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The Minority Confederate Induced Errors of the Majority Members in the Role-Inverted Asch Experiment

[Running Head: **Minority Confederate Induced Errors of Majority Members**]

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ABSTRACT

This study aimed to investigate whether errors made by minority group members could influence the behavior of the majority in a role-reversed version of Asch's conformity experiment. Eighty-five undergraduate students, comprising 51 males and 34 females, were organized into groups of four individuals who were already acquainted with each other. From these groups, we randomly selected twelve, and discreetly instructed the third student in each group (a confederate) to provide incorrect responses on six out of the nine line-judgment tasks, similar to Asch's majority's behavior. The findings revealed that groups with the confederate member did lead to an increase in errors from other group members, although this increase did not reach statistical significance. Nevertheless, further analyses indicated that participants were more likely to make errors when other group members had already responded incorrectly. Consequently, we interpreted these errors as a form of social conformity, where participants intentionally made mistakes to alleviate the awkwardness of having only one member of the group providing incorrect answers. In summary, this study provides insights into the dynamics of social conformity and the impact of minority errors on group behavior in a role-reversed Asch experiment.

Keywords: Asch conformity experiment, acquaintance groups, minority confederates, social function of making errors, line-judgment tasks.

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1 Introduction

The Asch conformity experiments [1] have been replicated in many ways across different cultures [2]. A considerable proportion of the minority participants, being alone among the majority confederates, tended to conform to the incorrect majority answers.

Mori and Arai [3] reproduced the Asch experiment without using the confederates with a new experimental procedure. Instead of using a group of actors to perform incorrectly, they used a presentation trick. One of the four participants observed the line lengths differently from the other three, who served as the majority actors in the original Asch experiment. They used the MORI technique (Manipulation of Overlapping Rivalrous Images by polarizing filters [4]) that allowed the experimenters to project two different images onto the rear screen; each image was observed separately with two types of polarizing sunglasses. Mori applied the MORI-Asch procedure to other studies to show various conformity tendencies of the minority participants [5, 6, 7, 8].

These studies revealed an unexpected finding that erroneous responses were even among the participants who formed the majority. They were genuine participants, not confederates. Although the majority-role participants made fewer errors than the minorities, they responded incorrectly more frequently than expected. Mori and colleagues treated them as perceptual errors because the line-judgment tasks in the MORI-Asch procedure might have become more difficult. Namely, the viewing condition was different from that of the original Asch task. Because the presentation trick was implemented, the participants watched the task figures projected on the rear screen while wearing polaroid sunglasses.

Meanwhile, there is another interpretation of the erroneous responses of the majority participants in the MORI-Asch studies; the participants might have intentionally responded incorrectly to attenuate the awkwardness of the situation where only the minority participants repeatedly made embarrassing mistakes. Here, it should be noted that the participants in the MORI-Asch experiments were all acquaintances, whereas the Asch participants were among strangers (confederates, as a matter of fact). Thus, interpersonal factors should be considered in the MORI-Asch experimental situation.

Moscovici, Lage, and Naffrechoux [9] conducted a pioneering study that focused on the effect of minority behavior on the majority. They examined the influences of two stooges' (confederates in the Asch terminology) behavior on the other four naive participants in groups of six in a color judgment task of blue or green, using several disks in the blue-green zone of the Farnsworth perception test. The two confederates responded by calling "green" consistently six times on the same objectively blue stimuli. They found that the 128 naive participants responded as "green" on 8.42 percent of the trials, whereas the 22 control participants did so on only two occasions or 0.25 percent. Thus, their study showed that the minority's behavior influenced those of the majority.

However, although both the MORI-Asch and Moscovici studies used perceptual decision tasks, there were crucial differences. First, Moscovici et al. [9] presented the same stimulus six times in a series of six color judgment tasks (36 times in total). The confederates repeated the "green" responses consistently six times. They used the other condition in which the confederates answered "green" on four out of six occasions and found the influence of the

minority's inconsistent responses produced much fewer "green" responses from the majority, 1.25% much less than 8.42% in the consistent condition. Meanwhile, in the MORI-Asch experiments [3, 5, 6, 7, 8], there were no consistencies in both majority and minority participants.

