



# The eyes of creativity: Impact of social comparison and individual creativity on performance and attention to others' ideas during electronic brainstorming



Nicolas Michinov\*, Eric Jamet, Natacha Métayer, Benjamin Le Hénaff

Université Rennes 2 (CRPCC EA n°1285), France

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## ABSTRACT

The present research aimed to examine how social comparison and individual differences in creativity might influence creative performance and attention paid to ideas generated by a partner during an electronic brainstorming session. After completing a creativity scale, forty-one psychology undergraduates generated ideas by computer with a remote partner/confederate presented as a student in either Arts (upward comparison) or Sciences (downward comparison) and who was instructed to give a list of pre-tested ideas. During the idea-generation task, the eye movements of each participant were tracked to measure the attention they paid to the ideas of their partner. As predicted, results showed that the quality (but not the quantity) of ideas was greater in upward than downward comparison, but only for high creative participants. Similar patterns were found for attention allocated to the partner's ideas. We discuss the role of motivational and attentional processes for electronic brainstorming research.

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## 1. Introduction

Creativity is crucial in current real-world settings, as innovation is one of the survival conditions for organizations in a competitive and technological environment (Oldham & Da Silva, 2015). A greater number of creative ideas may emerge from people working together (Glăveanu, 2011), such as scientists who have to solve complex problems (Dunbar, 1995; Michinov, 2012a), managers who have to generate new ideas to improve organization behaviors (West & Anderson, 1996), designers who have to imagine new products (Sutton & Hargadon, 1996), and so forth. In groups where individuals have to collaborate to be creative, comparison with other group members appears to be a crucial factor which may influence their own creativity (Paulus & Dzindolet, 2008) and the attention they pay to the ideas of their collaborators during a creative task (Paulus & Brown, 2007). To date, the impact of social comparison on creative performance and attention to others' ideas during a computer-mediated idea-generation task has not been extensively examined while controlling for participants' own creativity.

In the scientific literature, creativity is commonly defined as the production of ideas, products, and solutions to problems that are both novel (original) and appropriate (feasible, useful) (Amabile, 1996; Paulus & Nijstad, 2003; Sternberg & Lubart, 1999). To stimulate creativity, a group idea-generation technique was developed and popularized under the name of brainstorming (Osborn, 1957). This technique has been extended to electronic brainstorming, in which group members simultaneously produce as many ideas as possible on computers in a short period of time (Cooper, Gallupe, Pollard, & Cadsby, 1998; Dennis & Williams, 2003; DeRosa, Smith, & Hantula, 2007; Michinov, 2012a; Paulus, Kohn, Arditti, & Korde, 2013). The goal of (electronic) brainstorming is to generate a list of ideas, applying four rules (Osborn, 1957): (a) focus on quantity, (b) withhold criticism, (c) welcome unusual ideas, and (d) combine and improve one's own ideas and those of other participants (*piggybacking*). The latter rule consists of extending the line of thought suggested by someone else in the group, building on the ideas of others, improving, combining and integrating one's own ideas and those produced by others (Javadi, Gebauer, & Mahoney, 2013; Kohn, Paulus, & Choi, 2011). To be efficient, combination and integration processes require individuals to pay attention to others' ideas. However, one of the problems of electronic brainstorming is that individuals focus on generating their own ideas instead of looking at the ideas produced by others (Dennis et al., 2005). Although the extent to which group members

\* Corresponding author. Address: Université Rennes 2 (CRPCC EA n° 1285), Place Recteur Henri Le Moal, CS 24307, 35043 Rennes Cedex, France. Tel.: +33 299141955.

E-mail address: [nicolas.michinov@univ-rennes2.fr](mailto:nicolas.michinov@univ-rennes2.fr) (N. Michinov).

allocate their attention to the ideas of others is considered to be an important factor in the creative performance of groups (Ferreira, Antunes, & Herskovic, 2011; Paulus & Brown, 2007; Paulus & Yang, 2000; Paulus et al., 2013), the manner of achieving this has not been thoroughly and explicitly examined in the brainstorming literature. Because allocating attention to the ideas of others is not spontaneous in electronic brainstorming, participants need to be given specific instructions (Dugosh, Paulus, Roland, & Yang, 2000; Paulus & Yang, 2000) or be motivated to do so (de Dreu, Nijstad, Bechtoldt, & Baas, 2011; de Dreu, Nijstad, & van Knippenberg, 2008; Paulus, Dzindolet, & Kohn, 2011). One way of motivating participants to focus their attention on the ideas produced by others, and potentially improve creative performance, involves inducing social comparison by providing information about the performance of others (Jung, Schneider, & Valacich, 2010; Roy, Gauvin, & Limayen, 1996; Shepherd, Briggs, Reining, Yen, & Nunamaker, 1996), and more specifically of others who are better performers (upward comparison) (Dugosh & Paulus, 2005; Paulus & Dzindolet, 1993).

