SOCIAL PSYCHOLOGY | RESEARCH ARTICLE

Group decision quality, conscientiousness and competition

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Abstract: This experimental study examined the effects of conscientiousness and competition on group decision quality. The participants of this study (240 undergraduate students, 175 females, and 65 males) were divided into 40 groups of High-conscientiousness (HC) traits and 40 groups of Low-conscientiousness (LC) traits. Each group consisted of three people. The task was to make a group decision in two different settings, with and without competition. The exact logistic regression showed that HC personality significantly increased the risk of bad group decisions. It is likely that the inability of the HC group to adapt their strategy in problem-solving inhibits their performance in producing the quality group decision. The competition condition does not affect the quality. Nevertheless, there is an interaction effect of conscientiousness and competition in influencing the quality of group decisions.

Subjects: Sociology of Knowledge; Quantitative Methods; Psychological Science; Social Psychology; Applied Social Psychology; Personality; Social Cognition; Group Processes; Intergroup Behavior; Cognitive Psychology

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PUBLIC INTEREST STATEMENT

Group decision making is increasingly relevant and challenging at this present time, especially during the Covid-19 pandemic. Various profit and non-profit institutions need to make quick and well-informed decisions. What is lacking attention in current literature is the role of personality within a group that may affect decision making processes. This research found that socially desirable traits (i.e., conscientiousness) reduce the quality of group decisions, which may be caused by the low communicability and creativity in a high-conscientiousness group. The level of competitiveness of a decision making situation was also investigated, and it was found that this variable did not have a statistically significant effect. It is conjectured that the perception of “competition” among Indonesians does not have the same psychological saliency as Westerners who have previously been widely studied. However, there is an interaction effect of conscientiousness traits and competitive ambience in influencing group decision making quality.
Keywords: group decision making; conscientiousness; competition; collectivism; decision quality

1. Introduction

“Two heads are better than one” is an English proverb that means that two people working together have a better chance to solve a problem than one working on it alone (Spears, 2005). This proverb aligns with a group decision making principle that assumes that discussion by members of a group will generate better decisions than those made by one person alone. This is because a group discussion has at least two functions. First, it collects knowledge and abilities from among group members, which enables each member to correct the information of other members if it is incomplete or biased. Second, consensus must be reached between group members (Stasser & Titus, 1985).

Group decision making occurs in everyday life, whether in small groups, such as the family, or in world organizations such as the United Nations (UN). A family may gather to decide on where to have dinner; marketing managers evaluate and restructure a company’s marketing strategy every month; members of the Indonesian House of Representatives discuss the articles of the constitution they have arranged; the UN ambassadors get together to talk about border disputes among several countries; these are a few situations that require simple to complex group decision making.

Public policy is usually formulated by groups. This is done because the decisions (i.e. ones that are formulated by essential bodies) may have substantial impacts on many people, such as national policies or the policies of a company with great manpower. For these reasons, studies of group decision making are important. However, there have been many failures in group decision making, whether in practice or theory. It often occurs that participants discuss topics that all group members are familiar with, whereas unique and important information are not brought forward. As a result, such groups can make poor-quality decisions. Several studies have also found that corrective functions within groups do not work properly, thus affecting the quality of decisions (Larson et al., 1994; Stasser et al., 1989; Stasser & Titus, 1985).

The phenomenon, namely “biased sampling model of group discussion” (Stasser & Titus, 1985, p. 1477), is a phenomenon whereby discussion participants tend to speak on commonly known topics, was first noted by Stasser and Titus (1985) who experimented with the manipulation of information distribution with a hidden profile mechanism. It was an experimental design employing small groups consisting of three to four participants, who were given a discussion task to choose one of several hypothetical options on a given question, such as electing a student senate chairman, selection of job candidates, deciding what drugs should be marketed, and others (Kelly & Karau, 1999; Wittenbaum, 1998). The experimenter gave some information about the options (shared information) to all participants as a discussion material, but he/she only shared unique information (unshared information) with one participant. The information that was only known to this participant is called the hidden profile. The experimenter then observed how the participants in the group shared information, and how the hidden profile was brought into the discussion process and taken into consideration in the decision making process. The basic thesis of the hidden profile mechanism was that when the group participants successfully share information, whether it is commonly known or unique information, the group will be able to make a qualified decision because they have all the information needed to make a decision.