Moscovici and Personnaz [10] further examined the effects of minority behavior in a new experimental procedure. In addition to the blue-green color naming tasks, they utilized the afterimage effect by asking what color naive participants observed on the white screen. A green stimulus would yield a red-purple afterimage on the white screen, whereas a blue stimulus would yield a yellow-orange one. The influences of the confederate's "green" responses would appear as a "red-purple" answer of naive participants. With this clever experimental method, Moscovici and Personnaz [10] confirmed the minority confederate's influence on naive participants. They also reconfirmed the importance of the consistency of the minority's responses.

Inspired by the Moscovici studies, many researchers studied minority influence phenomena in a variety of social contexts, conflicting themes, and various procedures (see [11, 12] and [13] for review). However, minority influence research went from early studies that used perceptual tasks to those using cognitive attitudes and opinions as tasks.

More importantly, Moscovici and his colleagues interpreted the majority's influenced responses as "conversion" to the minority. By this terminology, Moscovici meant that the minority's consistent behavior caused genuine participants' perceptual or cognitive modification. This interpretation was similar to Asch's understanding of the minority's "conformity" responses. In both experiments, naive participants were put in a challenging situation where they were confronted with their own perceptual judgments and the conflicting information provided by others. That was because both of these studies used confederates who were unfamiliar to genuine participants.

Meanwhile, in the MORI-Asch experiments, all the participants were acquaintances. Those in the minority position might have conformed to the majority. In other words, they were somewhat uncertain about their perception, like the genuine participants in the Asch and Moscovici experiments. However, there can be a different interpretation, as stated above, for the majority's errors. The participants in the majority position made errors not because they were uncertain about their eyes but because they intentionally made errors to obscure the awkward situation that only a friend of them was making errors repeatedly.

The present study aimed to examine the new interpretation of the role-inverted Asch experiment. Instead of using the majority confederates, we asked one group member to perform incorrectly among the other members. It was role-inverted because one member was a confederate, and the others were genuine participants in the present study. The confederate acted the same way as the confederates in the Asch experiment, responding incorrectly on the six critical tasks out of nine.

We hypothesized that the participants in the with-confederate condition would make more errors than the without-confederate condition. The errors would not necessarily be conformities or conversions in the Asch or Moscovici experiments. Accordingly, we assumed

that the primary purpose of making errors would be attenuating the awkward situation where one acquainted member was making embarrassing errors.

2 Methods

2.1 Participants and Confederates

Eighty-five undergraduate students (51 males and 34 females) participated in the experiment voluntarily and received about US$3.00 worth of cash vouchers. They were all enrolled in an Educational Psychology course that one of the authors taught as a compulsory course for students majoring in education. For group activities in the class, they were divided into 21 groups of four (including one group of five) according to their course registration numbers. Thus, they participated in the experiment in pre-organized groups.

Twelve of the participants (seven males and five females) served as confederates. First, we randomly chose the twelve groups of four and designated the third student in each group as the confederate candidate. Then, we emailed them the night before the experiment, asking them individually to participate as confederates. All of them agreed to accept the role.

2.2 Line judgment tasks

We replicated the original nine figures used in Asch's experiment [1] in PowerPoint. The lines were black on a white background (see Figure 1).

2.3 Online administration of the experimental sessions

Because of the COVID-19 pandemic, all the university classes were conducted online using Microsoft Teams. So, we organized the experimental procedure in PowerPoint and administered the experiments through the Teams video chat.

The experimental process consisted of 47 PowerPoint slides. After two greeting slides, we gave general instructions and an example task in slides #3–9. Then, nine line-judgment tasks followed in the same pattern of four slides for each task, consisting of the task number slide, the line-judgment task (judgment only, no answer required), one dummy photo, and the slide asking to answer in the pre-determined order (slides #10–45). We expressed our thanks on slide #46. Then, the final slide (#47) showed participants the links to the Microsoft Forms questionnaire. We prepared five different versions for counterbalancing the dummy photos. The tasks were arranged in the same order as in the study by Asch [1] throughout the five versions, except that the nine tasks were

