Improving Individual Idea Generation with the Selective Brainwriting Technique

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ABSTRACT
In a growing competitive environment, innovation has become increasingly important for many organizations. Several different idea generation techniques have been researched, of which brainstorming and brainwriting are the best known. In the field of brainwriting, the anonymous and non-anonymous idea generation techniques have been thoroughly investigated. However, both techniques showed some disadvantages. Free-riding complicated the idea generation process for the anonymous technique, while evaluation apprehension showed to be a disadvantage of the non-anonymous technique. This paper focused on a combination of the two aforementioned techniques, the selective anonymous technique. The paper aimed to investigate whether the selective anonymous technique surpasses the other two techniques regarding (1) the number of ideas generated, (2) the average quality of ideas generated, and (3) the best idea quality generated. Although for answering the research questions and the corresponding hypotheses no significant relationships have been found, the quality measure purchase intent showed a significant effect on the best-generated ideas, just as the variables free-riding and evaluation apprehension on idea quantity. The findings could be of importance for businesses and future research.

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Idea generation; brainwriting; anonymity; non-anonymity; selective anonymity; free-riding; evaluation apprehension

1. INTRODUCTION

1.1 Academic Relevance

Innovation is one of the most important conditions for businesses in order to survive in an increasingly competitive environment (e.g. Anderson, De Dreu, & Nijstad, 2004, as cited in Le Hénaff, Michinov, & Le Bohec, 2018). It requires ongoing creativity and idea generation. The organizational development of a new technology is one example of an innovation. Dozens or even hundreds of ideas need to be generated first of which only a few get selected and go to the next stages in the innovation funnel. Many organizations use different approaches to idea generation and problem-solving processes. In the field of innovations normally the extremes matter, whereas in the manufacturing field the average idea quality is preferred (Girotra, Terwiesch, & Ulrich, 2010).

Frequently researched idea generation techniques are brainstorming and brainwriting. In this paper, the selective anonymous brainwriting technique for idea generation has been further researched, to find a possibly outstanding way in which many high-quality and valuable ideas can be developed for future business use. The selective brainwriting technique is a combination of the anonymous and non-anonymous brainwriting techniques. For the (non-)anonymous techniques, the subjects worked first individually on idea generation and afterwards shared their ideas either anonymously or non-anonymously, depending on which technique they have been assigned to. Prior research has focused on a few processes which have been found to negatively influence the process of idea generation; free-riding and evaluation apprehension (Diehl & Stroebe, 1987). The free-riding process can be described as a process in which subjects tend to underperform during group work as opposed to individual work, and meanwhile benefit from other participant's work (Ruël, Nauta, & Bastiaans, 2003). Since monitoring the subjects during idea generation sessions seems to lower free-riding, free-riding seems to be mainly a problem for the anonymous approach (Gallupe, Bastianutti, & Cooper, 1991). The evaluation apprehension process is described as a process in which subjects are hesitant to share their ideas because they are concerned about a negative reaction from the other subjects (Diehl & Stroebe, 1987) (Paulus & Nijstad, 2003). Evaluation apprehension negatively affects the non-anonymous approach, since only for this approach peer assessment is possible (Paulus & Nijstad, 2003) (Diehl & Stroebe, 1987) (Gallupe, Bastianutti, & Cooper, 1991).

The selective anonymous technique has been, in addition to the other two techniques, researched through a laboratory experiment. Subjects have been asked to come up with sports and fitness product ideas for the student market, and only the best 10 percent of the ideas have been namely revealed, whereas the results of the other two techniques have either not or completely been revealed. The results have been investigated to find out if the selective anonymous technique reduced evaluation apprehension and free-riding and if it enhanced the idea generation process, with respect to (1) the number of ideas generated, (2) the average quality of the generated ideas, and (3) the quality of the best ideas generated. The research relied on subjective evaluation of the generated ideas.

1.2 Research Question

Following on from the academic relevance, the research question of the experiment is:

"Does the selective anonymous brainwriting technique generate significantly higher idea quality and idea quantity per subject compared to the (non-)anonymous brainwriting techniques?"

1.3 Report Structure

The paper is structured as follows. First, the main literature has been reviewed in §2. In §3, the theory has been developed including the conceptual framework and the hypotheses of the research. Section 4 describes the experimental design and §5 describes the methodology. The results of the experiment have been described in §6. Section 7 describes the discussion of the experiment which focused on the contributions to theory and practice, while the research question has been answered in §8, the conclusion. Limitations and further research have been elaborated in §9.

2. LITERATURE

As described by Girotra, Terwiesch, & Ulrich in 2010, the idea generation process has been studied by the social psychology literature, which is also often termed as the brainstorming literature.

The brainstorming technique can be described as a method that advocates the creative thinking process. The term "brainstorming" became popular in 1939 when Alex Osborn, who was the first to come up with the method in a business context, claimed that the method increases both idea quality and quantity generated in the group process, and that it has many advantages over generating ideas individually (Osborn, 1957). Osborn (1957) developed the brainstorming method after concluding that also regular group work counteracted rather than enhanced creativity. A set of rules has been formulated to ensure successful execution of a brainstorming session. For instance, criticism is not allowed, combinations and improvements are encouraged and the session should not be over-structured (Osborn, 1957) (Furnham, 2000).

Several benefits of the brainstorming method have been claimed. For instance, it reduces dependence on a single authority figure, it encourages open sharing of ideas and it tends to be enjoyable (Napier & Gershenfeld, 1985).

However, the brainstorming method received increased criticism. Taylor et al. (1958) began to contradict this method and stated that it was not as effective as proclaimed.

They found that groups consisting of subjects who first brainstormed alone and afterwards combined their individual ideas (often termed as nominal groups) performed better than cooperating groups with subjects who worked together during the whole session (often termed as the real groups) (Taylor, Berry, & Block, 1958).

Brainwriting is a different technique which can be used for the idea generation process, which is very similar to the nominal technique. For the technique subjects share their individual written ideas after individual idea generation to enhance creativity and productivity (Paulus & Yang, 2000). Some other advantages are: (1) it encourages subjects to think the generated ideas through and to express them in a clear manner, (2) every subject has the same circumstances to work on idea generation, e.g. the same amount of time, (3) there is no pressure towards group conformity, and (4) it provides a substantial orientation towards the idea generation task,

which keeps subjects concentrated (Roco, 2004, as cited in Litcanu et al., 2015).

