

# A Field Experiment Comparing the Outcomes of Three Fraud Brainstorming Procedures: Nominal Group, Round Robin, and Open Discussion

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**ABSTRACT:** The current study examines the outcomes of three fraud brainstorming procedures—nominal group, round robin, and open discussion—via a randomized between-participant field experiment involving 150 audit clients and 2,614 auditors who participated in natural, hierarchical audit teams. The results indicate that nominal group and round robin brainstorming resulted in equivalent numbers of unique fraud risks and comparable increases in planned audit hours, while open discussion brainstorming yielded the least number of unique ideas and the smallest increase in planned audit hours. Furthermore, nominal group and round robin brainstorming yielded more changes/additions to the nature and timing of substantive testing than open discussion brainstorming. Study findings offer theoretical and practical insight into fraud brainstorming.

**Keywords:** *SAS 99; fraud; brainstorming; nominal group; round robin; open discussion; auditing; field experiment.*

**Data Availability:** *Requests for data need to be specific as to the intended use and must be approved by the participating CPA firm.*

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## I. INTRODUCTION

**S**AS No. 99 (AICPA 2002) requires audit teams to conduct a brainstorming session during audit planning to identify areas in which management could perpetrate and conceal fraud that might potentially lead to material misstatement. The Public Company Accounting Oversight Board (PCAOB 2007) recently emphasized the importance of the brainstorming standard and criticized audit firms for not always complying with its requirements.

SAS No. 99 (AICPA 2002) allows firms discretion with respect to the procedure they employ for a brainstorming session; the standard states “the discussion ordinarily should involve the key members of the audit team” and “a number of factors will influence the extent of the discussion and how it should occur” (AU 316.17). Most firms have adopted open discussion brainstorming, wherein audit team members exchange ideas in a relatively unstructured manner (Bellovary and Johnstone 2007). However, many psychology studies question the effectiveness of open discussion brainstorming, as this procedure is associated with multiple sources of process losses that often overwhelm process gains (Diehl and Stroebe 1987, 1991; Bonner 2008). While SAS No. 99 (AICPA 2002) reflects a positive step forward in the quest for higher quality fraud risk assessment, this study investigates whether alternative brainstorming procedures can improve the extant practice of open discussion brainstorming.

Psychology research typically assesses the effectiveness of open discussion brainstorming by comparing the number and quality of ideas generated to nominal group brainstorming. In nominal group brainstorming, each member sits alone and generates as many ideas as possible, the composite list of which reflects the collective set of unique ideas generated by the nominal group.<sup>1</sup> In the current study, we compare nominal group to open discussion brainstorming, wherein groups begin with the nominal group procedure and then meet face-to-face to openly discuss their ideas.

We also examine a promising fraud brainstorming procedure termed “round robin” (Beasley and Jenkins 2003).<sup>2</sup> During this procedure, each member is first asked to engage in nominal brainstorming; next, the group meets and each member is required to verbalize all of his/her fraud risk ideas to the other group members, while the rest of the team listens; afterward, each member is afforded a second opportunity to articulate more fraud risks that may have been triggered by others’ ideas, while the rest of the team again listens.

The current study examines the nominal group, open discussion, and round robin brainstorming procedures via a randomized field experiment in which professional auditors participate in actual brainstorming sessions during the planning of real audits.<sup>3</sup> Managers at the national office of a large CPA firm randomly selected 150 U.S. offices to participate in the field experiment, randomly assigned each office to one of the three brainstorming procedures, and set forth a

<sup>1</sup> We refer to the concept of “nominal group” brainstorming to reflect “individuals working separately with no discussion” (Valacich and Dennis 1994), which is different from the “nominal group technique,” which also involves discussing, ranking, and prioritizing ideas (Delbecq et al. 1975).

<sup>2</sup> The “round robin” brainstorming procedure is partly based on the “nominal group technique” (NGT), originated by Delbecq et al. (1975). In the current study, we use only the first two of five steps involved in NGT, plus we add a second round of idea generation that is not articulated in the NGT. Due to significant differences between the brainstorming procedure employed herein and the NGT, we use the term round robin (as suggested by Beasley and Jenkins 2003) to avoid confusion and add clarity.

<sup>3</sup> The impetus for the current study began with top-level CPA firm managers who read the Beasley and Jenkins (2003) article and wanted to compare their existing brainstorming procedure (open discussion) to round robin brainstorming. The researchers further suggested that these procedures should be compared to nominal group brainstorming, which would serve as a benchmark. While there may be other brainstorming techniques worthy of study, the researchers were restricted in this regard by CPA firm management.

standardized protocol for how to conduct each procedure. At the local level, the office managing partner randomly selected one audit client, subject to client characteristic constraints imposed by the national office.<sup>4</sup>

Team members in all three treatment conditions were first asked to engage in nominal group brainstorming. Open discussion team members spent less time and recorded fewer fraud risks during the nominal brainstorming activity than nominal group (only) and round robin team members. The number of unique fraud risks recorded during the interaction stage of brainstorming was greater than the initial set for the round robin teams, suggesting that process gains outweighed process losses, but smaller for the open discussion teams, indicating the opposite. After brainstorming, the nominal group (only) and round robin treatments resulted in equivalent numbers of unique fraud risk ideas and similar increases in planned audit hours, while the open discussion condition yielded a smaller number of unique ideas and a lower increase in planned audit hours. Further, the nominal group and round robin groups made more changes/additions to the nature and timing of substantive testing than the open discussion groups. Overall, findings suggest that the nominal group and round robin brainstorming procedures are similarly effective, while the open discussion procedure is less effective.

This study complements and extends recent fraud brainstorming studies (e.g., [Carpenter 2007](#); [Hoffman and Zimbelman 2009](#); [Lynch et al. 2009](#)) by conducting a contextually rich field experiment involving natural, hierarchical audit teams and real audit clients; examining the round robin procedure of fraud brainstorming, which to our knowledge has not been subjected to empirical examination in prior research; and examining a robust set of brainstorming outcomes (preparation time, number of unique ideas generated, changes in audit plan hours, and changes/additions to the nature, timing, and extent of substantive testing). The next section describes the SAS No. 99 fraud brainstorming procedure, reviews prior research, and develops hypotheses. Subsequent sections present the research method, analyze the results, and discuss findings.

## II. BACKGROUND AND HYPOTHESES

### Brainstorming Stages

In 2002, the Auditing Standards Board issued SAS No. 99, *Consideration of Fraud in a Financial Statement Audit*, because standard setters believed that auditors needed additional guidance to improve fraud detection throughout an engagement. The major difference between SAS No. 99 and its predecessor, SAS No. 82 ([AICPA 1997](#)), is that the new standard requires the audit team to discuss the potential for material misstatement in the financial statements due to fraud before and during the evidence-gathering process ([Ramos 2003](#)). The purpose of fraud brainstorming is to establish a forum for audit team members to share experiences about the client, discuss how fraud might be perpetrated and concealed at the entity, and change audit procedures to improve fraud detection if necessary. Based on [Bellovary and Johnstone \(2007\)](#) and [Beasley and Jenkins \(2003\)](#), the fraud brainstorming procedure can be divided into three stages.

In the *preparation stage*, auditors are asked to develop an initial set of potential fraud risks individually, without speaking to each other. During this stage, auditors are guided to think about the client with reference to the fraud triangle (opportunities, incentive, and rationalizations/attitude; [AICPA 2002](#)). This preparatory activity is known as nominal brainstorming, as there is no communication among team members during this stage. In the current study, all audit teams engage in *nominal group brainstorming*. The nominal group (only) teams moved to the evaluation

<sup>4</sup> The assignment of 150 offices was random (using a random number generator) from the firm's entire set of U.S. offices, and the assignment of treatments to the selected offices and the selection of one client at each local office were also random; however, the population of clients from which one client was drawn was constrained by the national office, as described in the Research Method section.

stage (below), while the open discussion and round robin teams participated in the interaction stage, as described next.