1.1. Group failure in decision making

The experiment opened new directions for group decision making research inspiring many follow-up studies, reaching up to at least 144 studies by 2012 (Lu et al., 2012). Researchers have attempted to evaluate the causes of group failures in making qualified decisions and finding the factors that can affect its dynamics. Some factors studied in relation to this phenomenon include the preference factor, the changing process of a decision when it is decided by one person or by an entire group, cognitive centrality, shared task representation, decision making procedures, groupthink, information
processing, the effect of competition and trust between groups, the role of a group leader, the role of cues, an individual's choice to share, time duration, training, the role of task distribution, the effect of group member status, group size, and others (Brodbeck et al., 2007; Cruz et al., 1997; Davis et al., 1997; Frey et al., 2014; Gigone & Hastie, 1993; Insko et al., 2001; Kameda et al., 1997; Kroon et al., 1991; Larson et al., 1996, 1994; Mennecke & Valacich, 1998; Ohtsubo et al., 2004; Reimer et al., 2010; Rutledge & Harrell, 1994; Stasser & Titus, 1985; Stewart & Stasser, 1995; Tindale & Kameda, 2000; Whyte, 1989; Winquist & Larson, 1998; Wittenbaum et al., 1999).

Researchers have considered three factors that lead to the hidden profile failure. First, there is the effect of pre-discussion preference (Gigone & Hastie, 1993; Winquist & Larson, 1998; Wittenbaum et al., 2004), which refers to choices that were made by discussion participants prior to a discussion, that is, right after they received shared information. The initial choice (i.e. to disclose or conceal the hidden profile) may not change even after new facts arrive in the next period. To prove this, shared information was distributed to avoid pre-discussion preferences, and participants were given questions about their first choice based on the information they received (Winquist & Larson, 1998). They found that pre-discussion preference lead participants to make a choice not based on the fact, instead merely based on their initial choice, and it affects decision quality.

Second, there is a higher probability that shared information will be discussed (Gigone & Hastie, 1993; Wittenbaum & Bowman, 2004; Wittenbaum et al., 2004). Shared information is discussed because more people have knowledge over it than the information restricted to one participant. To support this hypothesis, three groups were formed, each consisting of three participants, whereby each group received different treatments (Gigone & Hastie, 1997). In the first group, all group members received the same information, so there was no hidden profile (information was equally shared); in the second group, the hidden profile is given to two group members (partially shared), and in the third group, the hidden profile is given to one group member (unshared). They found that the more participants received information, the more likely it is for the information to be mentioned throughout the discussion and the larger its impact on group decisions.

Third, there is the influence of the social comparison factor, which is the tendency of members to compare the information they have with other group members. Information similarity also functions as social validation (Wittenbaum & Bowman, 2004; Wittenbaum et al., 2004). When other group members discuss the same information, the perception of the information quality is increased. Validation from other members about the information will prompt a group member to repeat the information (Wittenbaum et al., 2004). A social comparison may inhibit members from presenting their ideas in fear of being different from the group.

1.2. Role of conscientiousness personality trait in group decision making

Researchers from the Netherlands have promoted new ideas, as all factors in group decision making must be studied to understand it (De Dreu et al., 2008). Discussion participants must be seen as subjects who actively process information. A decision made by a group is the result of individual information processed together under certain environmental conditions. With their ideas, De Dreu et al. (2008) highlighted the knowledge gaps in group decision making studies. Nijstad and De Dreu (2012) examined a factor in group decision making that has less been studied, including the importance of the personality factors of the group members and their interactions with the environment. It was found that several self-qualities are important in leaderless group discussions, namely communication ability, the ability to work in a situation that needs new ideas and experiences, creativity and innovativeness in handling problems and situations, open-minded and strategic thinking, as well as excitement and enthusiasm (Costigan & Donahue, 2009). The importance of creativity has also been found in the dynamics of negotiation (Kurtzberg, 1998). Some of the self-qualities mentioned above are inherent to one’s self, in one’s character. For this reason, personality factors are important to be examined in studies of group decision making.
Many researchers studied the role of personality in group performance (Driskell et al., 1987; English et al., 2004; Waung & Brice, 1998). As justified by Moreland and Levine (1992), there is a relationship between personality and team or group performance and how it yields decisions or solutions to problems, which in public policy or organizational contexts, may have profound repercussions. The literature shows that two personality features have consistently been found to have roles in group performances; being extraversion and conscientiousness (Driskell et al., 1987; English et al., 2004; Waung & Brice, 1998). The differences between these two traits are that people with a high level of extraversion have positive roles in the group. High levels of conscientiousness, on the other hand, inhibit group performances. This is interesting because high-conscientiousness (HC) is often rated positively. The conscientiousness construct includes the feeling of competence, self-discipline, being task-oriented, neatness, dutifulness, planning, deliberation, achievement striving, being comprehensive, and working hard (Costa & McCrae, 1992; Costa et al., 1991; Digman, 1990). An individual with a high level of conscientiousness shows good performance in tasks that are routine, systematic and have completion guidance (Driskell et al., 1987). The conscientiousness trait is one of the strongest and most consistent predictors in describing individual performance across professions and could be used as a predictor of individual performance (Barrick & Mount, 1991; Tett et al., 2006), the second after general intelligence (Salgado, 1997).