The idea generation techniques which have been introduced do have advantages and disadvantages. The scope of the disadvantages can often be explained with two main processes that have been found to negatively influence the idea generation process; evaluation apprehension and free-riding (Diehl & Stroebe, 1987).

Another process named production blocking has also been found to negatively influence the idea generation process. Production blocking has been described as a process that occurs when subjects during brainstorming sessions cannot share their ideas immediately, which could lead to suppressing or forgetting ideas, and thus to a lower productivity (Diehl & Stroebe, 1987). However, production blocking only occurs in real groups and not in electronic and nominal groups, which means that production blocking has been irrelevant for this experiment.

Evaluation apprehension and free-riding have been elaborated further in §2.1 and §2.2.

2.1 Evaluation Apprehension

Evaluation apprehension describes that subjects are reluctant to share their ideas in fear of a negative response from other subjects (Diehl & Stroebe, 1987) (Paulus & Nijstad, 2003). Because of the lack of peer evaluation, evaluation apprehension seems not to be a problem in anonymous brainwriting groups (Paulus & Nijstad, 2003) (Gallupe, Bastianutti, & Cooper, 1991). Evaluation apprehension leads to a decreased idea generation performance (McFadzean, 2008).

2.2 Free-riding

Free-riding, which is also known as a form of social loafing, is a process in which subjects tend to contribute less to certain activities when working in a group than individually, while benefiting from other's work (Ruël, Nauta, & Bastiaans, 2003). Free-riding is related to group size, because an increase in group size lowers the identifiability of the individual contribution (Latané, Williams, & Harkins, 1979) (Diehl & Stroebe, 1987). Additionally, free-riding seems to be often negatively effected by the dispensability of a task, which means that when individuals believe that every group member works on different idea generation tasks perform better and create more ideas than individuals who believe that everyone works on the same task, as researched by Harkins and Petty in 1982 (Harkins & Petty, 1982, as cited in Diehl & Stroebe, 1987).

Monitoring does also play a role during idea generation processes. Since the productivity of idea generation can only be monitored in a non-anonymous setting, it implies that it is mainly a problem for the anonymous technique (Gallupe, Bastianutti, & Cooper, 1991). Moreover, it has been described as a problem for all other mentioned idea generation techniques (Paulus & Nijstad, 2003). Consequently, free-riding leads to a decreased idea generation productivity (Gallupe, Bastianutti, & Cooper, 1991).

3. THEORY

In view of the fact that this report focused on the field of innovation, a focus has been, next to the average idea quality, placed on the best quality of the generated ideas, since it is more important to have at least one extremely good idea, than several average-quality ideas. As has been argued by Girotra et al. (2010), most organizations focus on the extremes, instead of the average idea quality. However, the quality of a rough idea is subject to a high degree of uncertainty. Therefore, most organizations invest in multiple good ideas, instead of just one (Girotra, Terwiesch, & Ulrich, 2010).

As previously stated, the focus has been placed on the (non-)anonymous and selective anonymous approach for idea generation. The question is how the selective anonymous approach, which is a combination of the (non-)anonymous techniques and only reveals the best individually generated ideas, might offer advantages over the other two techniques. As elaborated in §2.1 and §2.2, the two main processes which stand out by explaining the differences between the techniques are free-riding and evaluation apprehension (Diehl & Stroebe, 1987).

Because the productivity of idea generation can only be monitored when the generated ideas belong to the top, it is likely that the selective anonymous technique shows a lower value of free-riding compared to the anonymous technique.

In addition, the selective anonymous technique might show a lower value of evaluation apprehension than the non-anonymous technique, since only the best ideas will be published and therefore the subjects will not have to fear bad responses.

Because both effects have been expected to be smaller for the selective anonymous technique, it has been expected that the selective anonymous technique scores higher on the level of idea quality and idea quantity. The corresponding hypotheses have been given and explained in §3.2.

3.1 Conceptual Framework

Based on the literature and the theory, a conceptual framework has been developed. The framework, as illustrated in figure 1, shows the direct causal relationship between the three techniques on idea quality and quantity. The treatment or "explanatory" variable is the selective anonymous technique, while the (non-)anonymous techniques function as control variables. Evaluation apprehension and free-riding function as mediator variables, which means that they considerably decrease the direct causal effects between the dependent variables, the three techniques, and the independent variables, the idea quality and the idea quantity (Abu-Bader & Jones, 2021).

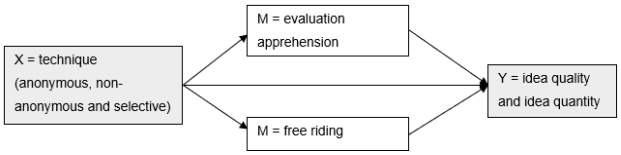

Figure 1. The conceptual framework.

3.2 Hypotheses of the Experiment

Based on the literature, the theory, and the conceptual framework, it is expected that the number of ideas generated by the subjects of the study is higher for the selective anonymous technique than for the (non-)anonymous techniques. Therefore, the first hypothesis is:

Hypothesis 1. *The number of ideas generated per subject is significantly higher for the selective anonymous technique than for the (non-)anonymous techniques.*

It is also expected that the quality of the best ideas generated by the subjects of the study is higher for the selective anonymous technique than for the (non-)anonymous techniques. Therefore, the second hypothesis is:

Hypothesis 2. *The quality of the best-generated ideas per subject is significantly higher for the selective anonymous technique than for the (non-)anonymous techniques.*

Formulated on the theory in §2.1 and §3, it is expected that the variable evaluation apprehension acts as a mediator variable between the direct causal effects of the three techniques on idea quantity and idea quality. Therefore, the third and fourth hypotheses are:

Hypothesis 3. *The direct causal effects of the three techniques on idea quantity are significantly influenced by the mediator variable evaluation apprehension.*

Hypothesis 4. *The direct causal effects of the three techniques on idea quality are significantly influenced by the mediator variable evaluation apprehension.*

Based on the literature and theory described in §2.2 and §3, it is expected that the variable free-riding acts as a mediator variable between the direct causal effects of the three techniques on idea quantity and idea quality. Therefore, the fifth and sixth hypotheses are:

Hypothesis 5. *The direct causal effects of the three techniques on idea quantity are significantly influenced by the mediator variable free-riding.*

Hypothesis 6. *The direct causal effects of the three techniques on idea quality are significantly influenced by the mediator variable free-riding.*

4. EXPERIMENTAL DESIGN

In order to compare the selective anonymous brainwriting technique to the (non-)anonymous techniques, an experiment has been designed to measure the average quality of the generated ideas, the quality of the best-generated ideas and the quantity of the ideas generated. The research has been conducted through an electronic survey, which is a quantitative data collection method. The survey can be found in the appendix, §A.1. The research has been conducted by a between-subjects study design, which implies that every subject only tested one of the three designs (the selective anonymous technique or one of the (non-)anonymous techniques).

