Beyond Idea Generation: The Power of Groups in Developing Ideas

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Beyond Idea Generation: The Power of Groups in Developing Ideas

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Brainstorming research has claimed that individuals are more creative than groups. However, these conclusions are largely based on measuring creativity by the number of ideas generated, and researchers have tended to neglect other important components of creativity, such as the quality of developed ideas. These studies aim to address this gap in the literature and investigate how well individuals and groups develop ideas. The first study compared collaborative groups, nominal groups (i.e., groups composed of individuals working separately), and individuals on developing an original design for a language-learning game. No differences were revealed between conditions on the game ratings. In the second study, one idea was preselected and given to the participants for further development. Groups received higher ratings in the marketability and overall categories than both nominal groups and individuals, and higher ratings in the fun category than individuals. The qualitative data showed that groups discussed a wider range of topics and topics related to marketability more than individuals did. Thus it appears that there are benefits to developing ideas in a collaborative group rather than individually. Possible explanations for the present findings are explored.
Rather, ideas are the starting point for product development, which “is among the essential processes for success, survival, and renewal of organizations, particularly for firms in either fast-paced or competitive markets” (Brown & Eisenhardt, 1995, p. 344). Developing ideas is, therefore, just as important as generating them (Gish, Clausen, & Hansen, 2009). However, the importance of idea development is not only largely underestimated by the general public, but also underinvestigated by creativity research. Although idea development has been identified as an important component of creativity (Guilford, 1971; Nijstad & De Dreu, 2002), previous studies have focused almost exclusively on the very first stage of creativity, ideational fluency, defined as the ability to generate a large number of distinct ideas (Brown, Tumeo, Larey, & Paulus, 1998; Paulus, 2000). Using this measure of creative performance, much brainstorming research has demonstrated that interactive groups are less productive than individuals on creative tasks (Diehl & Stroebe, 1987; Mullen, Johnson, & Salas, 1991). This robust finding and the resulting recommendation to delegate brainstorming to individuals (Diehl & Stroebe, 1987) stands in sharp contrast to the popularity of groups in organizations when it comes to brainstorming or other creative tasks (Furnham, 2000). Moreover, naturalistic studies that stress the importance of the spontaneous social interaction between members for creativity to emerge (e.g., Sawyer & DeZutter, 2009). These studies, therefore, compare how groups and individuals develop creative ideas.

IDEA GENERATION IN INDIVIDUALS VERSUS GROUPS

Within the process of creating innovative products, ideas for products have to be generated, selected, and developed. A large number of studies have addressed the question of whether groups can outperform individuals on any of those stages, especially the first stage of idea generation. These studies, however, have yielded mixed results.

Osborn (1953) first sparked interest in brainstorming techniques when he claimed that working in groups was an effective method for innovation. Because producing large quantities of new ideas was considered the ultimate goal of brainstorming, empirical research testing this claim focused on the idea generation phase. For example, Taylor, Berry, and Block’s (1958) study first compared the quantity of ideas generated by collaborative groups (i.e., participants working together) and nominal groups (i.e., groups composed of individuals working separately, with their performances aggregated for analysis). Participants in both conditions were told to solve a creative problem-solving task, such as coming up with as many ideas as possible for addressing an anticipated shortage of teachers in 10 years. They found that nominal groups were able to generate significantly more ideas than groups, thus contradicting Osborn’s predictions. Following this seminal work, decades of studies have replicated these results and searched for reasons for this productivity loss within group brainstorming (for a review see Stroebe, Nijstad, & Rietzschel, 2010).

Despite these findings, a wide range of companies still gather colleagues in groups for brainstorming sessions (Furnham, 2000). The continued use of groups in applied contexts implies a benefit of working in groups that empirical research has left relatively unexplored. A point to consider is whether measuring the number of ideas generated in a brainstorming session sufficiently captures potential performance differences between individuals and groups in creative tasks. Indeed, groups in real-world settings are often not restricted to working on the idea generation phase but are often used to develop initial ideas further. This may limit the applicability of recommendations from brainstorming research, focusing exclusively on ideational fluency, to real-world tasks.

