The Degree of Anonymity in Ideation

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ABSTRACT,

This study explores the effect of three degrees of anonymity on the output of the ideation process referred as to idea generation performance. Its aim is to determine if selective anonymity proves as the anonymity degree leading to the greatest ideation performance as it reduces evaluation apprehension and social loafing simultaneously as opposed to full anonymity's or identifiability's one-sided advantages.

An experiment has been conducted in which 106 students were assigned to produce ideas under one of the three treatment conditions. The collected data captured the treatment condition, perceived evaluation apprehension, social loafing, number of ideas per participant and their respective quality in terms of novelty, user value but also purchase intent. The gathered statistics were evaluated using variance, regression and mediation analysis in order to identify differences among the degrees of anonymity along with the effects between the variables.

The research did not recognize an effect of the predictor on the outcome nor on the mediating variables however, the negative impact of the mediators on the dependent variable was established. The three treatment conditions resulted in no statical difference in the idea generation performance.

Selective anonymity did not lead to a higher number of ideas generated or average idea quality compared to anonymous and identified ideation. Furthermore, the degree of anonymity did not present an effect on evaluation apprehension, social loafing or idea generation performance. Lastly, the negative impact of the inhibitors on the output of the conceptualization activity has been identified. These findings however display the selective anonymity's equivalent capabilities with respect to anonymity and identifiability.

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Keywords

idea generation; brain writing; brainstorming; anonymity; performance; idea quality;

1. INTRODUCTION

As individuals, groups and organisations continue to strive in the ever-changing and challenging environment they inevitably require new ideas to succeed in endeavours. While requirements are increasing in complexity and the urge for unconventionality is growing little attention is placed on the adequate design for the essential coping mechanisms. This paper will tackle the ideation challenges that individuals experience and aim to provide a thorough design recommendation for groups, teams and institutions.

As addressed in the succeeding Literature Review section the notion of a group's ideation advantage over isolated individuals has faded. Research has demonstrated that social interaction inhibitors are in place during group settings, leading to deficient group performance. The identified governing deterrents to interactive idea generation are production blocking, evaluation apprehension and social loafing (Diehl & Stroebe, 1987).

This study will reveal the utility of the degree of anonymity in overcoming such social circumstances. In contrast to our focus absolute and no anonymity have been uncovered as miscellaneous. Anonymity increases an individual's social safety enabling the expression of unconventional concepts but it does also eliminates identifiability thus increasing social loafing. In contrast, the usage of traditional methods such as brainstorming do produce an inverse effect of the previously mentioned.

The shift from perceiving anonymity as a binary to a spectrum component may lead to the required balance in tackling the ruling social inhibitors. The equilibrium of both extremes which is at the centre of this research is referred to as selective anonymity. This paper will research the effect of different degrees of anonymity on the social inhibitors and performance in idea generation.

2. RESEARCH OBJECTIVE

This paper aims to assess if selective anonymity is an effective treatment in stimulating the two of the main inhibitors of idea generation in group settings (evaluation apprehension and social loafing) in a beneficial manner. If such can be proven its application would hypothetically yield higher performance than traditional conceptualisation settings, leverage the joint collaboration of partakers and prove as one of the leading ideation methods.

2.1 Academic Relevance

In past research anonymity was evaluated using a binary perspective, the performance of anonymous and non-anonymous groups was compared against each other. This study is concerned with an intermediate view assessing the impact of selective anonymity.

Selective anonymity is regarded here as the reveal of the idea owner if it is ranked in the top 10% of all ideas. The proposition states that selective anonymity will create a social safe idea generation environment free of peer judgement or intimidation but incentivising by identifying the top 10% performers.

Anonymity (as elaborated in the *Literature Review*) has proven to have an inverse effect than identified methods reduceing evaluation apprehension and increasing social loafing. The proposed hybrid of this paper is hypothesised as leading to a higher amount of ideas and quality by containing both inhibitors. Such findings would solve the double-edged perception of anonymity and shift the attention of researchers to other inhibitors of group ideation.

2.2 Practical Relevance

Assuming that the superiority of selective anonymity over the traditional brainstorming and concealed identity group ideation can be verified it may lead organisations to question their methods of unleashing the creativity of individuals. Such a finding may prove beneficial to operational activities where unconventional conceptual development and lateral thinking are demanded.

Its successful implementation could then yield higher results in innovation, problem solving and technology development. This will succeedingly improve organisations responses to consumer demands, increase competition and elevate organisational units performance.

2.3 Research Question

The potential of this concept results in the following research question:

Does Selective Anonymity lead to higher Idea Generation Performance than Anonymous and Not Anonymous Ideation among Students?

Idea generation performance as elaborated further in the *Literature Review* and *Theory* sections is regarded as the amount of produced ideas per participant and their average quality. Whereas quality is measured according to three indicators novelty, purchase intend and user value.

3. LITERATURE REVIEW

3.1 Group and Individual Idea Generation

A. Osborn has suggested in his book Applied Imagination (1953) that a group of individuals following the brainstorming principles are able to perform better in generating ideas than individuals. His technique prescribes the elimination of criticism, encouragement of unique ideas, the association of proposals and embracement of a high volume of ideas.

This notion has been challenged by several studies comparing groups and individuals in idea production settings. Such studies evaluated nominal and real groups enabling the comparison of the average amount of ideas and their quality per participant in both configurations. Nominal groups consist of individuals operating individually and precedingly pooling their ideas. Contrary real groups develop concepts while interacting and influencing each other. Research has contradicted Osborn's suggestion, showcasing the superiority of an individual over a group's member regarding the number (Milton, 1965; Bouchard & Hare, 1970; Graham, 1977), uniqueness (Taylor et al., 1958) and quality of ideas generated (Taylor et al., 1958; Dunnette et al., 1963). Furthermore, it presents the necessity to reconfigure ideation settings in order to utilize the possible group synergies, remove/reduce inhibitors and boost its performance (amount and quality of ideas).

