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The Effect of Group Size on Social Facilitation and Social Loafing as Measured in Productivity

In recent years, there has been increased awareness in the apparent change of individual behavior when placed in a group. This study was designed to examine the relationship between group size and productivity. All 48 participants took part in each of the three trials. In each trial they were given a word (duct tape, knife or water) and worked as an individual, pair, or group of four to generate uses for that word. It was a prediction of this experiment that individual productivity would increase when the participant worked as a pair. However, it was also expected that the individuals' productivity would decrease when they were placed in a group of four. Data showed that individuals had the highest productivity while working as an individual and were the least productive while working in a group of four. However, data also showed that increasing group size led to an overall increase in the groups' total productivity. Several variables were identified for further study.

When walking into a 1950's classroom, one would observe thirty desks in perfectly spaced rows and columns facing the blackboard. Move ahead to the beginning of the 21 century and throughout the room one would observe chairs placed around circular tables to facilitate collaborative work. In recent years, the United States educational system has been making the transition from focusing on individual work to focusing on group work. This transition leaves a person wondering why. Some teachers who have implemented group work feel that students learn not only from dictation, but also by working with other students. The skills developed from being a group member can include increased ability to compromise, lead, and communicate with others (Forsyth, 1999). However, one possible detriment to group work is that people may feel less responsible to participate attentively and, therefore, process less information.

The observation of improved and decreased productivity due to working as a group can be applied to situations beyond the classroom. For example, Triplett (1898) led research in this field by studying children's performance on a simple task while working either as individuals or as pairs. The theory of social facilitation emerged from this study. Social facilitation is an increase in an individual's productivity or motivation due to the presence of another person (Forsyth, 1999).

However, social facilitation is not the only phenomenon observable when people interact in groups. The opposite effect, social loafing, can also occur. Social loafing is a reduction of an individual's performance due to working in larger sized group and taking on less responsibility for the production (Forsyth, 1999). An effort to explore social loafing was studied by Latane', Williams, and Harkins.
(1979). They conducted an experiment where the loudness of a shout was measured by auditory observation when the subject was tested alone, in dyads, and in a six person group. The results of the study suggested that students did not work to their full individual capacity while working in dyads and the group of six. Though the group produced more noise, individual contributions were lower when people shouted alone. This decrease in productivity caused by people working in groups may be attributed to either the perceived lack of responsibility or intimidation.

Past research has isolated the theories of social facilitation and social loafing in order to explain them. However, according to Harkins (1987), social facilitation and social loafing are two constructs so closely related as to be complimentary. Both phenomena measure the interaction of individuals in group settings which may differ due to various group dynamics such as group size. Harkins also states that social facilitation and social loafing can be observed in a single design to better understand both phenomena. Because of their complimentary relationship, when one is present it is likely that the other is also present.

This investigation will replicate and extend Harkins’ (1987) study. In his original study, males and females participated in a 2 (Alone vs. Coaction Pair) x 2 (Evaluation vs. No Evaluation) design. Within this study, the participants were given an envelope that contained a word, such as knife, for which they were given 12 minutes to generate uses (An example for uses of a knife include to cut fruit or to stab). The individuals were assigned to work alone or in pairs. The study found that pairs outperformed singles, supporting the social facilitation theory and contradicting the theory of social loafing. However, these results may have been inconsistent with the social loafing theory because the group size was limited to dyads.

The current study is interested in examining what happens to the amount of productivity (number of uses generated) when a person works as an individual, in a dyad, or in a group of four. Will the level of productivity increase when participants work in pairs, perhaps as a result of social facilitation? Will the individuals’ productivity level decrease when they are placed in a group of four? Individual productivity (number of uses listed) is anticipated to increase when the participants work in pairs. The presence of another person as well as the uses generated by that person might stimulate and increase the individual’s responses. However, it was also expected that the individuals’ productivity would decrease when they were placed in a group of four because individuals would perceive decreased responsibility in the larger group.