However, the role of personality in group decision making has less been studied. These few studies include examining the role of the following personality dimensions in group-level decision making: dominance, personality types in computer-mediated group environments, personality in agent-based group decision making, personality traits of group decision leaders and followers, agreeableness in risky group decision making, integrative complexity personality traits, and personality traits in the social dilemma context (Brodbeck et al., 2021; Callaway et al., 1985; Santos et al., 2011; Thatcher & De La Cour, 2003; Wang et al., 2019; Zhang et al., 2021; Zheng, 2018). For this reason, the personality trait of group members is the first focus of this study.

Regarding the conscientiousness mentioned above, people with high levels of conscientiousness do not appear to have certain attributes that may promote the quality of group discussions, such as the ability to communicate in a group, loosely expressing their ideas; they generally lack creativity (Driskell et al., 1987), innovation, self-motivation, and action orientation (Le Pine et al., 2000; Robertson et al., 1999; Waung & Brice, 1998). In groups, people with high levels of conscientiousness tend to be rigid in their attitudes, even when such attitudes clearly are inappropriate to the context. They prefer systematic procedures to be applied to complete tasks and become fixated on these procedures, even where they are inappropriate for task completion (LePine, 2003). Based on these findings, it is assumed that high or low levels of conscientiousness are very influential in a group discussion.

1.3. **Role of intergroup competition in group decision making**  
The next focus of this study is the motivation to compete and its effect on group decision quality. The adage that “two heads are better than one” is based on the assumption that each group member will cooperate to find the best answer to a given problem. But it may not necessarily be the case, as the process of thinking as a group entails complex mechanisms. Some members may have motivation to cooperate and act in the interest of the group, while others may have motivation to compete and act in their own interest (Toma & Butera, 2015). Therefore, in this research, competition ambiance was set. It is expected that through a competition, group discussion members will be motivated to compete with the external group by cooperating with internal group members to win against another group participant, by coming up with the best decision to a hypothetical problem.

Research on competition originated from Zajonc’s (1965) classic article on social facilitation. Zajonc suggested that the mere presence of others increases individuals’ arousal levels and that performance is inhibited by increases in arousal (Poteet & Weinberg, 1980). The study was challenged by Cottrell’s proposal (as cited in Poteet & Weinberg, 1980) that the mere presence of an audience is
insufficient to raise arousal levels, but it may rise from the potential evaluation by a present audience. Vaught and Newman (1966) extended this concept further by manipulating competition and trait anxiety by examining the effects of social facilitation. The competition produces not only evaluations but also comparison of performances. Thus, social evaluation is a key element that mediates competition and the effects of social facilitation (Poteet & Weinberg, 1980).

The competition is a condition where two or more parties try to reach the same target or tries to defeat each other (Deutsch, 2000). A competition between groups is assumed to affect individual behavior. Some studies have shown that competition is like a double-edged sword. It can increase motivation, especially if the competitors are explicit or visible (Deci et al., 1981), yet research by Eisenberg and Thompson (2011) found that competition can also cause stress. DiMenichi and Tricomi (2015), who studied the effects of competition on performance, found a difference between the effects of competition on physical and memory tasks. The study found that competition improves attention capacity which then increases the reaction speed for physical tasks, but contrarily decreases capacities memory tasks. The main issue during a competition is that our minds work against us; therefore, individuals must take signs of anxiety as part of the competition package, allowing it to improve performance (Gallwey, 2001). Granted that cognitive decision making tasks are complex, among others represented by memory tasks (Rosi et al., 2019; Yang et al., 2019), the hypothesis is that the ambition of a competition will negatively affect group decision making, and the effect will be worse when members of the group are high in trait conscientiousness.

It is known that intragroup competition has a worse effect than intragroup cooperation in producing quality complex group decision making (Dayeh & Morrison, 2020). However, little is known about the effects of intergroup competition. In addition, research has been carried out to deal with the negative effects of competition—namely preference confirmation (“reluctance to accept others’ perspectives and prefer information consistent with their favoured or chosen alternative”; Toma et al., 2013, p. 44)—on group decision quality. A recent study from De Wilde (2017) found that intergroup competition does not directly affect group decision quality, but serves as a moderator in the predictive relationship between preference disconfirmation, within-group competition, and group decision quality.

1.4. Research question
This present study tried to examine the role of personality (high-conscientiousness vs. low-conscientiousness) and environmental ambiance of intergroup competition (competitive vs. non-competitive situation) upon group decision making. This study aimed at answering the research question: Do conscientiousness and competition influence group decision quality in terms of their main effects and interaction effect?

The effort to learn about the combination of conscientiousness’ role within competition settings will bring novelty to studies of group decision making. The results of this study will be useful for organizations to anticipate the weakness points of meetings or discussion forums. They will help guide the creation of an atmosphere conducive to decision making among group members, and to enable selection or placement of the right people in the right places to yield quality group decisions.