Relevant to the current study, two forms of the *interaction stage* are described—*open discussion brainstorming* and *round robin brainstorming* (Beasley and Jenkins 2003).<sup>5,6</sup> During open discussion brainstorming, auditors discuss their fraud risk ideas in an unstructured manner. The rationale behind this procedure is that team members should be able to express all ideas that come to their mind, “in a kind of free-for-all” and with as little interruption as possible (Beasley and Jenkins 2003, 36). The other interactive procedure examined in this study is round robin brainstorming, reflecting a structured sharing of ideas where each team member is called on one at a time to read his/her ideas to the rest of the group. After the first round of idea sharing, each team member is afforded a second opportunity to express additional ideas that might have come to mind while listening to the other members’ first-round ideas.

The third brainstorming phase reflects the *evaluation stage*, which entails developing fraud risk assessments on the basis of ideas identified in the first two stages, and responding to the fraud risk assessments, which may or may not result in a modification of the nature, timing, and extent of planned audit procedures. While preliminary audit planning prior to the brainstorming session may have already resulted in a number of anticipated fraud detection tests, the purpose of the evaluation stage is to potentially adjust the preliminary audit plan on the basis of new ideas generated during brainstorming—ideas that had not been impounded into the preliminary plan. We next offer a brief review of extant research on brainstorming in psychology, information systems and auditing.<sup>7</sup>

## Brainstorming Research

### *Open Discussion Brainstorming*

Originally conceived by Osborn (1957), open discussion brainstorming should be conducted using the following four principles: (1) criticism is limited, (2) coming up with “wild” ideas is welcomed (“freewheeling”), (3) a great number of ideas is wanted, and (4) combination and improvement of mentioned ideas is sought. As a result, open discussion brainstorming is a procedure that involves a limited degree of structure and maximum interaction among team members, such that immediate feedback to new ideas is sought. Open discussion brainstorming is often intuitively assumed to result in a larger number of high-quality ideas than nominal group efforts because it purportedly enhances team members’ creativity and spontaneity. Furthermore, other team members’ ideas are supposed to trigger associations that would not come to mind during nominal deliberation (Paulus et al. 2000).

Despite the many potential process gains associated with open discussion brainstorming (Osborn 1957), most research has found that open discussion groups generate fewer and lower quality ideas than nominal groups (e.g., Diehl and Stroebe 1987, 1991; Mullen et al. 1991; Dennis and

<sup>5</sup> Beasley and Jenkins (2003) discuss a third interaction technique—electronic brainstorming—which essentially reflects open discussion brainstorming via electronic groupware.

<sup>6</sup> Beasley and Jenkins (2003) recommend a procedure for open discussion brainstorming that deviates somewhat from most brainstorming experiments in psychology; that is, they suggest that the interaction stage take place subsequent to nominal brainstorming activity, whereas most open discussion brainstorming experiments in psychology do not include a pre-interaction nominal brainstorming activity. In the current study, the CPA firm desired to mirror the procedures suggested by Beasley and Jenkins (2003) to the extent possible; hence, participating auditors in the round robin and open discussion treatments engaged in nominal deliberation prior to interaction.

<sup>7</sup> It is important to note that selection and examination of the open discussion and round robin techniques in this study was motivated by top-level CPA firm managers on the basis of their reading the Beasley and Jenkins (2003) article. Once the CPA firm contacted the researchers about studying these two techniques in a scientifically rigorous and methodical manner, we requested the addition of the nominal group procedure as a benchmark comparison.

Valacich 1993, 1994; Paulus et al. 1995; Dennis et al. 1999; Rietzschel et al. 2006). Four potential explanations have been offered to account for the failure of open discussion brainstorming groups to reach greater productivity levels than nominal groups.

First, in open discussion brainstorming groups, only one member can speak at a time, which may cause other members to forget or suppress their ideas because they are not allowed to verbalize them as they come to mind—a phenomenon known as *production blocking* (Brown and Paulus 2002; Nijstad and Stroebe 2006). Second, *evaluation apprehension* means that open discussion brainstorming members may refrain from voicing their ideas because they are afraid of negative assessments from peers and superiors (VanGundy 1984). Third, members might *free ride* or *socially loaf* on the efforts of other team members, thereby exert minimal participatory effort (Karau and Williams 1993; Shepperd 1993). Last, interacting groups tend to focus on a relatively limited set of ideas, resulting in *cognitive narrowing* (Lamm and Trommsdorff 1973; Dennis and Valacich 1994).

Production blocking and cognitive narrowing cannot influence nominal group (only) brainstorming since there is no interaction among team members. Evaluation apprehension could affect nominal group members if their responses are not anonymous. On the other hand, if responses are anonymous, some group members could engage in free riding or social loafing. To our knowledge, three published or forthcoming studies in accounting have compared the open discussion and nominal group procedures in the context of fraud brainstorming.

Carpenter (2007) conducted a two-phase laboratory experiment in which auditors from Big 4 CPA firms were experimentally assigned to three-person hierarchical teams, each involving a staff, senior, and manager auditor. In the first phase, participating auditors engaged in nominal group brainstorming, during which they were familiarized with case materials, and asked to think about and document possible fraud risks. In the second phase of the experiment, the same auditors participated in face-to-face open discussion brainstorming. Carpenter (2007) compared auditors' fraud ideas and fraud risk assessments before and after the open discussion brainstorming session. Consistent with many studies in psychology, she found that open discussion resulted in a smaller quantity of ideas; however, contrary to most psychology research of this nature, Carpenter (2007) found that open discussion led to higher quality fraud ideas.

Lynch et al. (2009) compared three brainstorming procedures: face-to-face discussion, electronic interactive discussion and electronic nominal group. Auditing students participated in the study and were formed into four-person teams. The face-to-face and electronic interactive groups both engaged in nominal brainstorming before they met in their teams. The results indicate that the electronic interactive discussion groups outperformed the face-to-face discussion groups, and brainstorming effectiveness was equivalent between the electronic interactive discussion and electronic nominal group treatments.

Hoffman and Zimbelman (2009) compared the brainstorming effectiveness of individuals versus three-person groups. A second treatment either did or did not prompt the participants to engage in strategic reasoning. Practicing audit managers from a large international audit firm were randomly assigned to the treatment conditions. In the "individual" condition, participants engaged in nominal group brainstorming and then moved to the audit-planning task without interaction. In the "group" condition, participants first engaged in nominal brainstorming and then collectively planned the audit via open discussion. The authors found that the groups outperformed the individuals and those who engaged in strategic reasoning outperformed those who did not.

The open discussion brainstorming procedure employed in the current study is similar to the two-phase approach in Carpenter (2007), the face-to-face discussion and electronic interactive methods in Lynch et al. (2009), and the "group" treatment in Hoffman and Zimbelman (2009). Another parallel among the four studies is the comparison of open discussion to nominal group brainstorming. Further, Hoffman and Zimbelman (2009) and the current study both examine the

effect of fraud brainstorming on audit planning. In addition, the current study examines round robin brainstorming, and the entire study is conducted in the context of a randomized field experiment involving experienced auditors and actual audit clients.