4.1 Subjects

The 106 subjects of the experiment have been recruited from the University of Twente, the University of Stuttgart, and the University Erlangen-Nürnberg. Most subjects were bachelor's and master's degree candidates. The subjects did not receive training related to idea generation techniques beforehand. The subjects were informed that they participated in the experiment and all subjects voluntarily agreed to participate. The experiment took place after receiving the official approval of the BMS Ethics Committee. No incentives were given to the subjects.

4.2 Treatments

The subjects of the research have been randomly assigned to one of the three study designs.

The subjects completed the electronic survey within a time restriction of 5 to 10 minutes. All subjects have been specifically asked whether they knew what technique (the treatment variable or one of the two control variables) they received, to ensure high reliability of the experiment.

4.3 Experiment

The subjects have been divided over the three techniques. The subjects have been asked to come up with ideas for new sports equipment products for the student market. The challenge of the experiment has been follows.

Challenge. You have been retained by a manufacturer of sports and fitness products to identify new product concepts for the student market. The manufacturer is interested in any product that might be sold to students in a sporting goods retailer. The manufacturer is particularly interested in products likely to be appealing to students. These products might be solutions to unmet needs or improved solutions to existing needs.

Figure 2 shows the experimental design.

Technique	Experimental design
1: Anonymous	- The description of each idea will not be revealed - The overall rank and evaluation score of each idea will not be revealed - The name of each idea's creator will not be revealed
2: Non-anonymous	- The description of each idea will be revealed - The overall rank and evaluation score of each idea will be revealed - The name of each idea's creator will be revealed
3: Selective anonymous	- The description of each idea will be revealed only if the idea is ranked among the top 10% - The overall rank and evaluation score of each idea will be revealed only if the idea is ranked among the top 10% - The name of each idea's creator will be revealed only if the idea is ranked among the top 10%

Figure 2. The experimental design.

A total of 461 ideas were generated.

5. METHODOLOGY

A precise measurement of the independent variables, the selective anonymous technique (functioning as treatment variable), and the (non-)anonymous techniques (functioning as control variables) on idea quality and quantity is essential in order to answer the research question and the corresponding hypotheses. Section 5.1 explains the measurements of the generated idea quality. Section 5.2 explains how the best-generated ideas have been measured. Section 5.3 elaborates how the direct effects have been measured, while §5.4 explains the measurement of the mediator variables and §5.5 elaborates the significance of the analysis. Section 5.6. elaborates removed values of the data.

5.1 Measurement of Performance

An accurate assessment of the idea quality is crucial for testing the theory. Therefore, the quality has been estimated in three different ways: the purchase intent, the originality and the usefulness of the products. The estimation has been done by several experts of the University of Twente through the Consensual Assessment Technique (CAT). The method has

been created by Amabile in 1982, and assumes that expert judges know when products are creative and no consensus is needed on a prior definition of creativity (Amabile, 1982) (Dollinger & Shafran, 2005). All experts needed to assess the idea quality in compliance with the guidelines and materials they received, and many responses should have been the result of the creative judgement (Amabile, 1982).

5.1.1 Purchase Intent

The first measurement of idea quality has been the purchase intent. The descriptions of the ideas have been evaluated from a customer point-of-view, where on a scale from 1 (very unlikely) to 7 (very likely) an assessment has been made on whether the experts would purchase the products or not. The descriptions of the generated product ideas have been randomly assessed via a Web-based interface, and every expert needed to assess 461 ideas by the use of the CAT method.

Prior researchers, such as Girotra et al. (2010), have distinguished the quality of novel products as multidimensional, including attractiveness and feasibility as dimensions. The quality of the generated ideas has furthermore been assessed by the use of several other metrics. Some of these were technical feasibility, specificity and demand, which also have been used for this research for measuring the purchase intent (Girotra, Terwiesch, & Ulrich, 2010).

Cronbach's Alpha has been used for measuring the interrater reliability. Cronbach's Alpha is a statistical measure which has been introduced by Lee Cronbach in 1951 (Cronbach, 1951). The measure "demonstrates that tests and scales that have been constructed or adopted for research projects are fit for purpose" (Taber, 2018). Cronbach's Alpha is expressed as a value between 0 (lowest reliability) and 1 (highest reliability), where acceptable values of alpha often lie between 0.70 and 0.95 (Tavakol & Dennick, 2011). However, some researchers accept values starting from an alpha value of 0.450 (Taber, 2018).

5.1.2 Novelty

The second measure of idea quality has been the novelty of the product ideas. The factors uniqueness and originality were given particular consideration for the measurement. For this approach, the experts took the perspective of customers, and assessed the novelty on a scale of 1 (not novel at all) to 7 (very novel) by using the CAT method. Cronbach's Alpha has been used to measure the interrater reliability.

5.1.3 Usefulness

The third measure of idea quality has been the usefulness of the generated ideas. The usefulness has been ranked on a scale from 1 (no value to users) to 7 (great value to users) by the use of the CAT method. Similarly to §5.1.1 and §5.1.2, the statistical method Cronbach's Alpha has been used for measuring the interrater reliability.

5.2 Best-generated Ideas

As explained in section 3, a focus on the best idea quality can be of higher importance than the average idea quality in the field of innovation. Therefore, a top 5 and top 8 of the best-generated ideas have been, next to the average values, created per treatment and the control variables. The top 5 and top 8 consist of a combination of the idea quality measures novelty, user value, and purchase intent. All measures are weighted equally. Additionally, a top 5 and top 8 have been created per quality measure.

