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# Are Groups More Productive When Intrinsically Motivated?

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Abstract

This research expands on the existing literature of the benefits of intrinsic motivation by comparing conditions with varying combinations of intrinsically-motivating factors. This experiment was conducted in the Salisbury University library and the participants were undergraduate Salisbury University students. The students who arrived on the first day were in Condition A, those on the second day were in Condition B, and those on the third day were in Condition C. The students in each condition were randomly divided into three groups. Each group in Condition A chose between three creative problems to solve together in their group. Each group in Condition B completed the same creative problem that the groups in the previous condition completed. They were unable to choose their problem, but were given a few minutes to talk and get to know each other before working together. Each group in Condition C completed the same problem that the groups in the previous conditions completed. They were unable to choose their problem and they sat in silence and wrote about their career goals before working together. After finishing their work, all participants each filled out a survey on how close they felt to their group members. During the second portion of the study, three other students judged the group work based on creativity. There was no significant difference between the work or feelings of closeness between the conditions. For future research, personality traits such as shyness and friendliness will be measured to determine if personality factors influenced the results.

# Are Groups More Productive When Intrinsically Motivated?

Motivation is the driving force behind decisions and the reasons people engage in certain behaviors. Kanfer, Chen, and Pritchard argue that motivation is an active development that is based on the relationship between sociopsychology, individual differences, and context (as cited in Hendijani, Bischak, Arvai, & Dugar, 2016, p. 251). There are multiple types of motivation. Intrinsic motivation leads individuals to engage in activities that are carried out merely for pleasure or interest in the activity. Extrinsic motivation, however, results in the participation in activities that are carried out in exchange for a desired reward or to prevent a negative consequence (Levesque, Copeland, Pattie, & Deci, 2010).

Ecology of Education is a blog lead by educators who report educational issues. In a posted article, "Intrinsic vs. Extrinsic. The Challenge of Motivation.", it is explained that external motivators are beneficial for completing tasks in the short-term. While extrinsic motivation is beneficial in inspiring an individual to behave a certain way quickly, it is insufficient for long-term use ("Intrinsic", 2012). For many applications of motivation research, the situation is rarely short-term. For example, researchers want to understand how to effectively motivate students in school or employees in the workplace. While external factors may be useful in motivating an individual to get one assignment done, it is impractical for teachers and employers to continue providing rewards for subsequent assignments. This is why it is important to learn how to inspire others to participate in behaviors for the sake of participating in the behavior.

There have been neuroscientific studies that explore the biological bases for motivation. This is significant since most research concerning motivation and performance are based on behavioral observation and self-report (Hendijani et al., 2016). Observation is not an objective

measure since interpretation of behavior is subjective. A common way to indicate intrinsic motivation for an activity is by the amount of time a participant spends on the activity. There may be a positive correlation between motivation for a task and time spent on it, however, it does not directly measure motivation and the amount of time spent could be due to extraneous variables (Ng, 2018). As for self-report, results could be influenced by participant memory and interpretation of their own reactions during the study. For instance, if an individual is unable to label their motivation as being intrinsic, then this will affect how they respond in a self-report. While neuroscience is not without its limitations, it offers a different perspective into the study of motivation.

Ng (2018) describes a meta-analysis of various studies that measure brain areas that are active during tasks that intrinsically motivate participants. Functional magnetic resonance imaging (fMRI) measures blood flow in the brain to determine which parts of the brain are active during which activities or experiences of stimuli. Electroencephalography (EEG) measures electrical brain activity. Both procedures are commonly used to study motivation. Baik (2013) explains that dopamine is a neurotransmitter that reinforces attention and captivation during the performance of a task. It is also responsible for providing a sense of pleasure from engaging in a specific activity or being exposed to a certain stimulus (as cited in Ng, 2018). It is found that when individuals are given more independence over the activities they do, they are rewarded with dopamine and are therefore more focused and engaged in those activities (Ng, 2018). There are several structures of the brain that become activated when individuals are intrinsically motivated. Holroyd and Yeung claim that one of these areas lies in the frontal lobe and is called the anterior cingulate cortex (as cited in Ng, 2018). In his doctoral dissertation, Lee states that a

region associated with the limbic system called the anterior insular cortex is also responsive to feelings of intrinsic motivation (as cited in Ng, 2018).