### ***Round Robin Brainstorming***

The current study considers a second interactive brainstorming procedure termed “round robin,” as suggested by [Beasley and Jenkins \(2003\)](#). Prior research suggests that more structured group decision-making methods, involving less free-flow interaction, may help brainstorming groups to improve their performance by reducing the process losses often found in open discussion brainstorming. Round robin brainstorming is partly rooted in a brainstorming method known as the nominal group technique (NGT), which was founded by [Van de Ven and Delbecq \(1971\)](#) and further formalized in [Delbecq et al. \(1975\)](#).<sup>8</sup> The NGT consists of the following five steps ([Bartunek and Murnighan 1984](#); [Mahler 1987](#)): first, participants independently and silently generate a list of ideas; second, the facilitator records one idea at a time from group members in a round-robin format until all participants have completed their list; third, participants discuss each idea for clarification only, without critical evaluation or lobbying; fourth, participants independently rate and rank the ideas; and fifth, the group decides the priority ordering of the alternatives based on voting and mathematical pooling of the individual rankings.

The current study adopts the first two steps of the NGT, and adds a third step suggested by [Beasley and Jenkins \(2003\)](#); specifically, after team members independently record their ideas in isolation (i.e., nominal group activity) and verbalize their ideas to the rest of the group without interruption or criticism, they are then afforded another opportunity to revise their initial ideas or mention new ideas in a second round of idea sharing. Since the round robin procedure used in the current study does not involve all group members discussing each others’ ideas (step three of the NGT), independently rating and ranking the ideas (step four of the NGT) or prioritizing the ideas (step five of the NGT), it would be difficult to directly compare the outcomes of the round robin procedure to the NGT. It is worth mentioning, though, that multiple research studies have demonstrated that the NGT yields the same or better outcomes than unstructured discussion (e.g., [Fox 1989](#); [Hegedus and Rasmussen 1986](#)).

We suggest that round robin brainstorming might reduce or even eliminate some of the process losses often found in open discussion brainstorming because free interaction is restricted, as members are called on and take turns reading their ideas out loud during the fraud brainstorming meeting. The inherent structure of this procedure forces all members to contribute to idea generation, thus considerably dampening the free-riding potential. Furthermore, the round robin technique prohibits immediate discussion of ideas; hence, production blocking and cognitive narrowing are eliminated because team members do not become trapped into spending excessive meeting time on a limited number of ideas. In addition, round robin brainstorming is potentially superior to nominal group brainstorming, because each team member is afforded a second opportunity to add new ideas that might have come to mind while listening to the first-round ideas. To our knowledge, audit research has not examined the round robin procedure in the context of fraud brainstorming despite its potential to yield improved outcomes relative to open discussion brainstorming.

<sup>8</sup> An alternative label for the procedure examined in this study could be the “Nominal Group Technique” (NGT). However, in the current study, we use only the first two of five steps involved in NGT, plus we add a second round of idea generation that is not articulated in the NGT; thus, for reasons of clarity and precision, we label our procedure as round robin.

### Hypothesis Development

The current study considers three dimensions of brainstorming outcomes. First, we examine the amount of time spent in the preparation stage, during which auditors brainstorm individually in a nominal manner. Second, we measure the number of unique fraud risks identified during the preparation and interactive stages. Third, we investigate the extent to which fraud brainstorming results in adjustments to preliminary audit plans during the evaluation stage.<sup>9</sup>

#### Preparation Stage

The audit teams in this study engage in a preparation stage, during which they contemplate individually about potential fraud risks. The concept of “free riding” (Diehl and Stroebe 1987; Wittenbaum et al. 1996; Brazel et al. 2004; Augustinova et al. 2005) suggests that auditors who are anticipating open discussion might tacitly assume that other team members are working diligently to prepare for the group interaction, thus adopt an effort-minimizing strategy that includes postponing idea generation until the discussion unfolds (Shepperd 1993; Wittenbaum and Stasser 1995). Auditors who are engaged in nominal group (only) brainstorming are unlikely to minimize their preparatory efforts to the extent of open discussion team members because they are cognizant that the ideas they generate during the nominal activity will be their only opportunity to offer fraud risks to the in-charge manager and audit partner, and they are aware that their input is not anonymous.<sup>10</sup> Finally, auditors who anticipate round robin interaction understand that they will be asked to express all of their fraud risks to the group, and since they do not know *a priori* when (in what order) they will be called on to express their ideas, the likelihood of “free riding” during the preparatory stage is lower for round robin team members than for open discussion team members.<sup>11</sup>

On balance, we predict that auditors in the open discussion brainstorming treatment are more likely to adopt an effort-minimizing strategy, resulting in less time expended and fewer ideas generated, than auditors who are involved in nominal group or round robin brainstorming. There is no convincing reason, however, to expect time and idea differences between the nominal group and round robin procedures, as auditors in both conditions are motivated to expend considerable effort during the preparation stage. Accordingly, we offer the first two hypotheses:

- H1:** The mean number of minutes spent in the preparation stage will be lower for open discussion brainstorming than for nominal group brainstorming or round robin brainstorming.
- H2:** The mean number of unique fraud risks generated in the preparation stage will be lower for open discussion brainstorming than for nominal group brainstorming or round robin brainstorming.

#### Interaction Stage

The next stage for open discussion and round robin brainstorming involves interaction among audit team members. Regarding open discussion brainstorming, prior research in psychology and auditing has generally found that the act of open discussion brainstorming results in fewer unique

<sup>9</sup> The brainstorming outcome variables reported herein are the only data the CPA firm will allow to be reported.

<sup>10</sup> We recognize that evaluation apprehension could encourage or discourage the nominal group members from listing all of the fraud risks that come to their minds. On one hand, evaluation apprehension could motivate an auditor to expend substantial effort during this activity out of fear that his/her supervisor might compare his/her list to the other auditors' lists. On the other hand, evaluation apprehension could suppress their willingness to jot down everything that comes to their minds, as they could feel as though some of their ideas might be viewed as insignificant or inferior.

<sup>11</sup> However, evaluation apprehension could exist since the auditors are asked to verbalize their fraud risk ideas to the whole group, thus constraining the free flow of ideas to some extent.

ideas than nominal group brainstorming (Diehl and Stroebe 1987, 1991; Mullen et al. 1991; Paulus et al. 1995; Rietzschel et al. 2006; Carpenter 2007; Lynch et al. 2009). We similarly expect that an open discussion brainstorming session will further reduce the (already limited) set of unique fraud risks identified during the preparation stage, because some auditors may fail to voice their ideas, due to the following process losses: They may forget or suppress their ideas while others talk (production blocking), feel uncomfortable voicing their ideas in the presence of others (evaluation apprehension), take advantage of others' efforts (free riding), and/or focus the discussion on a reduced set of ideas because of the potential for immediate feedback (cognitive narrowing). Hence, we posit the following:

**H3a:** The mean number of unique fraud risks generated during the interaction stage of open discussion brainstorming will be lower than the mean number of ideas generated during the preparation stage.

On the other hand, we expect that auditors engaging in round robin brainstorming will increase the initial set of fraud risks during the interaction stage. Recall that the round robin procedure involves a structured second round of idea sharing, wherein team members can express further ideas that might have come to mind as they listened to the first-round ideas. Due to the idea stimulation potential of the second round, we predict the following hypothesis:

**H3b:** The mean number of unique fraud risks generated during the interaction stage of round robin brainstorming will be greater than the mean number of ideas generated during the preparation stage.

Comparing the number of unique fraud risks that will be available in the evaluation stage (post-interaction for open discussion and round robin brainstorming, and post-preparation for nominal group brainstorming), we expect that open discussion brainstorming will result in the lowest number of unique fraud risks because of (1) reduced time and effort spent on the preparatory stage (see H1 and H2) and (2) process losses during the interaction stage (see H3a). Nominal groups should generate a greater number of ideas than the open discussion procedure, but fewer ideas than the round robin procedure, because nominal groups are not given the opportunity of additional idea stimulation in a structured interactive setting. Round robin brainstorming should lead to the greatest number of fraud risks, due to (1) greater time and effort spent on nominal deliberation during the preparation stage (see H1 and H2) and (2) the potential of additional idea stimulation during the second round of the interaction stage (see H3b). Accordingly, we offer our fourth hypothesis:

**H4:** The highest to lowest mean number of unique fraud risks identified during the evaluation stage will be ordered as follows: Round Robin > Nominal Group > Open Discussion.