5.3 Direct Causal Effects

The direct causal effects of the three techniques on idea quality and idea quantity (variables X on Y, as shown in figure 1) have been analyzed by first splitting them into three dummy variables. Thereafter the direct effects have been measured by the use of a One-Way analysis of variance (ANOVA) and multiple linear regression (MLR).

For the measurement of the generated idea quantity, no other measures have been used. The idea quantity has been corrected for the varying number of subjects per technique, by dividing the total amount of generated ideas per technique by the number of participants per technique.

5.4 Mediation Analysis

To identify whether the involvement of the mediator variable (M, which can be found in figure 1) in the regression analysis significantly decreases the effects of the independent variables (X) on the dependent variables (Y), a Sobel test could be run, a statistical test proposed by Sobel in 1982 (Abu-Bader & Jones, 2021) (Preacher & Leonardelli, 2001).

In order to identify the direct effects between the treatment variable and the two control variables on the mediator variables evaluation apprehension and free-riding (variables X on M, as illustrated in figure 1), One-Way ANOVA and MLR have been run. For the analysis of the free-riding variable, the inverse of the variable has been used, since a high value would then indicate a high value of free-riding. The independent variables have been split into dummy variables before the analysis (dummy coded 0 or 1).

Also for analysing the direct effects of the mediator variables on idea quality and idea quantity (variables M on Y), One-Way ANOVA and simple linear regressions (SLR) have been run.

A Sobel test would be run when a direct causal effect of the treatment and control variables on the idea quality and quantity would be identified (variables X on Y). Subsequently, the direct causal effects and the direct effects of the treatment and control variables on the mediator variables would be used as predictors in multiple regression, in order to find the mediation effects of the variables evaluation apprehension and free-riding on the dependent variables, the idea quality and idea quantity (variables M on Y).

For conducting the Sobel test, the unstandardized beta weight and standard error of all relations (X on Y, X on M and M on Y) are needed, in order to test the indirect mediation effect for statistical significance (Preacher & Leonardelli, 2001).

5.5 Significance

If not stated otherwise, an alpha level of 0.1 has been used for the significance of the analysis.

5.6 Removing Data

Before the analysis of the generated ideas, an evaluation has been held by all experts in order to identify unusable idea descriptions. Those ideas have been deleted.

6. RESULTS

6.1 Removed data

Before the analysis of the data, 6 generated ideas were removed, which led to a remaining amount of 455 ideas. The removed ideas had vague descriptions of products that could not have been rated correctly. The list of the removed ideas

can be found in the appendix, §A.2. The removal of the data led to the exclusion of 1 subject.

6.2 Interrater Reliability

Table 1 shows the results of the Cronbach's Alpha interrater reliability. The interrater reliability of the quality measure novelty has been 0.861. The measures user value and purchase intent showed a lower alpha value of 0.548 and 0.520, respectively.

Table 1. The interrater reliability.

Idea quality measure	Cronbach's Alpha	N of items
Novelty	0.861	7
User value	0.548	7
Purchase intent	0.520	7

6.3 Direct Effects of Techniques on the Number of Ideas Generated

Although the selective anonymous idea generation technique showed a slightly higher amount of generated ideas per subject (M = 4.43, compared to M = 4.17 for the anonymous technique and M = 4.39 for the non-anonymous technique, as illustrated in table 2), no significant differences between the three techniques on idea quantity have been found ($F(2,102) = 0.13$, $p = 0.878$, as illustrated in table 3).

Table 2. Descriptives – three techniques on idea quantity.

Technique	N	Mean	Std. Deviation
1 Anonymous	35	4.17	2.549
2 Non-anonymous	28	4.39	2.217
3 Selective anonymous	42	4.43	2.177
Total	105	4.34	2.298

Table 3. ANOVA[a] effects – three techniques on idea quantity.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.398	2	0.699	0.130	0.878[b]
	Residual	547.936	102	5.372		
	Total	549.333	104			

a. Dependent variable: idea quantity

b. Predictors: control variable 1 = anonymous, control variable 2 = non-anonymous

Based on these data the first hypothesis has been rejected, which stated that the number of ideas generated per subject is higher for the selective anonymous technique than for the (non-)anonymous techniques, since no significant differences have been found between the three techniques on idea quantity.

6.4 Effects Between the Techniques on Average Idea Quality

Table 4 shows the direct effects between the three techniques on the average idea quality. No significant differences have been found of the three techniques on the average idea quality ($F(2,452) = 0.326$, $p = 0.722$).

Table 4. ANOVA[a] effects – three techniques on average idea quality.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.248	2	0.124	0.326	0.722[b]
	Residual	172.170	452	0.381		
	Total	172.418	454			

a. Dependent variable: average idea quality

b. Predictors: control variable 1 =anonymous, control variable 2 = non-anonymous

6.5 Quality of the Best-generated Ideas

Table 5 shows the descriptives of the top 5 of the idea quality. Although the mean of the top 5 idea quality is slightly higher for the selective anonymous technique than for the other two techniques (M = 5.05, compared to M = 5.02 for the anonymous technique and M = 4.97 for the non-anonymous technique), no significant differences have been found between the three techniques ($F(2,12) = 0.126$, $p = 0.883$, as illustrated in table 6).

Table 5. Descriptives – three techniques on combined top 5 idea quality.

Technique	N	Sum	Mean	Std. Deviation
Anonymous	5	25.11	5.02	0.347
Non-anonymous	5	24.83	4.97	0.245
Selective anonymous	5	25.24	5.05	0.168

Table 6. ANOVA effects – three techniques on the top 5 idea quality.

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.018	2	0.009	0.126	0.883
Within Groups	0.835	12	0.070		
Total	0.852	14			

In order to test the validity of the top 5 analysis, an alternate version has been created, the top 8. Although some slight differences between the mean scores of the treatment and control variables on combined idea quality, novelty, user value and purchase intent have been found, no differences have been found within the significance. The descriptions and the ANOVA tables of the top 8 can be found in the appendix, §A.3.

The descriptions of the top 5 and top 8 generated ideas can be found in appendix §A.4, together with their associated scores. Because no significant effects have been found of the techniques on the best-generated ideas, an ANOVA has been conducted for the three techniques on novelty, user value and purchase intent.