2. Methods

2.1. Participants and design
The research method was a between-subject experimental design. The study was intended to examine whether two independent variables, competition and conscientiousness, affect the dependent variable of decision making. The participants were 240 undergraduate students (175 females and 65 males) from all faculties at the University of Indonesia, except for the Faculty of Medicine and Faculty of Nursing. These faculties were not included to avoid any biases stemming from their knowledge of drugs on the results of this study.
2.2. Materials and procedure
All the design and procedures of this present study were approved by the Ethical Committee of the Faculty of Psychology, Universitas Indonesia, Ethical Approval No. 5544/Fpsi.Komite Etik/PDP.04.00/2015. Informed consents were obtained from all participants.

The experiment was conducted in a large hall with no partitions. Participants filled out a personality test at the time of recruitment, to map them into high- vs. low-conscientiousness. To measure the conscientiousness personality trait of the group members, the NEO-Personality Inventory-Revised (NEO PI-R) instrument developed by Costa et al. (1991) was used (n of items = 9; α = 0.872). Responses are rated on a Likert-based scale with six options ranging from “Strongly disagree” (scored 1) to “Strongly agree” (scored 6). The selected participants were those with high (34 to 54) and low scores on conscientiousness (9 to 30). Whereas those in the medium score range (31 to 33) are not selected to participate in the study. The classification of high and low norms is based on the upper and lower score class of the Big Five (NEO PI-R) results, within the Conscientiousness subdomain.

There were 240 undergraduate students participated in this present study. Before the experiment, the names of 120 High-conscientiousness (HC) and 120 Low-conscientiousness (LC) participants were put in two different baskets. The blindfolded experimenter took three names from each basket at a time to be in a group. Then we have 40 groups of HC and 40 groups of LC participants (total of 80 groups). Each group consisted of three people. Three chairs per group had been set for 10 groups in the hall. The experiment was carried out for ten groups simultaneously (per session). There were therefore 8 subsequent sessions. Each group required 30 minutes from receiving initial instructions until the experiment’s closing, with an additional 15 minutes to prepare for the change between sessions, totaling to 45 minutes.

Then, competition ambiances (competitive vs. non-competitive) were created through specific instructions preceding the group discussion.

A group is categorized as a “competitive group” when the group gets special instructions to compete with other groups. The following text were the instructions for the competitive group:

“This is a research on a marketing strategy competition between two teams. Between your team from PT. Kolbe Farma and another team from PT. Dixa Medica. This competition is a replica of the real competition between the two largest pharmaceutical companies in Indonesia disguised as PT Kolbe Farma and PT Dixa Medica. The two companies are always racing to find the best medicine for a particular disease. Currently, the two companies are competing to find the best cholesterol-lowering drug. The PT Kolbe Farma research team where you work has found two cholesterol-lowering drugs, which are Drug A and Drug B with advantages and disadvantages for each type. While according to the intelligence department, your company’s competitor, namely PT Dixa Medica has also succeeded in finding an effective cholesterol-lowering formula. Now, all three of you are a team of PT Kolbe Farma that have to defeat PT Dixa Medica’s team, so work well together to run against your competitors! In today’s research on marketing strategies, you will play the role of the marketing manager of PT Kolbe Farma. We want all three of you to determine the best cholesterol-lowering drug to be marketed to the public by your company and defeat the drug PT. Dixa Medica.”

The following were verbal instructions for the non-competitive group:

“Thank you for taking part in this research. Today you will play the role of a marketing manager of a large pharmaceutical company. In a group discussion, we want all three of you to choose one of two cholesterol-lowering drug choices that must be marketed to the public by the institution where you work.”

Next, participants were asked to read profiles about the two hypothetical cholesterol-lowering drugs, Drug A and Drug B. The instrument containing information about this drug is an adaptation
of a research by Kelly and Karau (1999) and Bowman (2002), but with modifications. The information was then distributed in such a way that some important unique information was not disclosed to every group member but only to one person. Thus, groups must share the information they have to draw the best answers or decisions.

Each participant received information sheets (randomized) on the advantages and weaknesses of Drugs A (n of items = 28; α = 0.880) and B (n of items = 28; α = 0.959). The examples of its items are presented in Table 1.

The information for certain participants stated that the number of advantages and weaknesses of Drug A and Drug B were equal—Information 1 (Drug A = 9 items of advantages, 9 items of weaknesses; Drug B = 9 items of advantages, 9 items of weaknesses). Another participant received information that said there were more advantages to Drug A than Drug B—Information 2 (Drug A = 12 items of advantages, 8 items of weaknesses; Drug B = 8 items of advantages, 12 items of weaknesses). The remaining participant received all available information, showing that there were more advantages to Drug B than Drug A—Information 3 (Drug A = 12 items of advantages, 16 items of weaknesses; Drug B = 16 items of advantages, 12 items of weaknesses). Before the field experiment, an instrument testing with expert judges as many as 20 people showed that 100% of the judges chose according to the amount of positive and negative information they had. Those who held Information 1 were divided between Drugs A and B, with a low degree of self-efficacy in choosing the drug; holders of Information 2 choose Drug A; holders of Information 3 choose Drug B.