### *Evaluation Stage*

The third and final stage of fraud brainstorming reflects evaluation, during which the audit team determines whether the fraud risks identified during brainstorming warrant a modification of the nature, timing, and extent of planned audit procedures. For purposes of this study, we examine several aspects of audit plan adjustments: increases in planned audit hours and changes/additions to the nature, timing and extent of substantive tests. The preliminary audit plans already impounded some fraud detection tests, based on the experience and knowledge of the audit partner and in-charge manager who developed the plans. Thus, any changes to the preliminary audit plans would be based on unique fraud risk ideas that arose during brainstorming that had not already been incorporated into the preliminary (pre-brainstorming) plans.

In the open discussion format, it might be difficult for auditors to identify new fraud risk ideas that have not already been impounded into the preliminary audit plan due to cognitive narrowing;

therefore, given the already reduced set of unique fraud ideas arising from the preparation and interaction stages, we expect that open discussion brainstorming will result in the lowest number of audit plan adjustments. By their procedural nature, nominal group and round robin brainstorming are not threatened by cognitive narrowing; hence, these procedures are expected to result in greater audit plan adjustments than open discussion. Finally, given our expectation that round robin brainstorming will result in a greater number of unique fraud risks than nominal group brainstorming (H4), we predict that audit plan adjustments will be greater for round robin as compared to nominal group brainstorming. Accordingly, we offer the final hypothesis:

**H5:** The greatest to least magnitude of audit plan adjustments will be ordered as follows:  
Round Robin > Nominal Group > Open Discussion.

### III. RESEARCH METHOD

#### Design

The current study was conducted at the request of a large audit firm. Management of the firm was interested in evaluating the efficacy of their existing fraud brainstorming procedure—open discussion. After discussing many approaches with the researchers, the firm decided to compare the relative effectiveness of nominal group and round robin brainstorming to open discussion brainstorming.<sup>12</sup>

Managing partners at the national level of the CPA firm used a random method to select 150 offices from among the entire set of all U.S. offices to participate in the study and randomly assigned each local office to one of three treatment conditions (nominal group, round robin, or open discussion brainstorming). At each local office, the managing partner randomly selected one client,<sup>13</sup> subject to the following criteria imposed at the national level: the clients must be in the retail, manufacturing, and service industries;<sup>14</sup> only clients with a December 31, 2007 fiscal year-end would be considered; only publicly listed companies would be included; and only firms with gross revenues less than \$1 billion would be allowed.<sup>15</sup> Fifty of the randomly selected offices conducted fraud risk brainstorming sessions using open discussion, 50 offices used the nominal group procedure, and the remaining 50 used the round robin procedure.

#### Procedure

The fraud brainstorming process described herein took place during the preliminary planning phase of the audit (before substantive testing had begun). The study began immediately after key members of the audit team had performed analytical procedures, reviewed the prior year audit work papers, and established a preliminary audit plan. The audit partner for each client involved in the study sent a guidance memorandum to select members of the audit team explaining how

<sup>12</sup> As with any field experiment, the researchers are limited by management in many ways, such as the precise independent variables to examine, the types of dependent variables to analyze, sample selection procedures, and so on.

<sup>13</sup> The managing partners involved in selecting offices and clients for inclusion in the study were not part of the audit teams examined in the current study.

<sup>14</sup> The participating audit firm restricted the clients to the retail, manufacturing, and service industries because they comprise a significant portion of the client base, yet they do not unintentionally signal the identity of the audit firm.

<sup>15</sup> Due to privacy and confidentiality, the firm will not provide further data regarding the total number of offices in the U.S. or across the globe, or the total number of potential clients included in the sampling frame at each office location.

fraud brainstorming would take place for the client.<sup>16</sup> The guidance memorandum was crafted at firm headquarters and was standardized for all auditors within each of the treatment conditions.<sup>17</sup>

The guidance conveyed information that was common to all treatments; namely, the memorandum asked the auditors to consider potential fraud risks in the context of guidance provided by SAS No. 99, the fraud triangle, and firm policies and procedures related to fraud detection and prevention (all of which were described in the memorandum). Every member of the brainstorming teams was asked to sit alone, think about fraud risks related to the client and write down as many fraud risks as they could identify. The memorandum asked the auditors to keep track of the number of minutes they spent considering and documenting potential fraud risks during this preparatory stage. Finally, each team member was asked to document time spent along with the identified fraud risks to a designated administrative assistant at the local office. In addition to the common instructions, treatment groups were provided with the following specific information.

### **Nominal Groups**

Nominal group members were told that fraud brainstorming would be conducted using a procedure called nominal group. This was generally explained as a procedure where each team member is asked to sit alone and think about potential fraud risks related to the client, as explained in the common guidance. Team members were made aware that there would not be a meeting of the entire team (face-to-face or electronically), and that their lists of fraud risks would be the only means by which they could convey their risks to the audit partner and in-charge manager. They were also made aware that their lists would be specifically identifiable to them by the partner and in-charge manager.

It appears as though SAS No. 99 does not support nominal group brainstorming per se, as this procedure does not meet the criterion of “discussion.” Nominal group brainstorming could be compliant with SAS No. 99, though, if the audit team were to meet and discuss their fraud risk ideas after the nominal activity, as was done in the current study. Specifically, post-experiment, yet in time to affect audit planning, auditors who were assigned to the “nominal group” only treatment condition met in an open discussion forum to share their fraud risk ideas. Audit firm partners included this post-experiment phase to ensure conformity with SAS 99, encourage full participation by all team members, and include all possible fraud risk detection procedures in the audit plan.

### **Round Robin**

Round robin team members were told that fraud brainstorming would be conducted using a procedure called round robin brainstorming. In addition to the common instructions, the guidance further conveyed the following: there would be a face-to-face brainstorming meeting during which each person would read from his/her list of fraud risks while the others listened; following this first round of idea sharing, there would be a second round-robin opportunity for each auditor to mention any additional risks he/she might have thought of during the first-round, while the others listened. It was made clear that there would be no unstructured open discussion during the brain-

<sup>16</sup> Brainstorming team members were judgmentally selected by the audit partner and in-charge audit manager on each engagement and consisted of members at all ranks (staff, senior, manager, partner), thus constituting a typical hierarchical audit team.

<sup>17</sup> The audit firm will not allow the researchers to publish the guidance memorandum since it includes firm-specific guidance, policies, and procedures. Repeated appeals to the firm’s legal department to allow the publication of a “sanitized” version of the guidance memorandum have been unsuccessful. However, the researchers thoroughly read the materials and offer assurance that everything was held constant across conditions (i.e., explanation of the nominal stage and materials that accompanied the memorandum) except for explaining the upcoming procedure for each brainstorming technique.

storming meeting and, obviously, there was no anonymity. An administrative assistant who was not privy to the initial brainstorming lists was assigned to each brainstorming group. The administrative assistant's task was to attend the face-to-face meeting and write down all of the brainstorming ideas that were mentioned during the meeting.

### **Open Discussion**

Open discussion team members were told that fraud brainstorming would be conducted via open discussion.<sup>18</sup> The memorandum explained that there would be a face-to-face brainstorming meeting during which the team would openly discuss the clients' potential fraud risks. An administrative assistant who was not privy to the initial brainstorming lists was assigned to each brainstorming group. The administrative assistant's task was to attend the face-to-face meeting and write down all of the brainstorming ideas mentioned during the meeting.