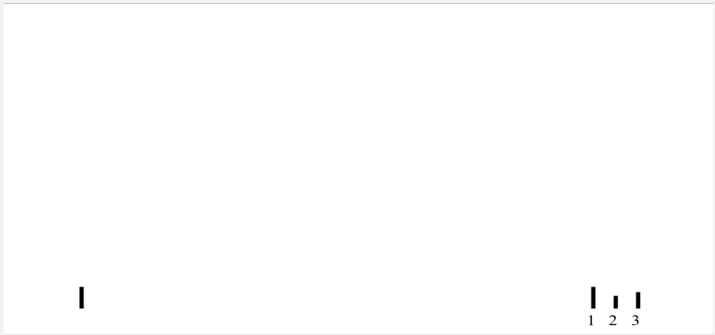

Fig. 1 An example image of the Line Judgement Tasks: Task 2

presented only once in the present study instead of twice in the original study by Asch.

2.4 Questionnaires

We prepared two different versions of the Microsoft Forms questionnaire for the genuine participants and the confederates. The 16 questionnaire items for the naive participants were the same as those in the studies by Mori and Arai [3, 14], with the exception of those related to the presentation trick used by the latter (see, Appendix A). For the confederates, we further eliminated five irrelevant questions (shown with * in Appendix A) and added two new ones inquiring how adequately they acted as confederates. Participants took the designated version of the Forms questionnaires after the line-judgment session at their own pace.

2.5 Experimental procedure

Before the experiments, all the participants engaged in the coursework in the pre-registered groups. Accordingly, they gathered in the Teams private channel assigned by the course instructor beforehand. Then, one of the five experimenters entered the private channel and administered the experiment group-wise. It took about 15 minutes for each participant to conduct the experimental session. We had planned to complete all the group administrations within the class time slot of 90 minutes except for the questionnaires.

3 Results

3.1 Preliminary analyses

The 12 participants who were to serve as confederates performed their roles appropriately. They answered all the tasks "correctly," i.e., as being told beforehand. They also reported in the questionnaire that they judged they had performed appropriately. Therefore, we concluded that the experiments went as intended.

The questionnaires revealed that only one student had answered that he had known this experiment well, and four other students had answered that they had learned about it in classes. Meanwhile, the other 80 students answered either that they were not familiar with the research or knew of it only vaguely. So, then, we included the results of these participants in the following analyses.

3.2 The initial hypothesis test

We first tested the original hypothesis. We counted the number of errors in the six critical tasks where the confederate had responded incorrectly. There were three genuine participants in each of the 12 groups. Therefore, there were 12 x 3 x 6 responding occasions in total, or 216. Meanwhile, 37 genuine participants in nine groups responded six times each; 37 x 6 = 222. As shown in Figure 2, the groups with confederates made 18 errors out of 216 responses, while those without confederates made 14 out of 222. Thus, the former made slightly more errors than the latter. However, the difference was insignificant ($\chi^2_{(1)} = .399$, n.s.).

Then, we examined the response patterns of each group individually and task-wise. This revealed that five out of nine without-confederate groups had made no errors. In comparison,

the two groups erred seven and four times, causing an unexpectedly large number of errors in the without-confederate condition.

In these groups, it seemed that an error of a member in the early stage would trigger additional errors from the other members. Ironically, this was what we had hypothesized before the experiment. Thus, it was not the confederate but an accidental erroneous member who induced errors from the others. In other words, those inaccurate members served as confederates in effect. As a matter of fact, it was not distinguishable for the participants between the confederates and the accidental error-makers.

Then, we excluded these two groups with the accidental error-makers from the without-confederate condition and counted the errors on all nine tasks instead of six. The groups with a confederate member made 35 errors of 324 responses, while those without confederates made only nine out of 261. The difference was statistically significant ($\chi^2_{(1)} = 10.207$, $p < .01$).