NATURALISTIC STUDIES OF GROUP BRAINSTORMING

Field studies of organizational creativity observed the entire creative process of interactive groups to determine outcome measures of creativity beyond idea generation (Nijstad & De Dreu, 2002; Sawyer & DeZutter, 2009; Sutton & Hargadon, 1996). For example, Sutton and Hargadon (1996) conducted a qualitative investigation of the creative procedures of IDEO, a design consulting firm. Brainstorming sessions were a crucial part of IDEO’s creative process and teams of its employees regularly collaborated not only to generate new ideas, but also to develop them further into products. The authors identified several positive consequences of group brainstorming that could be considered better indicators of success than the mere number of ideas initially generated. For instance, group brainstorming sessions enabled effective knowledge dispersion and the combination of different skills and perspectives. Similarly, Furnham (2000) summarized that the three main reasons for group brainstorming are to pool resources, benefit from specialization of labor and increase decision acceptance. Sutton and Hargadon (1996) also emphasized that the quality of the creative outcome was not just determined by originality, but also by how well it fit the client’s needs, which is in line with the current standard definition of creativity that includes usefulness as a criterion (Runco & Jaeger, 2012).

THE BENEFITS OF GROUPS

Studies that looked at other stages than the idea generation stage, such as idea selection (Putman & Paulus, 2011) have revealed that groups can be comparable to or even better than individuals. In particular, when considering the quality of the ideas selected no differences have been found between groups and individuals (Faure, 2004; Rietzschel et al, 2006).
More generally, groups have been shown to outperform individuals in research evaluating performance on problem solving and decision-making tasks (Hautz, Kämmer, Schaubert, Spies, & Gaissmaier, 2015; Reimer & Katsikopolous, 2004). For example, groups performed better than individuals when the task was to infer rules (e.g., “cards with the suit of diamonds”) from arrays of playing cards that served as examples or counter-examples of the rules (Laughlin, Bonner, & Miner, 2002; Laughlin, Hatch, Silver, & Boh, 2006). Some researchers also demonstrated that groups are better than individuals at error checking (Laughlin, VanderStoep, & Hollingshead, 1991) and at assessing whether the generated solutions are plausible (Brodbeck & Greitemeyer, 2000). Moreover, groups may benefit from the possibility to combine multiple perspectives and pool their information (Laughlin et al., 1991). A study by Azmitia and Montgomery (1993) showed that fifth graders working with friends on scientific reasoning problems (e.g., isolating the variables that caused plants to be sick or healthy) were more likely to evaluate each other’s solutions and build on each others’ reasoning, which lead to high problem-solving performance. Moreover, there is evidence that groups are better at combining ideas, a crucial process of creativity (Kohn, Paulus, & Choi, 2011). These findings from the problem-solving literature suggest that group work may have an advantage over individual work in testing and developing existing ideas.

THE PRESENT STUDIES

Given the great practical relevance, there is a need to evaluate the differences between groups and individuals in other stages of the creative process beyond idea generation. Specifically, there is a need to investigate if the development of an idea is best performed in a group setting or individually (Nijstad & De Dreu, 2002). This research was, therefore, designed to compare group performance with individual performance in developing an idea into an innovative product.

Study 1 considered the whole creative process, from generating new ideas to producing a final product. Study 2 focused on idea development to better determine if groups have an advantage in this particular phase of the creative process. For both studies, participants were asked produce several initial ideas, select one among them, and develop that idea into a final product. As the focus was on potential performance differences in the development phase, the idea generation phase was controlled by asking all participants to first generate ideas alone. The rest of the task was then completed either in groups or individually. Groups were hypothesized to excel in the development of ideas and the group condition was expected to outperform the individual and the nominal group conditions in our comprehensive creativity task.

Method

Participants

Sixty participants (32 men, $M = 24.9$ years, $SD = 4.22$) were recruited through the Max Planck Institute for Human Development participant pool in Berlin, Germany. Participants were compensated with 15 euros each, with a chance to win 40 euros each if their product design was rated the best. The study was conducted in German.

Design and Procedures

Participants were randomly assigned to one of two experimental conditions: (a) individual condition ($n = 15$) and (b) group condition ($n = 45$, i.e., 15 groups of three). Participants were seated at their own computer station and presented with the task through Unipark, an online survey platform:

Your task is to invent a brand new educational game that helps adults and university students worldwide learn a foreign language. The game has to be a realistic product that focuses on improving students’ basic vocabulary used in everyday life. You have 50 minutes in total to fully develop your idea and prepare a clear presentation.

Participants were encouraged to be as creative as possible, while creating a design that could be turned into a real product. Participants were told that their game design would then be rated by anonymous third-party raters and the participant(s) who designed the highest rated game would receive 40 euros (if a group had the best design, each group member received 40 euros).