Understanding the neurological foundations for motivation is beneficial, however, there have been conflicting findings regarding whether or not intrinsic motivation actually causes improvements in performance. The causal relationship makes sense in theory, but experimental results are inconsistent. Bodla and Naeem's (2014) research in Pakistan further tests the relationship between performance and intrinsic motivation by introducing another variable: creativity. Their inclusion of creativity is derived from the existing findings that intrinsic motivation leads to increased creativity (Bodla & Naeem, 2014). In their study, they distributed surveys to 688 salespeople from 30 random Fast-Moving Consumer Goods (FMCG) companies in Pakistan (Bodla & Naeem, 2014). In the surveys, participants were able to report the level of creativity they use in their job, their intrinsic motivation, and their sales performance. The article concludes by stating that while intrinsic motivation is linked to creativity which is connected to improved sales performance, intrinsic motivation does not have a direct relationship with sales performance (Bodla & Naeem, 2014). These results combined with the results of previous research mentioned in the article suggest that more studies need to be done in order to determine the influence motivation has on performance. So far, there have been mixed results.

The controversy of whether or not intrinsic motivation is beneficial to performance is further highlighted by the existence of multiple theories of motivation. While some researchers believe that motivation is greatest when one experiences both intrinsic and extrinsic motivation, others are concerned that the addition of an external reward will undermine the effects of intrinsic motivation (Hendijani et al., 2016). As noted by Kanfer and Ackerman, resource allocation theory states that individuals become distracted from the task at hand when an external

reward is introduced- causing a decrease in quality of performance (as cited in Hendijani et al., 2016). Self-determination theory states that individuals strive for accomplishment, independence, and relatedness and their behavior is a product of their motivation in trying to achieve these goals. This theory supports the idea that certain types of extrinsic motivators can be beneficial under specific circumstances (Hendijani et al., 2014). Even though there are several differing theories concerning motivation, it is certain that the study of motivation needs to be pursued further so that people can be internally driven to work as efficiently as they can.

The design for the research described in this document is based on the idea that individuals can be intrinsically motivated by working with others in groups. Ryan and Deci explain that social cues that "signal an invitation or an opportunity to work with others can inspire intrinsic motivation, leading people to work hard on difficult tasks for their "inherent satisfactions" even in the absence of external pressure or reward" (as cited in Carr & Walton, 2014). This study is not comparing the effects of intrinsic motivation and the effects of extrinsic motivation. We are comparing different combinations of intrinsic motivators to determine which is most effective. All conditions are composed of students working together in groups, so they are expected to be motivated already as they would feel a responsibility toward their teammates. The additional factors in the conditions (ex. being able to choose a project) are paired with the group work so that the different combinations can be considered.

It has been established that people can be intrinsically motivated by the possession of options in work to be done and by the completion of work in groups. Therefore, I have compared these methods of motivation to determine which leads to greater productivity when individuals are working to solve an issue creatively. The addition of creativity was inspired by the work of Bodla and Naeem (2014).

In this study, participants were split into groups of three people. The first section had a choice in what task they complete, the second group completed a team-building activity before working on an assigned task, and the third group did not complete a team-building activity before working on an assigned task. A common way to intrinsically motivate individuals is to allow them to tweak an assignment in a way that provokes more of their own interest. However, personal choices are not always possible in a workplace environment. The purpose of this study is to determine whether the intrinsically-motivating behavior of working in groups can be even more effective by adding team-building activities and personal choice of the topic to be worked on.

My hypothesis is that participants that work together after the team-building exercise will experience the most productivity.

## Methods

### Risks and Benefits

There are no known risks to participants as the study is a simulation of an experience a student may have in a typical classroom. The students were informed that participation was voluntary and that they could leave the research location at any point during the study. All of their information was confidential as they were not allowed to write their names on any documents except the Informed Consent form that they signed soon after entering the research location. All documents from the study have been kept in a secure location.

The only possible violation of confidentiality is that the participants were aware of the other participants present and recognized them from class. The students may have shared their names with each other and there was nothing preventing the students from discussing the study after their participation had come to an end.

Many students received external benefits of participating in the study since they were rewarded with extra credit in one of their classes. The extra credit was unrelated to performance and was provided as a result of participation. Several of the students reported enjoying themselves during the study and perhaps they received the internal benefit of becoming familiar with a few of their peers.