**METHOD**

**Participants**

The participants in this experiment were 11 male and 37 female undergraduate students from a small Catholic Liberal Arts college in the Midwest. Some students participated in this study to fulfill course requirements or to earn extra credit for their Introduction to Psychology course. Some students participated to obtain community service hour credits, while others participated for the experience.

**Design**

Participants were recruited through the psychology department staff or by the experimenters and signed up for the experiment on the undergraduate psychology bulletin board. This within-subject study required each participant to participate in the three conditions. Each participant’s performance was evaluated in three trials as an individual, a one of a pair, and as a part of a group of four. There were no more than four students present during each testing period, as the largest trial was a group of four. Throughout the study, a total of three different words were used (duct tape, knife, and water). Each word was used in one of the three trials, so each individual received each word once by the end of the third trial. In order to counterbalance for possible order effects, the order of the conditions and the order of the words were interchanged for each session. All possible combinations of the group size conditions and words were used.

**Procedure**

Upon entering the experiment room, each participant was randomly assigned a number for the researchers’ purpose of identi-
As the students arrived, they were asked to find a place to sit around a square table with four chairs. Once all students were present, experimenters introduced themselves and briefly explained the experiment. Participants were told that they were going to be given an envelope containing a word and their purpose was to generate as many uses possible for that word in an 8-minute time frame. They were also told that they would perform this task in three conditions, as individuals, one of a pair and within a group of four. The experimenters gave the students an example of the task they were asked to perform. Upon receiving their answer sheets, participants were told that they were not to write their names on any of the materials.

Each student participated in three trials. The content of these trials was predetermined in order to counterbalance the group sizes and words. Once each trial was completed the envelopes were collected and participants were asked to put their answer sheets in a box. During the session when the participants worked as individuals they were asked to go into a separate room and work alone. During the pair session, the experimenter sat in a room with the pair, and during the group of foursessions, the participants remained in the original main room. An experimen-

RESULTS

All of the results measured the productivity of participants throughout three trials. The trials represented the first, second, and third condition that each participated in. Each condition represented a certain group size (individual, pair, or group of four).

One-way ANOVAs for each trial showed that group size had a significant influence on productivity, trial 1, F (2, 45) = 10.60, p < .01, trial 2, F (2,45) = 15.96, < .01, trial 3, F (2,45) = 18.83, p < .01. Post hoc tests were conducted on each trial to determine which group sizes significantly differed in productivity. Tukey's HSD test found that there was a significant difference in individual productivity when comparing the individual and pair conditions (p < .01). As shown in Table 1, individuals working alone generated significantly more uses than when individuals worked in a pair. Also shown in Table 4, there was a significant difference in the amount of uses generated by the participant during the individual and group of four conditions (< .01)

As shown in Figure 1, the overall productivity of each group condition differed between individuals, pairs, and groups of four.

Table 1

<table>
<thead>
<tr>
<th>Trial</th>
<th>Individual</th>
<th>Group Size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean  SD</td>
<td>Mean  SD</td>
</tr>
<tr>
<td>Trial 1</td>
<td>21.63 10.22</td>
<td>11.56 6.22</td>
</tr>
<tr>
<td>Trial 2</td>
<td>23.38 7.76</td>
<td>15.19 5.47</td>
</tr>
<tr>
<td>Trial 3</td>
<td>26.56 9.53</td>
<td>16.75 7.23</td>
</tr>
</tbody>
</table>

These results differ from the tracking of individual responses in each condition because they examine the productivity of groups as a whole. A t-test was used to determine differences between the 3 group size conditions. A difference was found between the productivity of groups of four and the individual group, t (47) = 8.44, p < .01. There was also a difference between pair and individual groups, t (47)
FIGURE 1

Mean Number of Uses per Word Generated During Trial
One for Males and Females

2.83, p < .01. Lastly, there was a difference between groups of four and pairs, t (47) = 5.33, p < .01.