6.5.1 Novelty

Despite the fact that the selective anonymous technique showed a higher average score on idea novelty (M = 5.81, compared to M = 5.69 and M = 5.68, as shown in table 7), the ANOVA revealed no significant effects between the treatment and the control variables on the novelty of the generated ideas ($F(2,12) = 0.208$, $p = 0.815$). Table 8 shows the ANOVA table of the three techniques on idea novelty.

Table 7. Descriptives – three techniques on top 5 idea novelty.

Technique	N	Sum	Mean	Std. Deviation
Anonymous	5	28.44	5.69	0.344
Non-anonymous	5	28.39	5.68	0.110
Selective anonymous	5	29.03	5.81	0.484

Table 8. ANOVA effects – three techniques on top 5 idea novelty.

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.051	2	0.025	0.208	0.815
Within Groups	1.460	12	0.122		
Total	1.511	14			

6.5.2 User Value

Comparably to section 6.5.1, the selective anonymous technique showed a higher average score on user value (M = 5.63, compared to M = 5.58 and M = 5.48, as shown in table 9), but no significant effects between the treatment and the control variables on user value (F(2,12) = 0.741, p = 0.497), as shown in table 10.

Table 9. Descriptives – three techniques on top 5 user value.

Technique	N	Sum	Mean	Std. Deviation
Anonymous	5	27.92	5.58	0.077
Non-anonymous	5	27.42	5.48	0.250
Selective anonymous	5	28.17	5.63	0.223

Table 10. ANOVA effects – three techniques on top 5 user value.

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.058	2	0.029	0.741	0.497
Within Groups	0.472	12	0.039		
Total	0.531	14			

6.5.3 Purchase Intent

A significant effect has been found between the treatment and the control variables on purchase intent (F(2,12 = 12.059, p = 0.001). The descriptives are shown in table 11. Table 12 shows the ANOVA effects of the analysis.

Table 11. Descriptives – three techniques on top 5 purchase intent.

Technique	N	Sum	Mean	Std. Deviation
Anonymous	5	25.42	5.08	0.077
Non-anonymous	5	23.88	4.78	0.215
Selective anonymous	5	25.91	5.18	0.062

Table 12. ANOVA effects – three techniques on top 5 purchase intent.

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.449	2	0.224	12.059	0.001
Within Groups	0.223	12	0.019		
Total	0.672	14			

Because no significant differences between the three techniques on best idea quality have been found, the second hypothesis, which stated that the quality of the best-generated ideas per subject is significantly higher for the selective anonymous technique than for the (non-)anonymous techniques, also has been rejected.

However, as opposed to the other two quality measures idea novelty and user value, a significant effect has been found of the three techniques on purchase intent, which means that the selective anonymous technique does lead to a higher purchase intent.

6.6 Effects of Independent Variables on the Mediator Variables

No significant effect between the three techniques on the mediator variable evaluation apprehension has been found (F(2,102) = 1.949, p = 0.148).

Furthermore, no significance has been found between the techniques on the mediator variable free-riding (F(2,102) = 1.314, p = 0.273). The descriptives of the tests are shown in table 13. Table 14 and table 15 show the ANOVA effects.

Because no significant results have been found, the third and fourth hypotheses have also been rejected, which described that the direct causal effects of the three techniques on idea quantity and idea quality are significantly influenced by the mediator variable evaluation apprehension. The fifth and sixth hypotheses, which described that the direct causal effects of the three techniques on idea quantity and idea quality are significantly influenced by the mediator variable free-riding, have also been rejected.

Table 13. Descriptives – three techniques on the mediator variables.

Mediator Variable	Technique	N	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Evaluation apprehension	1 Anonymous	35	2.71	1.255	0.212	1.00	5.75
	2 Non-anonymous	28	3.26	1.279	0.242	1.00	5.25
	3 Selective anonymous	42	3.18	1.209	0.187	1.00	6.00
	Total	105	3.04	1.248	0.058	1.00	6.00
Free-riding	1 Anonymous	35	3.51	1.153	0.195	1.00	7.00
	2 Non-anonymous	28	3.20	0.904	0.171	1.50	5.00
	3 Selective anonymous	42	3.58	0.937	0.145	2.00	6.00
	Total	105	3.46	0.998	0.046	1.00	7.00

Table 14. ANOVA[a] effects – three techniques on evaluation apprehension.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6.025	2	3.013	1.949	0.148[b]
	Residual	157.657	102	1.546		
	Total	163.682	104			

a. Dependent variable: evaluation apprehension
b. Predictors: control variable 1 = anonymous, control variable 2 = non-anonymous

Table 15. ANOVA[a] effects – three techniques on free-riding.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.659	2	1.329	1.314	0.273[b]
	Residual	103.189	102	1.012		
	Total	105.848	104			

a. Dependent variable: free-riding
b. Predictors: control variable 1 = anonymous, control variable 2 = non-anonymous

6.7 Effects of Mediator Variables on Idea Quality and Idea Quantity

No significant effect of the mediator variable evaluation apprehension on the average idea quality has been found ($F(1,103) = 0.142$, $p = 0.707$, as illustrated in table 16). However, a significant effect of evaluation apprehension on idea quantity ($F(1,103) = 5.847$, $p = 0.017$) has been found, as shown in table 17.

Table 16. ANOVA[a] effects – evaluation apprehension on average idea quality.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.038	1	0.038	0.142	0.707[b]
	Residual	27.335	103	0.265		
	Total	27.373	104			

a. Dependent variable: average idea quality
b. Predictor: evaluation apprehension

Table 17. ANOVA[a] effects – evaluation apprehension on idea quantity.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.510	1	29.510	5.847	0.017[b]
	Residual	519.823	103	5.047		
	Total	549.333	104			

a. Dependent variable: idea quantity
b. Predictor: evaluation apprehension

Regarding the effect of the mediator variable free-riding on the average idea quality, no significance has been found ($F(1,103) = 2.854$, $p = 0.094$), as can be seen in table 18. However, as shown in table 19, a significant effect of the mediator variable free-riding on idea quantity has been found ($F(1,103) = 21.480$, $p = 0.000$).