Although the inferiority of traditional ideation methods such as the classical brainstorming have been proven, the distorted perception of group performance may contribute to its further application and suboptimal utilization. It has been revealed that individuals participating in groups overestimate their

performance significantly higher than individuals in individual or nominal settings (Pauhus et al., 1993).

3.2 Inhibitory Factors present during Idea Generation

The performance loss of conceptualisation in groups has been tackled in order to identify the underlying mechanisms in the interactive process. Three factors have been associated with the depletion: production blocking, social loafing and evaluation apprehension (Diehl & Stroebe, 1987).

Production blocking refers to the constraint of group members in expressing their idea(s) directly leading to a loss of conviction or failure to recall at a later point in time. As indicated by Diehl and Strobe in their paper in 1987 prior research has shown that as group size increases the quantity of ideas decreases showcasing the influence of production blocking (Bouchard & Hare, 1970; Diehl & Stroebe, 1987). This issue however reduced in prominence due to the recent utilization of information technology. It has been proven that electronic brainstorming yields higher performance than verbal brainstorming, this is mainly due to the near elimination of delay between the individual's idea materialization and its expression by virtual means (Gallupe et al., 1991; Nijstad & Stroebe, 2006).

Social loafing refers to the diminishing contribution of an individual which accentuates as the group size increases (Geen, 1991). This phenomenon occurs if an individual's contribution can not be discretely assessed, recognized or is perceived as unnecessary. Its presence is also facilitated if a subject discerns low responsibility for the task at hand or faces an unchallenging task (Karau & Williams, 1995).

Evaluation apprehension describes the fear of an individual being judged by other participants during ideation. This dread leads to a subject's inhibition to express unique or controversial ideas. Its negative effect on the idea generation performance (idea quantity) emphasizes as the status of the group members is perceived as high or as their expertise is regarded as superior (Collaros & Anderson, 1969; Diehl & Stroebe, 1987).

3.3 Anonymous Idea Generation

The identification of interaction mechanisms leading groups to underperformance in terms of generated ideas and their corresponding quality, led researchers exploring anonymity as a possible remedy. Its use has shown to affect the number of ideas positively demonstrating that anonymous- outperform non-anonymous groups in terms of the ideation output (Cooper et al., 1998; Diehl & Stroebe, 1987). Moreover the usage of the anonymity condition in idea generation tasks demonstrated an increase in controversial ideas indicating its potential to raise the average concept quality (Cooper et al., 1998).

Furthermore, prior research exhibited that anonymity alters the ruling inhibitors discovered in group ideation. Conceptualization forums that did not reveal the identity of the participants lead to lower evaluation apprehension levels than identified groups (Cooper et al., 1998; Pissarra & Jesuino, 2005; Chen et al., 2010; Stehgerd et al., 2015). Anonymity proves to facilitates a secure environment where participants do experience less discouragement from repelling reaction of other partakers or need to promote their persona.

Additionally, anonymous ideation has been found to display higher social loafing levels than identified groups (Stepherd et al., 1995; de Vreede1 et al., 2000). Such a manifestation is largely due to the reduction of an individuals reward for his/her contribution, necessary addition to achieve the task or potential gain requiring little effort.

The characteristics of anonymity in group conceptualization forums appears as having an inverse effect on the governing inhibitors when compared to identified teams.

3.4 Idea Generation Performance

The performance of idea generation procedures has been viewed frequently in previous research in terms of the quantity of produced ideas (Graham, 1977; Paulus & Yang, 2000) and its quality referenced as originality, practicality/feasibility (Diehl & Stroebe, 1987) and creativity (Collaros & Anderson, 1969).

In a recent study in 2010 Girotra and Terwiech proposed an additional operationalization of idea quality which can be viewed as more adequately in a commercial context. The two researchers define quality as the proposal's business value/ usefulness, originality and perceived purchase intent. Such a definition may be more beneficial when having the outlook of idea generation in a commercial setting.

4. THEORETICAL FRAMEWORK

This study considers idea generation performance as the dependent variable, degree of anonymity as the independent variable and evaluation apprehension & social loafing as intermediate variables (see *Figure 1*). Both intermediaries have a negative effect on the dependent variable. The degree of anonymity does influence the intermediarie's magnitude in the ideation process. The literature review-based theoretical framework is also reflected in the 2010 paper of Chen et al. but also by Stepherd et al. in 2015, contributing to its validity. Whereas in this study the selective anonymity aspect is included which can potentially lead to a simultaneous decrease of evaluation apprehension and social loafing. Thus it may eliminate the identified pitfalls in earlier ideation studies.

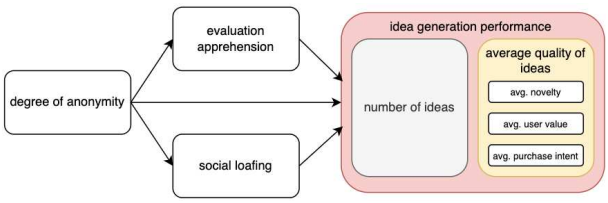

Figure 1: Conceptual Model

4.1 The Degrees of Anonymity

The presented model regards the independent variable as a range spanning from no anonymity to selective anonymity, over to full anonymity. The ordinality of the explanatory variable enables the comparison between the three degrees permitting to draw inferences about selective anonymity.