A One-way ANOVA was conducted for each trial to test whether the word difficulty (lack of familiarity with the given word) influenced the number of uses generated by the participant. As shown in Table 2, in trial 1 and trial 2 the word difficulty did not influence the number of uses generated; however, there was an influence of word difficulty in trial 3. Word difficulty did not have a significant effect in the number of uses generated for 10 out of the 12 trials, these two differences being present in the third trial. In trial 1 there were no significant differences in the participants’ number of uses listed for duct tape, knife, and water, F (2,45) = 2.5, p > .05. There was also no significant difference between uses generated for the three words in trial 2, F (2,45) = .31, p > .05. However, a significant difference between uses generated for the three words was found in trial 3, F (2,45) = 13.73, p < .01. Tukey’s HSD revealed a significant difference between duct tape and water (p < .01), and water and knife (p < .05). The difference between knife (M = 20.13) and water (M = 33.00) was found in the trial when the individuals worked alone, F (1,14) = 13.28, p < .01. The difference between duct tape (M = 12.75) and water (M = 20.75) was found when the participants worked as pairs, F (1,14) = 6.78, < .05.

As demonstrated in Table 3, a One-way ANOVA showed that the number of uses generated in each trial by women were not signifi-

<table>
<thead>
<tr>
<th>Trial</th>
<th>Duct Tape</th>
<th>Knife</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean SD</td>
<td>Mean SD</td>
<td>Mean SD</td>
</tr>
<tr>
<td>Trial 1</td>
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<td>13.06 6.92</td>
<td>14.56 10.19</td>
</tr>
<tr>
<td>Trial 2</td>
<td>14.94 9.07</td>
<td>16.20 7.76</td>
<td>17.58 10.31</td>
</tr>
<tr>
<td>Trial 3</td>
<td>10.63 4.38</td>
<td>17.25 7.97</td>
<td>24.40 9.71</td>
</tr>
</tbody>
</table>
Table 3
Mean Number of Uses Generated by Males and Females

<table>
<thead>
<tr>
<th>Trial</th>
<th>Gender</th>
<th>Male Mean</th>
<th>Male SD</th>
<th>Female Mean</th>
<th>Female SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial 1</td>
<td>Male</td>
<td>18.09</td>
<td>11.01</td>
<td>13.22</td>
<td>8.57</td>
</tr>
<tr>
<td>Trial 2</td>
<td>Male</td>
<td>16.91</td>
<td>6.82</td>
<td>15.89</td>
<td>9.31</td>
</tr>
<tr>
<td>Trial 3</td>
<td>Male</td>
<td>18.82</td>
<td>8.49</td>
<td>17.78</td>
<td>10.20</td>
</tr>
</tbody>
</table>

Contrary to the hypothesis that individuals working in a pair would outperform individuals when working alone, the data showed that individuals who worked alone were more productive than when they worked in pairs. The hypothesis of an increased performance in pairs was stated because it was believed that working with another person would encourage social facilitation (Harkins, 1987). However, it was not stated in what physical conditions Harkins' participants were placed when they worked in pairs. The increased production when working alone can also be attributed to Western culture's emphasis on autonomy. When working in pairs, the two participants had the opportunity to work off of each other as well as work with each

Table 4
Mean Number of Uses Generated for Recruited Participants and Psychology Students

<table>
<thead>
<tr>
<th>Trial</th>
<th>Subject Type</th>
<th>Recruited Participants</th>
<th>Psychology Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Trial 1</td>
<td>14.33</td>
<td>6.81</td>
<td>14.33</td>
</tr>
<tr>
<td>Trial 2</td>
<td>17.33</td>
<td>10.82</td>
<td>15.19</td>
</tr>
<tr>
<td>Trial 3</td>
<td>15.90</td>
<td>8.09</td>
<td>19.67</td>
</tr>
</tbody>
</table>
other to generate uses. Also, the presence of another person may have compelled the participant to generate more responses. The results, however, did not support this hypothesis and may be explained by the possible interaction between the two individuals. When participants worked alone they were able to work at their own pace and did not have to be concerned about writing down the other person's responses. They were also able to direct their full attention to the task, when they otherwise might have been distracted. When working individually, the participant was able to generate uses that may have already been stated by the other participant in the pair condition.

