Available online at www.sciencedirect.com
SCIENCE DIRECT®
Journal of Experimental Social Psychology 41 (2005) 313–320
Journal of Experimental Social Psychology
www.elsevier.com/locate/jesp

Cognitive and social comparison processes in brainstorming☆

Karen Leggett Dugosh[1], Paul B. Paulus*

Department of Psychology, University of Texas at Arlington, Box 19528, Arlington, TX 76016, USA

Received 10 May 2002; revised 3 May 2004
Available online 12 August 2004

Abstract

This brainstorming experiment assessed the extent to which idea exposure produced cognitive stimulation and social comparison effects. One hundred and sixty participants were exposed to either a high or low number of common or unique ideas. The participants' likelihood of engaging in social comparison processes (high or low) was also manipulated through instructional sets. The results indicated both cognitive stimulation and social comparison effects. Exposure to a high number of ideas and to common ideas enhanced the generation of additional ideas. The effects of exposure to a high number of ideas was greater under high than under low social comparison conditions. Finally, recall of exposed ideas was related to enhanced idea generation. These results are consistent with the social/cognitive influence model of group brainstorming (Paulus, Dugosh, Dzindolet, Putman, & Coskun, 2002).

Keywords: Groups; Creativity; Brainstorming; Electronic brainstorming; Social comparison; Cognitive processes

Group brainstorming is a popular method for generating creative ideas in organizations. Osborn (1957) developed the brainstorming technique and asserted that many ideas could be produced through its use. He believed that the effectiveness of brainstorming could be attributed to both cognitive (e.g., association) and social (e.g., social facilitation, competition) processes.

A great deal of research has tested Osborn's claims about the effectiveness of group brainstorming. Many studies have verified that groups generate more ideas when they use Osborn's brainstorming rules than when they do not (Johnson, Parrott, & Stratten, 1968; Meadow, Parnes, & Reese, 1959; Parnes & Meadow, 1959). However, when the performance of interactive brainstorming groups is compared to the pooled performance of the same number of individuals brainstorming alone (nominal groups), nominal groups outperform interactive groups in both the quantity and quality of ideas generated (Diehl & Stroebe, 1987; Mullen, Johnson, & Salas, 1991; Paulus, Larey, & Ortega, 1995). Several social and procedural factors have been identified as potential causes for this productivity gap, including evaluation apprehension (Camacho & Paulus, 1995; Collaros & Anderson, 1969), social loafing and free-riding (Diehl & Stroebe, 1987; Paulus, Dzindolet, Poletes, & Camacho, 1993), production blocking (Diehl & Stroebe, 1987), and downward performance matching (Paulus & Dzindolet, 1993).

Most brainstorming research has focused on social factors in the productivity gap between interactive and nominal groups (see Paulus, Dugosh, Dzindolet, Putman, & Coskun, 2002). However, researchers have recently begun to investigate cognitive factors as well, in particular the extent to which idea exchange influences idea generation (Dugosh, Paulus, Roland, & Yang, 2000; Nijstad, Diehl, & Stroebe, 2003). Our past research has provided evidence for both social and cognitive factors in brainstorming, and we have incorporated both of these elements into an integrative model (Paulus et al., 2002).

☆ This paper was based in part on a dissertation by the first author under the direction of the second author. This research was supported by GroupSystem.com's provision of its GroupSystems software.
* Corresponding author.
E-mail address: paulus@uta.edu (P.B. Paulus).
[1] Present address: Treatment Research Institute, Philadelphia, PA.

0022-1031/$ - see front matter © 2004 Elsevier Inc. All rights reserved.
doi:10.1016/j.jesp.2004.05.009

The social aspect of our model suggests that there may be a mutual influence process during group brainstorming in which the productivity of one brainstormer affects that of another. In novel task situations, participants may be uncertain about appropriate performance standards. This may lead them to imitate or socially compare themselves with co-performers (see Bandura, 1989; Blanton, Buunk, Gibbons, & Kuyper, 1999). There is a tendency for group members to converge to a similar low level of performance, although exposure to productive brainstormers or high group goals can raise performance to a high level (Paulus & Dzindolet, 1993).