In this study, no anonymity implies that the produced ideas of each individual will be made public after the ideation session accompanied by the creator's name, the overall rank and the evaluation score of each input. Selective anonymity dictates that the concepts ranked in the top 10% will be disclosed together with their overall placement, evaluation score and author. Full anonymity will lead to no information being made available to any participant.

4.2 Ideation Performance

The idea generation performance will be defined as the measure of the quantity of ideas generated and the average quality of ideas. Quality is defined in this context as the compound of Novelty, User Value and Purchase Intent. As a result of such a definition, an idea of high quality displays a creative product solving a particular customer need and exercises great desire.

The equal weight of the number of ideas per participant and their average quality form Idea Generation Performance. The attention towards the average quality of all produced ideas per participant is chosen since the interest at stake is the observation of a systematic effect of selective anonymity. If only the quality of the best idea is considered in assessing the ideation performance the results of such an analysis could lack reliability. The occurrence of one idea of high quality in a group of individuals is less reliant than an overall increase in all produced ideas of a group in which all individuals share the same treatment. Furthermore, the awareness of the number of produced ideas per participant is crucial in assessing the treatment's ability to encourage individuals in the ideation process but also as a high number of ideas may increase the probability of greater quality concepts. For the purpose of analysis simplification, both variables will be combined to ideation performance, but independent consideration will be given if inconsistent results will result.

4.3 Model Elaboration

Below displayed is the main research question of this study followed by the hypotheses which will ensure its clarification and validation of the theoretical model.

***RQ**: Does Selective Anonymity lead to higher Idea Generation Performance than Anonymous and Not Anonymous Ideation among Students?*

Evaluation apprehension is the fear of individuals being negatively judged by their peers for expressing a potentially debatable opinion or idea (Diehl & Stroebe, 1987). This inhibitor reduces ideation performance by decreasing the number of ideas and the average quality of ideas per participant since less unusual or unique ideas will be made available.

It has been found that evaluation apprehension is reduced or eliminated in anonymous settings due to the inability to identify the owner of a proposal but also to the invisibility of the coparticipant's possible intimidating characteristics e.g., status (Cooper et al., 1998). Selective anonymity is expected to create too favorable conditions as it provides comparable protection as anonymous settings and if the identity of a participant is revealed it is due to its merits.

***H1**: Selective anonymous groups experience lower evaluation apprehension levels than non-anonymous groups.*

Social loafing is the reduction of individuals' output in ideation settings as their contribution can not be discretely evaluated and praised (Geen, 1991). This phenomenon decreases the idea generation performance as it reduces the amount of ideas produced and lowers the possibility of generating high-quality ideas. No anonymity or identifiability proved to reduce the occurrence of free riding as it provides individuals the necessary recognizability for their efforts (Stepherd et al., 1995).

Selective anonymity does potentially overcome the high social loafing occurrence among individuals as the disclosure of the top 10% idea owners offers the desired effort recognition and may stimulate competition.

***H2**: Selective anonymous groups experience lower social loafing levels than anonymous groups.*

In order for selective anonymous ideation to prove as superior to identifiable but also anonymous idea generation, evaluation apprehension and social loafing need to demonstrate a great impact on ideation performance. If the two inhibitors do not account for the major difference in brainwriting performance the usage of selective anonymity may not produce the hypothesized benefits.

***H3**: Evaluation apprehension and social loafing are inhibitors of idea generation performance.*

If the former hypotheses are confirmed and the benefits of selective anonymity are identified its usage needs to result in a higher ideation performance than the other two methods.

***H4**: Selective anonymous groups perform better in terms of idea generation performance than non-anonymous and anonymous groups.*

5. METODOLOGY

The cause and effect relationship of anonymity on evaluation apprehension along with social loafing and consequently the idea generation performance was evaluated by a between-subjects experiment. The experiment was conducted by Dr. Tim Schweisfurth (University of Twente) in collaboration with the University of Stuttgart and FAU Nürnberg in 2021.

5.1 Experimental Design

Three different treatments were administered which correspond the independent variable (degree of anonymity). All participants were given the same task to perform under the influence of their treatment.

Furthermore, the experiment checked the participants understating of their treatment condition by a multiple-choice query. The active acknowledgement ensured the effectiveness of the treatment. Lastly, the independent group design forbore any order effects which could contort its effect.

5.2 Data Collection

A total of 106 individuals participated in the experiment. Every partaker was informed in regards to the survey conditions. Their identity was either fully, selectively (top 10%) or not revealed. Furthermore, the instructions did clarify that the collected data will be subject to evaluation by the associated research staff. An overview of the subjects profile according to gender and treatment condition can be found in *Table 1*.

Treatment condition	Gender	Number of participants
Anonymity	female	24
	male	12
	other	0
	total	**36**
No Anonymity	female	18
	male	10
	other	0
	total	**28**
Selective Anonymity	female	25
	male	15
	other	2
	total	**42**
TOTAL		**106**

Table 1: Participant Distribution

Each were given approximately 10 minutes to produce as many ideas for new product concepts of a sports and fitness manufacturer aimed at the student market. Succeeding the idea generation the subjects were asked to answer five questions. The first two were aimed at the evaluation apprehension and social loafing state of the individual during the exercise. The remainder were aimed at their self-efficacy perception, personality trait and gender.

For this research the data of the following variables were collected: treatment condition, number of ideas, idea quality, personality trait, creative self efficacy, free-riding and evaluation apprehension. The following paragraph will offer a detailed insight into the data collection of the relevant variables of this study.

The experienced evaluation apprehension extent of the participants during the brainstorming session was captured by four 7 Point Likert Scale questions (I fully disagree - I fully agree). The same principle (four 7 Point Likert Scale queries) was applied to capture the free-riding estate of the subjects. Furthermore, the assigned treatment (no anonymity, selective anonymity, anonymity) and the amount of generated ideas of the candidates was recorded.