### **Dependent Measures**

First, the current study assesses the mean number of minutes that auditors on the brainstorming team spent individually thinking about and documenting fraud risks (preparation stage). The second and third dependent measures consist of the total number of unique fraud risks identified during the preparation stage (all three treatment conditions) and after the interaction stage (open discussion and round robin conditions). An administrative assistant at each local office received the time spent and the initial set of fraud risks from the team members (preparation stage), and a different administrative assistant recorded fraud risks that arose during the round robin and open discussion meetings (interaction stage).

In the nominal group treatment, the audit partner and in-charge manager for each client reduced the individual team members' lists of fraud risks to a composite set of unique risks. They used the composite set of risks as the basis for modifying the preliminary audit plan. In the other two conditions, the audit partner and in-charge manager for each client reduced the meeting notes to a set of unique risks, which was used as the basis for modifying the preliminary plan. The purpose of not exposing the partner and manager to the initial lists generated by team members (in the round robin and open discussion treatments) was to remain consistent with the firm's extant procedure of taking notes during fraud brainstorming meetings, and using such notes to identify and evaluate unique fraud risks post-interaction.<sup>19</sup>

The fourth dependent variable, percentage increase in planned audit hours, is calculated as the number of additional planned audit hours due to identified fraud risks (i.e., after the complete brainstorming process) divided by the total number of planned audit hours before the brainstorming process (i.e., before the preparation stage).<sup>20</sup> The audit firm provided three additional audit plan-related variables, each focusing on a different aspect of substantive testing. To compute these

<sup>18</sup> Open discussion was the usual fraud brainstorming technique used at the firm; however, typical open discussion brainstorming at the firm was not preceded by a nominal group activity and did not include the recording of the number of minutes they spent considering and documenting potential fraud risks prior to the meeting, as is the case with the experimental open discussion technique.

<sup>19</sup> Once the preliminary audit plan was adjusted based on the unique ideas arising from meeting notes in the open discussion and round robin treatments, the audit partner and in-charge manager were provided with the initial lists of fraud risks (preparation stage) and they reduced the lists to a composite set of unique risks, as had been done in the nominal group condition. They were then afforded an opportunity to further change the (already revised) preliminary audit plan based on additional unique risks that arose from the preparation stage. As will be shown in the results section, there were fewer unique risks arising from the preparation stage relative to the interaction stage in the round robin condition, thus the revised preliminary plans were not further modified. However, there were more unique risks arising from the preparation stage in the open discussion treatment relative to the interaction stage, and the (already revised) preliminary audit plans were further modified. Statistical analyses of the additional audit plan modifications were non-significant; thus the results were qualitatively and inferentially unchanged.

<sup>20</sup> The audit firm would not allow the researchers to have access to the number of audit hours involved.

metrics, the audit partner and in-charge manager counted the number of substantive test changes/additions to the preliminary audit plan that were directly related to fraud brainstorming. Each affected substantive test was analyzed and categorized as a change in the nature, extent or timing of testing.

#### IV. RESULTS

##### Participants, Clients and Brainstorming Teams

Table 1 includes descriptive statistics regarding the study participants (Panels A and B) and selected clients (Panels C and D). As shown in Panel A, there were 2,614 auditor participants, of which there were 150 audit partners (one partner per selected client).<sup>21</sup> The mean number of participants in each group was about 17 (Panel B). Each brainstorming team included either one or two specialists, who were at the senior and manager ranks. While the audit firm would not allow the researchers to reveal the nature of the specialists (e.g., information technology, fraud and tax), statistical testing indicates that neither the number ( $F = 1.06, p > 0.50$ ) nor nature ( $F = 0.84, p > 0.50$ ) of specialists varied across the treatment conditions. The mean years auditing the selected clients was about nine (Panel C) and the most represented industry across the groups was service (Panel D).

##### Dependent Variables

Shown in Table 2 are means and standard deviations for the mean time spent on the preparation stage (Panel A), the mean number of unique fraud risks identified during brainstorming (Panel B) and mean number of preliminary audit plan adjustments following the brainstorming process (Panel C). All variables were divided by the same constant, which was selected by the audit firm and is unknown to the researchers. The constant reflects a number between 1.1 and 1.9. The audit firm divided the metrics by a constant for competitive and legal reasons.

##### Preliminary Testing

###### *Manipulation Check*

After the fraud brainstorming process was completed, the national partner at firm headquarters who coordinated the field experiment sent an email to all participating auditors asking about the brainstorming procedure they had used for the selected client (nominal group [only], round robin, or open discussion). All participants answered correctly in accordance with their treatment conditions.

###### *Potential Covariates*

The following covariates were included in all MANCOVA and ANCOVA models reported herein: perceived anonymity, brainstorming team size, mean age of the brainstorming team, mean years experience of the brainstorming team, number of years auditing the client, total revenues of the client, percent female auditors on the brainstorming team, client industry, and number of specialists on the brainstorming team.

<sup>21</sup> Participating auditors were unaware that there were other treatments being tested at other offices. However, they were likely aware that the firm was testing a procedural change related to brainstorming since one client in their office was being treated differently from the others. This would be the case even with the open discussion brainstorming treatment, as the auditors received a firm memorandum regarding the selected client that was procedurally different from the existing open discussion process for all other clients in the office.

**TABLE 1**  
**Descriptive Statistics for Participants and Clients**

<b>Panel A: Participants by Rank</b>	<b>Partners</b>	<b>Managers</b>	<b>Seniors</b>	<b>Staff</b>	<b>Total</b>
Number of Participants	150	337	679	1,448	2,614
Number (%) Female	4 (2.67)	57 (16.91)	236 (34.76)	818 (56.49)	1,115 (42.65)
Mean (S.D.) Age	46 (7.78)	31 (4.65)	27 (1.78)	24 (1.42)	32 (2.29)
Mean (S.D.) Experience	23 (6.66)	9 (1.88)	5 (1.67)	1 (0.50)	10 (1.74)

  

<b>Panel B: Participants by Treatment<sup>a</sup></b>	<b>Nominal Group</b>	<b>Round Robin</b>	<b>Open Discussion</b>
Mean (S.D.) Number of Partners	1.00 (0.00)	1.00 (0.00)	1.00 (0.00)
Mean (S.D.) Number of Managers	2.22 (0.86)	2.34 (0.75)	2.18 (0.75)
Mean (S.D.) Number of Seniors	4.66 (1.14)	4.30 (0.97)	4.62 (1.03)
Mean (S.D.) Number of Staff	9.66 (2.92)	10.00 (3.25)	9.30 (2.87)
Mean (S.D.) Total Participants	17.54 (2.75)	17.64 (3.10)	17.10 (2.79)
Mean (S.D.) Number of Female	7.94 (2.30)	6.98 (2.43)	7.34 (2.15)
Mean (S.D.) Age	31.64 (1.93)	32.15 (2.14)	31.94 (2.60)
Mean (S.D.) Experience	9.36 (1.75)	9.81 (1.66)	9.62 (1.82)
Mean (S.D.) Number of Specialists	1.53 (0.46)	1.77 (0.63)	1.42 (0.75)

  

<b>Panel C: Clients<sup>b</sup></b>	
Number of Clients in Study	150
Mean (S.D.) Years Auditing Client	8.99 (5.50)
Mean (S.D.) Total Revenues (millions)	\$545.91 (\$288.36)
Percent of Clients in Retail Industry	28%
Percent of Clients in Manufacturing Industry	17%
Percent of Clients in Service Industry	55%

(continued on next page)

**Panel D: Clients by Treatment<sup>c</sup>**

	<u>Nominal Group</u>	<u>Round Robin</u>	<u>Open Discussion</u>
Number of Clients	50	50	50
Mean (S.D.) Years Auditing Client	8.88 (5.52)	9.26 (4.89)	8.84 (5.78)
Mean (S.D.) Total Revenues (millions)	521.68 (284.40)	565.44 (304.91)	550.60 (279.24)
Percent of Clients in Retail	32%	24%	28%
Percent of Clients in Manufacturing	18%	14%	20%
Percent of Clients in Service	50%	62%	52%

<sup>a</sup> None of the participant attributes is significantly different across the three treatment conditions ( $p > .10$ ).