The task was divided into four semistructured phases:

1. The idea generation phase. All participants were given 10 min to generate ideas for new games that fit the task requirements. They were told to write down as many ideas as possible.
2. The idea selection phase. All participants were given 2 min to select an idea from the list they had generated. This is their initial idea.
3. The idea development phase. Participants were given 20 min to develop their idea into a full game design.
Participants in the individual condition remained at their computer and spent the next 20 min developing their initial idea into a game design. These participants were then interviewed about their development process at the end of the experimental session. Participants in the group condition met with their group for 20 minutes to develop their game collaboratively. They spent the first few minutes of this period sharing their initial ideas and choosing one together to develop it as a group. Group discussions were audio recorded while the experimenter, blind to the experimental hypothesis, took summary notes.

4. The idea presentation phase. Participants had 20 min to write an outline of their game as a text document. They were given a template where they had to fill in the title of their game, the required materials, and a description of the gameplay in up to 250 words. The three participants in a group wrote the presentation together.

Online Survey Ratings

To obtain our dependent variables, all descriptions of the game design were rated using a survey through the Max Planck’s WebPanel online software. Although 15 groups participated, only 14 games were included in the ratings and analyses because one group failed to enter their game design correctly, so there was no record of their entry.

One hundred and seventy-nine raters (67 men, M = 38.7 years, SD = 12.5) from the WebPanel participant pool volunteered to participate in the online study for 4 euros each. The raters were informed of the game design task and were told that they would each see 10 randomly chosen games and would have to rate them on a scale of 1 (low) to 10 (high) on seven characteristics that were identified by both the principal investigators and two experts of game design in Berlin, Germany. The rating categories are explained in Table 1: originality, fun, presentation, usefulness, marketability, implementation, and overall game quality. Games in the individual condition received an average of 23.53 ratings (SD = 1.55) and games in the group condition received an average of 25.21 ratings (SD = 1.96). The averages of the rating categories were then computed for each game, resulting in only one set of ratings per game to be used as dependent variables.

Additionally, a third condition was simulated, called nominal groups. This condition represents the pooled effort of groups of three participants working individually. To obtain the ratings of the nominal group condition, the 15 individuals’ games were assembled in all possible combinations of three and the highest performing game design determined (i.e., the game design with the highest average ratings on the seven categories) for the three different members in each group. A random sample of 15 nominal groups was selected to achieve an equal number of nominal groups as in the individual and group condition. This was repeated 10 times to minimize random sampling effects and the average ratings across the 10 samples computed.

Results

Correlations Among Categories

Intercorrelations between all seven rating variables are displayed in the Appendix in Table A.1. Except for the implementation category, correlations between the categories were medium to high, indicating that the different facets of a game were strongly interrelated.

Number of Generated Ideas

Participants in the individual condition generated as many ideas (M = 8.9, SD = 4.2) as participants in the group condition (M = 7.2, SD = 2.7); t(53) = 1.54, p = .13.

Quality of Developed Ideas

A multivariate analysis of variance (MANOVA), performed with the seven ratings per game as dependent variables and condition (individual, group, and nominal group) as the independent variable, showed no differences between the conditions in any of the rating categories, F(14, 72) = 0.973, p = .49 (see Table 2).

Discussion of Study 1

Results suggest that groups develop ideas that are rated as highly as ideas developed by individuals, though groups did not outperform individuals as expected. In fact, in this study, individuals and groups even performed at the level of the best individual members of the nominal groups.

In Study 1, the idea generation and idea selection processes were distinct phases with instructions and time
limitations. However, groups tended to spend a portion of the time allotted for idea development on selecting their initial idea among those generated by the individual members. This additional time spent on selecting the initial idea might have put groups at a disadvantage because they had less time to devote to the actual idea development. Completely isolating the distinct idea development phase might be crucial to detect differences between group and individual performance and to more thoroughly test our main hypothesis. Additionally, groups’ performances might have been impacted by the presence of an evaluator (Amabile, 1979). Study 2, therefore, introduces a different method to record the creative processes of both individuals and groups without these limitations.

STUDY 2

Study 2 focused on disentangling the idea development processes of groups and individuals from both idea generation and selection. Using methodology from previous brainstorming literature (Faure, 2004; Kohn et al., 2011; Larey & Paulus, 1999), participants were given an idea to develop, instead of having them generate and select their own as in Study 1. Study 2 was conducted with computer-mediated communication using a chat program, which keeps a record of when participants communicate with each other. Most important, both individuals and groups could type their thoughts while completing their task without being influenced by the presence of an experimenter taking notes. Their typed thoughts were recorded in chronological order, allowing for a relatively close analysis of how participants in both conditions developed their ideas. Additionally, using electronic methods of brainstorming has been associated with reduced production blocking and higher performance in creative tasks (Gallupe, Bastianutti, & Cooper, 1991; Heslin, 2009). Groups were hypothesized to do better than individuals when developing ideas and therefore expected to produce more creative and higher quality game designs.