Next, there were instructions given to the 2 groups. One group was designed to be competitive while the other was to be non-competitive (competitive vs. non-competitive). There were slight differences in the instruction given to the two groups.

For “competitive group”, the instructor told the group that they are against competing another group. The instructor also visually showed their competitor (another group). The instructions were as follows:

| Drug A: Advantages | Drug A: Weaknesses | Drug B: Advantages | Drug B: Weaknesses |
|--------------------|--------------------|--------------------|--------------------|
| The healing effect of Drug A is immediately felt by the patient within 5 minutes. | The use of Drug A for a long time is dangerous for kidney function. | Drug B was tested on 500 people for 6 months and showed very positive results, namely a decrease in cholesterol up to 90%. | Some people show side effects in the form of dependence from Drug B. |
| Drug A is proven to cure both young and old patients. | Production costs make the selling price of Drug A very expensive, so it will not be affordable for the poor. | Drug B contains 5 essential vitamins that are 100% recommended by the Indonesian Ministry of Health. | Drug B advertisements were canceled on TV because they were protested by the Indonesian Consumers Foundation, which caused losses to the company. |
| Foreign pharmaceutical companies have praised the effectiveness of Drug A’s success | Indonesian Food and Drug Agency announced that Drug A did not pass their drug-approval test. | Drug B’s distribution costs are cheap. | Japan delayed the agreement to buy Drug B because the company was unable to ensure the timely delivery of the drugs. |
| Your company’s Board of Commissioners will donate Drug A to the National Charity Agency. | So far no insurance company is willing to cover claims about the need for Drug A. | Drug B is safe from a variety of possible legal-related problems. | Drug B’s production costs are rather expensive because of its scarce pharmaceutical ingredients. |
“The next stage is discussion. Please discuss the two cholesterol-lowering drugs, Drug A and Drug B, from the information we have given. Your group’s task is to choose the best medicine to sell to the public, and win against the drug from PT Dixa Medica. Do you see the team over there? They are a team from PT Dixa Medica; while you are the Team of PT Kolbe Farma. You must try your best to beat your competitors. [These two latest sentences were to activate the social identities, ingroup vs. out-group, and competition nuances] As a gift, each of you will win additional prize of 100,000 IDR if your team wins. The rules of the game are: you have a maximum of 25 minutes to discuss. Please note that some of the information you have about the profile of the drug is only known to you, and not known to your colleagues. During the discussion, each of you may share the information on the profile sheet of the drug that you are holding, but you may not show the sheet to other discussion participants, your activities will be recorded. If your group has finished the discussion and has made a choice, then please write down your group’s choice of answers. Cooperate well, to win the competition!”

Instructions for the “non-competitive group” were:

“The next stage is discussion. Please discuss information about Drug A and Drug B that we have given. Your group’s task is to choose one of the two drugs that should be sold to the public. The rules of the game are: You have a maximum of 25 minutes to discuss. Please note that some of the information that you have about the profile of the drug is only known to you, and not known by your colleagues. During the discussion, each of you may share the information on the profile sheet of the drug that you are holding, but you are not allowed to show the sheet to other discussion participants, and your activities will be recorded. If your group has finished discussing and has made a choice, then please write down your group’s answer choices.”

The participants were asked to make a group decision by choosing the best drug to sell, Drug A or Drug B. It was expected that if the flow of the discussion went well and the group received all the information, then they would choose Drug B (good decision), because, in the complete information condition, Drug B had more advantages than Drug A. The group decisions were scored as correct (good) if the participants chose Drug B and incorrect if they chose Drug A. The output of the dependent variable was binary (1 or 0).

At the end of the sessions, the instructor debriefed the participants.

The variables controlled in this study were (1) status of the group members, related to their knowledge, (2) Group size, and (3) Instructor. The way group members perceive other group members will influence the discussion process. Group members who are considered more knowledgeable will be valued more by other group members. Therefore, the status of group members is a variable that must be controlled. There were two control methods for this matter. First is, because this research is about choosing good drugs, people with knowledge or were considered to have good knowledge about drugs were not employed as a participant in this study. Therefore, this study did not recruit participants who came from the faculty of medicine, faculty of public health, and faculty of nursing. Second, a person can also get a higher status in the group because outside the experiment room they already know each other’s capacity in the group. So, the group formation process is carried out by randomization. Group size is a factor that can increase and decrease the productivity of a group. In this study, the number of participants in each group consisted of 3 people. This choice is based on the study of Wheelan (2009) that groups of 3–4 people are more productive and significantly more advanced than groups of 5–6 people. Several steps were taken to anticipate biases that may occur due to instructor’s differences, namely (a) Uniforming all instructors’ sex, i.e. all women; (b) All instructors have professions as school teachers; (c) All instructors wore the same dress code, i.e. a dark blazer; (d) All instructors received training three times so that instruction delivery were uniformed, in terms of intonation, the tempo of speech, gestures, and how to respond to participant’s questions.
2.3. **Data analysis**