The cognitive aspect of our model suggests that exposure to ideas from others can stimulate associations that lead to the generation of additional ideas (Brown, Tumeo, Larey, & Paulus, 1998). Ideas from others can stimulate concepts in long-term memory that are connected by means of a semantic network. This can lead to an associational chain of ideas (Brown & Paulus, 2002). Our model contends that group members initially generate the ideas whose associations are most accessible in memory, then proceed to generate ideas whose associations are less accessible, until they run out of ideas. In an interactive context, group members may provide external cues that activate ideas that are low in accessibility for a particular individual. The model assumes that the stimulating impact of ideas from others depends on the extent to which people attend to these ideas and retain them in memory during the brainstorming session.

Research has provided evidence for both social processes (Paulus & Dzindolet, 1993; Paulus, Larey, Putman, Leggett, & Roland, 1996) and cognitive processes (Brown et al., 1998; Dugosh et al., 2000; Nijstad et al., 2003) in group brainstorming. The role of cognitive processes can be complex. Although the research evidence for cognitive stimulation in brainstorming groups is mixed (Connolly, Routhieaux, & Schneider, 1993; Diehl & Stroebe, 1987, 1991; Ziegler, Diehl, & Zijlstra, 2000), the results of several experiments by Dugosh et al. (2000) suggest that people can experience cognitive stimulation in response to external ideas under certain conditions. In one experiment, individuals in experimental groups listened to an audiotape containing 30 ideas attributed to a prior brainstormer, whereas individuals in control groups brainstormed without listening to any tape. Motivation to attend to the ideas on the tape was manipulated in the experimental groups by instructing half of them to memorize the ideas for a later recall test. The results indicated that participants who received memory instructions generated more ideas than both participants in the control group who heard no ideas and participants in the experimental groups who heard ideas but were not instructed to memorize them. In addition, idea generation increased as the number of ideas recalled increased. These results suggest that idea generation can be enhanced by exposure to ideas when people are motivated to attend to the ideas they encounter.

In a second experiment, Dugosh et al. (2000) exposed participants in experimental groups to either 30 or 60 ideas from an audiotape during an initial brainstorming session. Participants in control groups heard no tapes. The number of ideas generated during the initial session and during a subsequent session in which there was no further exposure to ideas was assessed. All participants were instructed to memorize any ideas that were presented to them, and a free recall test was given between the two brainstorming sessions. Participants who heard audiotapes containing 60 ideas generated more ideas than did participants who heard no tapes. In addition, participants who heard either 30 or 60 ideas generated more ideas than did control participants in the second session when no further ideas were presented. There was a tendency for participants who initially heard 60 ideas to generate more ideas during the second session than participants who initially heard only 30 ideas. Finally, recall for the stimulus ideas was positively correlated with performance during both sessions.

The results of these experiments suggest that cognitive stimulation through exposure to ideas can occur when attention to those ideas is enhanced. Yet performance gains in these situations may not be entirely attributable to cognitive factors. It is possible that participants in these experiments engaged in social comparison processes because they were exposed to ideas that they believed were generated by another person. Past research has often shown that the motivation to generate ideas during group brainstorming can increase as a result of social comparison (Coskun, 2000; Paulus & Dzindolet, 1993; Paulus et al., 1995). Consequently, the performance gains observed by Dugosh and her colleagues may reflect in part the effect of an upward comparison that increased the participants' motivation to generate ideas of their own.

The experiment reported here was designed to further examine the impact of social and cognitive factors during idea exposure and to test predictions derived from our social/cognitive model of brainstorming (Paulus et al., 2002). The experiment employed an electronic brainstorming (EBS) format that was designed to improve idea generation by eliminating production blocking (Gallupe, Bastianutti, & Cooper, 1991; Pinsonneault, Barki, Gallupe, & Hoppen, 1999). In EBS, groups of varying sizes generate ideas on computers that are connected to a central processor that collects the ideas and controls their display. The ideas that a group generates are displayed on the screens of individual group members while they are working. Production blocking is thus eliminated because different group members can type in their ideas simultaneously as they are generated (Dennis & Valacich, 1993).