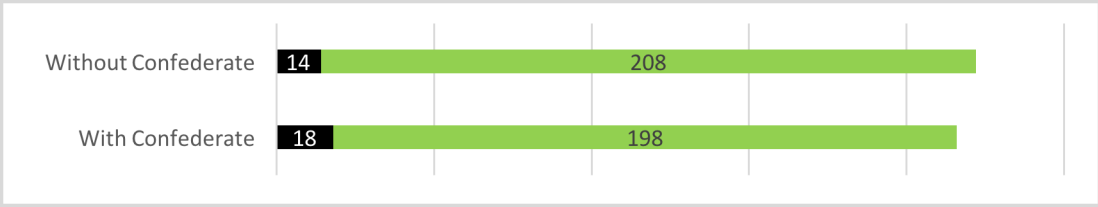

Fig.2 Errors (Black) and correct answers (Green) in two conditions

3.3 Post hoc analyses

We should go back to the original hypothesis and reconsider how we analyze the obtained data to examine the hypothesis appropriately. Our experimental hypothesis was that the participants with the confederate would make more erroneous responses during the tasks than those without the confederate. It meant that an error made by a member of a mutually acquainted group would induce mistakes of the other members afterward for obscuring the first member's embarrassing mistake.

We had asked 12 participants to be the error-makers, responding incorrectly during the tasks. However, there were more error-makers unexpectedly in the present experiment. These two types of error-makers were indistinguishable from other genuine participants.

Therefore, we should treat both as virtual confederates since they served the same way in the task sessions. Thus, we defined a virtual confederate as "a participant who made errors in the first three tasks" because the confederates made the first incorrect response in the third task. Consequently, we reasoned that any participants who made errors during the first three tasks played the same role as the confederates in the present experiment.

Then, we counted the errors and correct responses among the nine tasks for each participant, excluding the newly defined virtual confederates; 26 participants responded incorrectly during the first three tasks, in addition to the 12 original confederates. So, we excluded them as virtual confederates from the following analyses. Then, there remained only three non-

virtual-confederate groups and 16 virtual-confederate groups. Besides, there remained two groups, where all the members were either original or virtual confederates. Thus, we removed them from the following analyses. Finally, there were 47 genuine participants left, 35 in the virtual-confederate condition and 12 in the no virtual-confederate state.

As shown in Figure 3, there were ten errors out of 210 responses of the genuine participants in the virtual-confederate condition. In contrast, there were no errors out of 72 answers in the no virtual-confederate condition. Thus, the results supported our hypothesis that an error made by an acquainted member would elicit errors from other members.

As for the statistical analysis, we estimated the error rate of the present tasks as 10/210, or .04762, and calculated the possibility of no errors among 72 responses in the no virtual-confederate condition. It was .0298, which was below the standard significance criterion of $p < .05$. Therefore, we regarded the present results as statistically significant.

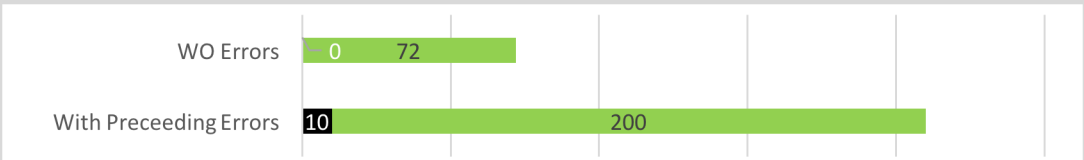

Fig.3 Errors (Black) and correct answers (Green) in two conditions

3.4 Questionnaire analyses

All the 85 participants answered the questionnaires. We eliminated 12 participants who acted as confederates for the following analyses. As for the following ten multiple-choice items (#1, #2, #5, #6, #7, #10, #13, #14, #19, and #22), we treated them interval scales and coded the choices "5" to "1" (or "0"). We coded the three binary question items (#7, #8, and #11), either "1" for "yes" or "-1" for "no," excluding the other answers. The overall statistics showed that the task images were clear enough (#2); the average rating is 4.16 (max. 5), but the task difficulty (#1) is in the middle range, 3.19. Nevertheless, they were mostly confident about their answers (#5), 3.45, and conformed to others (#13) only 0.40 times on average.

In probing the characteristics related to making errors, we divided the 71 participants into two groups, 39 who made no errors and 34 who made one or more errors, and compared their answers. Then, to screen out the considerably different items for the no-error participant group and the errored group, we administered *t*-tests and found no question items were significantly different between the two groups (though the *p*s varied from .08 to .99). As for the three binary question items (#7, #8, and #11), we used Fisher's Tests and found no p values below the .05 significant level ($p = .212$, $p = .263$, and $p = .307$, respectively).