Statistical measurement was performed with exact logic regression using STATA. The results of the measurement showed whether conscientiousness and competition affect group decision making. The exact logistic regression method, abbreviated as exlogistic, was the best method used due to the following considerations: appropriate for binary variables; when the sample is too small (less than 500; Bujang et al., 2018) to be tested using ordinary logistic regression; when there are missing data results (sparse); when estimations produced by this method do not depend on asymptotic results. The method of choice to estimate parameter values was Maximum Likelihood Estimation. Exlogistic produces more accurate inferential data on small data because it does not depend on asymptotic results. Exlogistic can also provide better estimations than asymptotic logistic regression methods.

3. **Results**

Descriptively, in general, the groups with a high level of conscientiousness (30%) make more wrong decisions compared to the groups with a low level of conscientiousness (2.5%) (see Table 2). The groups with a high level of conscientiousness make fewer good decisions (70%) compared to the groups with a low level of conscientiousness (97.5%).

Exact Logistic Regression was executed to discover the main effects of conscientiousness and on the quality of group decision (see Table 3). The result showed that conscientiousness does significantly affect group decision quality ($p = 0.00$ or $p < 0.01$). There is an increased risk of making bad/wrong decision among high-conscientiousness groups $\text{RR} = 13$, RR > 1; 95% CI = 1.78-94.96; Ranganathan et al., 2015) (see Table 3). However, competition does not affect the quality of group decisions ($p = 0.08$ or $p > 0.05$).

Exact Logistic Regression was executed to see the interaction effects of conscientiousness and competition on the quality of group decisions (see Table 4). The result showed that the interaction effect is significant in the competitive groups ($p = 0.00$ or $p < 0.01$) but not significant in the non-competitive groups ($p = 0.23$ or $p > 0.05$).

### Table 2. Risk Ratio Test of Making Bad/Wrong Decisions between High- and Low-Conscientiousness groups

| Quality of Decision  | High-Conscientiousness | Low-Conscientiousness | Total          |
|----------------------|------------------------|-----------------------|----------------|
| Bad/Wrong Decision   | 12 (30%)               | 1 (2.5%)              | 13 (16.25%)    |
| Good/Correct Decision| 28 (70%)               | 39 (97.5%)            | 67 (83.75%)    |
| Total Decisions      | 40                     | 40                    | 80             |
| Risk Ratio (RR)      | 13                     | 1.78-94.96            |                |
| Note. Pr = p         |                        |                       |                |

### Table 3. Exact Logistic Regression Results: The Main Effects of Conscientiousness and Competition on Good Group Decision Making

| Variables             | Odds Ratio | Suff. | 2*Pr(Suff.) | [95% CI]    |
|-----------------------|------------|-------|-------------|-------------|
| Conscientiousness     | 0.04*      | 28    | 0.00        | 0.00-0.26   |
| Competition           | 0.23       | 31    | 0.08        | 0.03-1.16   |

Note. *median unbiased estimates (MUE); 2*Pr(Suff.) = p
Descriptively, in the competitive groups, the groups with a high level of conscientiousness (45%) make more wrong decisions compared to the groups with a low level of conscientiousness (0%) (see Table 5). The groups with a high level of conscientiousness make fewer good decisions (55%) compared to the groups with a low level of conscientiousness (100%). However, there was a decreased risk of making bad/wrong decision among high-conscientiousness groups in the competitive groups ($RR = 0.55$, $RR < 1$; 95% CI = 0.37–0.82; Ranganathan et al., 2015) (see Table 5). It might

### Table 4. Exact Logistic Regression Results: The Interaction Effects of Conscientiousness and Competition on Good Group Decision Making

| Variables                                      | Odds Ratio | Suff. | 2*Pr(Suff.) | [95% CI]       |
|------------------------------------------------|------------|-------|-------------|----------------|
| High-Conscientiousness vs Low-Conscientiousness in Competitive Group | 0.05*      | 11    | 0.00        | 0.00–0.36      |
| High-Conscientiousness vs Low-Conscientiousness in Non-competitive Group | 0.24       | 17    | 0.23        | 0.00–0.23      |

Note. *median unbiased estimates (MUE); 2*Pr(Suff.) = p

### Table 5. Risk Ratio Test of Making Bad/Wrong Decisions between High- and Low-Conscientiousness in Competitive Groups

| Quality of Decision | High-Conscientiousness | Low-Conscientiousness | Total          |
|---------------------|------------------------|-----------------------|----------------|
| Bad/Wrong Decision  | 9 (45%)                | 0 (0%)                | 9 (22.5%)      |
| Good/Correct Decision | 11 (55%)            | 20 (100%)             | 31 (77.5%)     |
| Total Decisions     | 20                     | 20                    | 40             |