To examine this issue further, the present research aimed to investigate the impact of social comparison on creative performance in an electronic brainstorming task, using eye tracking to evaluate in real time the attention paid to ideas produced by others. Additionally, we investigated the role of individual differences in creativity as a potential moderating variable, which surprisingly has not been explored in brainstorming research since the pioneering experiment in this domain (Taylor, Berry, & Block, 1958). The theoretical part of the paper is structured as follows. First, we describe the effects of social comparison on performance of cognitive tasks and on attention allocated to others' ideas during electronic brainstorming. Next, we describe the potential moderating impact of individual differences in creativity on the relationship between social comparison and creative performance and attention to others' ideas. Finally, we put forward a series of hypotheses based on the theoretical background.

## 2. Background and hypotheses

### 2.1. Effects of social comparison on cognitive task performance

Following Festinger's (1954) social comparison theory, it has been suggested that upward comparison may lead to heightened performance by increasing effort (Rijsman, 1974; Seta, 1982; Seta, Seta, & Donaldson, 1991). Beneficial effects have also been found in studies demonstrating that students who compare themselves with others who are better than them tend to improve their academic performance (Blanton, Buunk, Gibbons, & Kuyper, 1999; Huguet, Dumas, Monteil, & Genestoux, 2001). Similarly, studies on the effects of social comparison on performance of cognitive tasks also demonstrated that participants in the physical presence of a better coactor were less prone to Stroop interference (Huguet, Galvaing, Monteil, & Dumas, 1999) and to the illusory conjunction effect (Muller, Atzeni, & Butera, 2004; Muller & Butera, 2007) than those in a downward comparison situation.

The positive effect of upward comparison on cognitive tasks has been explained, at least in part, by the amount of attention allocated to some parts of the task to the detriment of others. For example, Muller et al. (2004) demonstrated that participants made fewer conjunctive errors in upward than downward comparison when they were invited to focus their attention on central cues (i.e. characteristics of a target presented on a screen) rather than peripheral cues (i.e. distractors) in an illusory conjunction task. Similarly, Muller and Butera (2007), using the same task, showed that when a partner was not physically present but supposedly installed in another room, upward comparison led to greater attentional focusing than downward comparison.

In brainstorming research, experiments have also revealed some benefits of social comparison feedback (Jung et al., 2010; Michinov & Primois, 2005; Roy et al., 1996; Shepherd et al., 1996), and more particularly upward comparison (Brown & Paulus, 1996; Brown, Tumeo, Larey, & Paulus, 1998; Dugosh & Paulus, 2005; Paulus & Dzindolet, 1993). For example, Shepherd et al. (1996) reported that the number of non-redundant ideas increased by 63% during an electronic brainstorming session when social comparison feedback was provided. Similarly, when group members were informed that other members of the group produced more ideas than they did during a brainstorming session (a type of upward comparison), they generated more non-redundant ideas (Paulus & Dzindolet, 1993). However, the positive impact of upward comparison was only observed when ideas were provided by another person (social comparison) and not by a computerized system generating ideas automatically (Dugosh & Paulus, 2005).

These findings suggest that upward but not downward comparison motivates participants to attain the performance of superior group members. We propose to extend these studies in order to determine the impact of comparison with a more or less creative partner, not only on creative performance (quantity and quality of ideas), but also on the attention given to the partner's ideas during electronic brainstorming.

### 2.2. Role of attention during electronic brainstorming

Researchers have suggested that when individuals try to generate creative ideas in a group, a major factor determining the effectiveness of the group interaction is likely to be the degree to which each individual pays attention to the ideas generated by other group members before giving his or her own ideas (Brown et al., 1998; Paulus & Brown, 2007). Paulus and Brown (2007) proposed a comprehensive framework in their cognitive-social-motivational model of group ideation. This model focuses on how social and motivational factors such as group cohesion, group size, social facilitation, and social comparison influence the cognitive processes involved in idea generation by affecting a central factor, namely the amount of attention paid to the ideas of other group members. In their model, they gave a prominent role to attentional processes, claiming that "*paying attention to the ideas of others is the primary means by which an individual group member can use the ideas of others to facilitate his or her own idea generation*" (Paulus & Brown, 2007, p. 253). Among other things, this model aims to explain how motivational factors such as social comparison might influence the cognitive process of idea generation by affecting the amount of attention paid to group members' ideas.

Unfortunately, the way that attention may be influenced by social comparison in cognitive tasks such as idea generation has not been thoroughly examined in the literature (see also Paulus & Dzindolet, 2008). Indeed, there is little empirical evidence concerning the central role of attention in the brainstorming literature, in which attentional processes are often inferred rather than measured in real-time during brainstorming (Dugosh et al., 2000; Michinov, 2012b; Paulus et al., 2013). For example, Dugosh et al. (2000) indirectly increased participants' attention to the ideas of others by telling them that the test involved memory for ideas. In a series of experiments, they demonstrated that when participants were instructed to memorize the ideas of others, they were more cognitively stimulated to produce ideas and performed better both in face-to-face (studies 1 and 2) and electronic brainstorming (study 3). Taking an applied approach, Michinov (2012b) showed that participants generated fewer redundant ideas during electronic brainstorming than brainwriting, suggesting indirectly that they paid more attention to the ideas of other group members. Recently, Paulus et al. (2013) demonstrated that when participants

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