As expected, data supported the hypothesis that individuals placed in a pair would produce more than when placed in a group of four. This was hypothesized because it was believed that participants would behave in ways characterized by the social loafing theory (Latane', Williams, & Harkins 1979). The results may illustrate the theory; when the number of people in the group increases, fewer efforts are made by the individual. An alternative explanation for the results may be due to the fact that when group size increases, each individual has fewer opportunities to respond. For each word there may have been a limit to the number of responses that it was possible for a group to generate. With an increase in group size, the number of responses was spread out among the participants. Also, the lack of responses made by each individual in the group might have been due to the time restriction or perceived intimidation from the other participants in the group.

Some findings of this study were inconsistent with the original study by Harkins (1987) which found that pairs outperformed individuals. However, consistent with Harkins, this study found that social loafing and social facilitation could be studied in a single experiment. Examination of individual performances did not reveal social facilitation; however, it may have revealed social loafing. Social loafing may have been shown as individual's working in a group of four produced less than while working individually. However, data also showed that as a whole, groups of four outperformed both individuals and pairs. This could support the theory of social facilitation, similar to the results of Triplett (1898)

While the replicated study did examine social loafing and social facilitation, several variables of the study deviated from Harkins' study. All participants participated in each of the group size conditions (within subjects design), which differed from Harkins' between subjects design. This change in design was due to the small subject pool available at the college. The original study also used evaluated/non-evaluated conditions; however, the present experiment did not use this condition because it was not believed that this could be sufficiently produced by the experiment. In addition, this experiment added a third group size condition of placing participants in groups of four. This was added because the pair condition in Harkins' study was not found to facilitate social loafing. The time given to generate uses was decreased from 12 minutes to 8 minutes due to the increased number of trials in which each participant was evaluated.

While the replicated study focused on group size and productivity, other variables were also examined. One such variable was the impact of gender on productivity. Overall, the data showed that there was not a significant difference among uses generated between men and women. However, it should be noted that there were proportionately fewer males than there were females in this study. Due to the lack of psychology students, people were recruited to participate in the study by the experimenters. Overall, there was no significant difference in the productivity found between the two types of participants. Another variable that was believed to be necessary to examine was the difficulty of the word for which the participant generated uses. In the first and second trials there were no significant differences in the number of uses generated dependent on each word. However, in trial three while working as an individual, a significant difference was found between knife and water. Also while working as a pair in the third trial there was a significant difference in the words duct tape and water.

The design of this study is important because it observed every individual under all three group conditions, thus reducing error due
to individual differences. The study also counterbalanced group size and word order with the purpose of minimizing practice, fatigue, and order effects. In addition, this study's design reduced the possibility of demand characteristics because the participants were not aware that their results were being evaluated. Overall, the design of the study minimized error, thus giving the results of this study validity.

The present investigation originally set out to examine the phenomena of social facilitation and social loafing measured by productivity. However, it can be concluded that there are multiple factors that should be taken into consideration when measuring productivity dependent on group size. Future research can include taking into consideration other factors possibly influencing an individual's contribution to a group. These factors include having a dominant/passive personality as well as having an increased arousal level in the presence of others.

Future research can better operationally define social facilitation and social loafing by isolating these two phenomena. Further research should also examine variables such as larger group sizes, different assigned tasks (other than generating uses for a word), or same sex versus mixed sex groups. In addition, further studies could offer incentives to participants to measure the effect of motivation on productivity.

The present research demonstrates how increasing group size can decrease an individual's productivity within the group. This may also suggest that the smaller the group size, the more productive the individual was. Thus, in society, people may assume less responsibility when placed in larger groups; hence, being less productive. Regarding groups as a whole as group size increases individuals may produce less but overall, the group becomes more productive. Tangibly, these results ask an important question. Which is more important, individual productivity or group productivity?

REFERENCES