## Materials and Resources

Not many materials were utilized during data collection. Three different rooms on the second floor of the Guerrieri Academic Commons (Salisbury University library) were used in a single session. There were pieces of paper labeling each of the rooms being used as "Group 1", "Group 2", and "Group 3". This was done for easier data organization. The groups of participants were all given large white pieces of paper and black ballpoint pens that they used to solve their creative problem and report solutions. The researcher used a personal iPhone as a stopwatch so that each group and condition had the same amount of time to work.

## Participants

The individuals who participated in this study were all Salisbury University students. Nearly all of the students were informed about the study when they were offered extra credit by various psychology courses if they chose to participate. This opportunity to participate was advertised in three different psychology classes: Research Methods, Social Psychology, and Psychology of Sexuality. 25 students took part in the first portion of the procedure. The students had been informed that the research was about individuals working in groups, but had not been told that the true purpose of the research was the study of motivation.

Following arrival to the research location, all students were given a demographic form to complete about themselves. This form asked students to report their major(s), minor(s), age,

gender, and class position (Freshman, Sophomore, etc.). All students were from a psychology class and all but one of them had psychology as a major. The ages ranged from 19 to 26 years with 22.5 years as the mean. In this study, 76% were Seniors, 20% were Juniors, and 4% were Sophomores. 80% of the participants were female and 20% were male. The ratio of females to males may seem unrepresentative of psychology courses. However, not many male students attend psychology courses at Salisbury University.

In the second portion of the study, there were only three participants and they were responsible for rating the group work. None of these individuals had engaged in the first part of the study and were unaware of the various conditions of the groups they judged. All three students were female, two were psychology majors, and one a biology major. One student was 20 years old, one was 21 years old, and one was 22 years old. The 20-year-old was a Junior and the rest were Seniors.

## Procedure

Prior to data collection, the research was granted approval from the Salisbury University Institutional Review Board (IRB) under Expedited Review (see Appendix A). The entirety of data collection took place in the Guerrieri Academic Commons on the Salisbury University campus and lasted for a total of six days. The first part of the study was the focus for the first three days, with the second part of the study taking place in the remaining three days. The participants were Salisbury University undergraduate students (n = 28; 23 female, 5 male). Each participant was randomly assigned to one of six days (The first day corresponded with Condition A, the second with Condition B, the third with Condition C, and the remaining three with the second part of the study).

Initially, each condition was supposed to be composed of three different groups with three participants assigned to each. Due to attendance issues for Condition A, there were three students for Group 1 and three students for Group 2, but there were only two students for Group 3. We experienced the same problem in Condition B, so there were only two students in Group 3 while there were three students for each other group.

Each student was directed not to speak to other students as they entered the room before the study commenced. Once everyone had arrived, they were informed about the procedure for their specific condition. The students gave their informed consent to continue (see Appendix B), then they completed a few questions about their demographic information (see Appendix D). Students were randomly divided into three groups.

Each group in Condition A was given 5 minutes to choose between three problems. The problems were: design a dashboard of a self-driving car, reorganize a recipe to limit errors in following the instructions, and design a new Gull Card (card for the University that holds currency and allows access into certain buildings/rooms) with whichever and however many purposes they believe would improve the card. Coincidentally, each group chose to design a new Gull Card. Each group was then given 15 minutes to design the Gull Card using the paper and pens provided. The students labelled each piece of paper they used with the number of the group in which they were placed. After the 15 minutes ended, each paper with writing on it was collected from the students and placed in an envelope labelled "Condition A". The students were brought back to the same room in which they had assembled before the study had begun. They were given a survey asking them to rank their feelings of closeness toward their groupmates and their feelings of pleasantness toward the entire experience on scales of 1 to 7 (see Appendix E).

Once every participant had finished their survey, they took a debriefing form (see Appendix G) and left the research location.

The students from Condition B did not have the option to choose which problem they solved. Instead, a problem chosen in a group from Condition A was assigned to another group from Condition B. Since every group in Condition A chose to design a Gull Card, every group in Condition B had to design a Gull Card. Before Condition B began their assignment, each group participated in a team-building exercise for 5 minutes. The exercise involved asking the other members of the group about what music they like and how they enjoy spending their free time. The participants of each group were encouraged to get to know each other for the 5 minutes. Each group was also given 15 minutes to design the Gull Card using the paper and pens provided. The students labelled each piece of paper they used with the number of the group in which they were placed. After the 15 minutes ended, each paper with writing on it was collected from the students and placed in an envelope labelled "Condition B". The students were brought back to the same room in which they had assembled before the study had begun. They completed the same survey as the students had in Condition A and were provided with a debriefing form upon leaving.