The idea quality will be assessed by eight students of the University of Twente. The ideas will be split equally per evaluator. Each will be assessed individually in terms of the dimensions elaborated in the Theoretical Framework section: Originality, Usefulness and Purchase Intent. Each idea will be scored on each dimension using a 7 Point Likert Scale. The final score attributed to the idea quality will be the average of the three dimensions. After the evaluation of the ideas and conversion from their qualitative nature to a quantifiable component, an inter-rater reliability assessment will be conducted to ensure the data validity.

5.3 Data Preparation

To answer the research questions of this paper the collected data had to be readjusted in accordance to the variables at interest and the post-hoc idea evaluation.

Ideas that all reviewers marked as not applicable were removed and the amount of ideas per participant was adjusted accordingly. This intervention can be seen as generous as opposed to other thresholds but it is reasonable considering the limited sample size of this study.

Idea generation performance was not a characteristic extracted from the studies sample but was computed subsequently as the equal portion of quantity of ideas per individual and their average quality. The variable had to be standardised due to both components different scales (amount of ideas ranged from 0 to 10 and idea quality ranged from 1 to 7).

The amount of ideas per participant was divided by 10, since an individual was able to produce a maximum of 10 ideas. The average quality of the partakers idea was computed average quality of all ideas divided by 7, since 7 was the highest quality rating. Both scores were than divided by 2 in order to represent an equal portion of the target variable and later added. The computation is represented in Equation I, where outcomes range from 0 to 1 (or 0 to 100).

I: performance= [(nr. of ideas/10) + (average quality of ideas)/7]/2

5.4 Data Analysis

The first step of the data analysis will be the evaluation of the effect of anonymity on idea generation performance. This will be conducted with a regression analysis. It is crucial to perform this step in order to see if the degree of anonymity will have a significant impact on ideation. If no performance difference is proven by the ANOVA it may be an indication that anonymity will not affect the level of evaluation apprehension or social loafing of the participants.

Subsequently, two ANOVA tests will be conducted to explore the consequence of the anonymity categories on the two intermediate variables. The results will offer an insight into the consequences of the two relationships, showcasing which anonymity category is most appropriate to reduce negative effects (H1 & H2).

Further, a multiple linear regression analysis will be conducted displaying the idea performance for each sample. The results of this analysis will firstly reveal which of the intermediate variable has the largest impact on the ideation performance given the respective sample (H3). Furthermore, it enables the identification of the conditions yielding the highest results (H4).

Lastly, a mediation analysis will be conducted in order to validate the theoretical model and provide further insights into the variable relationships.

6. RESULTS

6.1 Data Validation

Furthermore, the required assumptions for an ANOVA analysis have been verified. According to Bock et al. (2019, pp. 775-777), three assumptions need to be satisfied for the analysis of variances to be reliant: Independence Assumption, Equal variance Assumption and Normal Population Assumption. The Independence Assumption is provided by the research design ensuring that each participant is associated with only one of the three anonymity categories. For the Normal Population Assumption the Skewness, Kurtosis and Kolmogorov-Smirnov tests were employed. In regards to the The Equal Variance Assumption, the Levene's test was referred to. The results are displayed in *Table 3.1* and *Table 3.2* all confirming the reliability of the ANOVA results at an $\alpha = 0{,}05$.

	Kurtosis	Skewness
Evaluation apprehension	-0,576	0,235
Social loafing	-0,527	0,365
Idea generation performance	0,754	0,465

Table 3.1: Skewness and Kurtosis

	Kolmogorov - Smirnov: p-value	Levene's: p-value
Evaluation apprehension	0,182	0,842
Social loafing	0,056	0,754
Idea generation performance	0,037	0,703

Table 3.2: Kolmogorov - Smirnov- and Levene's test

Lastly, the reliability of the quality metric was verified by evaluating the independent reviewers rating consistency on the three components. The inter-rate reliability was assessed using the Cronbach's Alpha measurement.

The analysis yielded $\alpha = 0.851$ for novelty, $\alpha = 0.623$ for user value and $\alpha = 0.579$ for purchase intent. This results are near the commonly used threshold of 0.7 (Cortina, 1993) and can be seen as acceptable when considering that the gender of the

reviewers influenced the ratings of ideas specifically aimed at the opposite sex.

6.2 Anova Analysis - Mean Comparison

Table 2 depicts the results of the One Way Anova analysis where the means of evaluation apprehension, social loafing and idea generation performance was evaluated according to the treatment (degree of anonymity) for statistically significant differences. The displayed outcome will be elaborated upon in the following sections in order to derive implications on Hypothesis 1 and 2 of *Section 4*.

Section	Variable	Degrees of Freedom	F - statistic	P-value
6.2.1.	Evaluation apprehension	2; 103	1,885	0,157
6.2.2	Social loafing	2; 103	1,376	0,257
6.2.3	Idea generation performance	2; 103	0,191	0,826

Table 2: One Way Anova Output

6.2.1. Degree of Anonymity and Evaluation Apprehension

The statistical test does yield a $F_{2,103} = 1,885$ and a p-value equal to 0,157. The examinations output implies no statistical difference of the mean evaluation apprehension levels according to the three levels of the treatment (no anonymity, anonymity and selective anonymity). Thus concluding that the evaluation apprehension levels are equal for all three anonymity degrees.

Figure 2 displays the mean evaluation apprehension experienced by the participants during the experiment. The chart confirms the statistical finds and illustrates the equivalent magnitude of the inhibitor (weak to moderate) in the three treatment conditions at an approximate level of 3 out of 7.