<sup>b</sup> The participating audit firm restricted the clients to the retail, manufacturing, and service industries because they comprise a significant portion of the client base, yet they do not unintentionally signal the identity of the audit firm.

<sup>c</sup> None of the client attributes is significantly different across the three treatment conditions ( $p > .10$ )

TABLE 2

Descriptive Statistics for the Dependent Variables<sup>a</sup>

## Panel A: Mean (Standard Deviation) Individual Minutes

Preparation Stage <sup>b</sup>	Nominal Group		Round Robin		Open Discussion	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Staff	70.67	(15.75)	77.77	(19.00)	69.62	(17.62)
Seniors	60.35	(10.44)	57.44	(13.72)	33.57	(8.56)
Managers	53.76	(12.02)	43.98	(11.85)	31.95	(4.51)
Partners	57.68	(20.10)	53.70	(30.01)	56.88	(27.00)
Total	60.61	(8.23)	58.22	(10.46)	48.00	(7.96)

## Panel B: Mean (Standard Deviation) Number of Unique Fraud Risks

	Nominal Group		Round Robin		Open Discussion	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Number of Unique Risks Pre-Interaction	16.45	(4.31)	15.43	(4.21)	13.62	(3.45)
Number of Unique Risks During-Interaction	NA	(NA)	17.59	(4.32)	11.44	(3.16)

## Panel C: Mean (Standard Deviation) Audit Plan Adjustments

	Nominal Group		Round Robin		Open Discussion	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
% Increase in Planned Audit Hours	1.81	(1.23)	1.65	(1.18)	0.83	(0.62)
Total # of Substantive Tests Affected	23.36	(11.47)	27.76	(11.95)	13.86	(6.83)
# of Substantive Tests: Nature	8.04	(4.56)	10.10	(5.85)	2.62	(2.54)
# of Substantive Tests: Timing	10.22	(6.10)	10.56	(5.40)	4.26	(4.97)
# of Substantive Tests: Extent	5.10	(3.47)	7.10	(5.48)	6.98	(4.03)
% of Substantive Tests: Nature	33.66	(11.93)	36.45	(13.13)	17.38	(13.03)
% of Substantive Tests: Timing	42.40	(9.80)	37.08	(8.39)	24.49	(25.18)
% of Substantive Tests: Extent	23.94	(15.19)	26.47	(15.93)	58.13	(26.76)

(continued on next page)

- <sup>a</sup> The metrics provided by the audit firm and shown in Panels A, B, and C have been divided by a constant, which was selected by the audit firm. The constant reflects a number between 1.1 and 1.9. The audit firm divided the metrics by a constant for competitive and legal reasons. Thus, the means are comparable across the treatment conditions, but they cannot be interpreted in an absolute sense.
- <sup>b</sup> The auditors were asked to think about and write down client fraud risks in the context of SAS No. 99, the fraud triangle, and firm policies and procedures, and note the number of minutes spent in this activity. This metric reflects mean individual number of minutes the auditors spent in the preparation stage by rank across the three brainstorming techniques.
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### Hypothesis Testing

The results of statistical analyses on the dependent variables are shown in Table 3. The multiple pairwise comparisons reflect both Bonferroni and Scheffe testing, both of which agreed in all instances ( $\alpha = 0.05$ ).<sup>22,23</sup>

Hypothesis 1 posits that open discussion brainstorming will yield less preparation time than nominal group or round robin brainstorming. Table 3 (Panel A) shows that the mean number of preparation minutes per team member was significantly lower with open discussion brainstorming (48.00) than nominal group (60.61) or round robin brainstorming (58.22); further, there is no significant difference in preparation time between nominal group and round robin brainstorming. Hence, H1 is supported.

While we did not hypothesize time variation across auditor ranks in the preparation stage, it is interesting to note where significant differences exist (see Table 3, Panel A). The mean number of minutes for *staff* in the nominal group, round robin and open discussion treatments are not significantly different. The mean individual number of minutes for *seniors* in the open discussion condition (33.57) was significantly lower than the nominal group (60.35) and round robin (57.44) conditions, and the latter two means are statistically equivalent. The mean individual number of minutes for *managers* in the open discussion condition (31.95) was significantly lower than the nominal group (53.76) and round robin (43.98) conditions, and the latter two means are not significantly different. The number of mean individual minutes for *partners* in the nominal group (57.68), round robin (53.70), and open discussion (56.88) conditions are not significantly different.<sup>24</sup> It appears that particularly seniors and managers in the open discussion condition were reducing their efforts in anticipation of the upcoming unstructured discussion forum.

Hypothesis 2 predicts that open discussion brainstorming will generate a lower number of unique fraud risks than either nominal group or round robin brainstorming during the preparation stage. As indicated in Table 3, Panel B, the number of unique fraud risks identified during the preparation stage is significantly lower with open discussion brainstorming (13.62), relative to nominal group (16.45) or round robin (15.43) brainstorming, which supports H2.<sup>25</sup>

The third hypothesis predicts that the number of unique fraud risks identified by audit teams using open discussion brainstorming will further decrease during the interaction stage (H3a), while the number of unique fraud risks identified by round robin brainstorming teams will increase during the interaction stage (H3b). Indeed, the interaction stage of open discussion brainstorming decreased the number of unique ideas from the initial set of 13.62 to a reduced set of 11.44 ( $t = 11.17$ ,  $p < 0.01$ ). Conversely, a comparison of the round robin pre-interaction number of ideas (15.43) and interaction number of ideas (17.59) indicates that the second round iteration of idea sharing was effective in adding unique ideas to the initial set ( $t = -9.651$ ,  $p < 0.01$ ). These findings support H3a and H3b.

Hypothesis 4 posits that the number of unique ideas arising from brainstorming will be lowest for open discussion brainstorming and highest for round robin brainstorming, with nominal group

<sup>22</sup> A MANCOVA analysis was conducted using the three treatment conditions as the independent variable, and the following dependent variables: mean number of minutes spent in the preparation stage across staff, senior, manager and partner team members, number of unique ideas, percent change in planned audit hours, and change in the nature, timing and extent of substantive audit tests. Pillai's Trace ( $F = 32.36$ ), Wilks' Lambda ( $F = 43.09$ ), Hotelling's Trace ( $F = 56.11$ ) and Roy's Largest Root ( $F = 99.52$ ) were all significant at  $p < 0.01$ , thereby indicating a treatment effect. None of the covariates were significant (smallest  $p$ -value = 0.12 for mean years experience of the brainstorming team).

<sup>23</sup> In total, 12 ANCOVA models comprise the results shown in Table 3. Rather than showing all 12 models separately, which would consume considerable space, the researchers condensed the significant covariates for each model into table footnotes.

<sup>24</sup> The partners' time only included their preparatory time—not evaluation or administrative time.

<sup>25</sup> We are not privy to the number of ideas generated by rank.