Since the previous conditions had designed a Gull Card, the participants in Condition C also had to solve this creative problem. Instead of engaging in a team-building exercise, each group of participants had to sit in silence for 5 minutes and independently write about their career goals. Each group was then given 15 minutes to design the Gull Card using the paper and pens provided. The students labelled each piece of paper they used with the number of the group in which they were placed. After the 15 minutes ended, each paper with writing on it was collected from the students and placed in an envelope labelled "Condition C". The students were

brought back to the same room in which they had assembled before the study had begun. They filled out the survey and were given a debriefing form as they left.

After the initial stage of data collection came to an end, another set of students were asked to judge the work of the groups from the previous stage. This portion also took place in the Guerrieri Academic Commons and one student was responsible for grading all of the work from a group number. For instance, one student judged the work of Group 1 from Condition A, Group 1 from Condition B, and Group 1 from Condition C. Prior to engaging in this portion of the study, the participants read and signed an informed consent form (see Appendix C). In this section, the participants completed a survey to rank the responses of Conditions A, B, and C based on how creative they were, how practical they were, how productive the group seemed, and how well-done the work was overall (see Appendix F). These rankings were then averaged and compared across sections. When the work had been completed, each participant also received a debriefing form.

## Results

Figure 1

| Factor | Condition | N | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Pleasantness | A | 8 | **4.3125** | 1.16305 | 2 | 6 |
| | B | 8 | **5.1250** | 1.80772 | 2 | 7 |
| | C | 9 | **3.3333** | 1.65831 | 1 | 6 |
| Closeness | A | 8 | **4.8125** | .37201 | 4 | 5 |
| | B | 8 | **5.4375** | 1.59099 | 3 | 7 |
| | C | 9 | **4.3333** | 1.32288 | 2 | 7 |

The computer program, SPSS, was utilized in order to obtain the statistical analysis for all data. The table in Figure 1 represents the results given by the participants in the first portion of the study in the questionnaire they completed after working on the creative problem. A score of 1 for pleasantness meant that the participant did not enjoy themselves at all during the study, and a score of 7 meant that they experienced feelings of pure joy during the study. A score of 1 for closeness meant that the participant felt very distant in their relationship with their groupmates, and a score of 7 meant that they felt as though they became best friends with their groupmates.

A few of the responses for pleasantness and closeness had a wide range (ex. The range for pleasantness in Condition B is 5). However, there were no large differences between mean responses for each condition. Condition A had a mean score of 4.31 for pleasantness and 4.81 for closeness. Condition B had a mean score of 5.12 for pleasantness and 5.44 for closeness. Finally, Condition C had a mean score of 3.33 for pleasantness and 4.33 for closeness. Since these reports are quite close to each other, none of the differences between conditions in either pleasantness or closeness are statistically significant. A One-way ANOVA test was performed and it showed that there were no significant differences between groups for pleasantness ($F(2,22)=2.772$, $p>.05$) or closeness ($F(2,22)=1.741$, $p>.05$).

Figure 2

| Factor | Condition | N (Groups) | Mean | Standard Deviation | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Creativity | A | 3 | **4.3333** | .57735 | 4 | 5 |
| | B | 3 | **3.6667** | 1.52753 | 2 | 5 |
| | C | 3 | **4.5000** | .86603 | 3 | 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Practicality | A | 3 | **4.3333** | .57735 | 4 | 5 |
| | B | 3 | **3.1667** | 1.60728 | 2 | 5 |
| | C | 3 | **3.5000** | .86603 | 3 | 4.5 |
| Productivity | A | 3 | **4.0000** | 1.00000 | 3 | 5 |
| | B | 3 | **3.3333** | 1.52753 | 2 | 5 |
| | C | 3 | **4.6667** | .57735 | 4 | 5 |
| Quality | A | 3 | **4.5000** | .86603 | 3.5 | 5 |
| | B | 3 | **3.0000** | 1.00000 | 2 | 4 |
| | C | 3 | **4.3333** | .57735 | 4 | 5 |