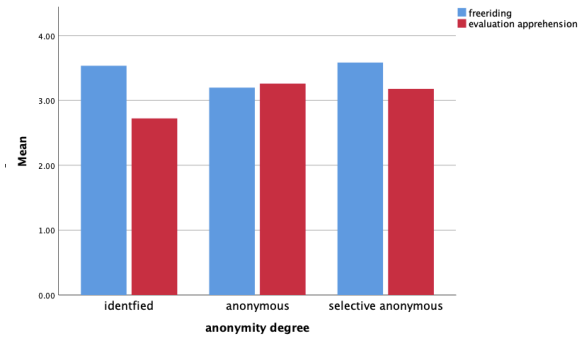

Figure 2: Mean of evaluation apprehension and social loafing by anonymity degree

6.2.2. Degree of Anonymity and Social Loafing

The analysis of variance does yield a $F_{2,103} = 1,376$ and a p-value of 0,257. The results correspond to an insignificant difference between the social loafing levels among the three levels of anonymity. Therefore we can conclude that the social loafing scores are statistically equal between the three anonymity degrees. This findings can be found too in the graphical representation in *Figure 2* displaying moderate free riding levels in all groups of around 3,4 out of 7.

6.2.3. Degree of Anonymity and Idea Generation Performance

The ANOVA Analysis of idea generation performance as the dependent variable and degree of anonymity as the factor results to a $F_{2,103} = 0,191$ and a p-value equal to 0,826. The outcome does showcase no significant difference in the idea generation performance scores in relation to the type of anonymity. The graphical analysis of *Figure 2* concludes the same findings presenting ideation performance levels in all three conditions of around 0,4673 out of 1 (or 46,73/100).

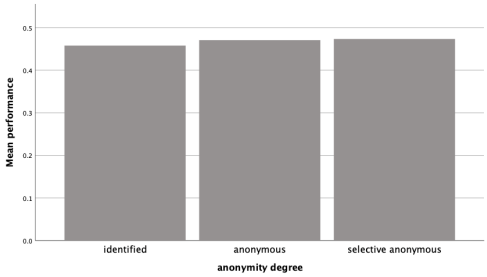

Figure 3: Mean of ideation performance by anonymity degree

In order to avoid overlooking any details of the treatments effect on one specific composite of ideation performance the mean number of ideas and their average quality were compared across the three treatment conditions. *Figure 4* present the graphical representation of this findings. The corresponding ANOVA analysis did yield insignificant results and it is therefore concluded that the number of ideas and their average quality is equivalent across the three degrees of anonymity. Consequently, it can not be stated that the proposed computation of ideation performance lead to a distorted representation.

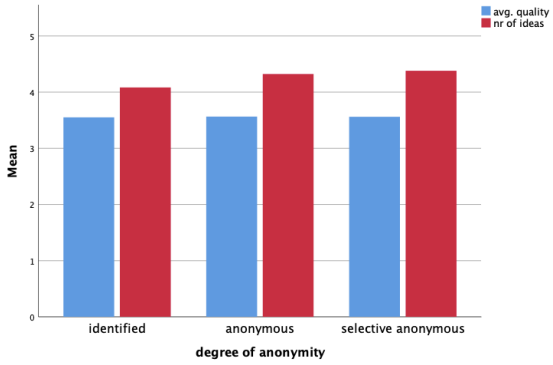

Figure 3: Mean of number of ideas per participant and their average quality by anonymity degree

6.2.4. Hypothesis Implications

The results of the conducted ANOVA analyses result in no statistical difference in evaluation apprehension and social loafing levels between the three treatment conditions. The treatment conditions do not propose an influence on the mean score of the two ideation performance inhibitors.

In regards to *Hypothesis 1* the study's sample does not support the claim of selective anonymity's superiority over no anonymity in terms of evaluation apprehension. Therefore it is concluded that all three treatment conditions experience on average the same level of apprehension.

With respect to *Hypothesis 2* the research does oppose the case of selective anonymity's advantage over anonymity in regards

to social loafing. Thus we can infer that the treatment leads to the same score of free riding as in anonymous and no anonymous settings.

6.3 Multiple Regression Analysis

To assess the degree to which evaluation apprehension and social loafing influence idea generation performance, a multiple regression was conducted, of which the outcome is displayed in *Table 3*. The model resulted into a $F_2 = 17{,}293$ with a p-value < 0,001 and a R-Square equal to 25.1%.

In addition, the Pearson correlation coefficient of the two ideation inhibitors with the dependent variable was conducted to assess the strength of their linear relationship. The findings displayed in *Table 4* dictate a weak and negative linear relationship between evaluation apprehension and idea generation performance. Furthermore, the correlation coefficient of social loafing and the dependent variable display a moderate negative linear relationship.

These characteristics will be further investigated in the following sections and implications will be drawn in regards to Hypothesis 3 of *Section 6.2.3.*

Section		Correlation	Unstandardized Coefficients	P-value	R^2
6.2.1.	Evaluation apprehension	-0,243	-0,017	0,038	-
6.2.2	Social loafing	-0,468	-0,051	<0.001	-
6.2.	MODEL	-	-	-	0,251

Table 4: Regression Analysis Output

6.3.1. Evaluation Apprehension and Idea Generation Performance

The performed multiple regression results in regards to evaluation apprehension to b = - 0.243, t_2 = - 2.105 and a p-value equal to 0.038 which is statistically significant using an $\alpha = 0.1$. Thus concluding that there is a statistically significant main effect of evaluation apprehension on ideation performance when considering social loafing. Lastly, we can observe a decrease of 0.243 in the idea generation performance score per unit increase in evaluation apprehension if social loafing is kept constant.