Method

Participants

Fifty-six participants (23 men, $M = 24.9$ years, $SD = 3.7$) were recruited through the Max Planck Institute for Human Development participant pool in Berlin, Germany. They were compensated with 17 euros each, with a chance to win 40 euros each if their game design was rated the best. The study was conducted in German.

Design and Procedure

Participants were randomly assigned to one of two experimental conditions: (a) individual condition ($n = 14$) or (b) group condition ($n = 42$; i.e., 14 groups of 3). Participants were seated at their own computer stations and were given sheets of instructions plus their own login for the online chat program HipChat. They were given a few minutes to ask questions and learn how to use the HipChat program.

All participants were given the task, “teach a new language by making a trip through a city,” that they would have to develop into an original game design. The task consisted of two semi-structured phases:

1. The idea development phase. Participants were given 25 min to freely develop the given initial idea. Participants in the individual condition were prompted to use the chat room interface to type notes to themselves about their creative development process. Participants in the group condition worked in groups of three and used the chat room to discuss and create a single collaborative game design. Groups were not allowed to talk outside the chat room context.

2. The idea presentation phase. Participants were given 20 min to wrap up their ideas and write a presentation of their design. In the individual condition, participants were instructed to fill in a blank template with the title of the game, the required materials, and the game description, as in Study 1. In the group condition, the

<table>
<thead>
<tr>
<th>Condition</th>
<th>Originality</th>
<th>Marketability</th>
<th>Usefulness</th>
<th>Implementation</th>
<th>Fun</th>
<th>Presentation</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>6.09 (1.20)</td>
<td>6.35 (1.12)</td>
<td>6.61 (1.18)</td>
<td>6.31 (0.98)</td>
<td>6.26 (1.03)</td>
<td>5.97 (1.58)</td>
<td>6.23 (1.07)</td>
</tr>
<tr>
<td>Group</td>
<td>6.00 (0.97)</td>
<td>6.43 (0.95)</td>
<td>6.80 (0.65)</td>
<td>6.68 (0.85)</td>
<td>6.55 (0.70)</td>
<td>6.32 (0.75)</td>
<td>6.37 (0.54)</td>
</tr>
<tr>
<td>Nominal group</td>
<td>6.73 (0.28)</td>
<td>7.06 (0.17)</td>
<td>7.29 (0.18)</td>
<td>6.46 (0.21)</td>
<td>6.89 (0.23)</td>
<td>6.91 (0.23)</td>
<td>6.91 (0.17)</td>
</tr>
<tr>
<td>All</td>
<td>6.28 (0.94)</td>
<td>6.62 (0.90)</td>
<td>6.90 (0.82)</td>
<td>6.48 (0.75)</td>
<td>6.57 (0.76)</td>
<td>6.40 (1.07)</td>
<td>6.51 (0.75)</td>
</tr>
</tbody>
</table>

*aAll categories were rated on a scale of 1 (low) to 10 (high).*
group worked together via chat on the presentation, but only one of the participants had to fill in the template for the entire group.

**Online Survey Ratings**

The 14 game designs from the individual condition and the 14 from the group condition were entered into a survey through Max Planck’s WebPanel online software. Sixty-four raters (20 men, 36.6 years, \(SD = 14.3\)) from the WebPanel participant pool volunteered to participate in the online study for 4 euros each. As in Study 1, participants were informed of the game design task and were told that they would each see 10 randomly chosen games and would have to rate them on a scale of 1 (low) to 10 (high) on seven characteristics (see **Table 1**). Games in the individual condition received an average of 23.29 ratings (\(SD = 1.81\)) and games in the group condition received an average of 23.36 ratings (\(SD = 1.69\)). The average ratings across raters per category and game were then computed to arrive at one set of ratings per game. The ratings of the best members of nominal groups were calculated as in Study 1.

**Qualitative Data of the Idea Development Phase**

The recorded chats of both individuals and groups were analyzed according to the guidelines of thematic analysis for qualitative research (Guest, MacQueen, & Namey, 2012). The first step was to code the chats for content that relate to general elements of game development, using an adapted and extended list of “structural elements of games” (Avedon, 2009). As a result, 11 game development elements were defined (see **Table 3**). Every speech act (i.e., participant chat entry) was assigned zero, one, or two of these game development elements. A speech act was assigned no element if it did not relate to any aspect of the game (e.g., procedural comments, such as “Should we begin? I have an idea.”).