The table in Figure 2 represents the results given by the participants in the second portion of the study in the questionnaires completed about each group's work. A score of 1 for creativity meant that the scorer believed that the answers for the creative project were unoriginal and lacked creativity, and a score of 5 meant that the scorer believed that the answers were unique and demonstrated out-of-the-box thinking. A score of 1 for practicality meant that the scorer thought that the answers were impractical and could not be utilized in everyday life, and a score of 5 meant that the scorer thought that the answers could be easily implemented in real life. Scores for productivity mainly referred to the amount of work shown on the papers provided for writing and brainstorming responses to the creative problem. If there was barely any work shown on the paper(s), then the group was deemed unproductive and received a 1. If there was a lot written on the paper(s), then the group was considered very productive and received a score of 5. Scores for quality refer to opinions about the work as a whole. A group will be awarded a score

of 5 if their paper(s) showed a lot of creativity, productivity, and practicality. A group will be given a score of 1 if their paper(s) were overall unoriginal, unproductive, and impractical.

The scores given to each condition for the various grading factors were relatively close in range. This may have been due to the small size of the scale. The greatest range was 3 (this was for Condition B in creativity, productivity, and practicality). Condition A had a mean score of 4.33 for creativity, 4.33 for practicality, 4.00 for productivity, and 4.50 for overall quality. Condition B had a mean score of 3.67 for creativity, 3.17 for practicality, 3.33 for productivity, and 3.00 for quality. Lastly, Condition C received a mean score of 4.50 for creativity, 3.50 for practicality, 4.67 for productivity, and 4.33 for quality. The Oneway ANOVA test that was performed showed that there were no significant differences between groups for creativity ($F(2,6)=.512$, $p>.05$), practicality ($F(2,6)=.886$, $p>.05$), productivity ($F(2,6)=1.091$, $p>.05$), or quality ($F(2,6)=2.920$, $p>.05$). None of the differences between conditions in any of the grading factors were statistically significant.

## Discussion

The results for both parts of the study were surprising. It was expected that the participants in Condition B have more fun and feel more connected to their group members than the participants in the other conditions since they had the opportunity to talk to each other first before working as a team. Condition A was expected to have lower scores of pleasantness and closeness, with Condition C having the lowest scores for both factors. However, there were no statistically-significant differences between any of the conditions in pleasantness or closeness. The mean scores for Condition C may have been lower than the mean scores for the other conditions, but the differences were not great enough to be considered differences caused by the varying instructions given.

It was predicted that there would be significant differences between groups in the feelings of pleasantness and closeness and the scores for creativity, practicality, productivity, and quality. If one group had fun interacting with each other and they felt a certain responsibility and closeness toward their teammates, then they would be intrinsically motivated to perform well on their creative task and they would receive high scores for creativity, practicality, productivity, and overall quality. Unfortunately, the results for the study did not support this hypothesis and there were no statistically-significant differences between any of the conditions with the scores they received on their work.

While there are no significant differences, something interesting to consider is the negative relationship between feelings of pleasantness and closeness and the scores for creativity, practicality, productivity, and quality for Condition B. Condition B has the highest reports of pleasantness and closeness out of all of the conditions, which was expected. However, this condition had the lowest scores for creativity, practicality, productivity, and quality. This finding was completely unexpected since the fun and feelings of comradery among teammates were predicted to produce high-quality answers for a creative issue. Perhaps creating a more enjoyable environment actually distracted the students from performing well on their task. Once again, none of the differences are truly significant, but the minute differences are worth considering.

**Limitations**

There were several extraneous variables during data collection that may have altered the results of the study. Some of the variables were due to factors that were out of the researcher's control, but there may have been individual factors about the participants that had been overlooked and not considered until after data collection had ceased.

**Lighting Problems**

For each day of the first portion of data collection, three separate rooms were reserved in the Guerrieri Academic Commons. One of the rooms had inconsistent lighting and the room reservations could not be changed due to short notice. All Group 3s worked in this room.

For the first day (Condition A), the lights were on at the beginning but turned off while the participants were working together. Instead of working in the dark, they decided to work in the lit hallway. They took their chairs into the hallway and wrote their answers in their laps. The lights then came on spontaneously and the group returned to inside the room. Working in the hallway could have been a problem because it made it easier for Group 3 and Group 2 to listen to each other. This additional noise could have been distracting and hearing the work from another group could have influenced their own work.

On the second day (Condition B), the lights were off the entire time. The participants chose to work partially in the hallway and partially in the room. They moved their chairs in the doorway and wrote their answers in their laps. Students decided themselves where they wanted to be located in relation to the doorway. Working partially in the hallway also could have allowed them to overhear the interactions between the members of Group 2 and Group 2 could have listened to Group 3 as well. Working partially in the dark and hearing the noise from other groups was distracting to the participants and could have impacted their work and interpersonal relations.