**Risk Ratio (RR)**

| Risk Ratio (RR) | 0.55 | 0.37–0.82 |

**$\chi^2 (1) = 11.61; Pr > \chi^2 = 0.00$**

Note. **Pr = p**

### Table 6. Risk Ratio Test of Making Bad/Wrong Decisions between High- and Low-Conscientiousness in Non-Competitive Groups

| Quality of Decision | High-Conscientiousness | Low-Conscientiousness | Total |
|---------------------|------------------------|-----------------------|-------|
| Bad/Wrong Decision  | 3 (15%)                | 0 (0%)                | 3 (7.5%) |
| Good/Correct Decision | 17 (85%)              | 20 (100%)             | 37 (92.5%) |
| Total Decisions     | 20                     | 20                    | 40    |

**Risk Ratio (RR)**

| Risk Ratio (RR) | 0.85 | 0.71–1.02 |

**$\chi^2 (1) = 3.24; Pr > \chi^2 = 0.07$**

Note. **Pr = p**
| Situation/Context | Risk Ratio (RR) | Meaning of RR | Statistical Significance of interaction effect between Competition and Conscientiousness |
|-------------------|----------------|---------------|-----------------------------------------------------------------------------------|
| Competitive (Table 5) | HC > LC | HC < LC | Significant (p = 0.00, \( p < 0.05 \)). Conscientiousness interacts with Group Competitiveness in producing Group Decision Quality. |
| Non-competitive (Table 6) | HC > LC | HC < LC | Decreased risk of making Bad/Wrong decisions \( (RR < 1) \), but compared to Table 6, the RR is closer to 1. |

**Note.** HC = High-conscientiousness group, LC = Low-conscientiousness group.
be that competitive climate is a protective factor for reducing the risk of bad/wrong decision among high-conscientiousness groups.

Descriptively, in the non-competitive groups, the groups with a high level of conscientiousness (15%) make more wrong decisions compared to the groups with a low level of conscientiousness (0%) (see Table 6). The groups with a high level of conscientiousness make fewer good decisions (85%) compared to the groups with a low level of conscientiousness (100%) (Table 6). However, the difference is not statistically significant, as appeared in Table 4 (p = 0.23, p > 0.05).

Table 7 summarizes the comparison of Tables 5 and Table 6.

4. Discussion
As this study was based on the phenomenon of groups' failing to reach sound decisions, the findings from this study's samples indicated personality characteristics, i.e. conscientiousness, played a role in the failure to produce quality decisions. This result is consistent with previous studies, which suggests that high-conscientiousness personality types tend to be less if not uncommunicative when in groups. It is possible that they are reluctant to convey ideas, are less creative with solutions, and are fixated on one particular way of problem-solving and are not open to alternatives for other solutions (Driskell et al., 1987; LePine, 2003; Le Pine et al., 2000; Waung & Brice, 1998).

The characteristics of the task in this study, namely decision making, are tasks that require creative processes and divergent thinking styles. In group decision making, exchanging ideas often require individuals to think outside the box, by giving original and creative problem-solving proposals, brainstorming, giving opinions, refuting ideas, supporting ideas, negotiating opinions, and communicating ideas with spoken, written, oral and body language. High-conscientiousness people are known to have careful behavior and habits that are structured, planned, and neat. People with high-conscientiousness also prefer to implement systematic procedures in solving problems. But unfortunately, they are inflexible, fixated on procedures that they have believe even when the procedure is not suitable for completing the task, thus resulting in poor performance (LePine, 2003). They also have difficulty in using body language (gestures). People with high-conscientiousness also have difficulty expressing their selves freely (Waung & Brice, 1998). Besides, conscientiousness is said to have low epistemic motivation. The higher one's conscientiousness, the lower the epistemic motivation, and it contributes badly to group decision making (Nijstad & De Dreu, 2012).

Another aspect that hinders the personal performance of high-conscientiousness people is the group task. When working alone, a person is able to do things according to their desires without having to consider others. This is different from working in groups. In the study of brainstorming, groups may generate fewer ideas than the same number of people but who work individually. Furnham and Yazdanpanah (1995) stated that there is a phenomenon in which a person with high ability works in a group then the quality of his performance will be lowered to resemble the quality of the performance of individuals with lower abilities in the group.