Table 18. ANOVA[a] effects – free-riding on average idea quality.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.738	1	0.738	2.854	0.094[b]
	Residual	26.635	103	0.259		
	Total	27.373	104			

a. Dependent variable: average idea quality
b. Predictor: free-riding

Table 19. ANOVA[a] effects – free-riding on idea quantity.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	94.791	1	94.791	21.480	0.000[b]
	Residual	454.543	103	4.413		
	Total	549.333	104			

a. Dependent variable: idea quantity
b. Predictor: free-riding

6.8 THE MEDIATION EFFECT

Because no direct causal effects of the treatment variable and the two control variables on idea quantity and average idea quality could have been significantly identified, conducting a Sobel test would have been irrelevant.

7. DISCUSSION

Three significant results have been found during the experiment, which were the three techniques on the top 5 purchase intent and the mediator variables free-riding and evaluation apprehension on idea quantity. Although only limited significance has been found, the results may contain valuable information. The contribution to theory has been discussed in §7.1, and the contribution to practice has been elaborated in §7.2.

7.1 Contribution to Theory

For the selective anonymous technique, the mediator variable evaluation apprehension described a higher average than the anonymous technique. This finding has to a certain extent been in compliance with the research done by Paulus & Nijstad in 2003. However, in non-compliance with their research in which they stated that evaluation apprehension is a problem for the non-anonymous technique, a lower value of the anonymous technique on evaluation apprehension has been expected, in view of the fact that the subject's names have not been published (Paulus & Nijstad, 2003).

In compliance with the research done by Paulus & Nijstad in 2003 and Gallupe, Bastianutti, & Cooper in 1991, the selective anonymous technique showed a lower average score on evaluation apprehension than the non-anonymous technique. However, the result was not significant, while it was expected that the selective anonymous technique would have scored distinctly lower than the non-anonymous technique.

In accordance with the research done by Gallupe, Bastianutti, & Cooper in 1991, the anonymous technique scored higher on free-riding than the non-anonymous technique. However, the effect of the selective anonymous technique on the mediator variable free-riding showed a higher average value than the other two techniques. That effect has not been expected, since the selective anonymous technique has only been partly monitored, which suggests that free-riding should have been a bigger issue for the anonymous technique (Gallupe, Bastianutti, & Cooper, 1991).

A recommendation given for future research is to test a different setting for the experiment. This recommendation has been elaborated in §9.

7.2 Contribution to Practice

The experiment led to three significant results which could be of importance, the effects of the three techniques on the top 5 purchase intent and the effect of free-riding and evaluation apprehension on idea quantity.

The first finding could be of importance to managers who value the purchase intent over user value and idea novelty. For them it could be interesting to apply the selective anonymous technique to their own idea generation process for innovation. The finding of the effect of free-riding on idea quantity could be interesting for businesses in which proper monitoring during brainwriting tasks is difficult to implement and mainly anonymous brainwriting techniques are used, because the experiment showed that the different levels of free-riding affected the idea generation performance, which is in compliance with the research done by Gallupe, Bastianutti, & Cooper in 1991. They are advised to consider a modification of their idea generation processes, for example by lowering the number of subjects per session, which is in compliance with the research done by Latané, Williams, & Harkins in 1979 and Diehl & Stroebe in 1987. The finding of the effect of evaluation apprehension on idea quantity has also been in compliance with prior research, and could be of importance to businesses that show high levels of peer pressure and mainly conduct non-anonymous idea generation sessions (Paulus & Nijstad, 2003) (Gallupe, Bastianutti, & Cooper, 1991). For them it is also advised to consider a modification of the idea generation process.

8. CONCLUSION

The aim of the paper was to determine whether the treatment variable, the selective anonymous brainwriting technique, results in a higher idea generation performance regarding (1) the idea quantity, (2) the average idea quality, and (3) the best idea quality than the two control variables, the (non-) anonymous brainwriting techniques. The research question was as follows;

"Does the selective anonymous brainwriting technique generate significantly higher idea quality and idea quantity compared to the (non-)anonymous brainwriting techniques?"

Because no significant differences between the three techniques on both dependent variables idea quality and idea quantity have been found, it can be stated that the selective anonymous technique does not lead to a higher idea quality nor to a higher idea quantity. The research question, therefore, needed to be negated.

9. LIMITATIONS AND FURTHER RESEARCH

The experiment led to new knowledge. However, some limitations have been detected and could be of interest for further research.

One of the limitations of the research has been the interrater reliability. The interrater reliability of the user value and purchase intent were relatively low. Removing ideas that showed an interrater reliability over 1.5 standard deviations would have led to a better interrater reliability, but also to a

decrease of 167 ideas (36.7%). Because it would have caused such strong decrease of the sample size, no further action has been taken to increase the interrater reliability.

Possible reasons for the low reliability could have been (1) the expert's gender and (2) the expert's lifestyle.

Because of the gender differences (3 female, 4 male in this experiment), some ideas could have been more attractive to one specific gender. Additionally, the lifestyle could have been an influence, such as a difference in favourite sporting activities or the frequency of exercising.

Another limitation has been the setting of the experiment. An electronic survey has been conducted for the experiment, instead of a survey within an in-person setting. A disadvantage could have been that the subjects did not get to know the other subjects of the experiment in an offline setting well enough, and therefore felt less uncomfortable about having their name revealed when they were assigned to the non-anonymous and the selective anonymous technique, which could have led to a lower effect on the variable evaluation apprehension. Additionally, the effects on the variable free-riding could have turned out differently in an in-person setting, due to the fact that the subjects could experience the monitoring during the idea generation process differently. Therefore, conducting the experiment within an in-person setting could bring more clarity, and could therefore be interesting for further research.

Additionally, a change in the sample group could be interesting for future research. The subjects of this experiment have mainly been bachelor's and master's degree candidates, which could have led to the experiment performing differently than for other relevant groups, such as employees. One option would be to take a possibly larger and more varied sample group to exclude such deviations.

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11. REFERENCES

Abu-Bader, S., & Jones, T. V. (2021). Statistical mediation analysis using the Sobel Test and Hayes SPSS Process Macro. International Journal of Quantitative and Qualitative Research Methods, 9(1), 42-61.