For the third day (Condition C), the lights were off the entire time. The participants chose to work in the dark because they decided that the lit hallway provided enough light to allow them to stay inside the room. Working in a dark room could have distracted the participants from the activity. It is also more difficult to see what is being written down when in a darker room.

Clearly, this study is not measuring the difference in creative work between individuals who work in well-lit rooms and those who work in rooms with inconsistent lighting. Since the working conditions differed for Group 3, this could have resulted in unexpected differences in work quality and relationship between group members. In addition, this study was meant to simulate working in a classroom setting. However, dysfunctional lights are not an issue in a typical classroom. For future research, the researcher would need to find a location with lighting that is more reliable.

**Participant Problems**

In many classes, it was advertised that participation in this study would reward students with extra credit for that class. Despite this, there was a serious attendance issue. Students were able to sign up for one of the time slots at which the study was going to take place. Only a couple students from each class signed up for a time slot and many who did sign up did not arrive at the research location. Originally, the plan was to have 3 participants in each group. Unfortunately, some students failed to arrive and there were only 2 participants in Group 3 for Condition A and Group 3 for Condition B.

In addition to the attendance issues, a group of students who were not involved in the study decided to speak to participants as they were working on their creative problem. They were asked to leave, but the students had already been distracted. This incident took place on the first day with Condition A.

**Personality Factors**

In hindsight, personality may have played a larger role in this study than previously believed. The participants were placed into their groups at random and they did not know each other well prior to the experiment (they were not friends, but they recognized each other from

their classes). It was expected that the participants in Condition B would feel closer to each other than the participants in Conditions A and C would feel. Since those in Condition B were instructed to speak to each other and try to get to know each other better, they should have been able to build more of a relationship with their groupmates. However, as noted earlier, there was no significant difference in feelings of closeness between conditions. Perhaps speaking to others for a few minutes was insufficient in forming small bonds between people. I also observed the interactions between all of the groups and realized that not all of them behaved the same way toward each other.

Some participants were naturally outgoing and some were shy. These differences were overlooked in the planning for the study, but they lead to interesting results. In Condition B, there was a group of quiet individuals who did not speak to each other much after being instructed to get to know each other. In Condition C, the students were told to sit quietly and not speak to each other before embarking on the creative task. As a result, they were not expected to have feelings of closeness. However, I noticed some individuals from the groups in this condition interacting enthusiastically with the other participants. They were unfazed by having to work quietly and immediately began speaking to their groupmates as if they were friends.

**Future research**

There were several unexpected factors during data collection that could have influenced the results. Several alterations to the design of the study would need to take place in the future in order to acquire results that are more reliable.

To avoid lighting problems, a different room or building would need to be utilized. It is difficult to predict which rooms and buildings will have inconsistent lighting. However, perhaps data collection can take place in a location with which the researcher is already familiar. Instead

of assuming every room in a building has adequate lighting, researchers should reserve rooms that they have already used for a separate project.

The participants in Part One of the study should all receive personality tests to try to explain differences in interactions between group members. Since the researchers were unaware of participant personality traits that indicate social behaviors, it is unclear whether or not personality played a significant role in the study. However, casual observations of participants during data collection support the idea that the formal inclusion of personality should be considered in future studies.

To address attendance issues, more professors should be contacted about the study so that they can ask their students to participate. For this research, only three professors were contacted. Participation in research is completely voluntary, so students cannot be forced to arrive at the location even if they previously agreed to come. However, the involvement of more psychology classes will increase the probability that the necessary number of students will arrive. Utilizing extra credit as means of recruiting participants is not expected to influence motivation during the activity since participants were informed that they will receive extra credit for merely arriving at the research location.

Finally, while the questionnaires used in Part One and Part Two of the study did not have any clear issues, they can still be improved. The questionnaires given to participants from both parts of the study could have been more detailed so that they could have had more opportunities to fully express how they felt about the task (Part One) or the work they were grading (Part Two). In the first portion, students ranked their experience and feelings of closeness to their group members on scales of 1 to 7. In the second portion, students scored each group's work on scales of 1 to 5. These questionnaires were very simple and could have included more questions

or increased the amount of numbers on the scale so that the participants could have been more specific about their reactions. The questionnaires could also include spaces for participants to explain their rankings instead of just reporting numbers. The inclusion of qualitative data would provide a clearer image of how the participants felt about the work they graded or the experiences they had.