6.3.2. Social Loafing and Idea Generation Performance

The regression analysis produces in respect to social loafing a b = - 0.051, t_2 = -5.141 and a p-value below 0.001. The significant result confirms the main effect of the inhibitor on the dependent level when accounting for the effect of evaluation apprehension. Moreover, it can be concluded that a unit increase in social loafing produces a reduction of 0.051 idea generation performance score when evaluation apprehension remains unchanged.

6.3.3. Hypothesis Implications

The results of the previous two sections lead to the following regression equation predicting the dependent variable.

$$Y = 0.693 - 0.017x_1 - 0.051x_2 \text{ where,}$$

Y = idea generation performance

x_1 = evaluation apprehension

x_2 = social loafing

The observed difference of the two regression coefficients is also showcased by the correlation analysis displayed in *Table 3*. Social loafing presents a greater effect than evaluation apprehension, both manifest an inverse relationship with idea generation performance.

In regards to Hypothesis 3 the R-squared value of the regression model will be considered as to its deterministic indication. The observed value translates into the models ability to a prediction of 25.1% variance of ideation performance by the two predictors. Such a moderate explained variability provides valid grounds in ascertaining evaluation apprehension and social loafing as inhibitors of idea generation performance.

6.4 Mediation Analysis

The mediation analysis of this paper employed two different methods due to the difference in theoretical interpretations (MacKinnon et al., 2002). The initial analysis did rely on Baron and Kenny's conceptualisation a mediation. Since one of the primary requirements of the methods mediation analysis was not fulfilled leading to the independent variable not predicting the dependent variable no mediation can be determined (Baron & Kenny, 1986).

The succeeding analysis was motivated by the provided expansion of the mediation conceptualisation by Zhao et al. (2010) laying out the possibility of an Indirect-only Mediation. In order to overcome the limitations of the preceding analysis and explore further mediation possibilities the Preacher and Hayes bootstrap method was engaged (Hayes, 2009).

Both analyses results will be elaborated in the following sections and implications in regards to Hypothesis 4 and the theoretical model of *Section 4* will be drawn.

6.4.1. Baron and Kenny Mediation Analysis

According to Baron and Kenny's mediation model the first condition is presence of a total effect (Baron & Kenny, 1986). This requirement was evaluated by utilising a Multiple Linear Regression with a categorical predictor. Degree of anonymity was dummy coded in order to make use of the linear regression option of SPSS. The analysis inspected selective anonymity and no anonymity in regards to selective anonymity.

The dummy coding procedure follows the below displayed scheme.

x_1 = {1 for anonymity; 0 for no anonymity and selective anonymity}

x_2 = {1 for selective anonymity; 0 for no anonymity and anonymity}

x_3 = {1 for no anonymity; 0 for selective anonymity and anonymity}

Table 5 presents the results of the regression analysis indicating no significant main effect between the degree of anonymity and idea generation performance. The statistical test reports a $b_2 = 0.016$, $b_3 = 0.013$, $t_2 = 0.593$, $t_3 = 0.441$, both coeffiencent's p-value above the alpha level of 10% and $F_2 = 0{,}191$. Additionally, the model's R-squared equals 0,4% thus implying nearly no prediction of the dependent variable by the multi-categorical predictor.

	Unstandardized Coefficients	P-value	R^2	t
selective anonymity	0,016	0,555	-	0,593
no anonymity	0,013	0,66	-	0,441
Model	-	-	0,004	-

Table 5: Multiple Linear regression

The previously elaborated results indicate no presence of a total effect and thus classifying the construct as of non mediating nature.

6.4.2. Bootstrapping Mediation Analysis by Preacher and Hayes

The mediations analysis using Hayes Process Macro corresponds to the previous findings presented in this section.

Degree of anonymity was automatically recoded by the test into dummy variable resulting into the following scheme:

x_1 = {1 for no anonymity; 0 for anonymity and selective anonymity}

x_2 = {1 for selective anonymity; 0 for no anonymity and anonymity}

No significant direct effect was identified. The test results to x_1 = 0.0051, t_1 = 0.1953, p_1-value = 0.8456, x_2 = 0.0262, t_2 = 1.129 and p_2-value = 0.2615. Furthermore, the indirect effects (axb) are not present due to path a_1,a_2 insignificance even though path b_1 and b_2. This does overlap with the results of the previous analysis. Lastly, there is evidence to acknowledge a total effect. The total effect model results to R-squared = 0.0037, $F_{2,103}$ = 0.1911 and a p-value = 0.8264. The coefficient statistics are to x_1 = 0.0129, t_1 = 0.4413, p_1-value = 0.6599, x_2 = 0.0156, t_2 = 0.5927 and p_2-value = 0.5547.

6.4.3. Mediation Implications

Both mediation analysis methods elaborated in the previous two section did yield the same conclusion. No mediation has been found due to the nonexistence of a main effect of the degree of anonymity on ideation performance, evaluation apprehension nor social loafing. Thus *Hypothesis 4* is falsified and the proposed conceptual model of *Section 4* can partially not be concluded in this analysis.

7. DISSCUSSION

This study was conducted in order to conclude if selective anonymity will lead to higher idea generation performance than anonymity or no anonymity by overcoming their respective pitfalls of social loafing and evaluation apprehension. The research evaluated 106 participants each given one of the three treatment conditions and instructed to generate up to 10 ideas for a given context.

In regards to ideation performance, it was expected to be positively influenced as the anonymity degree increases. Additionally, it was hypothesized that selective anonymity would present the highest performance level.

No difference has been found between the treatments in terms of the performance nor of its two components (number of ideas and their average quality). The descriptive statics evaluation across the sample presents an ideation performance mean of 0.467, mean number of produced ideas of 4.26 and mean average quality of ideas of 3.558 per participant. The analysis of variance did not yield any significant difference between the three anonymity categories on the three metrics.