Additionally, every speech act was inspected for its relation to five of the seven rating categories (see **Table 1**; note that two categories, presentation and overall rating, were not applicable for the chat coding). If a speech act was assigned one or more of the five rating categories, this speech act was also assigned at least one of the 11 game development elements (**Table 3**).

Two independent coders coded approximately 10% of all transcribed speech acts. The interrater reliability was Krippendorff’s \(\alpha = 0.68\) overall, which is considered substantial agreement by some standards (Landis & Koch, 1977) and is acceptable for this exploratory step as Krippendorff’s \(\alpha\) is a very conservative measure (Krippendorff, 2004; Lombard, Snyder-Duch, & Bracken, 2002).

**Results**

**Correlations Among Categories**

As in Study 1, the different rating categories of a game were strongly related, except for the implementation category (see **Table A.2** in the Appendix).

**Quality of Developed Ideas**

A multivariate analysis of variance (MANOVA), performed with the seven ratings per game as dependent variables and condition (individual, group, and nominal group) as independent variable, revealed a significant effect of condition, \(F(14, 68) = 2.672, p = .004, \eta_p^2 = .36\).

Separate univariate ANOVAs on the ratings revealed that condition had an effect on ratings in the category marketability, \(F(2, 39) = 9.839, p < .000, \eta_p^2 = .34\), fun, \(F(2, 39) = 3.431, p = .04, \eta_p^2 = .15\), and overall game quality, \(F(2, 39) = 5.087, p = .01, \eta_p^2 = .21\) (see **Table 4** for all means and standard deviations). Simple contrasts revealed that, for the marketability category, the games developed in the group condition received higher ratings than those of nominal groups, \(t(15.37) = 2.50, p = .02\), which were in turn higher than those of individuals, \(t(16.84) = -2.51, p = .02\). Concerning the fun category, groups received higher ratings than individuals, \(t(15.78) = -2.19, p = .04\), but there were no differences between the group and nominal group conditions, \(p = .26\), nor between individuals and nominal groups, \(p = .09\). In the overall game quality category, both types of groups received higher ratings than individuals—collaborative groups higher than individuals, \(t(22.15) = -2.56, p = .02\) and nominal groups higher than individuals, \(t(15.53) = -3.26, p = .01\), but collaborative groups and nominal groups did not differ, \(p = .42\).

**Qualitative Results**

Groups spent more time (\(M = 8.6\% , SD = 15.3\%\)) discussing themes related to marketability than individuals did, who did not discuss this category at all (0%), \(t(26) = -2.098, p = .05\), \(d = 0.80\). However, there was no similar difference for the second category for which groups received higher ratings, namely, the fun category, \(t(26) = 0.459, p = .65\) (see **Table 5**).

Differences were revealed for two coded elements of game development: Groups considered the game type (Category 11) more often than individuals did, \(t(26) = -2.330, p = .03\), \(d = -0.88\), whereas individuals spent more time considering the purpose of the game (Category 1) than groups did, \(t(26) = 2.701, p = .01, d = 1.02\) (for all means and SD see **Tables 3 and 5**). Also groups’ development phases involved a greater variety of rating categories than individual’s idea development phases (\(M_{groups} = 2.71, SD = 1.27\) vs. \(M_{individuals} = 1.21, SD = .98\), \(t(26) = -3.511, p = .002, d = 1.32\), and a greater variety of the 11 game development categories (\(M_{groups} = 7.71, SD = 1.14\) vs. \(M_{individuals} = 5.57, SD = 1.87, t(26) = -3.663, p = .001, d = 1.38\).
TABLE 3
Game Development Categories with Examples and Average Observed Percentage of Time (i.e., of all Coded Speech Acts) Spent on Each Category per Individual and Group, Respectively (SD in Parentheses)