The study of intrinsic motivation in groups should be pursued further. The results of previous studies have been mixed and the results of this study suggest that there are more factors involved than previously predicted. More research is required to develop a deeper understanding of how motivation can influence quality of work.

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# Appendix A

## IRB Approval Letter

Salisbury
*A Maryland University of National Distinction*

Salisbury University
Institutional Review Board
Committee on Human Research
Phone: (410) 548-3549
Fax: (410) 677-0052
Email:humanresearch@salisbury.edu

**IRB Research Protocol Approval Notification**

Date: 10/11/18

To: L. Becker
RE: Protocol #8
Type of Submission: Exempt
Type of IRB Review: Exempt
Protocol is scheduled to begin 9/18 end 5/19

**Approval for this project is valid from 10/11/18 to 5/30/19**

CONGRATULATIONS.

This letter serves to notify Dr. Larence Becker that the Salisbury University (SU) Institutional Review Board (IRB) approved the above referenced protocol entitled, How Do Group Interactions Moderate Productivity October 11, 2018.

Pursuant to Federal regulations 21 CFR 56.109, the IRB has determined that this protocol qualifies for Exempt review.

Federal regulation 45 CFR 46.103 (b)(4)(iii) requires Primary Investigators (PI), except when a subject is in immediate danger, to assure any change to an approved protocol is not initiated prior to IRB review and approval. Additionally, the PI must also inform the IRB of unanticipated problems involving risks to participants.

These same federal regulations require continuing review of research be conducted by the IRB at intervals appropriate to the degree of risk. Your research is scheduled to begin 9/18 and end 5/19. When necessary, the PI will receive a continuing review reminder notice prior to the date protocol approval ends; however, it is the PI's responsibility to submit continuing review reports in a timely manner (at least 3 weeks prior to scheduled end date on the protocol approval).

The SU IRB is organized and operated according to guidelines of the United States Office for Human Research Protections and the United States Code of Federal Regulations and under Federal Wide Assurance No. FWA00020237.

If you have any questions about this review or questions, concerns, and/or suggestions regarding this process, please do not hesitate to contact the Office of Graduate Studies and Research at 410-548-3549 or humanresearch@salisbury.edu.

Kimberly VanVolkenburg
Chair, IRB Committee on Human Research

Appendix B

Informed Consent: Part 1

INFORMED CONSENT: Part 1

Dr. Becker from the Psychology Department and honors student Joy Hayward are currently conducting a study on group problem solving.

Description of the study: During the study you will be assigned to work with two other students. Your group will collaborate on coming up with ideas to solve a problem creatively.

There are no known risks involved above what might occur in a normal classroom situation. You will also be asked to complete some demographic questions (e.g., age and gender). Please be aware that at no time will you be asked to put your name on any of the materials and we will make no attempt to match your name to any of your responses. To assure your anonymity we will not be collecting any information that can identify you.

It should take you no longer than 45 minutes to complete the study. General Psychology students will receive one unit of extra credit for their participation. The amount of extra credit given to those participating in upper-division classes will be determined by the individual professors.

While your cooperation and participation are greatly appreciated, participation in this research study is strictly voluntary; your participation or lack thereof will not affect your academic standing at this institution in any way. Choosing to withdraw from this study is your choice and will in no way affect your standing at this institution.

**BENEFITS**: Your participation is very valuable and will help us further understand how people work together and generate ideas.

Signing this form signifies your consent to participate in this research.

If you have any questions about this study or would be interested in the results, please contact **Dr. Larence Becker lxbecker@salisbury.edu, 410-677-0033 or The Office of Graduate Studies and Research at Salisbury University at 410-548-3549 or toll free 1-888-543-0148.**

Thank you for your cooperation,

Dr. Larence Becker
Assistant Professor of Psychology
Salisbury University

I have read the above information and agree to participate in this research.

Signature_____ Date _____

Appendix C

Informed Consent: Part II

INFORMED CONSENT: Part II

Dr. Becker from the Psychology Department and honors student Joy Hayward are currently conducting a study on group problem solving.

Description of the study: During the study you will view the creative solutions to a number of practical problems. Your task will be to evaluate these solutions for their creativity, usefulness, and overall quality.