Notably, no main effect has been found between the anonymity type and ideation performance. The regression analysis resulted in insignificant coefficients as high as 0.017 substantiating the findings of the equal performance means.

The absence of the anonymity effect on idea generation performance and the identical number of ideas and their quality across the treatment condition does not coincide with previous studies comparing anonymous and identified groups (Jessup et al., 1990; Gallupe et al., 1992). This phenomenon has been however also observed in other studies (Valacich et al., 1992) and may be caused by differences in experimental designs.

In reference to evaluation apprehension and social loafing it was hypothesized to be influenced by the degree of anonymity. Additionally, it was expected that both mediators will be reduced simultaneously by the selective anonymity treatment.

Contrary to the study's expectation no main effect has been identified between the treatment conditions and evaluation apprehension nor social loafing. Furthermore, the analysis of variance did not yield any significant difference on the two mediators between the degrees of anonymity. The descriptive analysis presented a mean evaluation apprehension of 3.045 and mean social loafing of 3.465 per individual.

The unidentifiability of the effect between treatment and the two inhibitors is inconsistent to prior research as anonymity has been consistently found to reduce evaluation apprehension (Cooper et al., 1998; Pissarra & Jesuino, 2005) and increase social loafing (Stepherd et al., 1995; de Vreede1 et al., 2000).

Due to the results inability to identify a main effect or difference, it is questionable if the findings are valid beyond the boundaries of this study's sample.

Lastly, it was expected that the two intermediate variables influence ideation performance negatively and that they explain mainly the variability of the dependent variable.

The regression analysis proved the negative main effect of both variables on idea generation performance. Social loafing and evaluation apprehension led to lower performance as their level rose. The analysis resulted in the unstandardised coefficients of -0.017 for evaluation apprehension and -0.051 for social loafing. The statistically significant effect denotes both factors as ideation determinants since they predicted 25.1% of the variability of performance.

The inhibitor’s negative effect on idea generation is in line with the origins of this research branch marked by Diehl & Stroebe, 1987 uncovering the main inhibitors in ideation settings.

8. CONCLUSION

The objective of this research was to conclude if the employment of selective anonymity will result in higher idea generation performance (amount of idea and their average quality) than anonymous and identified settings. The conceptualization configuration was expected to exhibit superiority due to its ability to stimulate evaluation apprehension and social loafing more advantageous than anonymous and identified methods.

This study did not identify the hypothesized benefits of selective anonymity and its effect on ideation performance. No effect has been found between the anonymity degree and ideation performance and no performance difference has been concluded between the three treatment conditions. Furthermore, the analysis did not infer any effect of the anonymity degree on the inhibitors of ideation performance (evaluation apprehension or social loafing). However, it did confirm the insights of previous research on social loafing and evaluation apprehension inhibitory attributes.

The unanticipated results are nevertheless not discouraging as the research showed that selective anonymity did not present lower results than anonymous or identified group ideation in terms of ideation performance, evaluation apprehension or

social loafing. This justifies its given attention and signifies worth for future research pursuits.

8.1 Practical Implications

This study reconfirms the findings of past literature on evaluation apprehension and social loafing inhibitory effect on the amount of ideas and their quality that individuals perform in ideation tasks. Therefore organizations should be aware of the pitfalls that are existing in group dynamics and introduce effective coping mechanisms.

Furthermore, it can be inferred that academic supervisors need to be conscious that anonymity (regardless of its extent) will not have any effect or produce any significant difference in the ideation performance of students. As elaborated in the *Discussion Section* this is not in line with all past research but it is not inadmissible in the light of this paper.

8.2 Theoretical Implications

The findings of this study partially support the theoretical model elaborated in the *Theoretical Framework Section.* Evaluation apprehension and free riding exercise a negative effect of the idea generation performance.

The paper however does not confirm the ability of anonymity to address idea generation performance directly nor through the mediating relationship with its two inhibitors. These results are not in line with previous literature as elaborated in the *Discussion Section* and may be explained by the altered social dynamics during the coronavirus pandemic combined with the scattering of observations by time but also region.

Nonetheless, the research introduces two new concepts worth pointing out. Firstly, the shift in perception from anonymity as binary to it as an ordinal construct can bring additional configurations in motion. Secondly, the introduced computation of ideation performance combines the two essential aspects which have been utilized often in a mutually exclusive manner. Its further use and development will contribute to more comprehensive measure of performance.

8.3 Research Limitations

Three main limitations have been identified in this research which are related to the methodology, theory and generalisability. These will be elaborated below and taken into account for further research.

In regards to the methodological limitations, it is worth pointing out that the experiment setting may have not stimulated the participants sufficiently to observe the effect of their treatment. Here the reference is made in regards to the task's difficulty and controversialness (Valacich et al., 1992). The creation of product concepts for a sport and fitness manufacturer aimed at the student market may not allow for considerable disagreements or discussions.

Furthermore, it can be argued that incentive of selective anonymity may have not been accentuated sufficiently to observe its benefits. Perhaps the disclosure of the idea owner could be designed in a more encouraging manner.

With respect to the data collection, the measured idea quality and its respective three sub-categories may display insufficient accuracy. The reviewer's limited task exposure may lead to a restricted ability in assessing the concept's novelty and originality (van Broekhoven et al., 2021).

Additionally, the generalisability of the study is restricted by the sample size and profile. This study was conducted with a sample size of 106 which is disputable as of representative sample. Moreover, the sample profile does not represent the research population since the participants were mainly students which are not the exclusive users of electronic idea generation tasks.

Lastly, the theoretical execution of quality may be assessed as incorrect. The research task and the idea review were aimed at products and did not include services, processes or other constructs. Thus quality, in this case, was strictly reliant on product innovation and not on others such as process -, technological - or service innovation.

