speech Journal,* 28, 113-121

Jablin, F. M., & Sussman, L. (1978) An exploration of communication and productivity in real brainstorming groups. *Human Communication Research,* 4, 329-337

Kramer, M. W., Kuo, C. L., & Dailey, J. C. (1997) The impact of brainstorming techniques on subsequent group processes: Beyond generating ideas. *Small Group Research,* 28, 218-242

Levine, K. J., Heuett, K. B., & Reno, K. M. (2015) Re-operationalizing established groups in brainstorming: Validating Osborn's claims. *The Journal of Creative Behavior,* 51, 3, 252-262

McCroskey, J. C. (1982) Oral communication apprehension: A reconceptualization. *Communication Yearbook,* 6, 136-170

Mongeau, P. M., & Morr, M. C. (1999) Reconsidering brainstorming. *Group Facilitation: A Research and Applications Journal,* 1, 14-21

Mullen, B., Johnson, C., & Salas, E., (1991) Productivity loss in brainstorming groups: A meta-analytic integration. *Basic and Applied Social Psychology,* 12, 3-23

Nemeth, C. J. Personnaz, B., Personnaz, M., & Goncalo, J. A. (2004) The liberating role of conflict in group creativity: A study in two countries. *European Journal of Social Psychology,* 34, 365-374

Nijstad, B. A., van Vianen, A. E. M., Stroebe, W., & Lodewijkx, H. F. M. (2004) Persistence in brainstorming: Exploring stop rules in same sex groups. *Group Processes & Intergroup Relations,* 7, 195-206

Osborn, A. F. (1957) *Applied imagination: Principles and procedures of creative problem solving.* (Revised ed.) New York: Charles Scribner's Sons

Paulus, P. B., Kohn, N. W., Arditti, L. E. (2011) Effects of quantity and quality instructions on brainstorming. *Journal of Creative Behavior,* 45, 38-46

Sutton, R. I. & Hargadon, A. (1996) Brainstorming groups in context: Effectiveness in a product design firm. *Administrative Science Quarterly,* 41, 685-718

Taylor, D. W., Berry, P. C., & Block, C. H. (1958) Does group participation when using brainstorming facilitate or inhibit creative thinking? *Administrative Science Quarterly,* 3, 23-47