There are no known risks involved above what might occur in a normal classroom situation. You will also be asked to complete some demographic questions (e.g., age and gender). Please be aware that at no time will you be asked to put your name on any of the materials and we will make no attempt to match your name to any of your responses. To assure your anonymity we will not be collecting any information that can identify you.

It should take you no longer than 30 minutes to complete the study. General Psychology students will receive one unit of extra credit for their participation. The amount of extra credit given to those participating in upper-division classes will be determined by the individual professors.

While your cooperation and participation are greatly appreciated, participation in this research study is strictly voluntary; your participation or lack thereof will not affect your academic standing at this institution in any way. Choosing to withdraw from this study is your choice and will in no way affect your standing at this institution.

**BENEFITS**: Your participation is very valuable and will help us further understand how people work together and generate ideas.

Signing this form signifies your consent to participate in this research.

If you have any questions about this study or would be interested in the results, please contact **Dr. Larence Becker lxbecker@salisbury.edu, 410-677-0033 or The Office of Graduate Studies and Research at Salisbury University at 410-548-3549 or toll free 1-888-543-0148.**

Thank you for your cooperation,

Dr. Larence Becker
Assistant Professor of Psychology
Salisbury University

I have read the above information and agree to participate in this research.

Signature_____ Date _____

Appendix D

Demographic Form

#_____

**Demographic Information:**

Please answer the following questions as accurately as possible. If you have any questions, feel free to ask the experimenters.

*If you do not have a declared major, please indicate the one in which you are most interested.

Major:_____

Minor:_____

Class: (circle one) Fr. So. Jr. Sr.

Age:_____

Gender: _____

Appendix E

Questionnaire for Part 1

**Questionnaire**

I was in Group # _____

1. On a scale of 1 to 7, with 1 being unpleasant and 7 being pure joy, describe your experience with working on this problem. (Please provide a numerical response)

2. On a scale of 1 to 7, with 1 being not very close and 7 being very close, describe how you feel toward the members of your group. (Please provide a numerical response)

Appendix F

Questionnaire for Part II

Group (A, B, or C)
Group #_____

There will be a group number written on the paper(s) you are scoring. Please write this number in the space above.

- On a scale of 1 to 5 with 1 being **least creative** and 5 being **highly creative/original,** how would you rate this group's work? (Please provide a numerical response)

- On a scale of 1 to 5 with 1 being **impractical** and 5 being **very useful/practical**, how would you rate this group's work? (Please provide a numerical response)

- On a scale of 1 to 5 with 1 being **unproductive** and 5 being **most productive**, how would you rate their work? (Please provide a numerical response)

- On a scale of 1 to 5 with 1 being **low quality** and 5 being **highest quality**, how would you rate this group's work? (Please provide a numerical response)

## Appendix G

### Debriefing Statement

The purpose of this study was to investigate how to best motivate groups of students to work creatively and productively. There was no risk involved in this study beyond those of working together in a classroom and the benefits are to advance scientific knowledge and help organizations (businesses, schools, etc.) in which work is performed in groups.
More specifically, we wanted to see the effect of various forms of intrinsic motivation. (In extrinsic motivation, one receives a reward for achievement whereas intrinsic motivation refers to accomplishing a task to simply please oneself or others). There were three groups in the study, and through our experimental manipulation, they each required different levels of intrinsic motivation to perform the creative task. One group was given a choice as to what to explore, another had the opportunity to become well acquainted with each other, and the third had neither of these opportunities. It is our hypothesis that the group having the greatest intrinsic motivation would have the best ideas.

If you would like to learn more about motivation of groups we recommend the following article:

Carr, P. B., & Walton, G. M. (2014). Cues of working together fuel intrinsic motivation. *Journal of Experimental Social Psychology, 53,* 169-184.

If you have any questions about this study or would be interested in the results, please contact Dr. Larence Becker lxbecker@salisbury.edu, Department of Psychology, Salisbury University.

If you have any adverse effects or concerns about the research, please contact the primary investigator or the University Research Services Department at Salisbury University at 410-548-5395 or toll free 1-888-543-0148.

***All papers submitted by participants will be kept in a secure location and no attempt will be made to discover participant identities.

*We would appreciate it if you would not discuss this study with others, as this experiment is ongoing and knowledge of the hypotheses could change people's behavior.*

*In addition, please do not reveal the identity of other participants or the nature of your interactions.*

Thank you for your participation,

Dr. Larence Becker
Assistant Professor of Psychology
Salisbury University