8.4 Further Research

The following recommendation for research will address the identified limitations of this study.

In regards to the methodology, two aspects were identified which would potentially increase the accuracy in capturing the influence of the three anonymity degrees.

Firstly, the task to be conducted by the participants of the study should be designed in a more controversial manner so that the effects of evaluation apprehension can unfold to a greater extent. An example of such would be a task in which decisions should be proposed in which social - and environmental considerations need to be balanced. Secondly, the treatment implementation should be adjusted in a more stringent manner ensuring its accurate representation. Such a recommendation would imply that individuals receiving the identified treatment execute the task in person and expose more than solely their names.

In regards to the theory recommendation, it is worth reiterating the comment made in the *Research Limitations Section* stating that the definition of quality should be broadened further than only measuring products. The operationalization of the quality and task of the experiment should be altered so that process innovations or management decisions can be assessed. An example of such would be the assessment of decisions in regard to workforce layoffs due to task automation.

Lastly, the generalisability recommendations are subject to two aspects improving the data analysis and results validity.

Firstly, a greater sample size should be achieved when conducting the analysis to avoid data skewness and provide more accurate measurements. Secondly, the sample profile should be expanded in order to capture individuals with different educations and professional activities. If the sample profile remains mainly students it would restrict concluding knowledge beyond the academic population.

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10. APPENDIX

10.1 Appendix A: Experiment Task

Your brainstorming task CT08

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.

Please come up with ideas for new product concepts in the field of **sports and fitness products for the student market**.

10.2.1 Appendix B: Anonymous Treatment Condition Description

- If you provide ideas, your ideas will be evaluated and ranked anonymously.
- After the evaluation, **NO information** from this brainstorming challenge **will be revealed** to other participants, i.e.
  - 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.**

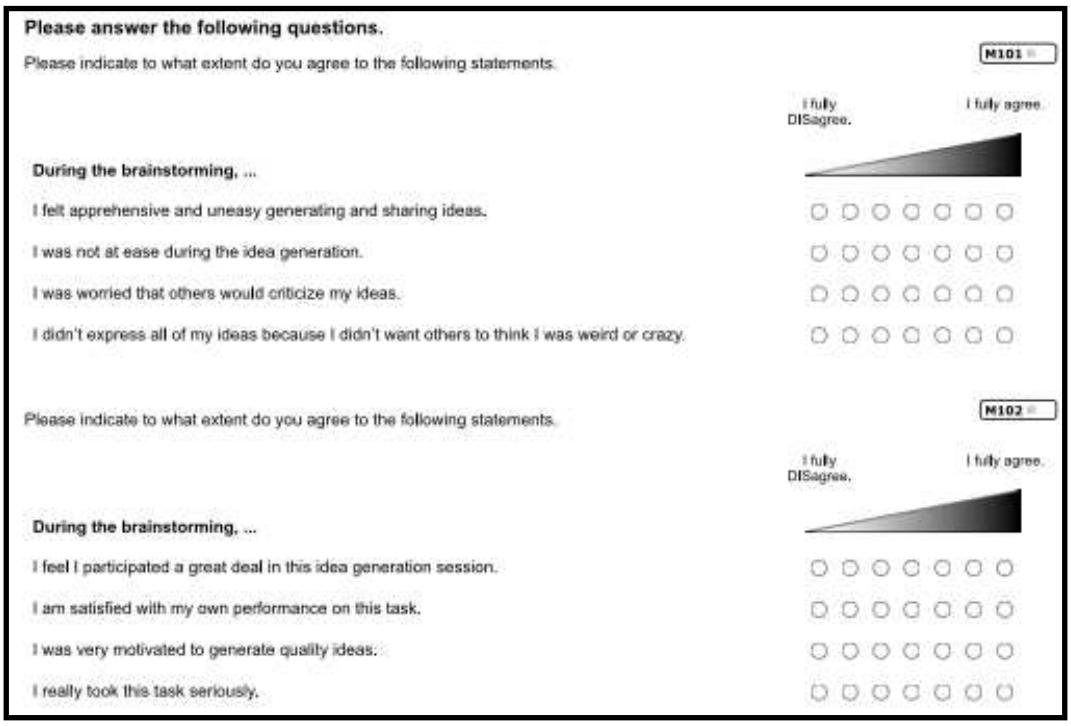
10.2.2 Appendix C: Selective Anonymous Treatment Condition

- If you provide ideas, your ideas will be evaluated and ranked anonymously.
- 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**, i.e.
- The description of each idea **will be revealed only if the idea 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%.**

10.2.3 Appendix D: Identified Treatment Condition

- If you provide ideas, your ideas will be evaluated and ranked anonymously.
- After the evaluation, **ALL information** from this brainstorming challenge **will be revealed** to other participants, i.e.
  - 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.**

10.3 Appendix E: Experiment post hoc survey



Please answer the following questions.

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

M101

	I fully DISagree.						I fully agree.
During the brainstorming, ...							
I felt apprehensive and uneasy generating and sharing ideas.	○	○	○	○	○	○	○
I was not at ease during the idea generation.	○	○	○	○	○	○	○
I was worried that others would criticize my ideas.	○	○	○	○	○	○	○
I didn't express all of my ideas because I didn't want others to think I was weird or crazy.	○	○	○	○	○	○	○

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

M102

	I fully DISagree.						I fully agree.
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 answer the following questions about yourself.

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

P103

	I fully DISagree.						I fully agree.
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.

P102

I see myself as someone who ...	I fully DISagree.						I fully agree.
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.	○	○	○	○	○	○	○

P101

1. Please indicate your gender.

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