Amabile, T. M. (1982, November 1). Social Psychology of Creativity: A Consensual Assessment Technique. Journal of Personality and Social Psychology, 43(5), 997-1013. doi:10.1037//0022-3514.43.5.997

Anderson, N., De Dreu, C. K., & Nijstad, B. A. (2004, February 2). The routinization of innovation research: A constructively critical review of the state-of-the-science. *Journal of Organizational Behavior, 25*, 147-173. doi:10.1002/job.236

Bröckling, U. (2006). On Creativity: A brainstorming session. 38(4).

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika, 16*, 297–334. doi:10.1007/BF02310555

Diehl, M., & Stroebe, W. (1987, September 1). Productivity Loss In Brainstorming Groups: Toward the Solution of a Riddle. Journal of Personality and Social Psychology, 53(3), 497-509. doi:10.1037/0022-3514.53.3.497

Dollinger, S. J., & Shafran, M. (2005). Note on Consensual Assessment Technique in Creativity Research. Perceptual and Motor Skills, 592-598.

Furnham, A. (2000). The Brainstorming Myth. Business Strategy Review, 11(4), 21-28.

Gallupe, R. B., Bastianutti, L. M., & Cooper, W. H. (1991, February 1). Unblocking Brainstorms. Journal of Applied Psychology, 76(1), 137-142.

Gallupe, R. B., Dennis, A. R., Cooper, W. H., Valacich, J. S., Bastianutti, L. M., & Nunamaker, J. J. (1992, June). Electronic Brainstorming and Group Size. 35(2), 350-369. Retrieved from https://www.jstor.org/stable/256377

Girotra, K., Terwiesch, C., & Ulrich, K. T. (2010). Idea Generation and the Quality of the Best Idea. Management Science, 56(4), 591-605. doi:10.1287/mnsc.1090.1144

Harkins, S. G., & Petty, R. E. (1982). Effects of task difficulty and task uniqueness on social loafing. *Journal of Personality and Social Psychology, 43*(6), 1214-1229. doi:10.1037/0022-3514.43.6.1214

Latané, B., Williams, K., & Harkins, S. (1979, June 1). Many Hands Make Light the Work: The Causes and Consequences of Social Loafing. Journal of Personality and Social Psychology, 37(6), 822-832.

Le Hénaff, B., Michinov, N., & Le Bohec, O. (2018, March 2). Applying the SIDE model to brainwriting: The impact of intergroup comparison and anonymity on creative performance. *Journal of Applied Social Psychology, 48*, 351-359. doi:10.1111/jasp.12515

Litcanu, M., Octavian, P., Oros, C., & Mnerie, A. V. (2015). Brain-Writing Vs. Brainstorming - Case Study For Power Engineering Education. Procedia - Social and Behavioral Sciences, 387-390. doi:10.1016/j.sbspro.2015.04.452

McFadzean, E. (2008, June 28). Improving Group Productivity with Group Support Systems and Creative Problem Solving Techniques. *Creativity and Innovation Management, 6*(4), 218-225. doi:10.1111/1467-8691.00072

Napier, R., & Gershenfeld, M. K. (1985). Groups, Theory and Experience. Boston: Houghton Mifflin.

Osborn, A. F. (1957). Applied Imagination - Principles and Procedures of Creative Problem Solving. New York: Scribner.

Paulus, P. B., & Nijstad, B. A. (2003). Group Creativity: Innovation through Collaboration. Oxford University Press. doi:10.1093/acprof:oso/9780195147308.001.0001

Paulus, P. B., & Yang, H.-C. (2000, May). Idea Generation in Groups: A Basis for Creativity in Organizations. Organizational Behavior and Human Decision Processes, 82(1), 76-87. doi:10.1006/obhd.2000.2888

Preacher, K. J., & Leonardelli, G. J. (2001, March). Calculation for the Sobel test: An interactive calculation tool for mediation tests. Retrieved from http://quantpsy.org/sobel/sobel.htm

Roco, M. (2004). Creativity and emotional intelligence. Iasi: Polirom Publishing House.

Ruël, G. C., Nauta, A., & Bastiaans, N. (2003). Free-riding and team performance in project education.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. Psychometrika, 16, 297–334. doi:10.1007/BF02310555

Taber, K. S. (2018, December). The Use of Cronbach's Alpha When Developing and Reporting Research Instruments in Science Education. Research in Science Education, 48, 1273–1296. doi:10.1007/s11165-016-9602-2

Tavakol, M., & Dennick, R. (2011, June 27). Making sense of Cronbach's alpha. International Journal of Medical Education, 2, 53-55. doi:10.5116/ijme.4dfb.8dfd

APPENDIX

A.1 Survey

The survey of the experiment is shown underneath. The subjects got first introduced to one of the three techniques.

Please enter your full name here.

Please describe in what form your idea, name, and idea rank will be shared with other participants.

- ◯ After the evaluation, NO information from this brainstorming challenge will be revealed to other participants.
- ◯ After the evaluation, ALL information from this brainstorming challenge will be revealed to other participants.
- ◯ After the evaluation, information from this brainstorming challenge will be revealed to other participants only if the idea ranks among the top 10% of all ideas.

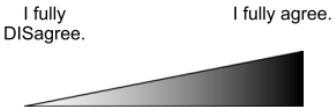
Please enter your idea(s) here.

- Please enter one idea per field.
- Please take ca. 5-10 minutes for this part of the brainstorming challenge.
- You can enter up to 10 ideas.

Idea 01:
Idea 02:
Idea 03:
Idea 04:
Idea 05:
Idea 06:
Idea 07:
Idea 08:
Idea 09:
Idea 10:

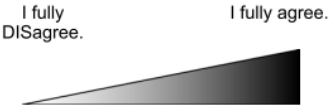
Please answer the following questions about yourself.

Please indicate to what extent do you agree to the following statements.



I have confidence in my ability to solve problems creatively.	○ ○ ○ ○ ○ ○ ○
I feel that I am good at generating novel ideas.	○ ○ ○ ○ ○ ○ ○
I am good at finding creative ways to solve problems.	○ ○ ○ ○ ○ ○ ○

Please indicate to what extent do you agree to the following statements.