**TABLE 3**  
**Results of ANCOVA and Multiple Pairwise Comparisons<sup>a,b</sup>**

**Panel A: Mean Collective Minutes**

<u>Preparation Stage</u>	<u>Nominal Group</u>		<u>Round Robin</u>		<u>Open Discussion</u>	<u>F-Ratio</u>	<u>p-value</u>
Staff <sup>c</sup>	70.67	=	77.77	=	69.62	3.15	.05
Seniors <sup>d</sup>	60.35	=	57.44	>	33.57	75.36	.01
Managers <sup>e</sup>	53.76	=	43.98	>	31.95	50.60	.01
Partners <sup>f</sup>	57.68	=	53.70	=	56.88	0.24	.80
Total <sup>g</sup>	60.61	=	58.22	>	48.00	22.44	.01

**Panel B: Number of Unique Fraud Risks**

	<u>Nominal Group</u>		<u>Round Robin</u>		<u>Open Discussion</u>	<u>F-Ratio</u>	<u>p-value</u>
# Unique Risks—Pre-Interaction <sup>h</sup>	16.45	=	15.43	>	13.62	5.99	.01
# Unique Risks—During-Interaction <sup>i</sup>	16.45	=	17.59	>	11.44	34.26	.01

**Panel C: Audit Plan Adjustments<sup>j</sup>**

	<u>Nominal Group</u>		<u>Nominal Group</u>		<u>Open Discussion</u>	<u>F-Ratio</u>	<u>p-value</u>
% Increase in Planned Audit Hours <sup>k</sup>	1.81	=	1.65	>	0.83	86.12	.01
Total # of Substantive Tests Affected <sup>l</sup>	23.36	=	27.76	>	13.86	23.58	.01
# of Substantive Tests: Nature <sup>m</sup>	8.04	=	10.10	>	2.62	3.59	.03
# of Substantive Tests: Timing <sup>n</sup>	10.22	=	10.56	>	4.26	12.53	.01
# of Substantive Tests: Extent <sup>o</sup>	5.10	<	7.10	=	6.98	14.88	.01

<sup>a</sup> In all cases, the Scheffe and Bonferroni multiple pairwise comparison tests provide the same results (alpha = .05).

<sup>b</sup> The following covariates were included in all ANCOVA models: perceived anonymity of fraud risks, size of the brainstorming team, mean age of the brainstorming team, mean years audit experience of the brainstorming team, number of years auditing the client, client revenues, percent female auditors on the brainstorming team, client industry. Significant covariates are indicated in the following notes.

<sup>c</sup> There were no significant covariates.

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- <sup>d</sup> Percent female auditors on the brainstorming team was significant ( $F = 3.25, p = .07$ ), greater percent female team members is associated with more time spent in the preparation stage.
- <sup>e</sup> Number of years auditing the client was significant ( $F = 3.79, p = .05$ ). more years is associated with less time spent in the preparation stage.
- <sup>f</sup> Brainstorming team size was significant ( $F = 3.58, p < .06$ ), larger team size is associated with more time spent in the preparation stage; client revenues was significant ( $F = 3.70, p = .06$ ), larger client size is associated with more time spent in the preparation stage; and mean years audit experience of the brainstorming team was significant ( $F = 2.84, p = .09$ ), less audit experience is associated with more time spent in the preparation stage.
- <sup>g</sup> There were no significant covariates.
- <sup>h</sup> There were no significant covariates.
- <sup>i</sup> There was no “interaction stage” for the nominal group technique, but the number of unique ideas generated during the preparation stage was used to compare against the number of unique ideas arising from interaction stage of round robin and open discussion brainstorming. There were no significant covariates.
- <sup>j</sup> In addition to the covariates mentioned in Note b (above), the ANCOVA models used to assess variables shown in Panel C also included the “number of unique ideas” as an additional covariate.
- <sup>k</sup> Mean years experience of the brainstorming team was significant ( $F = 7.48, p = .01$ ), greater mean experience is associated with higher percent changes in audit hours; the number of unique ideas was significant ( $F = 2,338.62, p = .01$ ), more unique ideas is associate with higher percent changes in audit hours.
- <sup>l</sup> Number of years auditing the client was significant ( $F = 3.37, p = .07$ ), more years auditing the client is associated with fewer numbers of total additional substantive tests; the number of unique ideas was significant ( $F = 3,361.31, p = .01$ ), more unique ideas is associate with greater numbers of total additional substantive tests.
- <sup>m</sup> The number of unique ideas was significant ( $F = 1,430.87, p = .01$ ), more unique ideas is associate with greater numbers of additional substantive tests involving the nature of tests.
- <sup>n</sup> Number of years auditing the client was significant ( $F = 2.86, p = .09$ ), more years is associated with fewer numbers of additional substantive tests involving the timing of tests; the number of unique ideas was significant ( $F = 1,373.68, p = .01$ ), more unique ideas is associate with greater numbers of additional substantive tests involving the timing of tests.
- <sup>o</sup> Client revenues was significant ( $F = 3.37, p = .07$ ), higher revenues are associate with greater numbers of additional substantive tests involving the extent of tests; the number of unique ideas was significant ( $F = 46.27, p = .01$ ), more unique ideas is associate with greater numbers of additional substantive tests involving the extent of tests.
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brainstorming falling in the middle. As indicated in Table 3, Panel B, open discussion brainstorming resulted in a significantly lower number of unique fraud risks (11.44) than round robin (17.59) and nominal group brainstorming (16.45); however, contrary to our predictions, the number of unique ideas arising from the round robin condition was not statistically greater than the nominal group condition; accordingly, H4 is only partially supported.

Hypothesis 5 suggests that adjustments to the preliminary audit plan will be greatest for round robin brainstorming and smallest for open discussion, with nominal group brainstorming falling between the two interactive procedures. We examine this proposition using multiple metrics (percent increase in planned audit hours, and number of changes/additions to substantive testing, subdivided into the nature, extent and timing of substantive tests), all of which are shown on Table 3, Panel C.

The mean percent increase in planned audit hours in the open discussion brainstorming treatment (0.83 percent) is significantly lower than in the nominal group (1.81 percent) and round robin (1.65 percent) treatments. Further, the total number of substantive tests that were changed or added as a result of fraud brainstorming is greater in the nominal group (23.36) and round robin (27.76) conditions than the open discussion condition (13.86). The number of affected substantive tests involving “nature” is greater with nominal group (8.04) and round robin brainstorming (10.10), as compared to open discussion brainstorming (2.62). Similarly, the number of affected tests involving “timing” is greater with nominal group (10.22) and round robin brainstorming (10.56), as compared to open discussion brainstorming (4.26). However, there is no significant difference in any of the aforementioned metrics between round robin and nominal group brainstorming. Finally, the number of changes/additions focusing on “extent” is lower in the nominal group condition (5.10) when compared to the round robin (7.10) and open discussion (6.98) brainstorming conditions, with the latter two being statistically equivalent.

Some researchers and practitioners have suggested that modifying nature and changing the timing of standard audit plans are valuable fraud detection procedures (Zimelman 1997; Albrecht et al. 2001; AICPA 2002; Glover et al. 2003; Asare and Wright 2004). The reasoning is that fraudulent audit clients are often prepared to deal with standard audit procedures, while unexpected changes to the types and timing of substantive tests can reveal evidence that might be otherwise consciously hidden. Because nominal group and round robin brainstorming resulted in greater numbers of changes/additions involving the nature and timing of substantive testing and higher percent changes to the preliminary audit plans, we suggest that these two brainstorming procedures generally resulted in a more favorable outcome than open discussion brainstorming. However, H5 is only partially supported since there is (generally) no difference in audit plan adjustments between the nominal group and round robin treatments.

## V. DISCUSSION

While fraud brainstorming is required by SAS No. 99, little is known about the relative efficacy of different brainstorming procedures, particularly in the field environment. In an attempt to further inform theory and practice in this regard, our field experiment compares the most commonly used brainstorming procedure in practice (open discussion) to nominal group brainstorming, and introduces a promising procedure that has not been examined in the context of fraud brainstorming, called the round robin procedure. In this study, the nominal group and round robin procedures yield equivalent outcomes from the perspective of the number of unique fraud risks identified, percent increase in planned audit hours, and number of changes to the nature and timing of substantive testing, whereas these outcomes in the open discussion brainstorming condition were lower.