<table>
<thead>
<tr>
<th>Game Dev. Elements</th>
<th>Speech act examples</th>
<th>Relative frequency in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Purpose or intent of the game: Defining <strong>how</strong> to win</td>
<td>“The player who is the first to visit all places wins.”</td>
<td>7.41 (6.57) 2.53 (1.58)</td>
</tr>
<tr>
<td></td>
<td>“It’s about which team crosses the finish line first.”</td>
<td></td>
</tr>
<tr>
<td>2. Results or pay-off: Defining <strong>what</strong> to win</td>
<td>“They will get points for the correct answer.”</td>
<td>3.25 (4.95) 3.66 (4.22)</td>
</tr>
<tr>
<td></td>
<td>“They will get money for taking pictures of specific sights.”</td>
<td></td>
</tr>
<tr>
<td>3. Number of required players</td>
<td>“Let’s say it is for two to six people.”</td>
<td>3.86 (5.03) 3.30 (3.31)</td>
</tr>
<tr>
<td></td>
<td>“Or one plays it by oneself?”</td>
<td></td>
</tr>
<tr>
<td>4. Roles of players</td>
<td>“You are playing it with a native speaker and the others are freshmen.”</td>
<td>3.22 (5.45) 1.30 (2.39)</td>
</tr>
<tr>
<td></td>
<td>“All players always get the same task.”</td>
<td></td>
</tr>
<tr>
<td>5. Rules governing action: Defining for which behavior one gets punished/points.</td>
<td>“We need a rule so that sentences that are too similar are rejected.”</td>
<td>2.77 (6.00) 0.93 (2.20)</td>
</tr>
<tr>
<td></td>
<td>“If they select a wrong answer then they cannot proceed.”</td>
<td></td>
</tr>
<tr>
<td>6. Abilities and skills required for action</td>
<td>“Are we creating a game for beginners or advanced learners?”</td>
<td>2.08 (3.12) 3.23 (3.50)</td>
</tr>
<tr>
<td></td>
<td>“The demands increase with ongoing playing time.”</td>
<td></td>
</tr>
<tr>
<td>7. Physical setting and environmental requirements</td>
<td>“Okay, you start somewhere… in a hotel.”</td>
<td>3.86 (8.04) 3.99 (5.31)</td>
</tr>
<tr>
<td></td>
<td>“Should the journey take place in real life or in a virtual world?”</td>
<td></td>
</tr>
<tr>
<td>8. Required equipment</td>
<td>“And for that he will get a city map and a subway map.”</td>
<td>11.46 (7.75) 6.97 (7.47)</td>
</tr>
<tr>
<td></td>
<td>“Using a microphone might be difficult.”</td>
<td></td>
</tr>
<tr>
<td>9. Procedures for action (and everything else related to the procedures of the game)</td>
<td>“If someone lands on this field an activity card gets drawn.”</td>
<td>52.76 (20.89) 57.20 (15.19)</td>
</tr>
<tr>
<td></td>
<td>“Players learn the answers to their unsolved questions and are then asked again.”</td>
<td></td>
</tr>
<tr>
<td>10. Interaction patterns: Defining whether players work together or against each other</td>
<td>“Oh, I thought the game would be more like a competition than a conversation.”</td>
<td>4.21 (5.67) 4.29 (4.54)</td>
</tr>
<tr>
<td></td>
<td>“The players should be able to communicate somehow.”</td>
<td></td>
</tr>
<tr>
<td>11. Game type: Defining the broader scope (very general classification)</td>
<td>“Should it be a board game or a card game?”</td>
<td>5.13 (5.93) 12.58 (10.40)</td>
</tr>
<tr>
<td></td>
<td>“Maybe a quiz like ‘Who Wants to Be a Millionaire?’”</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* The absolute number of speech acts coded for individuals was 275 and 1715 for groups.

TABLE 4
Mean Ratings per Condition and Overall (SD in Parentheses) in Study 2<sup>a</sup>

<table>
<thead>
<tr>
<th>Rating category</th>
<th>Originality</th>
<th>Marketability</th>
<th>Usefulness</th>
<th>Implementation</th>
<th>Fun</th>
<th>Presentation</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individual</td>
<td>5.97 (0.77)</td>
<td>5.67 (0.55)</td>
<td>5.95 (1.08)</td>
<td>6.34 (0.85)</td>
<td>5.72 (0.79)</td>
<td>5.70 (0.45)</td>
<td>5.71 (0.54)</td>
</tr>
<tr>
<td>Group</td>
<td>6.31 (0.90)</td>
<td>6.56 (0.71)</td>
<td>6.60 (1.05)</td>
<td>6.73 (0.74)</td>
<td>6.41 (0.86)</td>
<td>6.20 (0.86)</td>
<td>6.40 (0.84)</td>
</tr>
<tr>
<td>Nominal group</td>
<td>6.53 (0.17)</td>
<td>6.07 (0.21)</td>
<td>6.32 (0.22)</td>
<td>6.32 (0.25)</td>
<td>6.12 (0.27)</td>
<td>6.04 (0.13)</td>
<td>6.21 (0.17)</td>
</tr>
<tr>
<td>Overall</td>
<td>6.27 (0.71)</td>
<td>6.10 (0.64)</td>
<td>6.29 (0.90)</td>
<td>6.47 (0.68)</td>
<td>6.08 (0.73)</td>
<td>5.98 (0.59)</td>
<td>6.11 (0.64)</td>
</tr>
</tbody>
</table>

<sup>a</sup>All categories were rated on a scale of 1 (low) to 10 (high).