Therefore, other than the fact that the task difficulty was rated as moderate, the questionnaire analyses failed to reveal any relevant aspects of why participants made erroneous responses or answered correctly throughout the tasks. It also found no supporting evidence of the research hypothesis of the present study. Arai and Mori [14] adopted the questionnaire items from the original Asch study [1]. Their questionnaire analyses found that the female participants who conformed more than the males in the Mori and Arai [3] experiments were

less confident than the males. However, we did not find any significant differences in the confidence ratings of the erroneous group and the no-error group in the present study.

4 Discussion

4.1 Why were there so many errors?

According to Asch [1], "The differences were clearly distinguishable so that under control conditions with subjects judging individually, the estimates showed an accuracy of over 99 percent" (p. 3). We used the same task figures, with the exact proportional lengths, in the PowerPoint slides on the participant's computer screen.

However, the average accuracy of the nine tasks was 90.4% in the present study (cf., Table 1). The most severe outcome was that the percentage of correct answers to Task 2 did not even reach 70%. Almost a third of naive participants, 23 out of 73, responded incorrectly to Task 2. In addition to the high error rate, it was also crucial to the present study that the task was in the early stage of the series of judgments; it was the second task. We had asked the confederate, the third responders, to answer correctly on the first two tasks. Therefore, those accidental errors even preceded the experimentally planned ones.

Table 1. Number of Corrects and Errors for the Nine Tasks (Excluding Confederates' Answers)

Tasks	#1	#2	#3	#4	#5	#6	#7	#8	#9	Total
Corrects	69	50	72	66	69	71	61	70	66	594
Errors	4	23	1	7	4	2	12	3	7	63
Error rates	.055	.315**	.014*	.096	.055	.027*	.164*	.041+	.096	.096

($\chi^2_{(8)} = 59.411$, p<.01; +p<.10 *p<.05 **p<.01)

As shown in Figure 1, the task does not look so difficult. The errors were not induced by the other errors either. There were only four errors out of 85 responders, including the confederates, on the preceding task, Task 1. We have not detected the reason why so many participants made errors on this task.

The questionnaire analyses revealed little about this riddle. Both groups of participants, with or without error responses, rated the task difficulty levels similarly. Moreover, most of them answered that the task figures were "very clear" or "fairly clear."

4.2 Did the responders become careless after others made an error?

We assumed that those errors were intentional ones to attenuate the awkward situation. For an acquaintance group, it would be socially more acceptable when everyone makes mistakes.

However, was this interpretation correct? One of the alternative interpretations is that the responders became less cautious once others made an error. This interpretation would be valid for the present results. It has been known that a failure may cause another, and one success may lead to another one. We may not need a social reason for these phenomena.

To examine whether the phenomena are social, we need a further experiment using groups of participants in which all are strangers to each other. If the same phenomena occur with the stranger groups, they are not social ones. On the contrary, if the error rates are similar in the stranger groups with or without a preceding error, the alternative interpretation is discarded.

Again, as reported above, the questionnaire analyses did not show any relevant findings on this issue. Therefore, we need to revise the question items for future research. In addition, we would need an interview after the experiment to inquire why participants made errors on the particular task items.

4.3 Did the answering order matter?

Table 2. Number of Corrects and Errors for the Four Responding Orders

(Excluding Confederates' Answers)

Answering Orders	#1	#2	#3	#4	Total
Corrects	177	170	71	176	594
Errors	12	19	10	22	63
Error rates	.063	.101	.123	.111	.096

($\chi^2_{(3)} = 3.574$, ns)

If one error can induce another error, the responders answering in the later turns might produce more errors than the members responding earlier. We examined this answering order effect by comparing the error rates of each answering order. As shown in Table 2, the first responder had fewer errors than the other responders, but the differences were not statistically significant. It was partly because the tasks were repeated nine times, so answering orders

became less crucial as the tasks went on. Accordingly, even the first responders answered after other responders in the series of responses.