Meanwhile, there is an interaction effect of conscientiousness trait and competitive situation in influencing the decision quality. According to the Risk Ratio (RR) index, the risk of making Bad/Wrong decision is decreased in that kind of interaction. Environmental eustressors in the form of competition played a role as the protective or buffering factors of the quality of group decisions among high-conscientiousness groups. Informing the competitive group that other groups in the room were their competitors, with the lure of an attractive prize, have created a competitive atmosphere. This situation, among high-conscientiousness group members, has a positive effect on the quality of group decisions. Previously, in the same vein, Forrester and Tashchian (2011) found that competition is a strategy used by people with high-conscientiousness to achieve good participation in group decision making. They perceive competitive situations as opportunities to increase their success over the achievement of other groups through group decision making. In other words, the competitive situation is enjoyed by group members with high-conscientiousness in facilitating quality group
decision making. It is not in line with this present study’s hypothesis which predicted negative effect of competitiveness on group decision quality. There are two ways in which competition is used by group members with high-conscientiousness. First, from the within-group perspective, the competitive situation serves to convince the group itself that the decision resulted from their discussion is indeed the best decision currently available. Second, from the between-groups point of view, with a competitive atmosphere, a group “feels ready” to receive input in the form of good alternative ideas from competitors (Forrester & Tashchian, 2011). Thus, conditions like this could reduce the number of Bad/Wrong decisions. The feeling of wanting to beat other groups that are their rivals has made groups with high-conscientiousness increases their effectiveness by using two strategies. First, offensive strategy, i.e. increasing agility and planning, striving for the realization of its potential and capacity (outcome-focused), as well as, second, defensive strategies, i.e. preserve resources owned by the group in order to remain sustained and can always be used by all group members (process-focused) (Liao et al., 2018). It is not surprising that a competitive situation can remedy the downside of high-conscientiousness to reduce the risk of making inaccurate group decisions. Psychological readiness to consider all perspectives, resulted from competitive situation, before concluding a decision has a very significant impact on group decision quality (Meyer et al., 2009).

In the above argument, the “feeling of preparedness/readiness” is emphasized because, operationally, this present study participants did not communicate directly with their competitors. The competitive atmosphere is induced by the experimenter and confederate through experimental instruction and the presence of competitors (other groups) in the experimental room. This experimental situation could be classified as a “pseudocompetition” phenomenon (Burton-Chellew & West, 2012). Pseudocompetition leverages the degree of cooperation within the group and emotional response to group success, as well as serves as an input for building a collective action model. The psychological dynamics that occur might be that “cues of group competition have an automatic or unconscious effect on human behavior that can induce increased within-group cooperation …. [so] humans have a psychology that is predisposed to respond to cues of group competition …. that individual emotions were correlated with group success” (Burton-Chellew & West, 2012, pp. 947, 950).

However, Indonesia’s collectivistic culture (Hofstede Insights, n.d.) might be a distinguishing factor that allows people under competitive conditions to overcome the stressful and anxiety-inducing nature of competition that people encounter in the West who have the individuals’ characteristics; therefore, the main effect of the merely competition (without considering the conscientiousness traits of its members) is not statistically significant in influencing the group decision quality in this present study.

Meanwhile, there is no interaction between conscientiousness and non-competitive situation in influencing group decision quality. Previously, Löfstrand and Zakrisson (2014) found that the atmosphere of equality, warmth, and a sense of community that exists between groups in non-competitive situations are associated with the group performance. When linked with the results of this present study, such an atmosphere makes no difference in the quality of decision outcomes between high-conscientiousness groups and low-conscientiousness groups. What happens in these groups is mutual tolerance, mutual understanding, no achievement targets in group level. Both social facilitation and social loafing are equally likely to occur in high-conscientiousness and low-conscientiousness groups, and the randomness of the occurrences makes the accompanying positive and negative effects cancel each other out (zero-sum game) resulting in insignificant statistical differences of group decision quality.

5. Conclusion
This study shows that there is a main effect of conscientiousness on group decision making quality; there is no main effect of competition on the quality of decisions. Nevertheless, there is an interaction effect of conscientiousness and competition in influencing the group decision quality.
These findings imply that individuals with a high level of conscientiousness should familiarize themselves with the ambience of meetings so that they can cope with their inadequacy. It is recommended that they be given training in creative thinking and encouragement to be bold in expressing their ideas, especially in competitive environments. The research question that must be answered by subsequent studies is not whether the personality of group members influences the quality of group decisions, but what facets in conscientiousness affect decision making in groups.

This present study has not been able to explain much about the group dynamics that occur during the group is making decisions, so this study needs warrants further qualitative inquiries. The challenge for applying the results of this study is that organizations must completely map the personality traits of each group member, and it would require resources in terms of time and money.

Research on group decision making in collective cultural settings, such as Indonesia in this present study, is still scarce; and these findings are expected to stimulate studies on how collectivism interacts with personality traits and competitive ambience in influencing the group decision quality.

Funding

The authors received no direct funding for this research.

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Competing interest

The authors declare no competing interest.

Citation information

Cite this article as: Group decision quality, conscientiousness and competition, Lukman Nul Hakim, Gunirnaningish A. Santoso, Bagus Takwin, Yos Sunitiyoso & Juneman Abraham, Cogent Psychology (2021), 8: 1872907.

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