During the brainstorming, ...	
I feel I participated a great deal in this idea generation session.	○ ○ ○ ○ ○ ○ ○
I am satisfied with my own performance on this task.	○ ○ ○ ○ ○ ○ ○
I was very motivated to generate quality ideas.	○ ○ ○ ○ ○ ○ ○
I really took this task seriously.	○ ○ ○ ○ ○ ○ ○

Please indicate to what extent do you agree to the following statements.

	I fully DISagree.						I fully agree.
I see myself as someone who ...							
is reserved.	○	○	○	○	○	○	○
is generally trusting.	○	○	○	○	○	○	○
tends to be lazy.	○	○	○	○	○	○	○
is relaxed, handles stress well.	○	○	○	○	○	○	○
has few artistic interests.	○	○	○	○	○	○	○
is outgoing, sociable.	○	○	○	○	○	○	○
tends to find fault with others.	○	○	○	○	○	○	○
is thorough.	○	○	○	○	○	○	○
gets nervous easily.	○	○	○	○	○	○	○
has an active imagination.	○	○	○	○	○	○	○

1. Please indicate your gender.

- ○ Female
- ○ Male
- ○ Divers
- ○ Other
- ○ Prefer not to say

A.2 Removed Data

Table A.2.1. The removed ideas.

1	Fairrun
2	Challenge Accepted
3	Restaurant on Campus
4	BodyBooster
5	MoveYou
6	PassionAthlete

A.3 Descriptives and ANOVA Top 8 Generated Ideas

Table A.3.1. Descriptives – three techniques on the top 8 combined idea quality.

Technique	N	Sum	Mean	Std. Deviation
Anonymous	8	38.82	4.8525	0.354
Non-anonymous	8	38.55	4.81875	0.282
Selective anonymous	8	39.54	4.9425	0.195

Table A.3.2. ANOVA effects – three techniques on the top 8 combined idea quality.

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.070	2	0.033	0.404	0.673
Within Groups	1.702	21	0.081		
Total	1.768	23			

Table A.3.3. Descriptives – three techniques on the top 8 idea novelty.

Technique	N	Sum	Mean	Std. Deviation
Anonymous	8	43.72	5.465	0.405
Non-anonymous	8	44.29	5.536	0.227
Selective anonymous	8	44.17	5.521	0.539

Table A.3.4. ANOVA effects – three techniques on top 8 idea novelty.

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.023	2	0.011	0.070	0.935
Within Groups	3.542	21	0.169		
Total	3.565	23			

Table A.3.5. Descriptives – three techniques on top 8 user value.

Technique	N	Sum	Mean	Std. Deviation
Anonymous	8	44.21	5.526	0.100
Non-anonymous	8	43.16	5.395	0.227
Selective anonymous	8	44.18	5.523	0.232

Table A.3.6. ANOVA effects – three techniques on top 8 user value.

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.089	2	0.045	1.165	0.331
Within Groups	0.805	21	0.038		
Total	0.895	23			

Table A.3.7. Descriptives – three techniques on top 8 purchase intent.

Technique	N	Sum	Mean	Std. Deviation
Anonymous	8	40.00	5.000	0.130
Non-anonymous	8	37.59	4.699	0.194
Selective anonymous	8	40.91	5.114	0.105

Table A.3.8. ANOVA effects – three techniques on top 8 purchase intent.

Source of Variation	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	0.736	2	0.368	16.829	0.000
Within Groups	0.459	21	0.022		
Total	1.195	23			

A.4 Idea Descriptions Top 8

Table A.4.1. Anonymous technique on top 8 combined idea quality.

Rank nr.	Idea description	Mean Rating
1	Headphones that choose which song to play aligned with your bpm (so intense music for running/ cardio and chill music for yoga/cooling down)	5.38
2	AI analytics for evaluating form from videorecording	5.38
3	Multi functional office chair which you can turn into a bench press	4.95
4	Free weight rentals	4.78
5	quick back pain relief tool	4.62
6	Phone charging station that you can connect to your bicycle - when you're cycling to campus you are charging your phone with the power of your movement	4.62
7	A website for if you want to workout but you do not know which sport you want to try. By the website you can fill in your interests and based on that the website will generate ideas which sports you can try and may like. (Maybe even sports you did not know existed)	4.61
8	All in one supplement with vitamins/proteins etc.	4.48

Table A.4.2. Non-anonymous technique on top 8 combined idea quality.

Rank nr.	Idea description	Mean Rating
1	A device analyzing blood to indicate which supplements and vitamins are needed	5.33
2	Fitness products with a QR code that when scanned, would automatically upload all the information about a product on an application created for selling second-hand fitness goods. That is because international students usually sell some of their personal belongings after graduating. It would be way easier to have products sold by only scanning the QR code, having the information of the product uploaded on an app destined for selling second hand fitness products	5.06
3	LED yoga mats with pressure plates (or sensors) connected to an app, with features like music, dance moves, to make physical activity more fun and appealing to students	4.95
4	A sustainable solution for fitness gear. Especially in fitness matts and resistance bands, I often see plastic-ish materials being used. Since a lot of young people are interested in sustainability, maybe a more eco-friendly & affordable solution can be found	4.76
5	A customized IA to help them daily	4.73
6	An application which analyzes your weight and body goals and creates a shopping list and recipes to reach body goals and exclude allergens	4.71
7	Reducing space of the products. Many university students live in small rooms and do not have the space for a lot of fitness gear. Maybe providing smaller dumbbells or an efficient storage product would help	4.53
8	Interactive digital 'games'/applications, where students (even in student houses) can do choreographies of intense physical activity, or workouts, and can compete against each other	4.48

Table A.4.3. Selective anonymous technique on top 8 combined idea quality.

Rank nr.	Idea description	Mean Rating
1	Boxes all around the campus with sport material like, terra bands, weight or sports mats. The boxes can be booked online for 30-60 minutes.	5.33
2	Extra sport meals in the canteen of universities, with a high amount of Proteins as an example	5.06
3	App combining movements with learning materials (auditive) to enhance memory (linking movements with specific information)	5.00
4	A water bottle which can also be used as a phone audio enhancer. Can be used as a volume booster for music	4.95
5	Reward system for physical activity (discount on books, etc.)	4.90
6	All in one supplement	4.81
7	Mobile small gym center (like a small van or truck) which comes to universities etc. so students can try different exercises	4.78
8	Proteins that have vitamins that help with memory	4.71