Discussion of Study 2

Study 2 focused on the idea development phase to compare how groups and individuals develop an idea. The results confirmed our hypothesis that developing ideas in a group would lead to outcomes that are rated as higher quality than those developed by individuals. More specifically, the games produced by groups were rated higher than the games produced by the average individual in terms of marketability, fun, and overall quality. The groups’ games were even rated as more marketable than those of nominal groups.

The qualitative data revealed that groups and individuals differed in the content of their development process. First, groups considered a wider diversity of aspects of the game design as compared to individuals, which might have contributed to the higher overall rating. This implies that groups may benefit from their members’ multiple perspectives (Luan, Katsikopoulos, & Reimer, 2012), which may lead to a wider range of issues addressed in the creative development process. In addition, groups spent more time discussing topics related to the marketability category than individuals did. This is in line with previous research that argued that groups often generate ideas that are more
feasible than individuals do (Kohn et al., 2011; Rietzschel, Nijstad, & Stroebe, 2010). Groups in this research spent less time considering the purpose of the game than individuals did, which is a more abstract aspect of game development compared to the other categories. Therefore, developing ideas in groups may lead to addressing a wider range of concerns within creative tasks, particularly practical matters of producing marketable products.

However, our conclusions have to be drawn cautiously, as our qualitative analyses of the chats can yield only speculations on the potential mechanisms underlying the idea development process. Moreover, the recorded group discussions may not have captured the same creative processes as the individuals’ typed notes. Although the groups developed their ideas explicitly through the online chats, the individuals had to think of their ideas and then type them in the chat program. Despite these limitations, the chat program provided a method of unobtrusively observing creative idea development as it occurs in both groups and individuals without involving third parties.

OVERALL DISCUSSION

These studies aimed to compare how well groups and individuals were able to develop an idea into an original product. The results of study 1 suggest that groups and individuals are equally capable of developing ideas for an original product. The results of study 2 suggest that groups may be even better than individuals within different aspects of idea development. Specifically, groups may discuss a wider range of topics and emphasize marketability and how to make a game fun. Although motivating participants extrinsically with monetary compensation might have negatively affected the participants’ creative process (Amabile, 1985), this compensation was offered to all participants in the two studies, and therefore its possible influence was constant across conditions.

The findings from the second study are particularly interesting as the games produced by groups were rated higher overall compared to the games produced by both individuals and even nominal groups. There are several possible interpretations of these results. First, the higher performance may have resulted from the greater variety of perspectives that group members contributed to idea development (Larson, Foster-Fishman, & Keys, 1994; Stasser, 1992), as indicated by the larger range of topics addressed by groups. It can be assumed that the variety of topics raised by the members of the group can be further increased by deliberately selecting members with different areas of expertise to create heterogeneous teams (Nijstad & De Dreu, 2002; Rubenson & Runco, 1995; Stroebe & Diehl, 1994). The opportunity to build on each other’s ideas and perspectives may have been an advantage in the group condition, as demonstrated elsewhere (Kohn et al., 2011). Secondly, the wider range of topics discussed by groups indicated that groups addressed more aspects crucial to game development than individuals did. This can be interpreted as being a similar process to the error-checking process discussed in the problem-solving literature, which involves testing multiple hypotheses as viable solutions to a problem (Brodbeck & Greitemeyer, 2000). Moreover, our groups’ comparatively high ratings in the marketability category are consistent with research showing that groups are better at developing feasible ideas through their idea combination process (Kohn et al., 2011), without sacrificing originality or other aspects of the game, as was previously found (Stroebe et al., 2010). One reason for the observed higher marketability of the developed games might be that this aspect was deliberately considered by groups but not by individuals.

These insights into the different creative processes of groups and individuals have important implications for the practice and research of “idea work” (Gish et al., 2009, p. 447). If working individually or in a group yields different advantages, it may be most productive to have separate sessions of teamwork and individual work for optimal performance on a creative project. Some brainstorming researchers recommend having two separate phases: a written exchange of ideas in a group session first and then generating more ideas in a subsequent individual session (Paulus, 2000; Paulus & Yang, 2000). Therefore, an interesting direction for future research would be to evaluate the creativity of different combinations of group and individual work sequences in different phases of the creative process.