Another revealing finding from the current study is reflected in the mean time spent per team member in the preparation stage of fraud brainstorming. The results indicate that the mean time

spent was significantly less with the open discussion procedure, relative to the other two procedures, suggesting that auditors who were anticipating unstructured group discussion reduced their preparatory effort, perhaps because they were attempting to “free ride” on other auditors’ efforts since they knew that the ideas they generated during the preparatory phase (i.e., nominal group brainstorming) would not be revealed to others in the group. Interestingly, the lower preparation time can be attributed to senior and manager auditors in the open discussion treatment, as they expended considerably less time in the preparation stage of brainstorming than senior and manager auditors in the other two conditions. Future research should attempt to uncover reasons why preparation time differences across the treatment conditions were observed generally, and particularly for seniors and managers.

Our results are consistent with [Carpenter \(2007\)](#) regarding the number of unique ideas generated by brainstorming, as we similarly find that the nominal group procedure generated more unique fraud risks than open discussion. On the other hand, while [Carpenter \(2007\)](#) reported that open discussion brainstorming generated higher quality fraud risk ideas than nominal brainstorming, findings from the current study suggest the opposite. We observed fewer audit plan adjustments following the open discussion procedure. Because the contexts (laboratory versus field experiment), tasks (case scenario versus actual clients) and team compositions (artificial versus natural) differ between the two studies, it is, however, difficult to draw direct comparisons.

One particular difference between [Carpenter \(2007\)](#) and the current study holds future research potential. [Carpenter \(2007\)](#) directly measured the quality of fraud risk ideas, while the current study assessed a second-order effect of quality—audit plan adjustments. While the quality of ideas generated during open discussion brainstorming in the [Carpenter \(2007\)](#) study was judged to be greater than for nominal brainstorming, it is possible that some of the ideas generated already would have been impounded in the preliminary audit plan (pre-brainstorming); thus, the extent to which such ideas might have affected the audit plan is unknown. Comparing and contrasting these two studies suggests future research that directly measures the quality of fraud risk ideas generated through brainstorming and follows the ideas through audit plan adjustments.

Results from the current study are also consistent with [Lynch et al. \(2009\)](#), in that both studies find that nominal brainstorming is more effective than open discussion brainstorming. In addition, [Lynch et al. \(2009\)](#) report equivalent effectiveness between electronic interactive brainstorming and electronic nominal brainstorming, and we find similar effectiveness between the round robin and nominal group brainstorming procedures. Since electronic brainstorming is potentially more efficient and effective than face-to-face procedures, future research should examine the relative efficacy of electronic interactive, electronic nominal group and electronic round robin brainstorming.

[Hoffman and Zimbelman \(2009\)](#) examined the effect of different brainstorming procedures on audit-planning judgments. They found that auditors who interacted in brainstorming groups (open discussion) were more likely to change the nature of standard audit procedures, relative to individuals (nominal groups), while our results suggest the opposite. It is difficult to compare our results to the findings of [Hoffman and Zimbelman \(2009\)](#) because in the current study, audit plan modifications were made to a preliminary audit plan that had already impounded fraud detection testing based on standard audit plans and prior years’ audit experience coupled with client specific idiosyncrasies, while participants in [Hoffman and Zimbelman \(2009\)](#) were asked to modify a standard audit plan. Further, the current study involved 150 different clients across all treatments whereas [Hoffman and Zimbelman \(2009\)](#) used a single case in all treatments. Nevertheless, findings from both [Hoffman and Zimbelman \(2009\)](#) and [Carpenter \(2007\)](#) contradict the relative superiority of nominal group over open discussion reported in the current study, which calls for further research in this area.

This study is limited by several factors and conditions. First, the participating audit firm set several restrictions on the nature of clients that could be included in the sample. Without further information on the complete set of possible clients that could have been included in the sample frame, one cannot know the nature and extent of bias that these restrictions might have placed on the study results. Second, the audit partner and in-charge manager chose the audit team members who would participate in the brainstorming process, identified the unique fraud risks from the entire set of risks provided by the brainstorming team and decided what changes (if any) to make to substantive testing and planned audit hours. While leaving such discretion to the audit partner and in-charge manager could have biased the study results, randomization of client selection and treatments to clients alleviates the concern that such potential biases were systematically different among the treatment conditions. Third, the participating firm had never used the nominal group or round robin procedure prior to this study. As a result, auditors in these conditions might have felt an increased sense of accountability associated with the novelty of these approaches. On the other hand, auditors in the traditional open discussion brainstorming condition were also asked to engage in nominal brainstorming before meeting face-to-face, reflecting a procedure that was different from prior years and other clients; hence, any reactive effects driven by mere participation in this study should be fairly constant across the three conditions. Last, participants in the nominal group (only) condition knew that their fraud risks were not anonymous, as did participants in the round robin condition; however, participants in the open discussion condition neither forwarded nor verbalized their lists, thus, the lower number of unique ideas arising from the preliminary stage in the open discussion condition could be a result of differing anonymity perceptions.

After considering the limitations and offsetting strengths of the current field experiment, we believe that researchers and practitioners can gain some insight into the relative effects of nominal group, round robin, and open discussion fraud brainstorming, which can inform future research and practice in this area. First, we administered an experiment in a contextually rich field setting that involved natural hierarchical teams of practicing auditors and existing clients, where complex risks, motivations, and incentives are at stake. Second, in response to [Bonner's \(2008\)](#) call for research on interventions that may improve groups' judgment and decision making quality, we examined the round robin procedure of fraud brainstorming, which to our knowledge has not been subjected to empirical investigation in prior research. Third, as far as we can determine, this is the first field study to document the effect of fraud brainstorming on planned audit hours, and on the nature, timing, and extent of substantive testing. While the current study adds a few more pieces to the extensive and complex puzzle of fraud brainstorming, there remains much more to learn.

### **Practice Implications**

We recognize that every research project is limited in myriad ways, thus practitioners should be careful about making wholesale changes based on the findings of any single study. In this light, we would like to comment on the apparent "tie" between the nominal group and round robin procedures examined herein. Since both brainstorming approaches yielded equivalently effective outcomes, which one should a firm adopt if choosing between the two? On one hand, if a firm prefers the nominal group procedure, then we advise that team members meet face-to-face after the nominal idea generation activity to openly discuss their fraud risk ideas. This additional process will ensure compliance with SAS 99, and allow for learning and growth opportunities among team members. On the other hand, if the round robin procedure is favored by a firm, then we similarly advise an open discussion forum after the last round of idea sharing for the same reasons. Since the round robin method includes a face-to-face meeting as part of the procedure, the

incremental effort of including a final open discussion seems quite marginal; thus, we recommend round robin over nominal group brainstorming, which is consistent with the participating CPA firm's viewpoint, as next discussed.

### Epilogue

Although the participating CPA firm has yet to finalize its fraud brainstorming procedures, it is considering using a modified version of the round robin procedure. While the preparation stage and evaluation stage of brainstorming would take place as described in this study, the interaction stage would be expanded from two to three phases, as follows: during phase one, each team member, in turn, will be asked to voice his/her risks to the entire team while the other team members listen; during phase two, after all team members have had the opportunity to voice their risks, there will be a second round of expressing new risks that might have come to mind during the first round; and, during phase three, there would be an unstructured open discussion about fraud risks. The reason the firm is considering the third phase is because they wish to be in compliance with SAS 99 and the open discussion portion of the procedure would provide an opportunity for the less experienced members of the team to learn from the more experienced members, as the more experienced members will be able to explain their reasoning processes.

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