In this regard, we compared the error rates of Task 1 only for each answering order. As a result, we found that four errors were made by the second responders only. However, as they were rare cases, we could not make any decisive conclusion from these results.

5 Conclusions

We aimed to examine whether the errors of the minority member would induce mistakes of the others in the role-inverted Asch experiment. Unfortunately, because of unknown reasons, we observed an unexpectedly large number of incorrect responses in Task 2. Thus, it made it difficult to test the experimental hypothesis straightforwardly. Then, we examined the data participant-wise and task-wise precisely. The additional analyses revealed that participants tended to make errors when they experienced various answers in the early stage of the task phase. Therefore, we conclude that, as in the majority confederate of the Asch experiment, even an incorrect response from the minority participant may affect the other members' responses.

We interpreted those errors as social; mutually acquainted members would intentionally make erroneous responses to attenuate the embarrassing situation where a friend was only an error maker. Nevertheless, this interpretation needed to be fully supported by the present results. There is an alternative interpretation of the obtained results. People may become less cautious when others make mistakes.

To examine whether the errors are social or not, we need further experiments comparing acquaintance and stranger groups in the same procedure as the present study. There also remain some open questions. Why were there so many errors in the seemingly easy tasks? Especially why was Task 2 so misleading? There must be some more unknown factors for making errors in social settings.

DATA AVAILABILITY STATEMENT

The original data are available at the following site:

https://researchmap.jp/multidatabases/multidatabase_contents/download/230813/cd66f5eac7d59823ce427f88746ac73d/23074?col_no=2&frame_id=575977

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Appendix A

Questionnaire items used in Mori & Arai [3] and used in the present study (in bold font)

1. Do you think the task was difficult?
[Very difficult / fairly difficult / average / fairly easy / very easy]
2. Did the figures appear clear enough on the screen?
[Very clear / fairly clear / clear enough / not very clear/ very unclear]
3. Did you feel uncomfortable wearing the sunglasses? [Yes / No]
4. Did you feel content with your seating order?
[Very satisfied / fairly satisfied / neutral / rather unsatisfied / very unsatisfied]
5*. Were you confident in your answers? [*: not for the confederates]
[Confident / fairly confident / average / somewhat confident / not very confident]
6*. Did you ever answer as the others did when you were not sure about your choice?
How often do you remember doing so? [___ times out of 9 times]
7. Were you concerned about the answers of the others? [Yes / No]
8. Did you notice that others gave answers different from yours? [Yes / No]
9. How did you feel about the others giving answers that were different from yours?
(Please choose as many as you like from the following.)
[Surprised / competitive / anxious / superior / embarrassed / suspicious / other ( )]
10*. Did you have any thoughts that your eyes might be deceiving you?
[Often / sometimes / not really / not much / not at all]
11. Did you feel isolated during the tasks? [Yes / No]
12. Did you feel competitive against others during the task? [Yes / No]
13*. Did you conform to other people's answers? How often do you think you conformed?
[___ times]
14*. How often did you find difficulty in choosing between two alternatives? [___ times]
15. Do you think it would have been easier to do this task alone? [Yes / No]
16. Do you think you would have stuck to your own choices if the task had measured your intelligence? [I strongly think so / I think so / I'm not sure/ I think not / Not at all]
17. Have you ever heard of a psychology experiment like this?
[Yes, I know it very well. / I have heard of it in class./ I vaguely know of it. / I do not know of it at all.]
18. Which of the following do you usually consider most when you make a judgment?
[My own ideas / opinions of my close friends / objective data / social consensus / opinion of elders / other ( )]
19. Are you confident in general?
[Highly confident / fairly confident / average / a little confident / not very confident]
20. Do you wear glasses? [Normal vision without glasses / with glasses / with contact lenses]
21. What color was the background of the slides you observed? [ ]
22. Did you have any close friends in the task group today? [Yes/No. (If yes, how many?)]
23. What is your age and sex? [_____ years old: M / F]
24. How did you feel during the task? Describe anything you thought, felt, or considered during the task in the following space. You can also write down your opinions and impressions of the experiment. Thank you.

Two additional questions for the confederates are as follows:
Ex.1. Do you think you performed as we had told you to do so?
Ex.2. How many times did you fail to perform appropriately?