Empirical research comparing individual and group creative performance has often been approached from a brainstorming perspective, which has led to the emphasis on idea generation as the widely-used measure of creativity (Stroebe et al., 2010). Other benefits of group

<table>
<thead>
<tr>
<th>Rating category</th>
<th>Originality</th>
<th>Marketability</th>
<th>Usefulness</th>
<th>Implementation</th>
<th>Fun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual</td>
<td>0.00 (0.00)</td>
<td>0.00 (0.00)</td>
<td>27.38 (32.43)</td>
<td>9.82 (27.81)</td>
<td>34.23 (37.98)</td>
</tr>
<tr>
<td>Group</td>
<td>6.88 (14.50)</td>
<td>8.59 (15.32)</td>
<td>26.21 (23.43)</td>
<td>22.56 (24.85)</td>
<td>28.62 (25.46)</td>
</tr>
</tbody>
</table>
brainstorming, however, may be the possibility to pool resources, disperse specialized knowledge and skills, and to increase decision acceptance (Furnham, 2000; Sutton & Hargadon, 1996). Moreover, being exposed to ideas of others may lead to cognitive stimulation effects (Dugosh, Paulus, Roland, & Yang, 2000; Paulus & Yang, 2000). These advantages may play a role during the idea development phase, too. Other studies have alluded to even more criteria that could be considered and are thought to play an important role in real-world creative performance. For example, people tend to feel more positively about the task when working in groups (Cohen, 1997; Kramer, Kuo, & Dailey, 1997). Sutton and Hargadon (1996) observed that IDEO’s employees benefited in a multitude of ways from teamwork, including from building on the diversity of their skills and developing their collective memory of potential solutions to creative problems. Interaction analyses of improvisational theater companies creating new plays have revealed how group members rely on each other’s creative process to produce a collaborative piece (Sawyer & DeZutter, 2009). These studies provide examples of the multiple dimensions of success in applied contexts and of how working in groups can be an effective method of fostering creativity. However, these studies have not examined the components of the creative process separately and instead have treated the creative process as a unit. It is necessary for empirical creativity research to compare the creative performance of individuals and groups by looking systematically into the different components of the creative process (Cohen, 1997). Moreover, future group creativity research should consider some of these different criteria when investigating how to use the benefits of group work to maximize creative performance.

In sum, the findings from this study indicate that collaborative groups can be just as creative as individuals. Working in groups may even be particularly beneficial within some aspects of the creative process, such as developing ideas into marketable products.

ACKNOWLEDGMENTS

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REFERENCES

### TABLE A1
Study 1: Correlations (Spearman’s rho) Between Rating Categories; p-values in Parentheses. N = 44

<table>
<thead>
<tr>
<th>Category</th>
<th>Originality</th>
<th>Marketability</th>
<th>Usefulness</th>
<th>Implementation</th>
<th>Fun</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Originality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketability</td>
<td>.582 (.000)</td>
<td>.765 (.000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usefulness</td>
<td>.539 (.000)</td>
<td></td>
<td>.765 (.000)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fun</td>
<td>.664 (.000)</td>
<td>.575 (.000)</td>
<td>.331 (.028)</td>
<td>.277 (.068)</td>
<td></td>
<td></td>
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<tr>
<td>Presentation</td>
<td>.608 (.000)</td>
<td>.836 (.000)</td>
<td>.596 (.000)</td>
<td>.199 (.195)</td>
<td>.766 (.000)</td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>.707 (.000)</td>
<td>.897 (.000)</td>
<td>.752 (.000)</td>
<td>.136 (.379)</td>
<td>.720 (.000)</td>
<td>.897 (.000)</td>
</tr>
</tbody>
</table>

### TABLE A2
Study 2: Correlations (Spearman’s rho) Between Rating Categories; p-values in Parentheses. N = 42

<table>
<thead>
<tr>
<th>Originality</th>
<th>Marketability</th>
<th>Usefulness</th>
<th>Implementation</th>
<th>Fun</th>
<th>Presentation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketability</td>
<td>.508 (.001)</td>
<td>.448 (.003)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Usefulness</td>
<td>.325 (.036)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementation</td>
<td></td>
<td>.270 (.083)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fun</td>
<td>.714 (.000)</td>
<td>.181 (.252)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presentation</td>
<td>.629 (.000)</td>
<td>.512 (.001)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>.708 (.000)</td>
<td>.587 (.000)</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

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